

HERNIA, STRANGULATED AND REDUCIBLE.

WITH CURE BY SUBCUTANEOUS INJECTIONS. TOGETHER
WITH SUGGESTED AND IMPROVED METHODS FOR
HELOTOMY. ALSO AN APPENDIX GIVING A
SHORT ACCOUNT OF VARIOUS NEW
SURGICAL INSTRUMENTS.

BY

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WITH ILLUSTRATIONS.



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Dedication.

This work is most respectfully dedicated to JOSEPH PANCOAST, M.D., LL.D., the distinguished Emeritus Professor of Anatomy and Surgery in Jefferson College, Philadelphia, to whom belongs the honor of discovering the subcutaneous method of curing Hernia, and of being the first successful operator, as proved by the most careful researches.

And to SIR HENRY THOMPSON, M.D., F.R.S., etc., who is world renowned for his contributions to scientific medicine; for his operations for removing stone from the bladder, and for other difficult surgical manipulations upon the urinary organs; as a token of esteem for his great kindness and friendship towards the Author.

And to the late distinguished PROF. JOHN COLLINS WARREN, M.D., LL.D., etc., who will always be known as the EXACT teacher of Anatomy and Surgery in Harvard Medical School, and as the father of New England Surgery, in memory of his wise counsel and many kind words, which did much to advance the Author in the pathway of professional success.

PREFACE.

It has been the author's desire in placing the present work before the medical profession to do so in as concise a form as possible. There seemed to me great need for a work like the one now issued, giving a short sketch of the various operations for the cure of Hernia that are most worthy of mention, in order that the busy practitioner could refer to them without wading through whole volumes.

Much labour has been bestowed upon the little monograph, and very many authors consulted. I have striven, with the time at my command, to make a trustworthy work of reference on Hernia, although it is far from being as perfect or as extended as I should like. It will be found to contain much that is original with the author (the result of the study of Hernia for many years), and never before given to the profession in a printed form. Besides this will be found a condensation of many operations from the French, German, and English. A short Bibliography is given to indicate some of the work that has been devoted in previous years to the subject under consideration.

I am under many obligations to my very kind and generous friends in the profession, both in my own country and in others,

who by encouraging and cheering words have done much to aid me in accomplishing my task. I am under the most particular obligations to my son, Charles Everett Warren, A.B., Student in Medicine, and to my nephew, Willard Everett Smith, A.B., Student in Medicine, for the very great amount of labour and assistance they have rendered me in translating from the French and German, and in compiling these pages. Had it not been for their great interest and assistance I could not at such short notice have prepared the work.

To Messrs. Geo. Tiemann and Co., of New York, I am indebted for great assistance in the perfection of my various instruments, as well as for the loan of several electrotypes. Messrs. Codman, Shurtleff, and Co., of Boston, also supplied several electrotypes, and Dr. Codman has furnished me with an article on trusses.

I am also under obligations to Messrs. Weiss and Son, London, who so readily conceived my ideas in regard to a lithopaxy tube, and other instruments of great beauty and finish.

In conclusion, I would gratefully acknowledge the favour received from Prof. G. Dowell of Texas, and Dr. H. D. Marcy of Cambridge, Mass., whose operations are inserted in the body of the work.

I would express great obligation to Sir Henry Thompson for the favour which he showed me in allowing me to witness his operation for lithopaxy a number of times, and by explaining his operation and instruments to me; also I am grateful to Thomas Bryant for his great kindness to me in allowing me to use illustrations from his work, and for affording me

an opportunity to operate on Herniæ before a number of surgeons at Guy's Hospital.

And also to my very kind friends Dr. Brown Séquard of the College of France, who recommended me to the Academy of Medicine; to Dr. Alphonse Guery, Surgeon to Hôtel Dieu, who very kindly presented me, and explained my instruments more fully at the Academy; and to Dr. Blum, Surgeon to the Hospital Beaujon, who kindly assisted me in my demonstration of the operation for Hernia and other operations with the new instruments of my devising.

PREFACE TO AMERICAN EDITION.

My labors and efforts in developing the operations contained in this book, for the subcutaneous method of curing Hernia, as in perfecting the various instruments for the Uterus and Urinary organs, have been so well and flatteringly received in Europe, where no few compliments and praise was conferred upon the author in public and in private, as well as by personal letters, that I am, after such endorsement and recognition, greatly encouraged to present to the American profession my studies in this direction.

I present not only my own method of operating, but also the operations and observations of others, endeavoring to give them in as concise a form as possible, and to award credit wherever there seemed to be merit. It will, I think, be seen that I have not attempted to advocate my own peculiar views to the exclusion of other surgeons, but to present all fairly for the reader's consideration. I am now making a study of the pathological and microscopical appearances produced in connective tissue by the various fluids that have been used for injection as a cure of Hernia.

I thank the profession for having received so liberally my previous writings upon the subject of Hernia. It will give me pleasure to demonstrate, when opportunity presents, not only my method of operating for Hernia, but, also, for the removal of stones from the bladder by new and improved instruments, which, I think, I can show greatly facilitate the operation, besides giving greater safety and ease to the patient than has hitherto been possible. At no distant day I hope to lay before the profession my labors in this very interesting branch of surgery.

Since the publication of this book in London, I have received information that warrants me in giving the credit of the discovery of the subcutaneous method of curing Hernia to the operator, to whom, I think, the profession will join with me in agreeing that it legitimately belongs. See Dedication and Appendix.

JOSEPH H. WARREN, M D.

51 Union Park,
Boston, Mass

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HERNIA.

INTRODUCTION.

IN presenting to the profession this operation for the cure of Hernia by injection, I am well aware that I shall meet with some rebuffs and prejudice. This has always been the history of every new or important surgical operation; and in some aspects it is well that it is as it is. We have only to recall the history of ovariectomy to substantiate this statement most fully. When McDowell performed his first successful operation he was looked upon by the profession as rash and inconsiderate in the extreme to propose such a preposterous idea as the removal of the ovaries. If we refer to the earlier operators and writers on ophthalmology, we find that no suggestion for the removal of cataract was well received at first, and that it has been only by perseverance and success, obtained by a conscious honesty and sincerity that the operation was all that was claimed for it, that every similar improvement in surgical art has been attained. The same can be said of the operation of removing stones from the bladder, of which Sir Henry Thompson has become a world renowned authority. If such has been the history of our art, how can any one hope to present to notice anything new and not expect to run the gauntlet of professional criticism and opposition? It is in full knowledge of all these prejudices and

the severe criticism to be met, that I, after mature consideration and reflection, now make my best endeavours amid the cares of a general practice to present to the medical profession an operation which I esteem worthy of most careful study and its confident adoption. If by ovariectomy thousands are yearly relieved to the prolongation of their lives, by the operation which I present millions can be not only relieved but cured.

“Droit et Royal,” our family motto, rightly expresses my spirit of truthfulness and candour in freely offering to the profession this operation, with all my instruments, to the end that if my humble endeavours to aid the advance of scientific medicine and surgery shall be of any avail, all may redound to the glory and credit of the profession, and not to the selfish aggrandizement of any individual.

Soon after the proper test had been made of the efficacy of the operation for Hernia by injection, Dr. Geo. Heaton, leaving the West, came to Boston and began the practice of medicine in that city, celebrated for the high attainments of its professional men of *all* arts as well as for the special high order of all the thinking men who have prominence in any range of life. Flushed with youthful pride at what he naturally and justly thought to be a complete revolution of practice upon this great human malady, Dr. Heaton moved immediately to bring out his operation more fairly to the medical profession. There are those who will no doubt remember that he was not much more than courteously received in his first advances to the gentlemen of the profession. The operation that he described was so simple, so painless in comparison with the older methods, and so perfectly and concisely stated, that the practitioners were loth to believe that an operation so trifling should be so effective as he described it. Those whom he had invited to attend and witness his operation did not consider

it worthy of their attention, and with some coolness of manner did not hesitate to show such feeling; this too, in spite of the fact that it had already become known that the discoverer had effected cures on a number of patients. Not disconcerted, Dr. Heaton went to London, taking with him the *secret* of his invention, determined, in view of the treatment he had received, to give it to the old world, and let it reach the new, if it did, without either his assistance or his favour in any degree beyond his own practice. Sir William Fergusson became deeply interested in the operation. The London profession received him with great cordiality. He was, immediately at the topmost round of professional skill, and his fame began to spread. He soon became Fellow of the Royal Chirurgical Society of London, of the Westminster and London Medical Societies, and later of the Parisian Medical Society of France.

Upon his return to his native country the same prejudice he had first met awaited him. This was heightened by the anomalous position he had resolved to occupy in the profession. Although a regularly accepted member of the Massachusetts Medical Society, he resolved to practise his operation as a *secret*, both in principle and details known only to himself. Although I shared with the rest of the profession in this opposition to the method he took of keeping the operation to himself, if there was any good in it for the amelioration of human sufferings, still I have since had reason to believe that much injustice has been done to his motives. He was young when first he came to Boston, he did not fully appreciate the conservativeness of New England life, he was sensitive in his nature, and he keenly felt the slight put upon him, at that time an unknown operator. Instead, however, of excusing these fancied wrongs, he nourished them so that they gained renewed acuteness as the years went by. Finally he reached such a state of rebellion and self-confidence that he would never acknowledge he had

a failure, although many of us knew that his success, grand as it was, was not by any means perfect.¹

The principles of this operation given to the profession in Heaton's work on Rupture, I at the death of the discoverer assumed. I, now conscious of the imperfections of manner in which I present it, offer this operation as I have scientifically improved it for your favourable acceptance. If all as many as see fit to adopt the method of operation will keep faithful records of their results in a spirit of fairness, we may hope, if circumstances warrant, to produce in some future edition of this work more systematic and conclusive results than we can in a spirit of truth do now.

With this distinct understanding, that I do not wish to exaggerate, to deceive, or to be deceived, I beg you to receive and to weigh well whatever I shall say upon the method of subcutaneous injection into the hernial rings for the cure of Hernia, trusting that if there still remain theoretical doubts in the minds of any, time and experience will clear them away.

I hasten the more to present this work upon Hernia to the profession, because I am painfully aware that many who have heard the method of subcutaneous injection have held such woefully mistaken ideas as to the nature and results of the operation, to say nothing of the culpable mistakes in regard to the manner of performing it.

Although not wishing to be understood as defending Dr. George Heaton in his position towards the profession, and the Hon. Committee of the American Medical Association that was

¹ How perfect it was we had no means of knowing, yet many of us were all the time conversant with the fact that we had patients under our care that apparently had been cured by Dr. Heaton. I myself knew of many of his successful cases before I became personally acquainted with the operator.

sent to him, yet in justice to the deceased, and to give the grounds of justification which he took, I will here reprint his Review of the Report of the Committee that waited upon him from the Association to ascertain his method of operation. This will be of interest to the profession in Europe, and especially to the younger members, as it gives a short history of Dr. Heaton and of his operation of subcutaneous injection for the cure of hernia :—

“ A Committee appointed by the American Medical Association, to investigate the subject of the permanent cure of reducible hernia, having made a report on the same, wherein they come to certain conclusions, which a long and extensive experience in the treatment of hernia has convinced me to be unsustained by facts, and make a certain statement in regard to me which is not true, basing thereon some reflections alike unwarrantable and unworthy of honourable men, I am induced to submit the following review of the Report to the consideration of the profession.

“ Before considering the subject matter of the report, I will notice briefly the particular portion which the Committee have seen fit to devote to me.

“ In speaking of certain communications received by them from various sources, they say :

“ ‘ The writer of the fourth letter, George Heaton, M.D., of Boston, has devoted himself pretty extensively to the treatment of reducible hernia, and had given notice to that effect, from time to time, for some years, in medical and other publications. . . .

“ ‘ The Committee, therefore, *sent him not only a copy of the questions which they had addressed to the profession at large*, but they also wrote him a private note, couched in the most respectful terms. To this he made a courteous reply, but, at the same

time, declined giving the information sought for. Not content with this, he caused the note addressed to him, and his answer, to be printed in several newspapers, which has, in our opinion, given him a notoriety, wherever the transaction is known, of a very unenviable character.

“It is certainly an unusual course for a member of our profession to conceal from his brethren any method of treatment which he may regard as more valuable than those in common use; and it is clearly one which cannot be too strongly reprobated by all honourable and high-minded men.

“In this, there are two sources of complaint—the publication of their letter to me, with my reply, and my refusal to make them the medium of communicating my discovery to the world. The latter point I will discuss anon. I will only say of it now, that I feel myself fully competent, and imagine I have the right, to make known any discoveries that I may make, without the aid of any other man or committee of men, at such time, and in such way, as may be convenient to me.

“The statement of the Committee, in regard to the publication of our correspondence, grossly misrepresents the whole matter, and conveys a totally wrong impression.

“I will state the case briefly, and let the profession draw their own inferences.

“The Committee assert that they sent me, in the first place a copy of the questions which they addressed to the profession at large.

“Whether such a copy was sent to any or every other member of the profession, and if so, at what time, I know not. Nothing of the kind was ever sent to me; and it was not until after I had rendered doubtful, by my reply to their note, whether I should communicate my discovery through them, or not, that these questions were published in the Boston daily journals, addressed to the profession and public at large. The only

communication I ever received from the Committee, was the following:

“ BOSTON, Oct. 30th, 1851.

“ DEAR SIR:—The undersigned are a Committee of the American Medical Association, to prepare a report on the “Radical Cure of Hernia.” Being aware that you have given much attention to this interesting branch of surgery, and learning that your method of treatment has been attended with a great degree of success, they are desirous of ascertaining from you what is the precise mode you adopt, and what has been the general result.

“ They trust that you will readily communicate such information as may aid them in the performance of the duty assigned them by the Association, and a compliance with their wishes at your earliest convenience will be gratefully felt and acknowledged by your friends and humble servants,

“ GEO. HAYWARD,

“ J. MASON WARREN, } *Committee.*

“ S. PARKMAN.

“ GEO. HEATON, M.D.’

“ Although I was unable to see the propriety of a request on the part of those who did not profess to know anything of any practical value of a subject, to obtain from one the results which patience, perseverance, and years of hard study had afforded him on the same subject, merely that they might be the medium of heralding his discoveries to the profession, and considered their supposition, that I would readily accede to their request, as an hypothesis which neither they nor any other reasonable man ought to entertain, I still concluded, considering the very courteous manner of the Committee, to give their request due consideration. After having done so, I submitted to them the following reply, some two weeks or more after I received their note.

“**BOSTON, Nov. 17th, 1851.**
No. 2, Exeter Place.

“**GENTLEMEN** :—Your note of the 30th ult., requesting me to communicate to you the precise mode I adopt for the radical cure of reducible hernia, in order to assist you in making out a report, in compliance with the wishes of the American Medical Association, was duly received.

“I at once took the matter into consideration, and determined to comply with your polite request. Upon more mature reflection, however, I found that it would be very difficult, if not impossible, for me to do so, and at the same time do justice to myself and the subject, in the limited time allowed me.

“I have devoted, as you are aware, many years to the careful investigation of this important branch of surgery, and have, I am happy to say, discovered a safe and certain method of curing a complaint which has so long baffled the skill of our profession.

“But, knowing that so many surgeons of eminence have so far convinced themselves of their ability to cure the disease, that they have actually published to the world their particular modes of operation—no one of which, however, has outlived its author—and, on the contrary, knowing that many, by prematurely thrusting their supposed discoveries upon the profession, have not only brought upon themselves censure, but even ridicule,—I determined, even long after I had satisfied myself, and verified my theory, by hundreds of successful cases, that it should be subjected to the more convincing test of time, and consequently delayed publishing it to the profession.

“After long deliberation I decided that I would either publish the matter through a paper, or more at length in a volume, and finally had determined to follow the latter course.

“If I shall determine to publish, as preliminary to my work, a paper on the subject, I shall be most happy, gentlemen, to

make you the medium of communication. In the meantime, hoping that you will excuse the delay I have shown in replying to your note, and thanking you for your kind recognition of my claims, I am your friend and humble servant,

“GEORGE HEATON.

“GEO. HAYWARD, M.D.,
 “J. MASON WARREN, M.D.,
 “S. PARKMAN, M.D. } *Committee American Medical Association.*

“It was after I sent them this reply, that certain questions appeared in the daily journals, addressed, seemingly, to the medical profession, but virtually, like everything else in a public journal, to the public at large.

“The Committee, all Boston men, knew well, and the public knew well, that I had been attending for some ten or twelve years to the radical cure of hernia, and also as the Committee admit, that my method had been attended with a great degree of success.

“After having requested me, then, to make to them an *expose* of my peculiar mode of treatment, and having obtained what they deemed to be my refusal to do so, with my reasons assigned, (which they have, however, carefully, and most inexcusably, kept out of their report), they appealed through the daily press to the public.

“Now what, I ask, would be the inference which any man unacquainted with the whole truth of the matter, would draw from reading an appeal from eminent physicians, through the columns of a newspaper, desiring to be furnished with data,—if any such there were,—bearing on the radical cure of hernia? Manifestly, that there was no cure for hernia known.

“Should I, then, suffer so false an impression to be spread abroad, when I had professed, for years, to cure hernia? When

the public, or a large portion of it, at least, had understood that I did? When the medical profession throughout the country, and some of its leading members in Europe, understood it? When the very members of this Committee not only knew it, but knew of its great success?

“Did the Committee suppose, when they published those questions, calculated to brand me, in the eyes of those who read them, as an imposter, and all my pretensions, for ten years, as quackery, that I would neglect to notice them, merely to gratify an unwillingness on their part, to have what they pretended to be their honest sentiments made known? That I would disregard my own welfare, and that of those dependent on me, merely for fear of some imaginary breach of the laws of etiquette? If they did, they must have supposed me to be destitute of the very common and necessary instinct of self-defence, or, at all events, to be a very different person from what I am. I can assure them, that had their note been of a private nature, as it in reality was not, it would have been given to the public under like circumstances.

“The note contained, as I supposed, their honest sentiments; and, although containing nothing of a private nature, as any one may see by referring to it, would still have been cheerfully kept private, had not their course afterwards obliged me to publish it as a matter of self-defence. It was the only means I could adopt to destroy effectually the false, and to me fatal impression, which their appeal was calculated to produce. If they did not mean what they said in their note,—if it was only an ingenious trap to catch an unsuspecting victim, they may have reason to regret its publication; but not to charge me with any breach of professional or other etiquette. I repel any such imputation as an ill-disguised sophism to conceal a more ill-disguised feeling.

“As to the opinion of the Committee, that the transaction,

wherever known, has given me a notoriety of a most unenviable character, I must beg leave to differ from them entirely.

“As far as I can judge, from conversation with distinguished members of the profession, and from communications received from all parts of the country, immediately after the publication of those letters, the notoriety which accrued to me was eminently of an enviable character; if, by envy we are to understand (as the Committee seems to) the desire on the part of one person to come into the condition of another.

“The majority of the profession, and the public generally, probably neither cared nor thought anything of the letters themselves, or of the circumstances of their publication, any further than as they were the vehicle of conveying the announcement, that a new and valuable discovery had been made in surgery. The notoriety in question, seemed to me to be precisely that which would attach to any author of a discovery which had been confirmed by scientific men.

“It was such, for example, as accrued to the discoverer of the anæsthetic power of sulphuric ether, after its value had been attested by this Committee and others, at the Massachusetts General Hospital. And the opinion of the Committee on the particular mode in which this discovery was made known to the world, is of as little interest or consequence to the profession and the public, as the almost endless discussion known as the ‘Ether controversy.’

“The welfare of mankind being of so much more consequence than the laws of etiquette, men do not stop to inquire whether these latter have been fully observed in making a valuable discovery known.

“An engineer announces that he has discovered a mode of substituting heated air for steam, in the propulsion of machinery. It is immaterial to the public whether the gentleman consulted

his fellow engineers and mechanics, or not, so long as it has faith in the genuineness of his discovery.

“The opinion of the Committee, on this point, I deem to be false; and, whether false or true, of no value whatever, and totally out of place in a report purporting to treat of the radical cure of hernia. The relevancy of the laws of etiquette to the approximation of the pillars of the abdominal ring, the true point to be discussed in such a report, I have yet to learn.

“The Committee assert that ‘it is an unusual course for a member of our profession to conceal from his brethren any method of treatment which he may regard as more valuable than those in common use.’

“Without being the apologist or defender of selfishness, as exhibited by the medical or any other profession, I doubt the truth of the assertion as a general one. It is an adage, almost an axiom, that every physician makes his own theory and practice.

“The evident and immediate consequence of this is, that there are as many different modes of treating diseases in general (there are exceptions of course) as there are physicians. Another fact, with which we are all acquainted, and which has always been the standing reproach of the profession, is the jealousy, almost proverbial, which exists among its members. The origin of this feeling is not, it is true, to be charged upon physicians themselves, but probably to that disposition or desire on the part of patients or their friends, in critical or difficult cases, to change their medical attendants. The effect of it is, to induce them to study out more carefully than they otherwise might, successful modes of treating disease; and while they would not withhold from the profession or public the matured results of their careful experience, they do not feel called upon to pause from their labours at the command of every tyro, until he shall be instructed equally with themselves. Physicians, generally, do

not fling this as a reproach at each other, but consider it a merit rather. Complaints, if they ever do come, emanate from those who, having become independent of their profession, have time to instruct, in their peculiar ethics, their less fortunate brethren, since they are not likely to be called upon to act up to them. The '*high-minded and honourable men*' of whom the Committee make mention, I have too often found to be those, who, by an illustrious name handed down through a long line of ancestry, or by a competency of the means of subsistence, which has come to them over the same royal road, are independent of the labours to which other men are subject, and can, from their position of leisure, launch their darts at their more laborious brethren with impunity. So far from fearing to lose the esteem of such men, I am quite willing to be the object of their reprobation.

“ I do not wish to be understood as basing the defence of my position on any ground of expediency, but, as the Committee have taken the liberty to decide summarily certain points which are, at least, open for discussion, I have presumed to differ from them.

“ In my course, I profess to have followed no authority or precedent whatever, but to have been governed by my own idea of right, and the course I have taken is so in accordance with my own convictions of duty, that nothing would have induced me to swerve from it.

“ There is another fact, of which, however insignificant in itself, as it involves a point of etiquette, the profession may as well be informed.

“ The Association, as I am told by one who was present, appointed the Chairman of this Committee alone, giving him the privilege of selecting two others as associates. Now one would suppose, *à priori*, that in such a case, if there was one particular member of the profession whom the chairman knew to have

devoted more time than anyone else to hernia—whose mode of treatment, practised daily for years, he knew had been attended with great success,—he would, out of mere regard for professional courtesy, have selected this individual as an associate, instead of choosing one who, however otherwise distinguished as a surgeon, knew nothing more of the matter in question than he himself knew, and then, having completed his body corporate, turn deliberately to the individual whom he acknowledged to be the depositary of all the facts of any value not already known, and request him (very politely indeed) to make an *exposé* of his 'precise mode' of treatment, and a general history thereof, in order, forsooth, that these three individuals might have the privilege of communicating it to mankind.

"Verily, the Committee must either have regarded me as totally incapacitated for communicating my discoveries to the world, or as too modest to make them known without the aid of an interpreter, to neither of which hypotheses, I must say, do I plead guilty.

"The charge of a want of philanthropy on my part, (which I conceive to be the essence of what the Committee recommend to the reprobation of honourable and high-minded men,) from their own admission, is reflected directly back on themselves.

"They admit, without any qualification, that they have learned of the great success of my operation in the treatment of hernia, and yet not one of the Committee, that I am aware of, ever sent or even recommended a patient to me.

"Whenever patients of theirs have consulted me, it has been of their own accord, or at the suggestion of some friend; never by the advice of the physicians themselves in the outset.

"In cases where they have informed their physicians beforehand, that they were about to place themselves under my care, the former have, indeed, condescended to assure them (as the

patients themselves have informed me) that 'Dr. Heaton has had much experience in the treatment of hernia, and they would undoubtedly be safe in his hands.'

"Most of my patients from out of town have been sent to me by their physicians. In a majority of cases, these physicians have had no more to rely on than the mere announcement through a medical journal, that I treated hernia; yet, on the bare peradventure that I might cure it, hundreds have been thus recommended to my care.

"If the Committee were aware, as they assert they were, of my great success in treating hernia, it certainly would have been the truest philanthropy on their part (according to any plausible definition of the word philanthropy) to recommend the afflicted to one 'in whose hands, from his long experience in the treatment of hernia, they would undoubtedly be safe.'

"I will give a brief history of my experience in the treatment of hernia,—of the encouragement and discouragement with which I have been favoured by sundry of my professional brethren, and let those who are ignorant of the matter draw their own conclusions as to who is in the right and who in the wrong.

"As the Committee have much to say of the operation by injection, the value of which, in my opinion, they exaggerate entirely, and the origin of which, whether accidentally or intentionally, they attribute to the wrong source, I will give the true account of the origin and value of this operation; from which, I will premise, two conclusions will be obvious, at variance with those to which the Committee seem to have come.

"First, that Dr. Pancoast is not the originator of the operation by injection; that I performed it, and described it to my friend Dr. Mott, of New York; and, moreover, that Dr. Jayne, of Illinois, had invented an instrument for performing said

operation, and secured letters patent on the same some two years before Dr. Pancoast, according to his own account, made any experiments with it. Secondly, that the subcutaneous operation by injection of the hernial sac, is neither a simple nor advisable operation; that, although successful in many cases, if rightly performed, the difficulty of performing it without bad consequences ought to condemn it entirely.

“My attention, with that of Dr. Hart, of Alton, Illinois, was first directed more particularly to the operation by injection of the sac, for the radical cure of hernia, by Dr. Jayne, who had invented an instrument for performing such an operation, and before coming to us, had, in the year 1840, secured a patent on the same.

“Having at that time under our care several cases of reducible hernia among the convicts in the Penitentiary at Alton, we immediately set about testing the value of the operation on the persons of these, and also on that of some of the blacks at St. Louis. The operation consisted in injection of the sac subcutaneously with an irritating fluid, by means of the instrument before mentioned. In the selection of a fluid for the purpose, Dr. Jayne gave the preference to some one of the essential oils, using now and then tincture of cantharides. In my first operations I used also the essential oils, but soon abandoned them for the tincture of iodine. I believe, therefore, that I performed the operation of injection with iodine, of which so much has been said, before any other man.

“Before our experiments, the operation of injection by the subcutaneous method had never been performed either in this country or in Europe. At least no report had been made of any such operation, and there is no reason to suppose that it had ever been undertaken.

“With the success of these experiments we were much elated, and felt that the desideratum for the radical cure of hernia had

at length been discovered. Subsequently, in November, 1841, I communicated the result of the operation to Dr. Valentine Mott, of New York. He expressed himself highly pleased with it, and made a complimentary allusion to it in his lectures before the University.

“In the spring of 1842 I came to Boston, where I had concluded to remain, and make the treatment of hernia a speciality. Having obtained an introduction to the leading members of the profession in Boston, and particularly to the surgeons of the Massachusetts General Hospital, I informed these latter of my intention, and offered to operate in their presence, on any case or cases which they would furnish me, and let them see the result, knowing well that such cases were continually coming under the notice of physicians, and were probably always to be found in the hospital. No notice was taken of this offer; no cases were furnished me.

“Although I considered that I was under no obligation to those who had shown such entire want of what I believed to be common courtesy, I still, some six months after this, when I had, through the kindness of a medical friend, obtained several cases of reducible hernia, addressed the surgeons to whom I had made my original proposal, and other members of the profession, a polite note, inviting them to be present and witness me operate for the radical cure of hernia. Most of those invited were present, and witnessed the operation. I felt then that I had done my part, that I had cleared myself, at all events, of the liability to a charge of a want of professional courtesy; and from that day to the present I have taken an entirely independent course.

“Feeling that these men, not only by the total want of encouragement, but the complete discouragement which I had received from them, had forfeited all right to expect any further advances from me, I resolved to rely entirely on my

own individual effort for success, and in spite of the frowning, discountenancing, nay, the very direct opposition which the would-be leaders of the profession here have shown me, I have so relied to this day, and thank fortune that I have leaned on no broken reed.

“So much for my course, on which the Committee have seen fit to reflect so severely. I will only say in addition, that such reflections ill come from the very ones from whose want of courtesy and good feeling the course which they reprobate was entered upon.

“The operation by injection, in many cases so satisfactory and apparently so permanent, in others was not so. Frequently it required to be repeated several times on the same individual, and in all cases the utmost care was required in its performance to avoid troublesome consequences, as, I understood, those of the Committee who undertook it found out.

“Becoming dissatisfied with this operation, and having already, in the course of my investigations, tested every principle of any degree of plausibility which had been suggested or relied upon by operators in times past, for the cure of hernia, with no satisfactory results, I felt that the only hope of a permanent cure in all or in a majority of cases of hernia, lay in some *modus operandi*, the effect of which should be an approximation of the pillars of the abdominal ring, or a closure of the tendinous openings. For a long time, therefore, I conducted all my researches with a view of getting at some principle which would enable me to accomplish this.

“These researches, in which of necessity I was obliged to rely almost entirely on theory alone, did conduct me, I am happy to say, to precisely such a principle; a principle on which I have based a mode of treatment and operation which closes effectually and permanently the various openings through which hernial protusions take place. Not only, indeed, does it

do this, but in those cases where, from a general weakness resulting from the extreme delicacy of the textures connected with hernia, or a thinness, as it were, of the *parietes abdominales*, there is a positive predisposition to the complaint, I have found that it rendered the part firmer and better able to resist pressure than in its original condition.

“In such cases, where there has been a recurrence of hernia, I have almost invariably found it occurring at some other opening. Thus, when I have cured a person of oblique inguinal hernia, and he has afterwards, from a fall or violent strain, brought it on anew, it has proved, almost without exception, to be direct inguinal hernia.

“The Committee are aware, and every physician who knows the anatomy of the parts thoroughly must be aware, that any operation for the radical cure of hernia must be, at the best, a delicate operation, and an operation which an unskilful or unpractised hand would undertake with no little hazard. And yet it might be an operation, the apparent simplicity of which would strike any one ignorant of the complicated anatomy of hernia, the vital organs and vessels involved therein. The history of the attempts at the cure of hernia furnishes, we all know, a series of catastrophes perhaps unequalled in the annals of any other branch of surgery.

“Such is the frequency of the complaint, the alarming condition which it so often assumes, and to which it is always liable, and the readiness with which men submit to any operation likely to cure it, that it has always furnished a broad and fruitful field for the labours of quackery and imposition.

“Suppose, then, an operation against which scepticism, from a high quarter, has already directed its attacks, should be announced to the world, the apparent simplicity of which were its obvious characteristic. What, according to the reason and experience of every physician, would be its probable destiny ?

It would be undertaken by surgeons of every grade of capacity, by quacks of every grade of villany. With the more skilful and more experienced of the former, it would probably be attended with success. With those of less experience and manual skill, it would undoubtedly be condemned, not from its own deficiency, but simply from their inability to perform it.

“The attempts of the latter class would, in a majority of cases, prove most unfortunate, if not fatal to those who might fall into their hands. All the evil results would be attributed not to their true cause, the fact of a man’s undertaking what he is not competent to perform, but unquestionably to the operation itself.

“That this is not all theory I think I have letters in my possession to prove. I have been applied to from various parts of the country, through letters, by non-professional men, desiring to obtain from me, by payment or otherwise, my mode of operation; and by persons whose very letters show their entire ignorance of hernia, and their utter incompetency to undertake so difficult a branch of surgery as a profession.

“It is this class of reckless experimenters who would eagerly seize an operation apparently simple, which promised to cure a complaint so universally prevalent as hernia, and whose efforts would, in a very short time, condemn both the operation and its author to inglorious oblivion.

“I am not so destitute of foresight as to run any such risk in making haste to publish a discovery of mine. Although satisfied early of the value of my operation, I determined not to give it to the world until its success should have placéd it beyond the reach of cavil or scepticism. Such was the ground I took in my letter to the Committee, and such is the ground on which I defend myself from the unjust and dishonourable reflections in their report.

“But, setting aside all apologies and extenuations, how the

Committee can so ignore the indisputable right which every man has to make known a discovery he may have made in science, at such time and in such way as he may see fit, is beyond my comprehension. It is a right which, if we have any rights as individuals, is so evident, that any man or any society that shall attempt or pretend to override it, certainly lays itself open to the charge of an unwarrantable assumption of authority.

“The Committee have presumed not to form an opinion only—which of itself would be of no consequence,—but, on the ground of that opinion, to base certain reflections for the public ear, when the very premises on which alone a correct opinion may be formed are entirely unknown to them.

“A man may, for the very best of reasons, keep a certain discovery for a time to himself. It may be necessary both for his own safety and that of the discovery itself. Nay, the case is supposable, and even probable, where it may be the part of the highest philanthropy for him to do so.

“A surgeon, for example, from long experience in performing a very delicate operation, for an ever-varying and always complicated complaint, may have so disciplined his sense of touch, and have acquired such delicacy of manipulation, that he can detect those peculiarities, whether anatomical or abnormal, a knowledge of which is absolutely essential to the successful treatment of the complaint, and adapt his mode of treatment to the Protean phases it may assume. This faculty, acquired only by long experience, he knows he cannot communicate to another; yet on it the success of his operation mainly depends. The mere description of the operation he may give to any one; but in the hands of other men it is very sure to prove unsuccessful. In this want of success he of course must share, until finally the operation is condemned, merely because other men lack the ability to perform it.

“Yet, according to the Committee’s theory of condemnation, the very course on the part of the surgeon which would secure to humanity the benefit of such an operation, is not merely to be found fault with, but actually held up to the reproach of all honourable and high-minded men.

“The absurdity of such a judgment, on the part of sensible men, is to me so manifest, that I deem it almost an insult to common sense to expose it; and had they seen fit, in their report, to have stated their own private opinion in regard to my course, although it must have been entirely without foundation, it might have remained on record undisturbed; but as they have gone still further, and founded on this baseless opinion certain reflections derogatory to my character, I cannot refrain from holding up so dishonourable, if not libellous an attack, as eminently worthy the reprobation of every true gentleman in the profession and community. I find nothing generous, nothing manly in such an attack. Indeed, what I have done to merit it I cannot divine. I am not aware that I ever intentionally insulted any one of the Committee. If my course has not been such as comes up to their idea of philanthropy, they may in their hearts pity my want of humanity, but never, while I am not doing evil to my fellow men, upbraid me publicly. I flatter myself, however, that I feel quite as tenderly for those suffering in mind or body, as they do. I think I might descend to the same acts of charity and self-sacrifice. In the faculty of deliberately attacking a fellow physician who is pursuing the even tenor of his course, and perchance doing good in an humble way, without interfering in the least with others—of attempting to undermine the reputation which years of steady industry may have afforded him—I yield the palm most willingly to the Committee, and trust they may find quiet repose on such laurels. I must inform them, however, that denunciation founded on mere surmise, from however lofty a source it

may emanate, and however well it may answer as an apology for the meagreness of a report, is not likely to be digested as truth by the generality of men of sense and honour.

“ After expressing their acknowledgment to the few physicians who have furnished them with the results of their experience in the treatment of hernia, they assert that they have not obtained all, in this way, which the Association had a right to expect. Just how extensive may have been the expectations of the Association, in fact, just whom the Committee mean by the Association, it is not easy to tell.

“ I understand the American Medical Association to include all regular physicians in the country. A majority of these, probably, had no expectation whatever in regard to any of the reports of the various committees.

“ Those who might have had any in regard to that of the Committee on hernia, imagined, I presume, that this Committee themselves had something extraordinary which they were anxious to divulge, and were not to furnish a report of various unsuccessful attempts to cure hernia, already made known to the profession over and over again, by their authors and others treating on hernia, and without exception abandoned as failures. That surgeons of high standing should presume to fill out the pages of a report with an exposition of operations of such notorious worthlessness and barbarity as those of cauterization, ligature, suture, invagination, &c., was more than the Association had reason to expect or desire. It certainly was to be hoped, for the honour and welfare of the medical profession, that such operations, already expounded and exploded *ad satietatem* one would suppose, might never again be dragged out from their obscurity, and paraded before the profession and public to increase a prejudice, already sufficiently strong, against physicians, but might be permitted to rest in peace, as sad monuments of the rashness and complete disregard of life of

which scientific men may be guilty. Had any troubled themselves to think of the matter beforehand, they would, of course, have seen that had a particular individual anything really new and valuable in regard to the treatment of hernia, he would be far more likely to make it known *per se* when he saw fit, than to take advantage of even so distinguished a medium of communication as this Committee furnished.

“The interest created among physicians in general by their appeal, seems to have been by no means commensurate with the Committee’s expectations. From the entire medical profession throughout the country, (exclusive, I suppose, of the Canadas and Mexico,) seven only have thought it worth while to furnish them with communications, the value of which may be inferred from the fact, that the sweeping conclusions at the close of their report condemn them without mercy or apology.

“Their language seems to imply that, in their opinion, many physicians have kept back valuable information which they had a right to expect; and I only wonder, considering the particular notice they have taken of one individual for his inexcusable reserve, that they did not condense their indignation against all these other imaginary delinquents into, at least, one general sentence of condemnation.

“At the close of their report are three conclusions, which seem to contain the sum and substance of their efforts to perform the duty assigned them by the Association.

“As I presume I have had more experience in the treatment of hernia than the Committee and all those whose communications they give in their report together—having, as far as I can learn from the published accounts of their experience, treated and cured a hundred cases where they have attempted one—I shall take the liberty to examine these conclusions critically.

“They are as follows :

1. “There is no surgical operation at present known which

can be relied on, with confidence, to produce in all instances, or even in a large proportion of cases, a radical cure of reducible hernia.'

"This conclusion I, of course, affirm to be false *in toto*. I assert that there is a surgical operation which can be relied on with confidence, to produce a radical cure of hernia, not only in a large proportion of cases, but in all cases which one could reasonably expect to be cured; and I am ready to prove the assertion by referring the sceptical to five hundred cases,¹ or more, if they choose, including those of almost every degree of severity, exhibiting the complaint in nearly every form, which, it seems to me, it is possible for it to assume, and as it occurs in those of every age, from the infant of nine months to the adult of seventy years,—treated and radically cured by this operation.

2. "That they regard the operation of injection by the subcutaneous method, as the safest and best. This will, probably, in some cases produce a permanent cure, and in many others will afford great relief.'

"As this conclusion is entirely empirical, I suppose the one who has had the most extensive experience with the operation may be permitted to decide upon its merits. As to its being the safest and best, I will only say that I think it neither safe nor well for the Committee to recommend it in any such terms. Certain it is, that in the hands of inexperienced operators it is very far from being a safe operation; in the hands of none, whether expert or not, is it the best. The second portion of this conclusion is of no consequence. The same might be said, with equal truth, of the obsolete operations of cauterization, invagination, the royal stitch, and various other barbarities which the humanity of modern surgeons has condemned. No one doubts that in some cases they did produce permanent cures, while in many

¹ I have given a few examples of these as an appendix to this Review.

other cases, the relief afforded by them was certainly permanent and final as to all troubles of the body.

3. "That compression, when properly employed, is, in the present state of our knowledge, the most likely means of effecting a radical cure in the greatest number of cases."

"As to compression as a curative agent, twelve years' experience in the treatment of Hernia has led me to a different conclusion entirely. As a remedial agent, as an agent essential to the safety of those afflicted with Hernia, before they are radically cured, I do not wish to detract from its value. That now and then persons are cured by means of compression, is not to be denied. But as a curative agent in general, it is not to be relied on at all.

"I have known, and so have the Committee, in all probability, the most favourable cases to have received almost perfect compression, from well-constructed trusses, and that, too, for a period sometimes of twenty years, without having their aspect changed, unless for the worse, in the slightest degree.

"There are some other points in the report deserving criticism, and some not connected with it, which I may have occasion to notice at a future time. In what I have said, I may have shown feeling, perhaps too much. My apology is, that I have had to defend what I know in my heart to be an honourable course, against an uncalled for and unjust attack, which would represent it only as dishonourable, but as worthy the reproach of honourable men. Engaged in defence of character, I have spoken decidedly. I have no disposition to offer insult, and cannot brook it, come whence it may. For condemning mis-statements, misrepresentation, and pernicious opinions, by whomsoever made or entertained, I offer no apology.

"Taking the report as a whole, as it has failed to add to our knowledge a single new fact or principle from which future good is likely to be derived, while, as a review of various

obsolete operations, its place was more than supplied by a similar review by Dr. Bryant, of which it seems to be little more than a mere transcript; and, moreover, as they have seen fit to make it the vehicle of an ungentlemanly attack upon a private individual, for not complying with an arbitrary request—an individual, too, towards whom one of the Committee, at least, had not shown even common courtesy—it is certainly unworthy the character of the Association for which it was prepared.

APPENDIX.

“I HAVE here subjoined skeleton reports of a few cases, taken at random from my journal. It will be readily seen by those conversant with Hernia, that these exhibit the complaint in its most aggravated form, and are those which serve as tests of the value of any operation for its radical cure. In all or nearly all of them, the Hernia could not be retained with any truss; the patient suffered great pain at times, and constant inconvenience; in many, a bad varicocele or enlargement of the spermatic veins accompanied the Hernia; while in others, these two complaints were combined with hydrocele. The time I have required patients, in such cases, to remain under my care, has been ordinarily from two to three weeks.

“The impression, which I find to be quite general, that my mode of treating Hernia requires a formidable surgical operation, I would here state to be entirely wrong. The operation which I perform is wholly subcutaneous, and is done with a delicate instrument adapted to the purpose, the wound from which cannot be discerned six hours after the operation.

“Mr. K. D. C., of Marlboro', Vt., aged 22 years, consulted me February 28th, 1847, for a direct Inguinal Hernia, of about one year's standing. The Hernia had got to be of great size, had descended into the scrotum, which it filled up. He was

unable to retain it with any truss, and had in consequence been obliged to give up business in a great measure. I operated for its radical cure, February 28th. He remained under my care one week. It has never made its appearance since the operation.

“Mr. J. C., of Fall River, Mass., aged 35 years, very fleshy, had a very large oblique Inguinal Hernia, which he had found it impossible to keep up with a truss. May 15th, 1847, I operated for the cure of the same. Cure complete.

“Mr. J. B., Boston, aged about 24 years, had had for six years an oblique Inguinal Hernia of the right side. The opening through which the protrusion took place, I found so large as to admit three fingers readily. I performed my operation for its radical cure, May 20th, 1847. There has been no appearance of the Hernia since.

“Mr. A. M., Gloucester, Mass., aged 27 years, consulted me for a Hernia and Varicocele, both of over ten years' standing, and very troublesome, rendering it difficult and sometimes impossible for him to attend to his business. May 21st, I operated on the Hernia; May 24th, on the Varicocele. He remained under my care two weeks. Both complaints were radically cured.

“Mr. D. G. A., of Prospect, Me., seafaring man, placed himself under my care for the cure of an oblique Inguinal Hernia, of six years' standing, June, 1847. The Hernia had attained the size of a large hen's egg, and was partially irreducible. I operated for the radical cure of the same, June 1st. The last time I heard from him, two years afterwards, he was entirely well.

“Mr. P., of Providence, aged about 54 years, consulted me in July, 1847, for an Inguinal Hernia of the right side, of sixteen years' standing. It was very large, and he had been unable to find any truss to retain it. For several years he had allowed it to remain down constantly. After a few days' preparatory treatment, I operated for its radical cure, July 10th. He left me cured, and has remained so.

“Mr. D., of Boston, aged 26 years, had suffered much for several years, from a double Inguinal Hernia. Although he

had worn a strong double truss, he had, at times, found it ineffectual for retaining the Hernia. It had several times become partially strangulated, causing excessive pain, and threatening his life. I operated for its radical cure, July 28th, 1847. He remained under my care two weeks. and left cured.

“Mr. H., of Bridgewater, Mass., aged about 35 years, had been troubled for seventeen years with an oblique Inguinal Hernia of the right side. When it descended it became very painful. It was accompanied with a hydrocele of the spermatic cord. He came under my care in November, 1847. Left cured, and there has been no appearance of the Hernia since.

“Mr. J. S., Gloucester, Mass., aged about 40 years, consulted me for a direct Inguinal Hernia of the right side, of long standing. The protruded mass was very large, consisting, I found on examination, of both bowel and omentum, the latter being about equal in size to a hen's egg, and irreducible. I found the adhesions so strong, that it was impossible to reduce it by taxis. I therefore cut down and removed the irreducible mass of omentum. Afterwards I operated for a radical cure, January 10th, 1848. He has had no trouble since.

“Mr. H., of Boston, aged about 28 years, had been troubled from boyhood with oblique Inguinal Hernia of the right side. I operated for a radical cure of the same, March 31st, 1848. Hernia has never appeared since.

“Mr. F. B., of Concord, Mass., consulted me, January, 1848, for an oblique Inguinal Hernia of the right side, and a Femoral Hernia on the same side, the latter being of unusual size. They were of four years' standing, had descended freely, and he was unable to prevent the descent with a truss. Much of the time he had been unable to work with any comfort. January 20th, I operated on both. A radical cure was effected.

“Mr. J. S., Valley Falls, R. I., came to me with an Inguinal Hernia on the right side, of fourteen years' standing. It had for a long time caused him great pain in the back and loins. Accompanying the Hernia was a small Hydrocele, and a Varicocele of the left side. He was a good deal broken down. October 5th, 1847, I operated for the cure of the Hernia; a

day or two afterwards for the radical cure of the Varicocele and Hydrocele. Patient remained at my Infirmary three weeks. A permanent cure was effected of the three complaints, followed by a great improvement in the general health.

• “Mr. D. H., of Essex, Mass., aged 18 years, was ruptured and otherwise badly injured by a fall from the cars. Admitted to my Infirmary, March 10th, 1848, previous to which he had been confined to his bed six months. Simultaneously with the Hernia, Varicocele appeared on the left side. March 10th, I operated on the Hernia; shortly afterwards on the Varicocele. April 5th, he left cured, and has had no trouble from either complaint since. He is now in California.

“Mr. H. B. G., of Boston, consulted me for an oblique Inguinal Hernia of the right side, of large size. The hernial opening was very large, so that a truss would not retain the protrusion. It descended readily beneath the truss, causing great inconvenience. I operated for its radical cure, March 6th, 1848. It has never appeared since.

“Mr. J. J., of South Boston, aged 40 years, had had an Inguinal Hernia on the left side for two years. The opening was very large, and the Hernia could not be kept up with a truss, but descended into the scrotum. I operated on it, March 18th, 1848. Cure was permanent.

“Mr. A. J. W., of Boston, aged 27, placed himself under my care for the treatment of Inguinal Hernia of the right side March 24th, 1848. The hernial opening was large, and the protrusion not retainable by a truss. Operated, March 24th, and effected a radical cure.

“Mr. W., of New Orleans, 35 years of age, had had an Inguinal Hernia of many years' standing, accompanied with Varicocele. He came to my Infirmary, 26th July, 1848. Left August 7th, cured of both complaints.

“H. E., of Charlestown, 9 years old, had a direct Inguinal Hernia of five years' standing. Trusses had been tried, and as usual, to no purpose. Difficulty grew worse. Truss had caused much soreness of the parts. I operated on him, January 4th, 1849, and effected a radical cure of the Hernia.

“Mr. M. A., of Essex, Mass., aged 61 years, accustomed to

hard work, had an oblique Inguinal Hernia of the right side, of five or six years' standing. Admitted to Infirmary, February 26th, 1847. Left cured, and has had no trouble since.

"Mr. W., of Brooklyn, Mass., age 68 years, consulted me for an oblique Inguinal Hernia of the right side, of five years' standing. He had found it impossible to retain it with a truss. May 17, 1849, I operated for its radical cure. Hernia never appeared afterwards.

"Mr. J. A., of Fall River, aged about 27 years. Admitted to my Infirmary, May 14, 1850. Had an oblique Inguinal Hernia of the right side, of several years' standing; also a Varicocele of the left side. May 14th, I operated on the Hernia; May 31st, on the Varicocele. A complete cure of both was effected. This patient had tried the best trusses without any relief, but rather an aggravation of his difficulties.

"Mr. F., of Boston, about 30 years of age, came to me in June, 1849, with a very large direct Hernia, which he had never been able to keep up with a truss. June 6th, admitted to my Infirmary, and operated on. Left in a short time, radically cured.

"Mr. M. F., of Portsmouth, N. H., aged about 23 years. Admitted to Infirmary, June, 1850. Had a very large direct Hernia of the right side, accompanied with Varicocele of the left side. June 14th, I operated on the Hernia; within a week, on the Varicocele—effecting a complete cure of both.

"Mr. G. B., of Jamaica Plains, Mass., about 22 years of age. Admitted to Infirmary, Sept. 9th, 1850. Had a large Inguinal Rupture of the left side, which he had tried in vain to retain with a truss. Operated for its radical cure, Sept. 9th. Hernia never reappeared.

"Mr. K., of Kennebunk, Me., aged about 27 years, very fleshy. Admitted to Infirmary, Oct. 22nd, 1850. Had a very large direct Inguinal Rupture of long standing, which he had been unable to keep up with a truss. Patient called on me a few days since to show that he was completely cured.

"Mr. M., of Fall River, Mass., aged about 46. Admitted to Infirmary, November, 1850. Had an oblique Inguinal Rupture of the size of a hen's egg. It was of several years' standing,

and could not be kept up by a truss. Radical cure readily effected.

“Mr. S., of Salem, aged 55, very fleshy. Admitted to Infirmary, December 9th, 1850. Had two very large Inguinal Ruptures which would descend in spite of the strongest truss. Operated, December 9th, for a radical cure, which was effected.

“Mr. G. P., of Salem, aged about 37 years. Came to Infirmary, December, 1850. Had had for many years a direct Inguinal Hernia, accompanied with a Hydrocele. A radical cure of both complaints was effected.

CASES OF IRREDUCIBLE HERNIA.

“During the month of June, 1844, Mr. D., aged 41 years, of thin habit of body, consulted me for a Femoral Hernia on both sides. That on the right was about the size of a butternut, and had been irreducible twenty years. He had worn a scoop truss a part of the time, and had been a great sufferer. This, to my surprise, I was able to reduce by taxis, continued for about half an hour. I immediately operated on it for a radical cure. The Hernia on the left side had not been irreducible so long as the other, but I found it impossible to reduce it by taxis, and therefore cut down and removed a portion of the contents of the tumor, which proved to be omentum, and which had increased to such an extent that it was impossible to return it. The patient was radically cured of both Herniæ.

“Mr. M., aged 55, very fleshy, weighing over three hundred pounds. Came to me in December, 1845, with an Umbilical Hernia of twenty years' standing, which had not been returned to its proper place during the whole time, and was considered irreducible. On the 22nd of December I made my first attempt to reduce it by taxis. The next day I made another trial, and so on for the several succeeding days, working on it for some half an hour or more once or twice in twenty-four hours, until, on the 27th, I succeeded in reducing it completely. A radical cure was then easily effected.

“September, 1846, Miss H., aged 35, of spare habit, came under my care with an omental Femoral Hernia, of two years'

standing. The omentum had been irreducible from six to eight months. During this time she had been able to do but little work,—had suffered much from attacks of colic, which could with difficulty be relieved. Finding it impossible to effect the reduction by external pressure, I performed the operation usually done in strangulated Hernia. I found strong adhesions existing between the sac and omentum. These I found it difficult to break up, as is almost always the case in Femoral Hernia. This being done, and a slight enlargement of the ring having been made, the reduction was readily effected. A radical cure followed this operation.

“July, 1847, Mrs. K., aged about 43, of spare habit, came to consult me for two Inguinal Herniæ. The one on the right side had been irreducible from three to four years. The protrusion was about the size of an English walnut. I found it impossible to reduce it by taxis, and therefore operated with the knife. The operation was successful, and was followed by a radical cure.

“Mrs. K., about 45 years of age, of robust person, consulted me, May, 1847, for an omental Inguinal Hernia of the left side, of sixteen years' standing. For nine years it had been irreducible. She had been under the care of eminent surgeons, without, however, obtaining relief. At their suggestion she had worn a scoop truss, which seemed to afford little or no relief. During a part of the time she had been unable to walk, and finally had become much broken down in health by her sufferings. I found, on examination, that there was much water in the sac, and probably for that reason no adhesions of any consequence. I therefore concluded to perform a subcutaneous operation. This I did, and upon enlarging the ring, the protruded mass readily slipped back into the abdomen. I afterwards operated on this, and on a reducible Femoral Hernia of the other side, for a radical cure.

“Capt. S., aged 40 years, came under my care in January, 1848. He had an omental Intestinal Hernia, which had descended into the scrotum. The omental portion had been irreducible for five years. This I removed. Patient suffered little inconvenience from the operation, and I soon after operated **successfully** for the radical cure of the Intestinal Hernia.

D

“Mrs. H., aged 88, somewhat corpulent, came to me in May, 1848, with a very large Inguinal Rupture on the right side, and an irreducible Femoral Rupture on the left side. Her sufferings, she informed me, had been very great, sometimes almost intolerable. Finding it impossible to reduce the tumor on the left side, I cut down upon it. Finding the contents to be omentum entirely, I removed that portion which could not be returned, and restored the remainder to the abdominal cavity. The patient soon recovered from this operation, so that I was enabled to operate on this side as well as on the Hernia of the right side, for a radical cure, which proved entirely successful, restoring the patient to health, and freedom from the severe pain with which she had so long been afflicted.

“Mr. K., of Acton, Mass., aged 54. Admitted to Infirmary, Nov., 1848. Had an irreducible omental Femoral Hernia of several years' standing. It was very painful, and obliged him to give up work. Being unable to reduce it by taxis, I removed the protruded mass, and afterwards operated with success for a radical cure.

“Capt. R., aged 55, of spare habit, came to me in the month of November, 1850, with an irreducible Femoral Hernia on the left side, of seven years' standing. I found, on cutting down, that it contained omentum only. Having been out for a long time, it had become considerably enlarged, and was not fit to be returned; I therefore removed it. The patient very soon recovered from the operation, and was radically cured.

“Mrs. B., aged about 25, consulted me in June, 1841, for an irreducible Femoral Hernia, of thirteen years' standing. She had suffered much at different times from attacks of colic. I tried in vain to effect the reduction by taxis, and therefore resorted to the operation. I found very strong adhesions existing, and was obliged to enlarge the ring considerably, in order to effect the reduction. No inconvenience was experienced from the operation, and the patient soon recovered.

“Mr. C., aged about 24 years, came to me with an irreducible Omental Hernia of recent occurrence. It was very painful, so much so that he had been unable to wear a truss, or any kind of support, and most of the time had not been able to walk.

The soreness was so great that I could not try the taxis to any extent ; I therefore cut down upon it, and returned it, the patient suffering little inconvenience from the operation. A cure was effected in this case, and the patient restored to health.

“ Miss V., aged about 35, consulted me, December, 1851, for an irreducible Femoral Hernia, of ten years' standing. She had suffered much, at times, from partial strangulation, to which she was almost constantly subject. Protracted vomiting or retching occurring at frequent intervals, and sometimes continuing for two or three days, had rendered existence oftentimes a burden to her. I endeavoured to reduce the protrusion by taxis, but without success, and finally was obliged to resort to the operation that I usually perform in such cases. I found the Hernia to consist of omentum, a portion of which I had to remove. I afterwards operated successfully for its radical cure.”

It will be seen in his reply that he promised to give his operation to the profession, and this promise he fulfilled to the letter. He always held his word sacred and after handing me this little pamphlet said in answer to my oft repeated request, that he would publish his operation as soon as he could find a suitable editor. This work he entrusted to Dr. Davenport, but as the author was advanced in years, the result was far from satisfactory or perfect. Had he lived longer I know that another edition would have been issued with many corrections, and much more extensive than the first. Had Dr. Heaton published his operation ten or fifteen years before, a much fuller account and a more perfect work would have been the result.

In the present work I have tried to correct any wrong impression the profession may have drawn from his little volume, have added to and improved the same as much as I could by explaining more fully all the details of the operation, adding also the results of my study and experience in this as well as in other branches of surgery, in which my practice has been by

no means small or limited. I have been enabled to accomplish much in this direction from intimate acquaintance with Dr. Heaton for many years, and have been brought into much closer relation, as his physician, than would otherwise be possible. I have repeatedly gone over the operation, discussing all of the details of the operation both before and after the publication of his work.

Should any fail to succeed in this operation after a careful study of this work, let them not imagine that some secret has been withheld, for I have written with full knowledge of Dr. Heaton's methods of treatment, and have given all that he knew upon the subject, which it is possible to convey through the press. It is true I cannot convey his fine sense of touch and delicate manipulation, any more than I can by writing convey to you my own, but I have done all that I can do to give you a full knowledge for a successful operation. How well I have succeeded I leave to your judgment and approval.

JOSEPH H. WARREN.

15, NEW CAVENDISH STREET, LONDON,
August, 1880.

Reports of cases, suggestions, and other communications relating to the subject would be gratefully received and duly acknowledged.

J. H. W.

CHAPTER I.

HERNIÆ : KINDS AND FREQUENCY.

KINDS OF HERNIÆ.

THE varieties of Herniæ as generally described derive their names from the time of life at which the hernial sac is formed, from the region of the body which is affected, from the viscus composing the protrusion, or from the condition in which their contents are formed.

As regards the time of life at which Herniæ may be found, we recognise *Congenital*, occurring either at time of birth or immediately thereafter; with its variety, the *Infantile* or *Encysted* Hernia; the former relating to the complete openness of the vaginal sheath of the tunica vaginalis, and the latter, the encysted, to the closure of the sheath at the abdominal parietes leaving a cavity below inclosed by the tunica vaginalis; *Accidental*, from whatever cause, whether undue exertion or severe injuries; and Herniæ as the result of weakness of the abdominal tissues.

Herniæ named from the region of the body in which they occur may be

Cerebral.—This term is applied to several different forms; one form may be due to a defect in the cranial ossification, another to a congenital deficiency of both cranium and integuments resulting in the speedy death of the infant, while a third form is seen as a result of the operation of trephining.

Diaphragmatic or Phrenic.—These are somewhat rare, often congenital, and when strangulated are beyond operative means of relief. The part of the diaphragm where the fibres are especially weak and deficient is “between the sides of the muscular slip from the ensiform appendix and the cartilages of the adjoining ribs.”¹

Umbilical, Exoniphalos, Omphalocele, or Ruptured Navel.—These are more frequent in infants. When in adults they are more common in females than in males and in obese than in spare persons.² They protrude through the opening left

¹ They are of three kinds:—1st, where the muscular fibres of the diaphragm lose tone, so that the abdominal viscera are pressed into the thorax; 2ndly, where there is a congenital defect in the fibres; and thirdly, where the hernial tumour protrudes through one of the natural openings in the diaphragm which have been stretched.

² To illustrate some of the remarkable displacements in the thoracic and abdominal cavities that may result from this variety of Hernia, I make the following quotation from the *Proceedings of the St. Louis Med. Society* of a rather unique case. The report was made by Dr. Stevens:—

HERNIA OF THE TRANSVERSE COLON.

“I report this case from notes taken at the time of my observations. I was called by Dr. John Laughton to make the dissection in an examination of the body of Police-officer Holton. Besides Dr. Laughton, who had been the attending physician, there were present Dr. Thompson and Prof. Ellsworth Smith. About a year before death, and while in the performance of his official duty, Holton received a stab, made with a pocket knife. The wound was on the left side between the eighth and ninth ribs and about four inches from the sternum. The wound healed readily and without any alarming complications. After a few days, just at the site of the wound, there appeared a soft reducible tumour, about the size of half a hen-egg but causing no inconvenience. He returned to his occupation and continued to perform his duties for several months; in fact, till within a few days of the time of his death. The death was caused by enteritis and was not attributed to the lesion mentioned. In the long interval between the time of the injury and his death the case excited considerable interest and there was a wide difference of opinion as to the nature of the tumour, the majority believing it to be a Hernia of the lung; only one or two, as the sequel demonstrated, formed a correct diagnosis, viz: A Hernia of the transverse colon.

“Upon opening the cavity of the chest a most remarkable displacement

by the umbilical vessels of the fœtus. The visci found most frequently protruding are the epiploon or omentum, the jejunum, the arch of the colon and sometimes the stomach. The tumour is usually round, readily reducible and not very liable to strangulation. In the fœtus the opening left by the umbilical vessels is perfectly patent but in the adult the aperture is so firmly closed that it is stronger than the linea alba itself. The linea alba however shows even in the normal state weak places around the vessels as well as various orifices in the tendinous parietes for small cutaneous blood-vessels. When from any unusual strain, as from pregnancy, these openings have yielded and

of thoracic and abdominal viscera was apparent. The stomach with its greater curvature upwards, was the first object in view; the left half, at least, of the transverse colon was above the plane of the diaphragm; the heart was found backward from its normal position, and the lung diminished by at least four-fifths of its usual dimensions driven to the extreme upper part of the cavity, and presenting more the appearance of a spleen than of a lung. It was wholly impervious to air. The right lung seemed to have expanded and have forced the mediastinum to the left of its normal location. The diaphragm of that side seemed to have almost disappeared; only a vestige remained showing its marginal attachment. You will readily form an idea of the enormous distension that had taken place in order to admit the passage upward of nearly the whole of the stomach and a large section of the colon.

"This then was the state of things as revealed by the autopsy. Our conclusions were as follows: That the knife first passed through the integument and intercostal structures, entering the pleural cavity during the act of expiration, the lung escaped injury; the blade then passed through the diaphragm without wounding any viscus beneath; that at first, a small section of either the colon or the stomach entered the opening in the diaphragm, and then by slow advances, so slow in fact as not to be perceptible to the individual himself, and so slow that the natural functions of the various organs implicated had ample time to conform their compensatory or other actions to the gradually changing relations. Probably it took weeks or months to work out the entire revolution.

"A rather interesting fact was mentioned by the attending physician, that the patient frequently vomited during his illness. Of course this must have been performed solely by the contraction of the muscular fibres of the stomach and without the action of the diaphragm and abdominal muscles."

become enlarged in adults, the protrusion of the viscus may be and often is called umbilical because *near* the umbilicus.

Thyroid.—In this variety the protrusion of the abdominal viscera comes through the thyroid or obturatum foramen.

Ischiatic.—Protrusion through the sacro-sciatic notch.

Vaginal.—When the tumour descends along or into the vagina.

Perinæal.—When the protrusion is through a laceration of the perineum of the male. It is the counterpart of the vaginal in the female.

Lumbar.—Of this variety a very few rare cases have been reported by Petit and Cloquet. The intestine is protruded through the posterior muscles immediately above the pelvis.

In the *anterior* region of the abdomen we have Inguinal and Femoral, the former protruding above and the latter below Poupart's ligament.

Of Inguinal Hernia there are two varieties.

External or Oblique.—Called external because the neck of the sac lies on the outer or iliac side of the epigastric artery. The intestine emerges through the internal abdominal ring, pushing before it a pouch of peritoneum, and then lies in the inguinal canal. "Pursuing the oblique direction of this canal, it emerges at the external abdominal ring, and enters the scrotum, into which it descends. The mouth of the hernial sac is situated to the outer side of the internal epigastric artery, whilst its neck and body are usually in front of the structures composing the spermatic cord. But in rare cases these organs are divided; sometimes the blood-vessels pass over the tumour, the vas deferens behind it, and *vice versa*; or they are attached to the sides of the tumour. The relative positions of the hernial tumour and testicle differ. The variable site of this latter organ depends upon congenital defect, and hence in some cases the testis cannot be distinguished from the tumour produced by the hernia.

However, in the majority of cases the testicle is situated at the posterior and inferior regions of the scrotum; more rarely, it may be detected at the front of the fundus of the tumour. An endeavour should always be made to ascertain the site of this organ, in every case of Inguinal Hernia, and under all circumstances." ¹

Internal or Direct.—Not so common a form as the oblique. It pushes through some part of the abdominal wall internal to the epigastric artery, *i.e.* on the pubic side of it, and passes *directly* through the abdominal parietes and external ring. "The mouth of the sac is close to the outer border of the pubic attachment of the rectus muscle, the posterior surface of which may be more easily felt when the Hernia is reduced than in the oblique variety." "The finger enters the abdominal cavity much more readily in the direct form of Inguinal Hernia than in the oblique. In its passage from the abdomen it traverses merely that small portion of the inguinal canal which lies immediately behind the external inguinal ring, and those structures which form that part of the floor of that canal are either pushed before the Hernia, or they are lacerated when the hernial sac escapes through the opening so formed. Those structures are the conjoined tendons of the internal oblique and transversalis muscles and the pubic portion of the internal abdominal fascia. The spermatic cord and round ligament are not attached to the hernial sac until it has reached the external abdominal ring. When it has passed that point, they lie to its outer side, and are usually less identified with its tissues than in the oblique variety." ²

A rare anatomical variation is when the tumours pass not through the true external abdominal ring but through a division of the fibres of the external abdominal muscle near the ring.

Bubonocoele.—When an indirect or oblique Inguinal Hernia

¹ Beckett.

² *Ibid.*

is incomplete, *i.e.* not fully formed or protruded, it is called a Bubonocoele, probably from its resemblance to an inflamed lymphatic gland in the groin (bubo).¹

Scrotal or Oscheocoele and Pedendal.—When a complete Inguinal Hernia passes through the external ring and escapes into the scrotum it is called Scrotal, when into the labia majora, Pedendal.

Ventral.—When it escapes through some part of the abdominal walls usually strong and muscular it is called Ventral (See note.)

Ventro-Inguinal.—When a Ventral Hernia slips into the inguinal canal it is called Ventro-Inguinal.

Femoral, Crural or Merocele.—This form of Hernia was not accurately differentiated from Inguinal until the middle of the seventeenth century, and its exact anatomical relations were not properly understood or described for many years after. It protrudes through the femoral or crural ring, the upper opening of the crural canal in the angle formed by Gimbernat's and Poupart's ligaments, and emerges from the saphenous opening of the fascia lata in the upper and inner side of the thigh, the femoral veins lying on the outer side of the ring, and the epigastric artery crossing the upper and outer angle of the ring. It is more common in males than in females.

As regards the contents of the sac or the viscus composing the protrusion, if it be intestine, usually the small intestine and more particularly the ileum, we have an *Enterocoele*, if omentum we have an *Epiplocele*, while a combination of the two is called *Enterio-Epiplocele*. Rarer forms of hernial tumours from the abdomen are Gastrocele, Hepatocele, and Cystocoele, protrusions of stomach, liver, and bladder.

The terms applied to the pathological conditions in which we

¹ It has passed through the internal ring but not the external, therefore it lies in the inguinal canal.

find Herniæ are *Reducible* when the protrusions can be readily returned to the abdomen.

Irreducible, a generic term to signify a Hernia that cannot be returned either because of adjoining adhesions, incarceration, strangulation, thickening of coverings or deposit of fat.

Incarcerated, when the Hernia has become *temporarily* irreducible because of a constriction in the intestines which prevents passage of fæces.

Strangulated, when the Hernia is irreducible because of a constriction which prevents not only passage of fæces but also *circulation* of blood in the tumour. This circulation may be impaired "by muscular spasm, œdema or the sudden forcing of additional contents into the sac." For the relief of this form of hernia, the operation of herniotomy or kelotomy must be employed.

FREQUENCY OF HERNIA.

The frequency of the occurrence of Hernia varies in different kinds of herniæ according to kind, sex, age, population, occupation, walls of the abdomen, social state of the nationality.

1. *Relative frequency of the different Kinds*.—The Inguinal and Femoral are the most frequent, and after them come Umbilical, while all the others can be considered as very rare. Out of the 93,355 Herniæ forming the total of the statistics published in 1855 by Bryant, we find 46,551 simple Inguinal to 7,452 Femoral without distinction of sex, being 1 Femoral to 624 Inguinal. Of 30,575 double Herniæ there were 28,503 Inguinal and 1,972 Femoral which gives the relation of 1 double Femoral Hernia to 14·25 double Inguinal. The sum of these figures gives 75,054 simple and double Inguinal to 10,425 simple and double Femoral, being 1 Femoral to 7·19 Inguinal. These figures may not form an absolute rule, but still the result of 93,355 cases ought

to be some guide to the relative occurrence of these kinds of Herniæ.

2. *Relative frequency according to Sex.*—J. Cloquet states the relation of this occurrence as 2 males to 1 female. According to Malgaigne it is 4 males to 1 female. The tables prepared by the Truss Society of London give still different results, being 5 males to 1 female. According to Kingdon this last proportion is too great, leaving the relation given by Cloquet as nearer the truth. As regards the relative occurrence of Inguinal and Femoral Herniæ in the two sexes the Truss Society in 1855 claim about 1 Femoral in the male to 75 Inguinal, but in the Report for 1863 give 1 Femoral to 32 Inguinal. It is so hard to understand such a difference in these figures that only a general idea must be drawn from them. According to the same Report of 1855 the relation in the female is 1 Inguinal to 4.6 Femoral, while according to Malgaigne Inguinal are even more numerous than Femoral in the female, although proportionally less than in the male. In the Report of 1863 the proportion was not quite 1 Inguinal to 1.04 Femoral in the female, figures which seem *à priori* much more reasonable.

As regards Umbilical Herniæ, they are more frequently found in the female than in the male.

3. *Frequency according to Age.*—In 300 Herniæ examined by Malgaigne

26	occurred	between	the	ages	of	10—20
45	"	"	"	"	"	20—30
66	"	"	"	"	"	30—40
163	"	"	"	"	"	40—80
<hr/>						
300						

4. *Frequency in Relation to Population.*—According to the same authority above cited—

Before 1 year there is 1 Hernia in every 21 individuals.

From	1— 2	„	1	„	29	„
„	2— 3	„	1	„	37	„
„	5—13	„	1	„	77	„
To	20	„	1	„	32	„
„	28	„	1	„	21	„
From	30—35	„	1	„	17	„
„	35—40	„	1	„	9	„
At	50	„	1	„	6	„
„	60—70	„	1	„	4	„
„	70—75	„	1	„	3	„

He estimates the proportion of the whole population of France which is ruptured to be 1 out of every 13 males, and 1 out of every 52 females, or taking both sexes together 1 out of every 20·5 individuals.

5. *Frequency according to Occupation.*—In a general way we may say that the more difficult the occupation the more liable are those engaged in it to suffer from Herniæ. Here as in all other tables of a similar nature, figures can be only approximately valuable and must not be relied upon as absolute. The following table I believe to be as nearly accurate as can possibly be.

REPORT OF KINGDON (TRUSS SOCIETY).

According to Census of 1851.	1859.	1860.	1861.
Farm labourers	—	171	173
Farmers	776	503	734
Boot and Shoemakers	38	53	12
Carpenters and Joiners	173	178	99
Tailors	20	33	28
House servants (male)	101	176	131
Workers in Silk	63	71	58
Blacksmiths	48	51	63
Masons and Paviers	—	18	—
Porters and Gardeners	478	410	351
Gardeners	65	119	114
Brickmakers	—	—	49
Butchers	53	52	52
Painters and Plumbers	33	45	50
Breadmakers	35	69	52
Carters	73	87	82
Commercial Brokers	29	30	65
Clerks	—	—	41
Boatmen	—	44	35
Savvyers	35	34	29
Pedlars	33	57	37
Wheelwrights	10	—	18
Engineers	26	51	42
Coopers	20	32	23

We can, however, go further than this and investigate the influence of position during work. This question has been especially discussed in regard to Inguinal Herniæ, and the question that has arisen is, "Are various attitudes capable of modifying the diameter of the Internal Abdominal Ring and of the Inguinal Canal?" Here again, all that is best known on the subject rests upon the authority of Malgaigne, who is content to say that occupations requiring the adduction and flexion of the thighs expose the bowels to displacement much more than the occupations allowing a normal position of the body. Thompson and Richet on the other hand, think that adduction of the thighs will relax the *external* ring, it being impossible to modify the dimensions of the *internal*

ring by special attitudes. If this be really so, the effect of position will be not to modify the causation of Hernia but only the development when the Hernia has once been formed.

6. *Frequency according to the Side of the Body.*—Herniæ as a rule are more frequent on the right side than on the left, and that in the proportion of 7 to 4 or 5. The reason for this has been variously expressed. Schinkens thought it due to the larger lobe of the liver being upon the right side, Martin to the inclination of the mesentery, Cloquet to the predominance of those who are right-handed in their actions over those who are left-handed. This seems by far the best and most plausible way of accounting for the fact, since we observe that in all movements of the right side the diaphragm forces the abdominal viscera downward, forward, and to the right side. Malgaigne as usual doubts the statement, and by figures seeks to show that Herniæ in right-handed persons are more frequently on the left side than on the right. Thus of 313 Inguinal Herniæ 40 were double, and of the 273 remaining, 171 were right and 102 left, while of the 273, 1 out of every 11 was left-handed.

7. *Frequency according to Race of Men.*—As regards the race most frequently afflicted with this abdominal weakness, it has been found that inhabitants of warm climates are more often "ruptured" than those of temperate and cold regions. Then of course we can make the general statement that the hard toiling nations are more like to be "ruptured" than those who lead a more moderate life. This will as well apply to the different orders of men in the same nationality, and when thus much has been said, we can say no more that could be of the least authority or practical value.

CHAPTER II.

ANATOMY : DESCRIPTIVE AND SURGICAL.

ANATOMY OF HERNIA : DESCRIPTIVE AND SURGICAL.

OF all these varieties, the kinds most commonly met are the Umbilical, the two varieties of Inguinal and the Femoral; to these we will now more particularly confine our attention, defining minutely the anatomy, coverings and symptoms, their several variations under unusual conditions, differentiating diagnostically between them individually, and also between them and the other abnormal conditions of the abdominal region likely to be confounded with Herniæ. For this purpose I have, besides consulting other authors, made many extracts from Gray, Anderson, Lawrence, Bechilt and Ramsey, to whom I wish to give due credit for their labours, researches and writings.¹

SURGICAL ANATOMY OF UMBILICAL HERNIA.

This protrusion is *directly* through the abdominal parietes at the navel, or umbilicus, or its immediate vicinity. Passing from without inwards we meet the integument, superficial fascia, the aponeurosis formed by the union of the oblique and transversalis

¹ *Descriptive Anatomy.* By Henry Gray.—*System of Surgical Anatomy.* By William Anderson. New York, 1822.—*A Treatise on Ruptures.* By W. Lawrence. Philadelphia, 1843.—*A System of Surgery.* Edited by T. Holmes. Vol. IV.—*Surgical Diagnosis.* By Ambrose L. Ramsey. New York, 1879.—*The Essentials of Anatomy.* By William Darling and Ambrose L. Ramsey. New York, 1880.

muscles, the fascia transversalis, a layer of sub-peritoneal cellular tissue often containing fat and a pouch of the parietal layer of peritoneum, forming the hernial sac. These coverings being of more importance in Inguinal Hernia will be there more fully described. In Umbilical Herniæ these coverings may become so inseparably united and thinned that they appear as one and allow the contents of the sac to be seen from the surface. Other variations in the coverings have reference to the method of formation of the sac. If it be suddenly produced, not only may the tendon of the external oblique be wanting but also the superficial fascia and the fat. If the tumour be formed before the separation of the umbilical cord, it passes directly through the umbilicus into the substance of the cord and gains from it a peculiar covering. No blood-vessels, unless it be superficial vessels or abnormal veins, as seen by Mance, Maniere and Velpeau, are situated near a Hernia in this region. The contents of an Umbilical Hernia are usually both omentum and intestine, entero-epiplocele. Other viscera besides the large and small intestine may be inclosed by the sac, as for example the stomach or uterus.

The firm margin of the umbilical ring forms an unyielding ring around the neck of the sac which is itself thicker at this point than over the body of the sac. As the tumour increases in size it does not extend uniformly over the abdominal surface but downwards towards the symphysis pubis more than in any other direction. It may be sessile with an immense base, or pyriform, and suspended by a peduncle or stalk.

In the *Fætus*, umbilical Hernia is always in consequence of a defective development in the abdominal walls, as I have already said, and is often associated with other malformations such as hare-lip or club foot. It has a covering formed by the union of the peritoneum and the envelope of the umbilical cord. If the

tumour be large, death often takes place from peritonitis a few days after birth.

In the *child*, umbilical protrusions occur usually after some violent muscular exertion, as coughing or crying, are small and

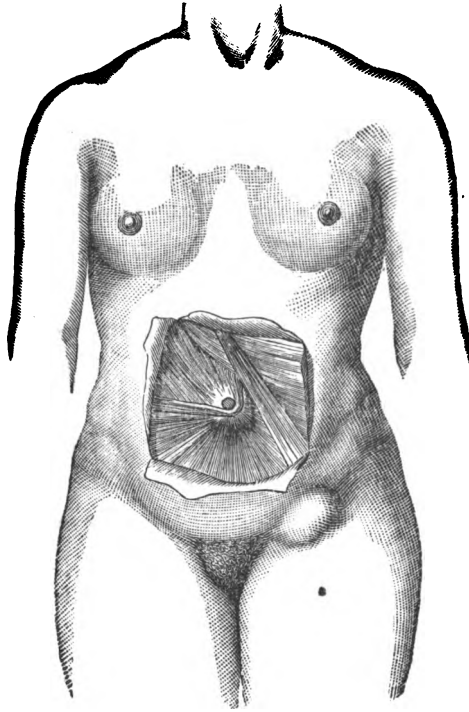


FIG. 1.—Umbilical Hernia.

The three most common forms of Hernia, named in the order of their occurrence in the female, are Umbilical Femoral and Inguinal. Oblique Inguinal, or Pedental in the female, is very finely shown on the right side of the figure. Umbilical as well as Femoral on the left side speak for themselves. The fibres and fascia transversalis in the Umbilical region are very well drawn, and show the appearance of a Hernia in that stage of its formation when the intestine has already passed the internal ring and commenced to protrude from the external surface.

conical and almost always contain only intestine and not omentum.

In the *adult* I have already said this variety of Hernia is not

strictly umbilical, but only so-called by convention and for convenience of classification. The tumour is globular or pyriform, and in corpulent persons tends to insinuate itself into the adipose tissue downwards towards the pubes. Thus it may for years exist unsuspected because concealed in this way. In such a state too there is great danger of strangulation and fatal results. Such Herniæ more frequently exist in fleshy women who have borne many children, than in men.

Certain symptoms are characteristic. The tumour at first is small, soft and ovoid. It readily reduces by pressure when a distinct sharp outline of the umbilical ring can be felt by the finger. On removing the finger the skin either remains creased in folds or it gradually distends until the tumour re-appears. On coughing a distinct impulse in the tumour is felt by the finger. In adults, who have Umbilical Hernia, any tenderness of the abdomen, constipation or nausea should be carefully watched as giving symptoms of possible strangulation. (For diagnosis from Ventral Hernia see Table on p. 80.)

SURGICAL ANATOMY OF THE ABDOMINAL REGION RELATING TO INGUINAL HERNIA.

The superficial fascia of the abdominal region is of two layers, between which are the superficial vessels and nerves and the inguinal lymphatic glands. It was first described by Camper. The superficial layer is thick and areolar, and contains adipose tissue. The deep layer is thin, aponeurotic and strong. It adheres in the middle line to the linea alba, and below to Poupart's ligament and the fascia lata, although it does not increase the strength of the abdominal ring. Between them are the superficial epigastric, circumflex, iliac and external pudic arteries and veins, terminations of the ilio-hypogastric and ilio-inguinal nerves and the upper group of the inguinal lymphatics.

These cutaneous arteries all arise from the femoral, about half an inch below Poupart's ligament. The *superficial epigastric* passes through the saphenous opening, crosses Poupart's ligament midway between the spine of the ilium and pubes, and ascends nearly as high as the umbilicus, anastomosing with the deep epigastric from the external iliac and with the internal mammary from the subclavian. It supplies the integument and fascia. Its vein enters the internal or long saphenous. The superficial *circumflex iliac* runs parallel with Poupart's ligament out to the crest of the ilium. The *superficial external pudic* passes inward across the spermatic cord to supply chiefly the integument of the penis and scrotum of the male and of the labia of the female.

The *ilio-inguinal* nerve pierces the transversalis and internal oblique muscles, and escaping at the external abdominal ring accompanies the spermatic cord to the scrotum and thigh.

The *aponeurosis of the external oblique* muscle lies beneath the fasciæ. It is thin and strong with fibres running downward and forward. The lower edge of the aponeurosis, thickened and stretched like an arch between the anterior superior spinous process of the ilium, and the spine of the pubes is called Fallopius' or Poupart's Ligament, and under Femoral Hernia will be spoken of as the femoral or crural arch. It is narrow behind and increases in breadth towards the front. On the superior surface is a concavity for the spermatic cord. The reflection of this ligament backwards and inwards to the iliopectineal line is called Gimbernat's ligament, which is about an inch in length although larger in the male than in the female and almost horizontal in the erect position. It is triangular in shape; its outer margin or *base*, concave and sharp, being in contact with the crural sheath and blended with the pubic portion of the fascia lata; its *apex* joining the spine of the pubes. A reflection of this ligament extending behind

the internal pillar of the external abdominal ring to the linea alba is called the *triangular* ligament. In the middle line of the body, the fibres of this aponeurosis join with the fibres from the aponeurosis of the corresponding muscle on the opposite side to form a thickened line from the ensiform cartilage to the pubes, the linea alba, formed by the union of the aponeurosis of the oblique and transversalis muscles.

About an inch and a half from the pubes the thickened fibres of the aponeurosis separate to form the *pillars* or *columns* of the external abdominal ring. The *internal* or *superior* pillar is broad, thin and flat, and attached to the upper edge of the pubes near the symphysis. It interlaces with fibres from the opposite side. The *external* or *inferior* pillar is narrower, thicker and stronger, is inserted into the spine of the pubes, and is curved around the spermatic cord to form the groove above mentioned. The separation of these tendinous pillars leaves a triangular opening over the pubes, called the external or abdominal ring. The pubes forms the base of the triangle and the tendinous columns the sides. At the apex are some curved fibres, intercolumnar fibres, which increase the strength of the aponeurosis, and are more developed in the male than in the female. Through this triangular opening passes the spermatic cord in the male and the round ligament of the uterus in the female. Over the outer surface of the cord and testis is prolonged a thin fascia, the *intercolumnar* or *external spermatic fascia*, attached to the pillars of the ring. The abdominal ring, or more properly triangular aperture, is directed upward and outward. When distended by a Hernia it assumes more of a circular form, so that then the appellation of ring is much more appropriate. Its size and form vary; sometimes it is rounded, and closely embraces the cord or round ligament, sometimes elongated, and sometimes square. It is usually about an inch in its long diameter from pubes to internal angle, and about one half inch

transversely between the columns. It is larger and stronger in the male than in the female.

The fascia of the obliquus internus muscle along the middle line over the rectus for the upper two-thirds of its extent is divided into two layers, of which the outer is blended with the fascia of the obliquus externus, while the inner is blended with the transversalis fascia. In the lower third all this expansion of

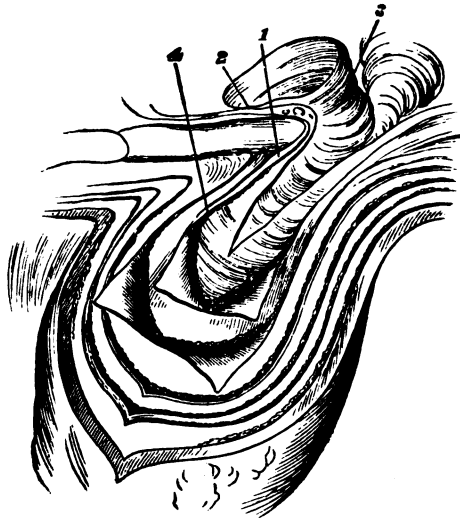


FIG. 2.—Inguinal Hernia.

This figure shows the various coverings; 1, skin, superficial fascia; 3, intercolumnar fascia; 4, crura of external oblique muscle, infundibuliform fascia, subserous cellular tissue; 2, sac, epigastric artery with veins on either side of it.

fasciæ passes in front of the rectus. The fibres of the internal oblique from the upper half of Poupart's ligament arch downward and inward across the spermatic cord, to be inserted with the tendons from the transversalis as the *conjoined* tendon into the crest of the pubes and pectineal line for half an inch. It lies behind, and so closes Gimbernat's ligament, and the external abdominal ring, and strengthens the ring towards the abdomen. Sometimes it is insufficient to resist the pressure

from within, and is protruded as one of the coverings of direct inguinal Hernia.

The *Fascia Transversalis* lies between the inner surface of the transversalis muscle and the peritoneum, and closes the ring of the external oblique toward the muscle ; otherwise there would be a direct opening into the abdomen behind the ring. Thick and dense in the inguinal region, it become thin and cellular as it ascends toward the diaphragm.

The internal abdominal ring is an oval opening, running upwards and downwards, much larger in the male than in the female, situated in the transversalis fascia "midway between the anterior superior spine of the ilium and the spine of the pubes, and about half-an-inch above Poupart's ligament." The following description of this ring is taken from Sir Astley Cooper, who first noticed the fascia in which it occurs.

The edges of this ring "are indistinct on account of its cellular connections with the cord ; when these are separated, the fascia of which it is formed will be found to consist of two portions : the outer strong layer, connected to Poupart's ligament, winds in a semi-lunar form around the outer side of the cord and bounds the aperture by a distinct margin, from which a thin process may be traced passing down upon the cord. The inner portion which is found behind the cord is attached to, but less strongly connected with, the inner half of the crural arch, and may be readily separated from it by passing the handle of a knife between it and the arch. It ascends between the tendon of the transversalis, with which it is immediately blended, passes around the inner side of the cord, and joins with the outer portion of the fascia above the cord, being at length firmly fixed in the pubes ; the inner margin of the ring is less defined than the outer, the fascia transversalis being doubled inwards towards the peritoneum to which it is firmly attached. Thus, then, it appears that the internal ring is not a circumscribed

aperture like the external abdominal ring, but is formed by the separation of two portions of fascia, which have different attachments and distributions at the crural arch; the outer portion terminating in Poupart's ligament while the inner portion will be found to descend behind it, to form the anterior part of the sheath that envelopes the femoral vessels. The strength of this fascia varies in different subjects; but in all cases of inguinal Hernia it acquires considerable strength and thickness especially at its inner edge; and if these parts had been formed without such a provision, the bowels would, in the erect posture, be always capable of passing under the edge of the transversalis muscle, and no person would be free from inguinal Hernia.¹"

The opening then in the abdominal parietes for the passage of the spermatic cord is not a simple aperture, but an oblique canal, the abdominal or *Inguinal Canal*, although it is not properly a canal unless distended by a Hernia. In its normal state it is merely a flattened passage. The crural arch running from the anterior superior spine of the ilium to the spine of the pubes, and forming a channel in which lie the psoas and iliacus muscles, with the femoral vessels, gives attachment to the internal oblique and transversalis muscles, and contains in its lower half the spermatic cord or the round ligament. The external oblique presents in the lower and inner parts of its aponeurosis above the pubes the triangular opening called the external ring, but now more properly the lower or external opening of the inguinal canal. This space between the tendinous columns of the ring is closed behind by the insertion of the internal oblique into the pubes. Hesselbach has accordingly called it the "crural surface of the anterior inguinal ring." It is the only place where the internal is left uncovered by the external oblique muscle. The corresponding surface on the posterior or abdominal side

¹ Cooper on Hernia, part I. p. 6, ed. 2.

of the canal is a triangular space bounded on the inner side by the outer edge of the rectus abdominis, on the lower by the pubes, or as usually given by Poupart's ligament, and on the outer by the femoral and epigastric vessels. This has been called the "triangular inguinal surface," or Hesselbach's Triangle. It is the weakest part of the abdominal parietes, being covered only by the transversalis fascia and the conjoined tendon. The inguinal canal is bounded posteriorly or on the abdominal aspect, by the transversalis fascia, in which is the opening of the internal abdominal ring, higher and more external than the external ring, and about an inch and a half distant from it.

Besides the superficial epigastric artery coming off from the femoral, the surgeon must pay particular attention to the deep epigastric from the external iliac. It arises immediately above the crural arch in a loose cellular structure. Concealed at first by the crural arch, it lies behind the obliquus internus and transversalis, and is covered by the spermatic cord just before the cord enters the inguinal canal. It ascends obliquely inward between the transversalis fascia and peritoneum to the outer margin and posterior surface of the rectus, running "along the lower and inner edge of the internal abdominal ring, in general, precisely along the inner margins, but sometimes rather nearer to the pubes, passing at the distance of nearly an inch from the upper extremity of the ring of the external oblique." It lies behind the inguinal canal and immediately above the femoral ring.

It is accompanied by two veins, the larger of which is always found upon the inner side. They unite into a single vein before they terminate in the external iliac vein. Several small branches of the artery ought to be known to the operating surgeon, the *cremasteric*, which accompanies the spermatic cord, the *pubic*, which runs across Poupart's ligament and then descends to the inner side of the femoral ring and the *muscular* branches.

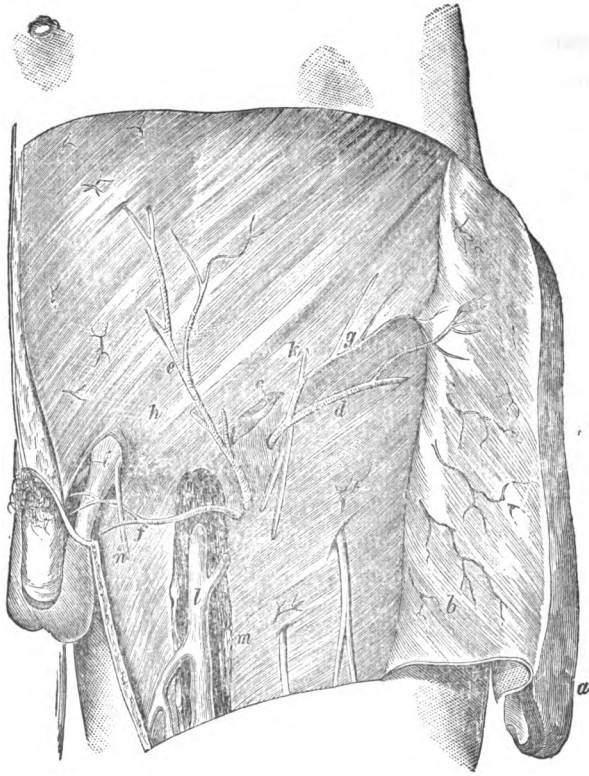


FIG. 3.

Superficial dissection of inguinal and crural regions. Below the groove upon front of thigh is seen the triangular depression forming the lower part of groin. This is described in connection with Femoral Hernia. Above the pubis may be felt the opening in the deep parts of the superficial abdominal ring through which the spermatic cord escapes to testicle. Beneath the skin of groin and fascia superficialis are two layers, between which are found the superficial vessels and lymphatics. The layer below this is made up of elastic areolar tissue and fat, closely attached to Poupart's ligament *c*, anterior pubis and crest of iliac *b*. Crossing the groin are seen three blood-vessels turned obliquely inwards and upwards from common femoral artery. Outer one, superficial circumflex iliac, passes up to superior iliac spine, *d*. The middle one, superficial epigastric, supplying glands and integuments of groin to umbilicus, *c, c*. Inner one, superficial external pubic, enters fascia lata near the pubis, crossing beneath spermatic cord to scrotum and root of penis. The external pubic is liable to be divided in cure of Inguinal Hernia; if a dull bistoury be used in making the division, hemorrhage is less liable to occur, unless the vessel is very much enlarged, which is the case sometimes in old and large ruptures.

The abdominal wall is made up of layers of muscular and aponeurotic tissue below the iliac crests. The external oblique is very strong, and the fibres curve downwards and inwards towards median line and pubis, forming with other tendons a vertical line and by union with opposite side *linea alba*.

Externally towards thigh, fibres growing thicker and oblique, running in with fascia lata, and uniting with deeper fascia forms crural arch or the ligament of Poupart's, *g*. This band of fibres forms the arch between anterior superior iliac spine and spine of pubis. To the two bony protuberances is attached a convexity downwards, outwards, and backwards, forming concavity of groin. Fibres of the aponeurosis bound together by areolar tissue all form the intercolumnar, *h*, various sized openings through which pass vessel and nerves in abdominal wall. The larger opening forms the external abdominal ring, *i*.

There are considerable variations in the point of origin of the artery. It may arise "from any part of the external iliac between Poupart's ligament and two inches and a half above it, or it may arise below this ligament from the femoral or from the deep femoral."

The measurements of these parts vary so in the two sexes that the subjoined tables by Sir Astley Cooper, from the measurements of well-developed persons, will be of especial value. Although the distances will be somewhat different according as the person be large or small, the relative proportions will be the same.

	MALE. inches.	FEMALE. inches.
From symphysis pubis to anterior superior spine of ilium	5 $\frac{1}{4}$	6
to tuberosity of pubes	1 $\frac{1}{2}$	1 $\frac{3}{4}$
to inner margin of the lower opening of the abdominal canal	$\frac{7}{8}$	1
to inner edge of the upper opening	3	3 $\frac{1}{4}$
to middle of iliac artery	3 $\frac{1}{2}$	3 $\frac{3}{4}$
to iliac vein	2 $\frac{3}{4}$	2 $\frac{1}{2}$
to origin of epigastric artery	3	3 $\frac{1}{2}$
to course of epigastric artery on inner side of upper opening	2 $\frac{1}{2}$	2 $\frac{7}{8}$
to middle of the lunated edge of fascia lata	2 $\frac{1}{2}$	3 $\frac{1}{4}$
From the anterior edge of the crural arch to the saphena major vein	1	1 $\frac{1}{4}$
From symphysis pubis to middle of crural ring	2 $\frac{1}{2}$	2 $\frac{3}{4}$

The transversalis muscle and fascia with the epigastric vessels which form the anterior boundary of the abdomen are lined behind by the peritoneum, which presents a well-marked depression or pouch. A thin fibrous prolongation extends for

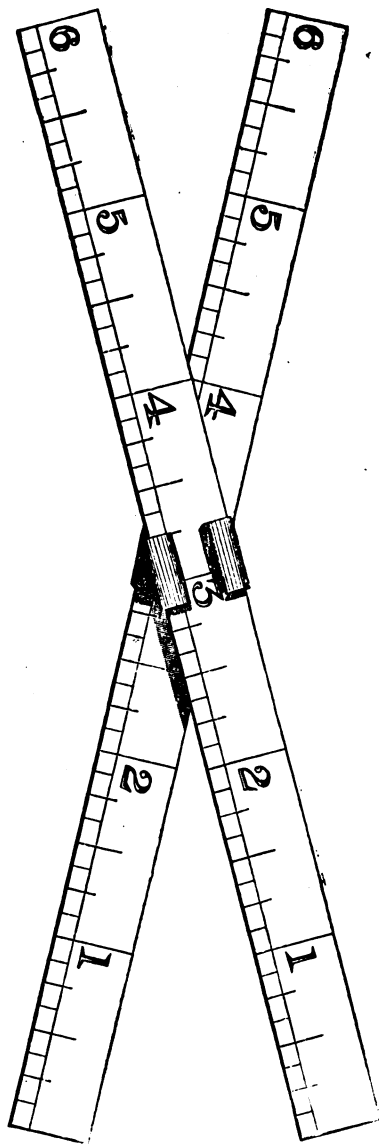


FIG. 4.—Rule.

This sliding and revolving rule will be found very handy in taking these anatomical measurements. This was loaned to me by T. Bryant, Surgeon at Guy's Hospital.

a short distance over the front of the spermatic cord, and is the remains of the pouch of peritoneum which in the fœtus accompanies the descent of the cord and testis into the scrotum, and which soon after birth begins to be obliterated.

The spermatic vessels situated behind the peritoneum descend over the psoas and iliacus internus muscles connected to them by loose cellular tissue, and at the divisions of the transversalis fascia are joined by the vas deferens at an acute angle. This union forms the spermatic cord, composed therefore of arteries, veins, lymphatics, nerves, and vas deferens invested by its proper coverings. Making a sudden bend upward, it enters the inguinal canal through the inner abdominal ring, and running obliquely downward and inward in the inguinal canal between the transversalis fascia and the aponeurosis of the external oblique, emerges at the external abdominal ring. It then descends nearly vertically into the scrotum, lying on the outer pillar of the external ring so as to cover its insertion into the pubes.

In its passage through the inguinal canal the cord is strengthened by the cremaster muscle, which consists of scattered bundles of pale reddish fibres derived from the internal oblique during the descent of the testis. They form around the cord and testis a series of inverted arches or loops, rather difficult to dissect. As to their insertion, M. Cloquet says, "the lower fibres of the internal oblique, traversing the external angle of the ring in front of the cord, ascend again immediately, to be fixed to the pubes behind the external pillar of the ring, forming loops of small extent, with their concavity directed upward."

These parts forming the cord are joined together by a cellular structure which Scarpa thus describes:—

"The soft cellular texture which envelopes the spermatic vessels behind the great bag of the peritoneum, and accompanies them under the fleshy edge of the transversus muscle

passing with them through the separation of the lower fibres of the obliquus internus and along the inguinal canal into the groin and scrotum, continues to surround them as far as the part where they terminate in the testicle. This cellular investment,

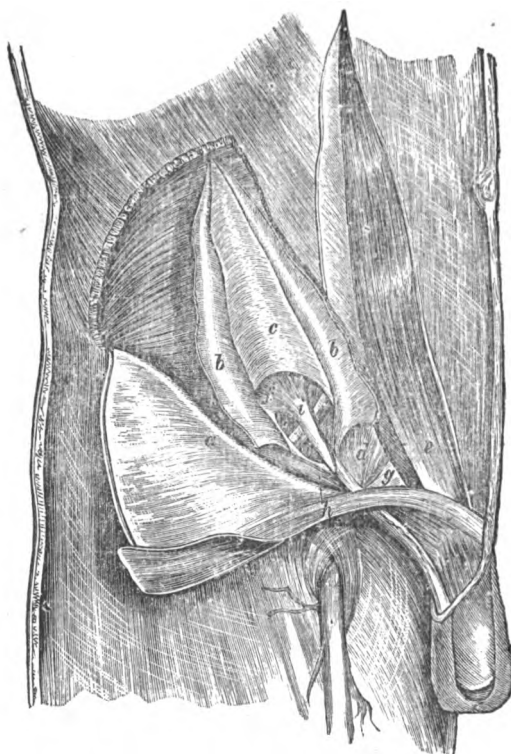


FIG. 5.

Deep dissection of inguinal canal and abdominal wall. After external oblique and the aponeurosis comes internal oblique, *b* and *c*, transversalis muscle, and thin conjoined tendon, taking origin from Poupart's ligament, *a*, internally conjoined tendon, *d*, rectus muscles, *e*, which bars hernial protrusion at the point, *f*, transversalis fascia, internal or deep ring. From its margins arise fascia propria or infundibularis. Base of triangle above outer half of pubic crest is seen, the sills slit in two bands, pillars of ring, the outer forming inferiority, opening obliquely, intercolumnar fascia.

Fascia spermatica externa, *i*; cremaster ilio-inguinal nerve-branch of first lumbar plexus is seen; Gimbernat's and Poupart's; triangular aponeurosis; muscle oblique at *b*; muscle transversalis, *c*; see Fig. 3, page 53—umbilical branch of iliac internal, external iliac artery; lymphatic ducts crural-ring to aortic chain, *g*; genito canal nerve to internal abdominal ring.

being a continuation of that which connects the great bag of the peritoneum to the muscular and aponeurotic parietes of the abdomen, becomes thicker and more copious as it approaches the part where the vessels pass out of the inguinal ring, and after that passage it is enclosed together with the vessels and the tunica vaginalis testis in the muscular and aponeurotic sheath formed by the cremaster, which extends to the bottom of the scrotum. If we make a small opening into the upper part of the sheath and impel air through it the cellular texture is immediately distended, and the cord is swelled into the form of a cylinder extending from the groin into the scrotum as far as the attachment of the vessels to the testicle, where a circular groove or depression is seen marking the boundary between the cellular substance of the cord and the tunica vaginalis testis. While the part is thus artificially distended we may carefully slit up the sheath of the cremaster and expose the investment of the cord, which is then seen as a vesicular spongy tissue with large and long cells capable of extension without tearing. The spermatic vessels are seen running through it separate from each other, and near them is that prolongation of the peritoneum which const. . . in the infant the neck of the tunica vaginalis testis. The diffused hydrocele of the spermatic cord affords another proof how easily this cellular texture may become distended. The cellular sheath of the spermatic cord, which constitutes an investment of tolerably close texture, is connected to the margins of the opening of the transversalis, and again to the external abdominal ring. The cremaster muscle contributes further to fix and support the cord in its passage through the abdominal parietes, while it provides for the necessary movements of the testicle."

To recapitulate: of inguinal Hernia the great majority of cases are of the external or oblique variety. The viscera protrude "through the opening left between the two portions of the

fascia transversalis and under the margin of the internal oblique and transversalis muscles: that is, at the point where the tunica vaginalis communicates with the abdomen in the foetus, and where the spermatic cord passes out in the adult." The mouth of the sac is at the upper or inner opening of the

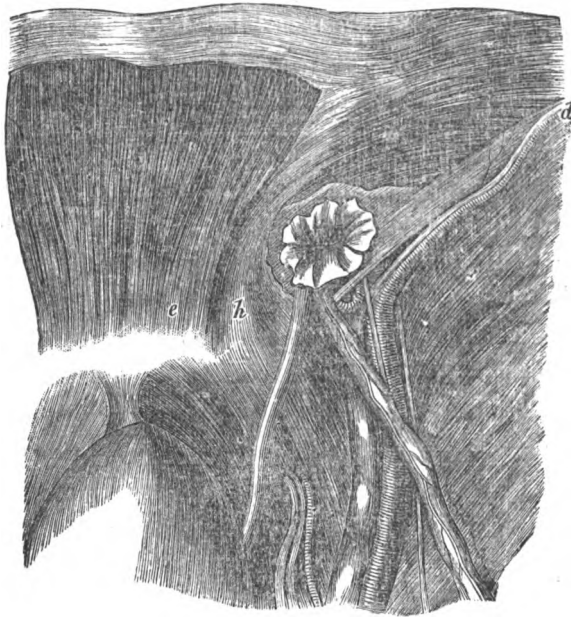


FIG. 6.

Dissection from the peritoneal surface of the parts affected by an oblique rupture; peritoneum, fascia and fascia transversalis; the epigastric artery is seen in its relation below the neck, inner-side removed, showing deep aspect of conjoined tendon, *h*.

inguinal canal, and is therefore midway between the anterior superior spine of the ilium and the spine of the pubes. The normal distance between the internal and external rings is rarely seen in Herniæ of long standing; in fact the normal distance is rarely preserved in any *complete* inguinal Hernia. The spermatic cord is placed behind the hernial sac. After the

Hernia has escaped beyond the external ring, however, many variations in the relations of the cord to the sac may be presented. It may be found at the sides or even on the anterior surface, or, as often happens, the vas deferens and the spermatic vessels, owing to the great pressure following the distension, may

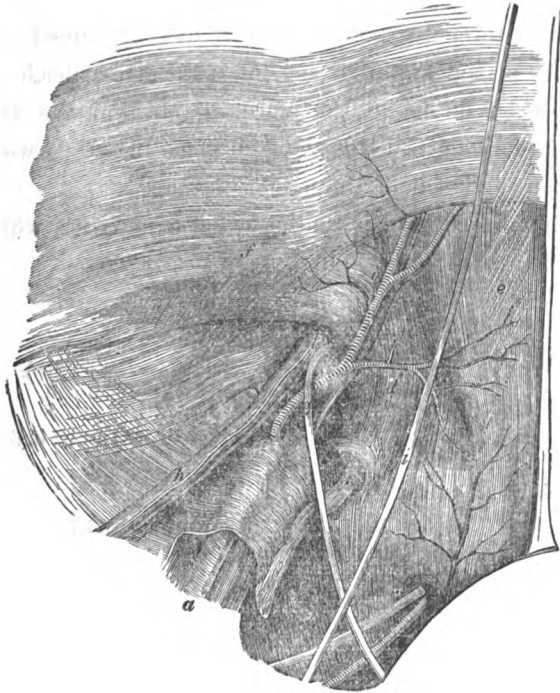


FIG. 7.

Is a part of Inguinal and Crural Hernia, with internal surface of peritoneum and its fascia removed. *b*, epigastric artery passing across and behind Poupart's ligament between internal abdominal and crural rings to sheath of rectus at the fold of Douglas. *c*; Poupart's and Gimbernat's ligament, Hesselbach's triangle. *d*; cord of hypogastric artery, *f*; vas deferens duct spermatic, *g*; spermatic plexus of veins, artery, and nerves, *h*; subperitoneal fascia, *l*.

separate, the former on the inner side of the tumour and the latter on the outer. An internal or direct inguinal Hernia protrudes through the fascia transversalis at Hesselbach's triangle and then through the external abdominal ring. Such a Hernia

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according to Cooper, takes place "if this tendon is unnaturally weak ; or if from malformation it does not exist at all ; or from violence has been broken." The spermatic cord lies usually on the outer side of the sac, although it may lie behind it as in the external or oblique variety. The epigastric artery is pretty constant in its relation to the Hernia, that is as in its normal state about three-quarters of an inch from the upper and outer extremity of the external ring, although Hesselbach records a case in which he found the epigastric so near the symphysis pubis that had a direct Hernia taken place the artery would have been upon the inside of the mouth of the sac.

The inguinal canal has the following boundaries, which have been taken from Darling :—

In front (5 structures)	{ Skin. Superficial fascia (2 layers). External oblique (<i>entire</i> length). Internal oblique (outer third).
Behind (5 structures)	{ Conjoined tendon of internal oblique and transversalis. Transversalis fascia. Triangular ligament. Sub-peritoneal tissue and fat. Peritoneum.
Above (2 structures)	{ Fibres of internal oblique. Fibres of transversalis.
Below (2 structures)	{ Poupart's ligament. Transversalis fascia.

Femoral Hernia.—The superficial fascia of the femoral region is of two layers just as in the abdominal region, between which are the cutaneous vessel and nerves and the lymphatic glands. These vessels are the *internal saphenous vein* and the *superficial epigastric, superficial circumflex iliac, and superficial external pubic* arteries from the femoral, while the cutaneous nerves are from the *ilio-inguinal, genito-crural, and anterior crural* from the lumbar plexus. The ilio-inguinal

nerve lies upon the inner side of the internal saphenous vein, the genito-crural on the outer side, and the middle and external cutaneous nerves still more external. The superficial layer of this superficial fascia is continuous above with the superficial fascia of the abdomen, while the deeper layer is continuous below with the fascia lata a little below Poupart's ligament. Where it adheres to the saphenous opening in this fascia lata it is pierced by small blood-vessels and lymphatics; hence the name *cribriform fascia* has been applied to it in this situation.



FIG. 8.—Femoral Hernia.

The *deep fascia* lying beneath the superficial fascia is called from its great extent the *fascia lata*. At the upper and inner side of the thigh, a little below Poupart's ligament and on the pubic side of its centre, is seen an oval opening directed obliquely downward and outward about an inch and a half in length and half an inch in width. This is the *saphenous opening*. To understand it properly the fascia lata may be described as consisting of two portions, *iliac* and *pubic*. The former "is attached externally to the crest of the ilium and its anterior superior spine, to the whole length of Poupart's

ligament as far internally as the spine of the pubes, and to the pectineal line in conjunction with Gimbernat's ligament, where it becomes continuous with the pubic portion. From the spine of the pubes it is reflected downwards and outwards, forming an arched margin, the outer boundary (superior cornu) of the saphenous opening. This is sometimes called the *falciform process* of the fascia lata or femoral ligament of Hey; it overlaps and is adherent to the sheath of the femoral vessels beneath; to its edge is attached the cribriform fascia, and it is continuous below with the pubic portion of the fascial lata by a well-defined curved margin."¹ The *pubic* portion attached above to the pectineal line and internally to the margin of the pubic arch is upon the inner side of the saphenous opening, and at its lower margin is continuous with the iliac portion. We see therefore that the iliac portion "passes in front of the femoral vessels, the pubic portion behind them, while an apparent aperture exists between the two through which the internal saphenous joins the femoral vein."²

The outer margin of the saphenous opening forms a curved process, the falciform process of Burns, Burns' or Hey's ligament or femoral ligament. It curves inward upon its upper border to join Poupart's ligament, the spine of the pubes and pectineal line where it is continuous with the pubic portion. The inner margin of the opening is on a lower plane, lying behind the femoral vessels, and is less distinctly marked in its contour. When the limb is extended or rotated outward, the saphenous opening will be found tense and constricted; on the other hand, when the limb is flexed, or rotated inward, the opening is relaxed. So that this position of the limb is an important point to be borne in mind during the operation of taxis.

¹ Gray.

² *Ibid.*

The triangle at the upper and anterior surface of the thigh where femoral Hernia makes its appearance is called Scarpa's. It is bounded above by Poupart's ligament, which forms the crural arch already described under inguinal Hernia, and which has a reflection at the pectineal line called Gimbernat's ligament. Externally this triangle is bounded by the sartorius and internally by the adductor longus, while its apex is formed by the meeting of these muscles.

Covered by the iliac portion of the fascia lata, and resting upon the pubic portion of the same fascia, is a continuation downward of the abdominal fascia, called the *femoral sheath*, the transversalis fascia passing in front of the femoral vessels and the iliac behind them. About an inch below the saphenous opening the femoral sheath intimately blends with the vessels, but at Poupart's ligament it is much larger; hence it presents a funnel shape.

Besides the crural arch already described we have the *deep crural arch*, which is a thickened band of fibres running across and in front of the crural or femoral sheath. "It is apparently a thickening of the fascia transversalis, joining externally to the centre of Poupart's ligament and arching across the front of the crural sheath, to be inserted by a broad attachment into the pectineal line behind the conjoined tendon." It is often altogether wanting.

By removing the anterior wall of the femoral sheath we see the femoral artery and vein separated by a thin septum; the artery being upon the outer side and the vein upon the inner. The interval between the vein and the inner wall of the sheath is filled only by loose areolar tissue and a few lymphatics; it is the *femoral or crural canal* through which femoral Hernia protrudes. It should be borne in mind by the dissector that this canal only exists as a distinct canal when distended by a Hernia or other tumour, or when artificially

separated in dissection. It varies in length from a quarter to a half an inch, and extends from Gimbernat's ligament to the saphenous opening. It is bounded *in front* by the transversalis fascia, Poupart's ligament, and the falciform process of the fascia lata, *behind* by the iliac fascia and the pubic portion of the fascia lata, on the *outer* side by the fibrous septum between the artery and vein, and on the *inner* side by the junction of the transversalis and iliac fascia, which cover the outer edge of Gimbernat's ligament. The lower opening of this femoral canal is the saphenous opening closed by the cribriform fascia, already fully described, while the upper opening is the *femoral* or *crural ring*, closed by the *septum crurale*. This septum crurale is a layer of condensed areolar tissue with its upper surface concave and separated from the sub-areolar tissue and peritoneum by a lymphatic gland. When this sub-areolar tissue has become infiltrated with a large amount of adipose tissue it may frequently be mistaken for the omentum, and lead one astray in his diagnosis. As the size and degree of tension of the saphenous opening is modified by the limb being flexed and rotated inward, so is the size and tension of the femoral canal likewise favourably influenced.

The *femoral ring*, like the canal, is an "artificial product" made by the descent of a femoral Hernia. It leads into the cavity of the abdomen, is of an oval form, measures about half-an-inch in its long, or transverse diameter, and is larger in the female than in the male; hence the more frequent occurrence of femoral Hernia in the former sex than in the latter.

In front it is bounded by Poupart's ligament and the deep crural arch, behind by the pubes, internally by Gimbernat's ligament, the conjoined tendon, the transversalis fascia, and the deep crural arch, externally by the femoral vein.

It is important to bear in mind that the spermatic cord and round ligament lie immediately above the anterior margin of the femoral ring, that the femoral vein lies upon the outer side of the ring, that the epigastric artery crosses the upper and outer angle of the ring, and that the obturator artery, instead of lying in its ordinary position on the outer side of the ring, occasionally "curves along the free margin of Gimbernat's ligament," and therefore runs along nearly the whole circumference of the ring.

The viscera in a femoral Hernia descend from the abdomen at first in nearly a perpendicular direction and lie in the hollow of the pectineus muscle. Covering the peritoneal sac is an investment named by Sir Astley Cooper the *fascia propria*. It lies "immediately external to the peritoneal sac but is frequently separated from it by more or less adipose tissue," and anatomically it is identical with the sub-serous cellular tissue already mentioned.

The protrusions of the hernial sac occur almost invariably on the inner side of the femoral vein. Cloquet, however, says, "The epigastric artery may be found on the inner side of the sac of a crural Hernia, the parts having descended in front of the femoral vessels;" and, together with Hesselbach, thinks this sufficient to warrant the division of femoral Hernia into internal and external. Besides these varieties, Cloquet also mentions a case where the Hernia "passed through an opening in the posterior part of the sheath, so that it lay immediately upon the pectineus and *behind* the femoral artery and vein." Such cases are however very rare; by far the greater number being of the internal variety.

To recapitulate. The femoral ring is situated *internal* to the femoral vessels, and is bounded as follows:—

Above (2 structures) { Poupart's ligament.
Deep crural arch.

- Below (4 structures) { Pubic bone.
Pectineus muscle.
Iliac fascia.
Pubic portion of fascia lata.
- Internally (4 structures) { Gimbernat's ligament.
Conjoined tendon.
Deep crural arch.
Transversalis fascia.
- Externally (2 structures) Femoral vein and septum.

Going from the spine of the pubes outward, we meet the following in their order :—

1. Gimbernat's ligament.
2. Femoral opening.
3. Femoral vein.
4. Femoral artery.
5. Anterior crural nerve.

The femoral canal, about half-an-inch long, extends from the femoral ring, where it is closed by the septum crurale to the upper part of the saphenous opening, closed by the cribriform fascia, and is bounded as follows :—

- In front (3 structures) { Poupart's ligament.
Fascia transversalis.
Falciform process of fascia lata.
- Behind (2 structures) { Iliac fascia.
Pubic portion of fascia lata.
- Externally (2 structures) { Femoral vein.
Femoral septum.
- Internally (4 structures) { Fascia transversalis.
Iliac fascia.
Gimbernat's ligament.
Deep crural arch.

Let us now look at the formations of a hernial sac.

The essential parts of a hernial tumour are three in number—

The sac.

The tissues enveloping the sac.

The contained viscus.

The sac is a prolongation of the peritoneum, and consists of the *mouth*, which is continuous with the abdomen; the *neck*, that portion of the parietes through which the sac protrudes; the *body*, which makes up the main bulk of the tumour, and the *fundus*, which is that portion of the body furthest from the abdomen. The neck undergoes many abnormal changes. It becomes thickened, discoloured, and opaque, from deposition of plastic adhesions, from irritation by a truss, or from a puckering of the sack consequent upon compression within the aperture from which it protrudes. It may, instead of being single, consist also of two constrictions representing the anatomical condition of the surrounding parts, while Gant mentions a large scrotal Hernia with three such necks.¹

The *body* varies greatly in different individuals, both in size and shape, being usually pyriform, but often globular, ovoidal, cylindrical, or constricted, like an hour-glass. It varies in size from a cherry to a tumour as large as a man's head. At first it is thin, but often, as in femoral, it becomes thickened and laminated in structure, although in umbilical Herniæ it is like to be thinned and atrophied, while in some rare cases there may be a fibrous or even calcareous degeneration of the component tissues.

The formation of the sac varies in different Herniæ. The congenital hernial sac is found only in Inguinal Herniæ, and is a tubular prolongation of the peritoneum formed by the descent of the testicle, the natural foetal opening of the tunica vaginalis not having been closed because of some abnormal condition. The formation of such a Hernia is rapid, occurs in infancy, and has only a single layer of peritoneal covering. The artificial

¹ The aperture may become altered too in shape, losing its triangular form, and becoming circular, and gradually with the lapse of time being displaced toward the middle line by the elongation of the peritoneum and the thickening of the transversalis fascia, so that the two rings become merged into one.

sac formed by the protrusion of a viscus through the abdomen by the stretching of the parietes, has been named by Birkett the "acquired sac." The formation of such a Hernia is gradual, and belongs only to middle and old age.

In some cases, as in internal and caecal Herniæ, in cystocoele, or in rupture of the sac, either from violence or ulceration, the sac may be absent. On the other hand, just as there may be two or more necks to a single sac, so there may be two sacs protruding through the same aperture, and forming a double Hernia. Indeed, Sir Astley Cooper mentions a case where six sacs occurred together in the same person.

Proceeding from without inward, and observing the coverings of a Hernia, we meet in Inguinal Herniæ the following tissues :—

<i>Oblique.</i>	<i>Direct.</i>
1. Integument.	1. Integument.
2. Superficial fascia, 2 layers.	2. Superficial fascia, 2 layers.
3. Intercolumnar fascia.	3. Intercolumnar fascia.
4. Cremaster.	4. Conjoined tendon (occasionally).
5. Fascia transversalis.	5. Fascia transversalis.
6. Sub-serous cellular tissue.	6. Sub-serous cellular tissue.
7. Peritoneum.	7. Peritoneum.

In femoral hernia the following are the coverings :—

1. Integument.
2. Superficial fascia.
3. Cribriform fascia.
4. Femoral sheath, or fascia profunda.
5. Septum crurale, or sub-serous cellular tissue.
6. Peritoneum.

Since the superficial fascia consists of two distinct layers, the coverings of Inguinal Hernia are generally considered to be eight, and those of femoral seven, in number.

The coverings of the hernial sac may undergo pathological modifications. The peritoneum is very tough and firm in texture, being able, according to Scarpa, to uphold a weight of fifteen pounds. It usually suffers little change, although it

may become thickened, opaque, and firmer near the abdominal opening, and may have serous or lymph effusions upon it. The sub-serous cellular tissue often becomes thickened, exceedingly vascular, and fatty, so as greatly to resemble omentum, while the fasciæ and integument become stretched and, if a truss has been long worn, very much thickened and condensed. The fibrous and sub-cellular tissues covering old and long standing herniæ often become so blended together that it is impossible not only for the young student, but also for the skilled and practised dissector, to distinguish more than a single layer.

The muscular fibres are, however, usually more distinct in their structure, and preserve their identity intact.

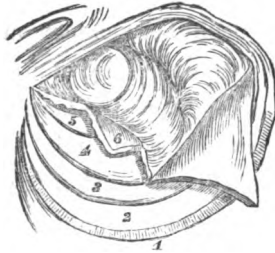


FIG. 9.—Coverings of Femoral Hernia. 1, skin; 2, superficial fascia, cribriform fascia; 3, crurale sheath; 4, femoral sheath; 5, septum crurale; 6, peritoneum.

Adhesions are commonly within the sac, and in long-standing cases, although often a hernia is rendered irreducible on account of fibrous adhesions to the tissues surrounding the rings. When the adhesions are within the sac, they may be between the coils of viscera, between them and the omentum, or between the contents and the walls of the sac. In recent cases these adhesions are soft and easily broken down, but in old cases they often become very firm and fibrous, and especially strong around the neck of the sac.

The symptoms of a reducible Hernia are as follows:—

There is a soft compressible swelling or tumour in the

abdominal parietes, or on the thigh, commonly in the groin, either above (inguinal) or below Poupart's ligament (femoral). This tumour enlarges, and is well marked when the patient stands, and still more so when he coughs or forces down. Coughing will moreover cause a distinct pulsation perceptible to the touch. When the patient assumes the recumbent position the tumour diminishes, and can be reduced by proper manipulation in the direction of its protrusion. The tumour is like to be larger after a meal, and the patient to suffer from flatulence, grumbings in intestines, and other inconveniences resulting from the difficulty of passage of matter through the protruded intestines. There is usually no other pain or sign of inflammation. The hernial tumour, if it attains any considerable size, becomes pendulous, hanging in scrotal and umbilical herniæ even to the knees. Such herniæ may at any time be made irreducible by blows or pressure, by improper manipulation, by the application of a truss when the hernia has not been fully reduced, or by undue violence in taxis. Oftentimes, although the intestine can be readily restored to its normal position, the sac remains protruding because of adhesions which have formed. Further manipulation is then of no avail, and may produce a severe inflammation. Although it has been sometimes recommended to confine these tissues in the aperture of the rings in order to excite adhesive inflammation for the support of the Hernia, such methods have usually been fruitless in results except in young children.

The presence of fluid in the hernial sac will be almost certain to obscure the visceral nature of the contents of an epiplocele or of an entero-epiplocele so as to simulate an enterocele. Hydrocele of the cord may also lead us far astray in our diagnosis of a Hernia as the following case will show.

A little boy with a congenital oblique inguinal suffered at the age of five a strangulation. Dr. J. Leonard, an old friend of

mine, succeeded in reducing the strangulation after long efforts, although he told the parents that to his mortification he had so enlarged the hernial rings, that the hernia could not be retained in the abdomen although he knew he had reduced it. The fact was, as I have since learned by personal examination, the boy was suffering from hydrocele as well as strangulated Hernia and the parts were dilated not so much by the doctor's manipulation as by the pressure caused by the effusion in the hydrocele.

Since the symptoms of many other varieties of tumours so closely resemble hernial tumours it will be necessary to distinguish accurately between them in order not to be misled in our diagnosis. In surgical practice we have to distinguish between the two forms of Inguinal Herniæ, direct and indirect; between Inguinal Hernia and the following conditions :—

Femoral Hernia.	Variocèle.
Hydrocele of the cord.	Hæmatocele.
Hydrocele of testicle.	Bubo.
Sarcocele of testicle.	Impacted fæces.
Undescended testicle.	

We have also to distinguish between femoral Hernia and enlarged glands.

Psoas abscess.
 Varix of saphenous vein.
 Lipoma of femoral canal.

Ventral Herniæ may be confused with Umbilical, Thyroid with Perineal, Diaphragmatic Herniæ with Mediastinal Tumours, Congenital Herniæ with Hydrocele, and with Infantile, or Encysted Herniæ.

To make clear the different points of distinction between these various conditions, I have thought it best to arrange in tabular form the following differential diagnosis.

No. 1.]	Shape, Colour, Translucency.	Location, Weight, Size.	Advent and Development.	Percussion and Auscultation.	Palpation.	Cough Inpulse and Fluctuation.	Inguinal Canal.	Spermatic Cord.	Bowel.	Reduction.	Addenda.
Indirect Inguinal Hernia.	Flask-shaped.	Frequently scrotal and often very large.	Advent Sudden.	P. Resonant.	Soft and doughy. (Enterocoele.)	Present.	Filled.	Usually concealed behind neck of sac.	Possible	Pressure outward and backward. Usually reducible	Pulsation of deep <i>epigastric</i> artery concealed.
Direct Inguinal Hernia.	Globular.	Seldom scrotal and usually small.		P. Flat.	Hard when it is epiplocele.		Empty.	Outside of the neck as a rule.		Pressure directly backward.	<i>Epigastric</i> often felt pulsating outside the neck
Scrotal Hernia.	Smooth and regular. Flask-shaped.	Scrotum. Weight: light.	Sudden.	P. Usually resonant. A. Gurgling.	Soft and doughy.	Present in majority of cases.	Usually filled.	Concealed & displaced by neck of sac.	Occasional embarrassed.	Pressure backward unless strangulated inferiorly irreducible	Seldom <i>painful</i> unless inflamed or strangulated.
Sarcocele.	Often nodular and irregular in outline.	Testicle. Weight: heavy.	Grows slowly as a rule.	P. Dull or flat. A. Negative.	Hard and resistant.	No impulse.	Empty.	Surrounds the cord	Never affected.	Irreducible.	Frequently painful.
Scrotal Hernia.	Flask-shaped. Opaque.	Scrotum. Weight: light.	Develops suddenly from above downward	P. Resonant.	Soft and doughy.	Fluctuation absent.	Filled except when direct Hernia enters scrotum.	Usually concealed by neck of sac.	May be embarrassed	Usually reducible.	Aspiration negative.
Hydrocele of Testicle.	Pyiform or ovoid. Translucent.	Tunica vaginalis. Testis.	Develops slowly from below upward.	P. Dull or flat.	Hard, tense and elastic.	Fluctuation well marked.	Empty.	Neither concealed nor displaced.	Never affected.	Never reducible.	Fluid withdrawn by aspiration or tapping.
Scrotal Hernia.	Smooth and regular in outline. Colour: normal.	Scrotum on either side. Weight: light.	Develops suddenly.	P. Usually resonant.	Smooth on surface.	C. I. Usually present. F. Absent.	Usually filled.	Concealed and displaced.	May be embarrassed	Reducible by taxis only.	Effect of heat: negative. Return of tumour prevented by pressure at external ring.
Varicocele.	Knotty and irregular. Colour: bluish.	Most frequent on left side. Around spermatic cord.	Develops gradually.	P. Dull.	Feels like a bag of worms.	C. I. None. C. II. May exist if vessels are large	Uninvolved.	Not affected.	Never affected.	Often reduces spontaneously when position favours increased venous return.	Effect of heat: tumour increases. Tumour returns in standing position in spite of pressure at the ring.
Scrotal Hernia.	Flask-shaped, unless due to direct Hernia. Colour: normal.	Scrotum. Weight: light.	Develops suddenly from above downward.	P. Usually resonant. A. Gurgling.	Soft and doughy.	F. Never present.	Usually filled.	Concealed and displaced.	May be embarrassed	Usually reducible.	No constitutional symptoms except when strangulated or severely inflamed.
Hematocele of Testicle.	Pyiform. Infundibuliform. Colour: ecchymotic.	Tunica vaginalis. Testis. Weight: heavy.	Suddenly if of traumatic origin; slowly if spontaneous. Grows from below upward.	P. Dull or flat. A. Negative.	Soft at first but hard after coagulation occurs.	F. Always present until coagulation occurs.	Empty.	Not affected.	Never affected.	Irreducible.	Failor: Great prostration often present from loss of blood.

No. 2.]	Location. Weight, Size.	Advent and development.	Percussion and Auscultation.	Cough Impulse and Fluctuation.	Bowel.	Reduction.	Addenda.
Femoral Hernia	Often felt deep in groin. Movements restricted.	Usually due to some severe muscular effort.	P. Resonant. A. Gurgling.	C. I. Present on flexion and adduction of thigh with body bent forward. F. Never present.	Often embarrassed.	Reduced by pressure downwards, backwards, and upwards.	Tumour always solitary. Rare in the male sex.
Enlarged gland.	Always superficial. Great mobility.	Scarificulous diathesis.	P. Flat. A. Negative.	C. I. None. F. Often detected.	No embarrassment.	Irreducible.	Tumour seldom solitary. Equally frequent in both sexes.
Femoral Hernia.	Neck of sac lies internal to femoral artery.	Usually due to severe muscular effort.	P. Resonant.	F. None.	Intestinal derangement often present.	On pressure downwards, backwards, and upward. Distinct and sudden disappearance with gurgling.	Pain frequently absent. Tumour remains reduced in recumbent position.
Psoas abscess.	Neck of sac external to femoral artery.	History: Spinal disease or pelvic affection.	P. Dull or flat.	F. Often occurs if tumour is superficial.	Bowel acts normally.	Disappears gradually on direct pressure. No gurgling.	Pain in back or joins <i>always</i> precedes development. Tumour returns after removal of pressure.
Femoral Hernia.	Directed obliquely across the thigh. Usually small.	Severe muscular effort.	P. Resonant. Often exists.	C. I. Present on flexion and adduction of thigh with body bent forward.	Often embarrassed.	By pressure downward, backward, and upward with a sudden slip and gurgle.	Tumour usually hard and tense; may be doughy. Skin of normal colour. Return of reduction prevented by pressure over femoral ring when patient is standing. Heat has no effect on size.
Vary of saphenous vein.	Lies in longitudinal axis of limb. Variable in size.	History and increased size of veins below crural ring.	P. Flat.	C. I. Often absent but may exist.	No embarrassment.	Reduction gradual by direct pressure in recumbent position. No gurgle.	Soft and indistinctly fluctuating, often discoloured. Tumour returns when patient stands in spite of pressure at femoral ring. Increased by heat.
Femoral Hernia.	Small and well- defined in outline.	Advent sudden.	P. Resonant. May exist.	C. I. Often detected with thigh flexed and adducted and body bent forward.	Intestinal embarrassment not infrequent	Usually reducible.	Tumour often hard. Symptoms in common. Tumour in upper part of the thigh, " inside of femoral vessels, " external to pubic spine, " below " " Tumour <i>always</i> doughy.
Lipoma of femoral canal.	Not well-defined in outline. May be large.	Develops slowly.	P. Dull.	C. I. Never present.	Bowels not affected.	Irreducible.	
Femoral Hernia.	Neck below Poupart's ligament. Usually small and round.	Spermatic cord. Internal to and in front of neck of sac.	P. Frequently dull.	Femoral pulsation. Felt external to neck when finger is in the canal.	Spine of pubes. Internal to neck of sac.	By pressure downward, backward, and upward.	Tumour if elongated lies obliquely across the thigh and never enters scrotum and labia.
Inguinal Hernia.	Neck above Poupart's ligament. Often very large and flask- shaped.	External and behind neck of sac.	P. Resonant.	Finger in the Femoral canal detects no pulsation.	External to neck of sac.	Indirect: By pressure outward and backward. Direct: By pressure directly backward.	Tumour if elongated is often scrotal in situation.

No. 3.]	Location.	Advent and Development.	Reduction.	Age.	Shape.	Consistency.	Translucency.	Position.	Navel.
Ventral Hernia.	Most frequent between recti muscles of abdomen.	Never congenital. History: Traumatism, abscess or weakening of abdominal walls.	Often somewhat difficult.	May occur at any age.	Neck is well-defined.	Edges of opening in abdominal walls can be felt.	Present and in normal position.		
Umbilical Hernia.	Bulging at the navel. Navel therefore absent.	Often congenital. History of traumatism or abscess <i>acutum</i> present.	Effected by mere pressure.	Most frequent in infants.	No apparent neck, but only a bulging at the navel. Usually spherical.	No unnatural opening can be detected.	Absent: tumour supplants its place.		
Thyroid Hernia.	In the thigh near the interior commissure of vulva. Seldom found in male sex.	Sudden.	Reducible.	Occurrence.	In the old and emaciated neck is felt from outside the body. In obscure cases a vaguant or necessary.	Symptoms in common.	Symptoms in common.		
Perineal Hernia.	Perineum above rectum. In both sexes.			Often impossible to detect when small.	Not discernible unless protrusion is extensive and involves perineum. Origin easy to decide if tumour is pronounced.	Sudden advent. Resonant percussion. Reducibility. Cough impulse as a rule. Possible intestinal embarrasment.			
Diaphragmatic Hernia.	Passing through diaphragm.	Sudden advent of protrusion into the thorax known to the patient.	May possibly be reduced by manipulation and position.	Rare but easily detected.					
Mediastinal Tumours.	High up in the thorax.	No marked or sudden symptoms until the size creates pressure.	Irreducible.	Pericussion.	Auscultation.	Thirst.	1 eritonitis.		
Congenital Hernia.	Inguinal canal distended and involved.	Occurrence sudden. May suddenly increase when once developed.	When fluid pressure is reduced it reveals a concealed testicle, which also reduces with gurgle and peculiar sensation of sickness.	Tympanic or localized dullness <i>lost</i> down in mediastinum or thorax if hernia is superficial.	Gurgling.	Embarrassment may exist.	Symptoms rapid if tumour is seen when ated.		
Hydrocele.	Inguinal canal empty.	A ways developed slowly and gradually.	Irreducible	Localised dullness	Negative. If aneurism exists a bruit is heard.	Unaffected.	Extreme thirst is absent.		
Congenital Hernia.	May occur anywhere but here we consider only the serotal variety.	When in serotum, is formed before the tunica vaginalis closes after descent of testicle.	After reduction of fluid and intestinal portion the testicle appears. This is also reducible with gurgling and pain.	Age.	Shape.	Pedicle.	Translucency.		
Infantile Hernia.	Serotum.	Occurs after closure of tunica vaginalis.	Reduction of tumour leaves testicle irreducible.	Usually in infants. Subsequent attacks may occur in adults.	Globular.	Marked.	Usually fluctuating at upper part.	Either distended or involved.	
				Any age. Not necessarily associated with previous attack.	Pyramiform.	None.	Marked at all points.	Always translucent.	Empty.
				Age.	Fluctuation.	Fluctuation.	Translucent.		
				Never attacks adults unless a previous attack has existed in infancy.	Exists at upper part of tumour from presence of peritoneal fluid.				
				Most common in infants, but may occur at any age.	Absent.				Opaque.

No. 4.]	Location.	Advent and Development.	Resonance and Auscultation.	Palpation.	Cough Intermittent and fluctuation.	Bowel.	Pain.	Reduction.	Addenda.
Incomplete Inguinal Hernia.	Confined to limits of inguinal canal. Outlines often indistinct.	History of muscular strain usually present.	P. Frequently resonant. A. Gurgling.	Usually soft.	C. I. Often detected. F. Absent.	May be embarrassed.	Generally <i>painless</i> .	Possibly and often easy.	Edema absent. Constitutional symptoms absent unless sac be strangulated or inflamed.
Bubo.	Often diffused beyond the limits of the canal. Outline usually clearly defined.	Venereal origin often detected.	P. Dull. A. Negative.	Hard at onset.	C. I. Usually absent. F. Present if suppuration occurs.	Unaffected.	Generally <i>painful</i> .	Impossible.	Edema present. Frequent constitutional symptoms.
Bubonocoele.	Inguinal canal.	May be sudden.	P. Frequently resonant. A. Gurgling.	Usually soft.	C. I. to both common	May be embarrassed.	Generally <i>painless</i> .	Reduction with a gurgle.	Vomiting. Scrotum normal and both testicles present.
Undescended Testicle.			P. Dull or flat. A. Negative.	Hard like a gland.	C. I. to both	Unaffected.	<i>Very</i> painful. Pressure causes characteristic sensation of sickness.	May be impossible. No gurgle.	Vomiting. Scrotum imperfect on side corresponding to tumour and testicle wanting.
Inguinal Hernia.	Felt only in inguinal region.	Developed <i>subtly</i> after strain or injury.	P. Usually resonant.	Usually soft.	C. I. Frequent. F. None.	May be associated with <i>obstinate</i> constipation.	Usually <i>painless</i> .	Pressure may effect reduction.	Intestine absent unless hernia be strangulated or inflamed. Not sensitive unless strangulated or inflamed.
Impacted Faeces.	Felt at the side as well as in inguinal region.	Developed <i>slowly</i> with colic pains and <i>no apparent</i> causation.	P. Flat.	Hard and nodulated.	C. I. Absent. F. Present.	Always associated with <i>obstinate</i> constipation.	<i>Painful</i> .	Localized pressure causes indentation.	Vomiting usually present. Always tender on pressure in advanced stages.
Inguinal Hernia.	Frequently scrotal and generally diffused.	<i>Sudden</i> and from above downward.	P. Resonant, as a rule. A. Gurgling.	Soft as a rule. Opaque.	C. I. Frequent. F. None.	Often embarrassed.	Usually <i>painless</i> .	Reduces with a gurgle.	Movements of testicle have no effect. Reduction remains while recumbent position is maintained.
Hydrocele of Cord.	Circumscribed in limits.	<i>Slow</i> unless produced by violence. Occurs from above downward.	P. Dull. A. Negative.	Tense. Often translucent.	C. I. Absent. F. Present.	<i>Never</i> embarrassed.	Usually <i>painless</i> .	Usually irreducible. If reduced, no gurgle.	Movement of testicle transmits an impulse to the tumour. Return of reduction irrespective of position.
Enterocele	In all forms of hernia.	Advent sudden, with <i>acute</i> pain.	P. Usually resonant.	Soft, compressible, elastic.	C. I. Distinct.	May be embarrassed.	Frequently absent.	Sudden return with gurgling.	
Epiplocele.	Rare in <i>Femoral</i> .	Advent <i>slow</i> , with <i>dull</i> pain.	P. Flat.	Doughy, harder, inelastic, and lobulated.	C. I. Less distinct.	Unembarrassed unless we have Entero-epiplocele.	More painful.	Reduced <i>slowly</i> in a lump with <i>no</i> gurgling.	

The following diagrams illustrating the different forms of Hernia with some of the complications, are taken from my distinguished friend Thomas Bryant's highly esteemed work on Surgery, by his according me free permission for the use of this work. The same permission is granted by my no less distinguished friend Mr. J. Wood.

In all these diagrams the thick black line represents the parietes covering the hernial sac; the thin line the peritoneum and hernial sac; the small body at the bottom of the sac the testicle.



FIG. 10.

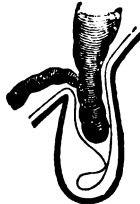


FIG. 11.

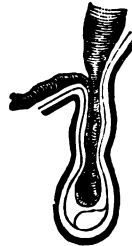


FIG. 12.

FIG. 10.—This diagram illustrates the tubular vaginal process of peritoneum open down to the testicle, into which a hernia may descend. When the descent occurs at birth the hernia is called "congenital;" when at a later period of life the "congenital form," Birkett's "hernia into the vaginal process of peritoneum," or Malgaigne's "hernia of infancy."

FIG. 11.—The same process of peritoneum open half-way down the cord, into which a hernia may descend at birth or at a later period. Birkett's "hernia into the funicular portion of the vaginal process of the peritoneum."

FIG. 12.—The same process undergoing natural contraction above the testicle, explaining the hour-glass contraction met with in the congenital form of scrotal hernia as well as in hydroceles.

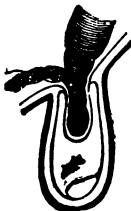


FIG. 13.



FIG. 14.



FIG. 15.

FIG. 13.—Diagram showing the formation of the "acquired congenital form of hernia," the "encysted of Sir A. Cooper," "the infantile of Hey," the acquired hernial sac being pushed into the open tunica vaginalis which encloses it.

FIG. 14.—Diagram illustrating the formation of the "acquired" hernial sac, distinct from the testicle or vaginal process of peritoneum which has closed.

FIG. 15.—Illustrates the neck of the hernial sac pushed back beneath the abdominal parietes with the strangulated bowel.



FIG. 16.



FIG. 17.



FIG. 18.

FIG. 16.—Shows the space in the superitoneal connective tissue into which intestine may be pushed through a rupture in the neck of the hernial sac; the intestine being still strangulated by the neck.

FIG. 17.—Diagram showing how the neck of the vaginal process may be so stretched into a sac placed between the tissues of the abdominal walls either upwards or downwards between the skin and muscles—muscles themselves or between the muscles and the internal abdominal fascia—forming the intra-parietal, inter-muscular, or interstitial sac; hernia *en visac* of the French; “additional sac” of Birkett.

FIG. 18.—Diagram illustrating the reduction of the sac of a femoral hernia *en masse* with the strangulated intestine.

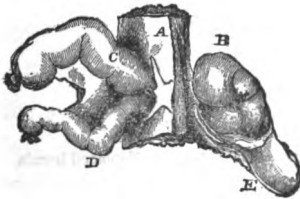


FIG. 19.

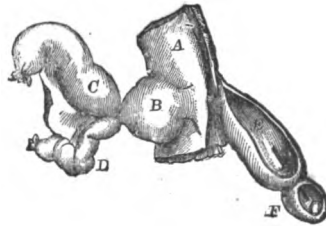


FIG. 20.

Drawing illustrating the second varieties of displaced hernia.

FIG. 19.

A. A portion of abdominal muscles, with the peritoneal lining.

B. The strangulated fold of intestine.

E. The testicle.

The dark lines at the neck of the sac represent the duplicature of the peritoneum, which being unfolded formed a sac for containing the intestine when reduced.

FIG. 20.

A. Peritoneum lining the abdominal parietes.

B. The tumour formed when the strangulated intestine was pushed through the spermatic canal into the sac formed by peritoneum in the inside.

C. The superior portion of the intestine.

D. The inferior.

E. The scrotal hernial sac.

F. The testicle, with the vaginal coat opened.

HERNIA.

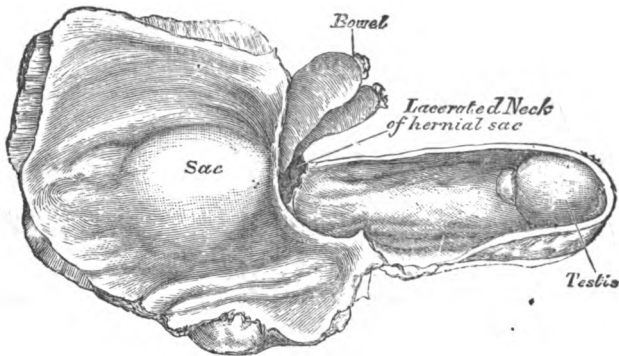


FIG. 21.—Third variety.

Interstitial hernia with ruptured neck of hernial sac.

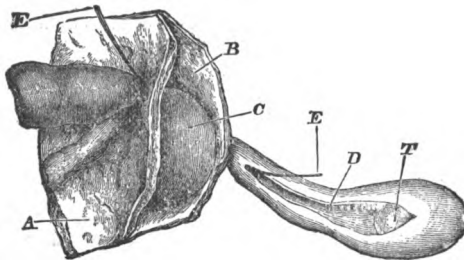


FIG. 22.—Drawing illustrating the fourth variety or intra-parietal form of displaced hernia.

- A. Peritoneum lining the abdominal muscles (B).
- C. Intra-parietal sac with strangulated bowel.
- D. Scrotal hernial sac leading down to testicle (T).
- E. Director passed from the congenital scrotal sac through the internal ring.

In the drawing the strangulated bowel has been introduced to make the description clearer.

CHAPTER III.

STRANGULATED HERNIA.

A HERNIA is said to be strangulated when not only the passage of *feces* is impeded by the constriction, but also the circulation of the blood. The varieties of Hernia in which strangulation is most violent and severe are the femoral and incomplete inguinal, since they are small and therefore apt to be overlooked.

A large and long standing Hernia is more liable to strangulation than a large and recent one, but a small recent Hernia is still more liable to strangulation than one of longer standing. Sir Astley Cooper says, "A small Hernia is more easily strangulated than a large one, the pressure on the contents being more violent and the symptoms much more urgent, as the stricture acts with much more effect upon a single knuckle in stopping its circulation, than when the contents of a Hernia are large and voluminous." On the other hand it must be borne in mind that of Herniæ of the same size, an old one is more liable to strangulation than a recent one, although in the latter the symptoms are more dangerous and likely to be attended with mortification of the intestine.

Is this condition of strangulation solely the result of a mechanical constriction, or is it partly the result of some pathological change set up in the intestine before protrusion? Birkett feels justified from the symptoms preceding the constriction, "in attributing the strangulated state of a Hernia to

a predisposing cause, commencing in a morbid state of the alimentary canal generally; at least in some cases." The patients have usually complained for some time of a disordered or relaxed state of the bowels, and it is also found that the entire mucous surface of the small intestines secretes more than a normal amount of their fluid, and that the intestines are greatly distended and congested.

Erichsen on the other hand gives a slightly different ætiology of the Hernia. He thinks it induced by the constriction to which the intestines are subjected, producing stagnation of blood and inflammation of the congested part.

The *stricture* is most commonly outside the neck of the sac in the tendinous structures surrounding it, although sometimes at the neck itself, and more rarely around the body of the sac, thus giving a Hernia shaped like an hour-glass. It takes place suddenly and usually in consequence of some violent muscular exertion.

1. What is the condition of a Strangulated Hernia ?
2. What changes take place in it ?
3. What are the symptoms excited in the constitution, and the morbid conditions in the abdomen ?

1. The first condition of strangulation is that the blood is impeded, and next that it is arrested. The tissues of the bowel become swollen, they are solid and leathery, their colour dark purple often mottled with red. This inflammation causes a flow of lymph into the intestines giving then a rough and villous appearance.

When the bowels have been some hours strangulated their tissues become soft, the serous surface has lost all its normal characteristics, it is black and adhesive, gangrene has now set in. This state usually comes on within twenty-four hours, although it may come on in a very few hours or may be delayed for forty-eight hours. The intestine becomes firmly fixed to

the mouth of the sac by adhesions, the omentum becomes dark purple, and there is usually a large quantity of turbid serum in the sac. If the strangulation is unrelieved, gangrene of the skin may take place, and the fæcal matter may be discharged through the disintegrated tissues. Such a state is somewhat rare, and it is often the case that there is no external evidence that gangrene has attacked the intestines.

2. As a result of the gangrenous inflammation an artificial anus may be formed in two ways; one in which only a hole is corroded through the alimentary canal without interfering with its continuity, the other "due to an ulceration of all the coats of the bowel even to the mesentery," and therefore interfering with the continuity of the bowel.

The coverings of the hernial sac undergo pathological modifications due to ecchymoses, inflammations, œdema &c. The tumour may become very sensitive and excruciatingly painful; it may also become swollen, from infiltration of serum, tense and regular in outline.

"The discoloured parts become cold and insensible, and more and more dark except at their borders which are dusky red; a thin, brownish, stinking fluid issues from the exposed integuments; gas is evolved from similar fluids decomposing in the deeper-seated tissues, and its bubbles crepitate as we press them; At the borders of the dying and dead tissues, if the mortification be still extending, these changes are gradually lost; the colours fade into the dusky red of the inflamed but still living parts; and the tint of these parts may afford the earliest and best sign of the progress toward death or the return to a more perfect life. Their becoming more dark and dull, with a browner red, is the sure precursor of their death; their brightening and assuming a more florid hue is as sure a sign that they are more actively alive."¹

¹ Paget, *Surgical Diagnosis*.

Another appearance of mortified parts, characteristic of a class, is presented after they have been strangulated. I have mentioned the difference which in these cases depends on whether the strangulations have been suddenly complete, or have been gradually made perfect. In the former case the slough is very quickly formed, and may be ash-coloured, gray, or whitish, and apt to shrivel and become dry before its separation. In the latter case as best exemplified in Strangulated Hernia, the blood vessels become gradually more and more full, and the blood grows darker till the walls of the intestine, passing through the deepest tints of blood colour and of crimson, become completely black. Commonly by partial extravasation of blood and by inflammatory exudation they become also thick, firm, and leathery, a condition which materially adds to the difficulty of reducing the Hernia, but which is generally an evidence that the tissues are not dead; for when they are dead they become not only duller to the eye, but softer, more flaccidant, yielding, and easily torn like the rotten tissue of other mortified parts. The canal which was before cylindrical may now collapse; and now commonly the odour of the intestinal contents penetrates its walls.

I have said the serum might be turbid. It also becomes brownish yellow with the odour of fæces and before bursting though the walls of the intestine may infiltrate its tissues of coverings.

3. One of the first and main symptoms of strangulation is nausea in the morning after rising from bed with vomiting due to a nervous irritation upon the viscera. As soon as the strangulation has taken place the patient feels restless and uneasy, a feeling of tightness is felt as though a band were bound around the body. In general, the symptoms are those of obstruction. Around the seat of constriction there is acute pain, often increasing so as to resemble the severe pains of peritonitis. As a

result of the stoppage of peristaltic movements, complete constipation, severe and continuous vomiting together with violent retching, first ejecting the contents of the stomach and then faecal matter, and colic pains ensue. When the symptoms of peritonitis have appeared, the pulse is quick and hard, the mouth dry, surface of body hot and head racked with pain. The countenance assumes the peculiar shrunken aspect called by the name of Hippocrates, the extremities are cold, the mind is clouded with delirium, and when gangrene has set in hiccough comes on with a sudden cessation of pain. This symptom of hiccoughing is regarded as an especially unfavourable symptom. The period at which death takes place varies from three to five days, being earlier in small and recent than in large and long standing Herniæ.

It is worthy of notice that strangulated omental Hernia has symptoms resembling strangulated intestinal Hernia, only they are less severe; they lead however to the same result—fatal peritonitis.

As in reducible so in strangulated Hernia there is need of a differential diagnosis. It may be confused with *ilius* but may be distinguished from it because in general the patient can tell the state of his bowels, there will be the history to help us and if we are to deal with a Hernia we can always with more or less search find a tumour. It may be confused with an *obstructed irreducible Hernia* but distinguished from it because the latter is not tender to touch and has no peritonitis. Although there may be constipation there is no vomiting as there is in strangulated.

From an *inflamed irreducible Hernia*, because in it there is no vomiting and because the constipation is not entire, liquid faeces usually passing.

From *general peritonitis conjoined with Hernia*, because in it the peritonitis is not confined to the region of the sac because

what little vomiting there is does not bring up fæcal matter and because the constipation is not entire.

With *double* Hernia, one may be strangulated and the other not; the strangulated one will be the more tender about the neck of the sac, and thus we can determine in which the constriction lies.

CHAPTER IV.

OPERATIONS FOR HERNIA.

"The radical cure of Hernia would be too important a triumph for surgery and a resource too deeply interesting to humanity to permit that we should not endeavour to improve it still more and to modify its processes and to make renewed efforts for the purpose of attaining this result. For myself I cannot cease to entertain the idea that in the experimental spirit of our age we may succeed in obtaining a remedy of this description which shall be of real efficacy."—VELPEAU, *Operative Surgery*.

IN this brief and necessarily imperfect sketch of the various operations that have been or are now used for the relief and cure of Hernia, I have thought it best to insert without material alterations a paper prepared by me and read before the Vermont State Medical Society, June 15, 1880. With this brief explanation I trust the reader will kindly pardon any peculiarities of expression that may have crept into an essay intended to be delivered in an assembled meeting of medical gentlemen.

"As many of you are aware, I have written of late much upon the radical cure of Hernia, which has been received by the medical press and profession with no little interest. I therefore take the present opportunity to say that I do not like the term *radical* when applied to this or any other surgical operation. To me it sounds unprofessional, contrary to all my ideas of professional propriety and detrimental to the fair name of medical and surgical science. I know that some of the most honoured men that have brightened the pages of surgical litera-

ture or that have taught in our universities of medicine have thus denominated many of the operations that have been devised for the treatment of Hernia. The term has been more extensively used, however, by those who are not of the regular profession and whose ideas of professional etiquette are not models for us to pattern after. I can but think then that in our present progress of the healing art, it would be out of harmony with the advancing march of improvement to retain the cognomen longer. If I have heretofore used the term radical it has been only to convey to the general profession a more distinct idea of the nature and possibilities of my operation. I now will gladly join hands with you of the profession in erasing from our vocabulary wherever we possibly can the word 'Radical Cure,' and I feel confident that under the less pretentious phrase, 'Cure of Hernia,' we shall accomplish just as successful results as with the more ambitious cognomen in general use.

"In presenting to your notice the various mechanical cures for Hernia, such as external compression, the application of sutures, of metals, catgut or silken cords, the insertion of goldbeaters' skin, the invagination of the external abdominal covering or any other device, whether herniotomy, tendinous irritation, or the actual cautery I would have you take into consideration the remarks of our distinguished and learned fellow and one of Boston's adopted sons and renowned operators as well as teachers in surgery. His remarks at our last February meeting of the Suffolk District Medical Society were that in all the various operations in Hernia it was a well-established fact and a true principle in surgery that all of the operations for Hernia had sooner or later with hardly an exception given way in a few days or years where a cure had been attempted by sutures or pins for the relief of the sufferer. There never were truer words uttered by any surgeon ancient or modern than these of Dr. D. W. Cheever,

whose name shines brightly in the annals of our society and upon the pages of surgery. Words like these are comparable to the utterances of a Webster in constitutional law, and I take great pleasure in recording them. Well may the state of his nativity take pride in claiming such sons in medicine and law. But while his remarks, as well as those of Dr. Henry H. Smith, in his *Principles and Practice of Surgery*, are true of all previous operations for the relief and cure of Hernia, still we must remember that in all these operations a different irritation and a different amount of effusion is produced from that produced in the operation by injection now under consideration, and that by their methods of operation either the surrounding tissues are directly excited to absorb the lymph that has been effused or else they produce suppuration which is always fatal to the adhesive formation of lymph tissue whether this lymph is produced on muscles or on tendons. Even if by this new method of injection for cure there should be a tendency in the newly formed tissues to melt away the process will be so gradual and will take place from such a superabundance of tissue (as has been fully borne out by experience) that nature will have sufficient opportunity to reassert her power and form afterwards out of the effused plasto-lymph as strong a tissue to say the least as ever originally existed around the rings.

“May we not hope then with your generous efforts as well as those of the profession at large to perfect this operation and present to the world a glorious exception to all the previous operations? Who would not lend a helping hand to give this priceless gift to our fellow-men?”

“If I perform this or any other operation I wish, as any medical gentleman would, to do it well; but because I wish all this it is not necessary that I should make a specialty of curing Hernia only nor need I feel inclined to follow the

example heretofore set by some to keep all of my doings in this operation from the light of the profession. My whole professional life, and all that is manly in my nature revolts against pursuing any operation in the art of surgery or medicine in secret and apart from my professional associates for the purpose of selfish aggrandisement or personal gains. I do not believe in an idea of specialists in our noble, grand, old profession. The gentlemen who generally follow one idea and branch as a specialty are apt to become circumscribed in all of their professional reasoning and acts: if the specialty is that of the disease of women, all their ideas of the suffering and illness of the fair sex are centred in the uterus and its appendages; if the disease of the eye, great opacity to every other ailment of the body. He who follows the treatment of the insane finds all insane except those who recover under his treatment. If Sir Henry Thompson removes stone from the bladder by a peculiar process of his own discovery, and does it successfully, he does not think it necessary that he should be interested only in the operation of lithophaxy; or because Henry J. Bigelow may have thought to improve the tube of Thompson, and to establish the toleration of the bladder to undergo prolonged operations, he does not operate for removal of stone only. No, gentlemen; those doing one operation exclusively, even if they do arrive at great perfection in it, lose their enlarged views on others that may be quite of as much importance as the single operation they perform. This is the reason we find Von Gaff, and Agnew, or Williams, operators of distinction on the eye, taking as much interest in other surgical operations or in any improvement in medicine or hygiene as in their own department. By this study and interest do they not have better perceptions of all that pertains to all professional advancement? You will also find Spencer Wells of England, Thomas and Barker of New York, and Brown Séquard of Paris, taking the

same interest in other branches as in that branch which they have so worthily developed and perfected by their study. In speaking thus, I would not have you think that I do not fully appreciate those who may have made a special study of any special branch of medical and surgical science, and that I intend to infer that we should not call such men to our aid and refer to them in any difficult operation requiring their peculiar operative skill. I do not, as is quite apparent, expect to do all the operations for the cure of Hernia, or overcome all the strictures of the urethra, or pass all the catheters of vermicular point into the human bladder. No, I give freely my instruments and my method of performing these various operations and I feel confident that in them all will succeed quite as well as I have or even better. In this may I not look for its full approval and adoption?

“What has been called a *Radical Cure*? A cure has been considered radical when the tendons, muscles, and fascia forming the barriers to the protrusion of the bowels are restored to a normal firmness and power of resistance. Such a cure is tested by the firmness of the rings and the absence of inconvenience and tenderness when the patient has returned to his usual avocations. Hernia was formerly considered an immoral disease, and ever since the days of Hippocrates, Galen, and Celsus there have been constantly proposed new and pretended cures for this terrible affliction; yet it would be manifestly unjust to condemn all cures indiscriminately simply because they were new and because they laid claim to a complete cure. Many of them are, however, so thoroughly empirical and absurd that the barest mention of them will be sufficient. The more scientific methods employed have been either to plug up the orifice by articles which will fuse with the surrounding tissues, or to produce such an inflammation of the parts as will provoke adhesions of the enlarged opening, and hence a contraction. Some of these

methods are plausible, others probable, while others may justly lay the claim to fairly successful results.

“ Among operations long ago obsolete, may be mentioned the ‘*cerat de brique*’ of Fabricius, the vinegar bags of Verduc, the remedy of the Prior of Cabriere, which was an astringent plaster over the hernia and milk given internally, the method of A. Paré, which consisted of a cataplasma of iron filings with internal administration of diamond, Armand’s decoction of dog-grass and laurel, the application of ammonium carbonate, as recommended by Belmas, &c.

“ *Compression.*—Among the advocates of this well-known palliative remedy are Celsus, Theodorus Aetius, de Saticet, Norsia, Blegny, Trécourt, Petit, Juville, &c. Fournier, Beaumont, and Duplat favoured the use of compression combined with the application of astringents, while in Germany some went so far as to recommend pressure to such an extent as even to form gangrene.

“ *Position.*—This is too laborious a cure to be at all practical or practicable, yet Ravin, Rivière, de Hilden, Reneaume, Armand, Fedran, Hey, and Riech have soberly advocated a horizontal position in bed for six months with topical compression and astringents, together with low diet, blood-letting, and purging as insuring a prospect of recovery.

“ Passing such unscientific procedures, we now come to methods of cure which rightly deserve the name of surgical operations. Some, to be sure, are more dangerous than others, while many, although now abandoned in their original form, have recently been revived in methods based upon them, but improved in various ways. These operations will include cauterization, incision, excision, ligature, suture, castration, scarification, dilatation by organic plugs, acupuncture and closure of the rings either by wires or by injection.

“ *Cauterization.*—This operation of laying bare the hernia,

raising up the internal envelope without opening it, and cauterizing the ring with a red-hot iron is spoken of by Avicenna. Franco was in the habit of laying open the sac and touching the neck with a button cautery. Among the cauteries that have been used we may mention sulphuric acid, muriate of antimony, potash, essence of euphorbium, ranunculus, &c. The object sought was to obtain an eschar around the neck and thus to cause a suppuration sufficient to produce new tissue. The cautery was applied by two methods, one directly to the hernial coats, the other indirectly from the interior of the sac. In the former method there is the serious inconvenience of not penetrating deep enough to accomplish our result, or if we do succeed in cauterizing the right parts, of injuring at the same time some important and vital organ, while in the latter the danger of injuring the viscera by the cautery is avoided by pushing them out of the way.

“*Incision.*—This has been so popular a method that it was not until the latter part of the last century that it was abandoned. The hernial coverings, together with the sac, were first divided as in strangulated Hernia. The viscera having then been reduced the opening was closed by suture. But the results were fatal almost immediately; and while Armand, Lieutaud, and Le Blanc favoured the operation, Acrel, Richter, Sharp, Abernethy and others as strongly condemned it as formidable and dangerous.

“Just here it might be well to say that G. W. Hinman, of Derry, Vermont, recently reported one cure by opening the sac and brushing the inside with tincture of iodine, an operation which has in it some reasonable hopes of success.

“*Excision.*—This consists in dissecting and removing the sac, and involves such exceedingly great and almost inevitable danger of peritonitis, that although practised by Brandi, Lafranc, Arnand, Smucher, Langenbeck and others of more

recent date, it is painful even to think of it. After this was done away came the method of cutting down upon the sac and introducing a ligature which prevented hæmorrhage and did not expose, although it might involve, the peritoneum.

“*Ligature.*—Some have applied the ligature directly upon the sac by cutting down upon the parts; others apply it to the superficial integument.¹ Celsus speaks of those who placed the integument between two pieces of wood and pinched it so as to produce gangrene, while Saviard and Desault constricted the hernial envelopes so as to produce its mortification.

“It is recorded of Guy de Chauliac that in 1360 he laid bare the sac and then applied a ligature around its neck. Although this may be an operation to be preferred above cauterization, yet as it is essentially painful and dangerous in its liability to injure the peritoncum, it seems strange that in recent days it should be revived. An attempt was, however, made in 1872 in Paris and Lyons, by M. Martin, to rescue it from oblivion, and within the last thirty years by J. C. Nott, of Mobile, Alabama, who binds the columns together by a leaden ligature, at the same time compressing the sac, but taking care not to constrict or involve the spermatic cord.

“*Suture.*—Closely allied to the preceding method is the method of suture which is applicable especially to inguinal Hernia in males, and as it involves only the external ring, can be applied only to the direct kind of inguinal. Some accomplish the suture after a tedious dissection, but Thomas Wood of Cincinnati, Ohio, in 1851 passed a suture through both columns of the ring and bound them together by adhesive inflammation,

¹ This cure is especially applicable to young subjects. Although censured by Sabatier, Scarpa, and Sir A. Cooper, as producing convulsions and inflammation in children, it has been successfully used by Desault and Dupuytren. For an improved cure by ligating with carbolized catgut see p. 101 for Lister's antiseptic method.

taking care not to compress the sac.¹ The new tissue formed however in these cases has not been found sufficient to prevent the return of the Hernia.

¹ Essentially the same method has been used by G. Dowell, of Texas, who about 1859 performed the operation in the following manner:—The double spear-pointed needle (Fig. 23) being threaded with silver wire at one end, a portion of the skin and cellular tissue was pinched up over the hernia and the needle inserted and pulled through until the threaded point reached the superior tendon of the external ring. The sac was now invaginated and the needle passed through both superior and inferior tendons

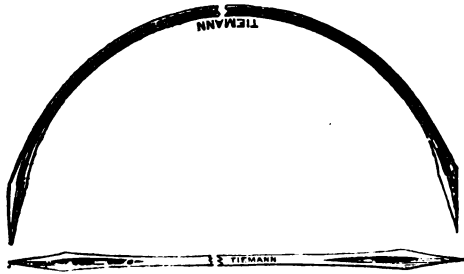


FIG. 23.—Dowell's Needles.

of the ring. A second ligature was applied in the same way and both tied over a piece of cork, drawing the edges of the two tendons together.

Another method by ligature is that recently devised by Octavius White, of New York, and soon to be given to the profession. The point *A* is invaginated into the ring. The needles are then pushed out through the

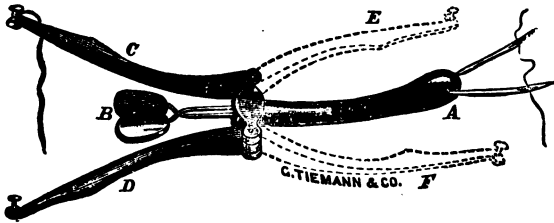


FIG. 24.

integument and a ligature tied over the two handles and knobs *C* and *D*, these handles being turned over, as shown by the dotted lines. The needles are then withdrawn and the instrument, weighing less than an ounce, is left in place for some days.

“S. R. Beckwith, of Cleveland, Ohio, also reports a process (May, 1872,) for the cure of recent inguinal and umbilical Herniæ by a hare-lip suture.

“*Castration*.—Some of the operators by excision, ligature and crowding up of the sac, finding the operation too tedious enveloped the cord and sac by the same thread; from this originated castration as a method of cure. This was long ago interdicted by law, even by Constantine, although in very recent years many have boasted of the number of cases thus operated upon in secret. It is not only dangerous to life, unnecessary and barbarous, but it offers no hopes of a radical cure.

“*Gilded Point*.—To prevent the loss of the testicle, this operation was invented. It was used by Buchwall, in Denmark, and by Berrault and A. Paré, in France. It is practically the same as castration, although theoretically it avoided compressing the cord, compressing only the sac.

“*Royal Suture*.—This ancient process consisted in dissecting the sac and sewing it up without involving the cord. It is nothing more or less than suture applied to scrotal Herniæ, and was fancifully called *Royal* by Fabricius because it saved the lives of subjects who if cured might protect the king in his royalty.

“After taking this cursory and synoptic view of the ancient operations, what surprises us most is not that the operations of excision, incision and exposure of the sac and ligature of the same were practised in ages gone by, but that they should be revived with all their suffering and danger by modern operators when safer and better means of cure lie near at hand.

“*Scarification*.—In this operation Le Blanc took advantage of the method of dilatation of the ring used for strangulated Hernia.

“It is, after all, only a variety of the incision method already

mentioned and is open to the same dangers, although it is true that the effusion of lymph thus produced favours the consolidation of the tissues and not their relaxation as Petit has claimed. Alphonse Guerrin, the tenotomist, scarified subcutaneously, and compressed the abraded surfaces with the pressure of a truss. The operation, though plausible, is nearly useless, although Heaton sometimes resorted to it when supplemented by his injection of quercus alba.

“*Organic Plugs.*—Of this method there are five varieties:

1. Plug of the Epiploon.
2. Plugging with the testicle or the sac.
3. Plug of integuments.
4. Plug with the invaginated skin.
5. The two methods of Belmas.

“1. This applies to cases where we are dealing with an entero-epiplocele; the epiploon or omentum may be inserted into the rings and compel them to contract so that the Hernia will not reappear; Cooper, A. H. Stephens, of New York, Velpeau and Goyrand have in this way been successful in cures. The process is in some respects a natural one, but still has two inconveniences: it seems applicable only to strangulated Hernia and is liable to produce colic and traction upon the stomach. Besides it is not uniformly successful.

“2. The obstruction of the ring by the testicle is a useless operation advocated by Moinichen and Scultetus. Garengest and Steffen claim to have accomplished the same result by dissecting the sac and inserting it into the rings.

“3. Jamson, of Baltimore, reported in 1828 one solitary case of a crural Hernia upon a lady, cured in the following way. He cut down to the ring, cut from the neighbouring integuments near the ilio-pubic ligament a strip two inches long and ten

lines wide, which he succeeded, he says, in engrafting into the ring. Although painful, complicated, and somewhat dangerous, it has every reason in its favour theoretically, in small femoral Herniæ. Practically, however, the fact of this reported cure is vitiated by the circumstance that there was no professional witness of the operation. His only follower was Redfern Davies, of Birmingham, England, whose instrument (Fig. 25) and operation seem to be a complicated modification of Wurtzer's. He also was successful in his case.

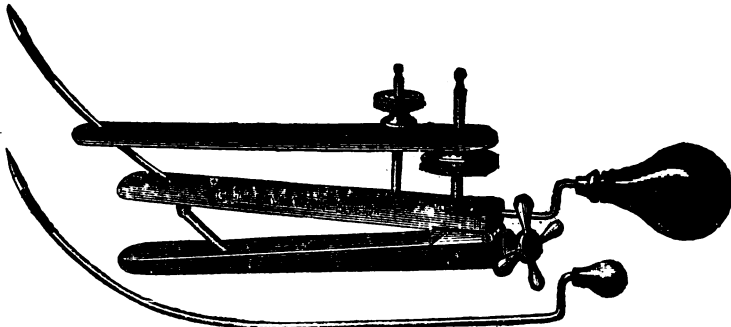


FIG. 25.—Redfern David's Instrument.

"4. This is the method of M Gerdy and Signoroni performed in 1837, and modified by M. Leroy. Velpeau reports one successful operation in his practice. Gerdy reports about sixty cases, some of which failed utterly after a time. The adhesions formed are in fact too slight and tender ever to consolidate, and although it may not involve serious injury to the epigastric artery still it may produce dangerous and even fatal inflammation and peritonitis. It is principally adapted to the inguinal form. A fold of skin is pushed as far as possible up the sac, held there by two interrupted sutures introduced about 1—3 inch from each other by a curved double-threaded needle through the covering tissues, the ends being tied over a bougie. The cuticle of this pouch is then destroyed by ammonia, which

causes the inflammation that is supposed to work the cure. The suppuration produces adhesion about the eighth day, when the threads are removed. But when the threads were removed the plug often came out and with it the hernia came down. Gerdy used the finger for invagination, while Signoroni used a piece of catheter. It not only often failed of good results, but was also frequently fatal, as Thierry has shown. The principles of the operation have in a modified form done some service in the hands of other operators, *e.g.*, Wurtzer and others.

“D. Hayes Agnew, of Philadelphia, used an instrument (Fig. 26) like a bivalve speculum, with which to invaginate the plug, and then embraced the base of the plug with a silver wire, which

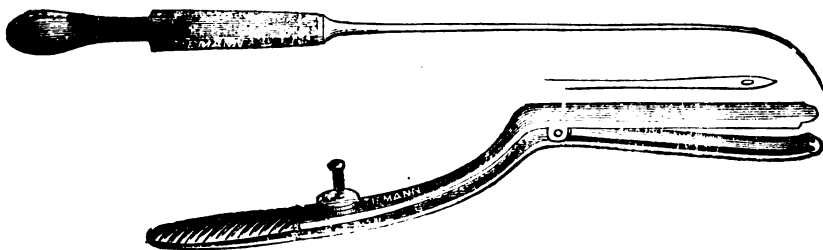


FIG. 26.—Agnew's Instrument.

could be removed after 10—14 days. This operation is no longer performed.

“*Belmas' Method.* 1829.—The original operation consisted in the introduction and attachment of a small *pouch* of gold-beaters' skin to the upper part of the sac. The plastic material poured forth by the irritation produced by the presence of the foreign body spreads, involves this foreign body and forms the nucleus of an insurmountable barrier to the protrusion of the viscera. The operation was first tried upon dogs and with success. The first human subject operated on was easily cured by Belmas. He then induced M. Dupuytren to undertake the operation. This was upon a boy of fourteen, whose life was in

danger for ten days in consequence of the operation, but who was radically cured after two months, not only of a congenital hernia, but also of a hydrocele. Five cases in all were operated upon. Velpeau, who assisted in the last one, thinks the operation safe in itself, but provocative of remote dangerous symptoms.

“Belmas now modified his operation and deposited in the *sac strips* of gelatine or goldbeaters' skin, instead of *pouches*. These strips were introduced by a *canula* which can be separated into two halves within the hernial sac. This second method is pronounced by Velpeau as even less beneficial than that of Gerdy and is now entirely abandoned.

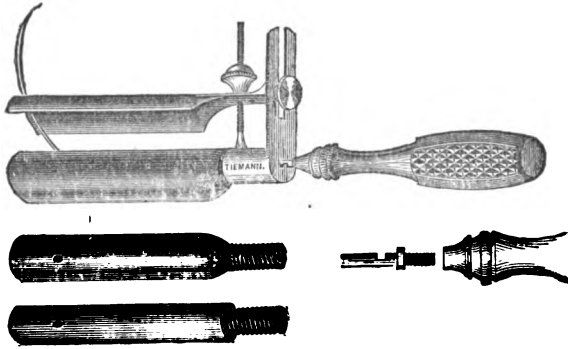


FIG. 27.—Wurtzer's Instrument.

“*Acupuncture*.—A more simple method of cure was introduced by Bonnet, of Lyons, in 1836. It is called *acupuncture*, and consists in perforating the scrotum and sac near the rings with several pins, which are allowed to remain until they produce ulceration of the skin. M. Mayor of Lausanne, used a seton instead of a pin; but whatever the modification, the method is useless since the whole canal is left open and the sac only imperfectly agglutinated.

In 1838, *Wurtzer*, of Bonn, Germany, invented an instrument (Fig. 27) which carries out Gerdy's method of invagination simply

and safely. His instrument consists of three pieces--a wooden (or, as now used, hard rubber) cylinder, a long curved needle, and a concave wooden cover to produce adhesions. The cylinder is about three inches long and from 3—8ths to 3—4ths inch in diameter, according to the size of the Hernia, of a flattened shape, perfectly smooth and rounded upon the free end, a short distance from which is the orifice for the exit of the curved needle which runs through the cylinder, and is attached to the movable handle. The cover is to compress the folds of integument during the operation and likewise has a hole in it for the needle. The protruded parts having been returned, the integument is pushed up the canal with the forefinger of the left hand, the cylinder is introduced into the cul-de-sac thus made, the finger at the same time being withdrawn. When the end of the cylinder is in the internal ring, the needle is pushed through the sac, canal, and integument. The handle is then removed and the rest of the instrument allowed to remain in position 6—8 days. The puncture made by the needle suppurates by the fourth day, the bowels are not allowed to move, rest is enforced, with a plain diet, and then a truss is worn for six months or more. Dr. Otto Weber, of Bonn, says, however, that of fourteen cases operated on by Wurtzer, not *one* was cured, for the rings are not closed and the plug gradually withdraws. The failure is not due to peritonitis, but rather to the insufficient character of cellular or lymphoid tissue poured forth by the suppuration. Such tissue from its very nature never can be permanent, and is entirely different in this respect from that produced by irritation of the tendons by injection.

“ This operation has been followed by Mosmer, by Rothemund, in Munich, Sigmund in Vienna, and by Spencer Wells in 1854, in the United States.

“ Professor Armsby, of Albany, New York, has modified the operation by allowing a thread, which is occasionally moved to

produce inflammation, instead of a needle, to remain in the hernial sac and internal ring so as to cause the necessary suppuration. Dr. J. W. Riggs, of New York, in March, 1858, also advocated the use of a seton, but on a larger scale, and reported several successful cures.

“Still another modification is that of Dr. Hachenberg, of Dayton, Ohio, who used an ivory ball threaded by a double thread to produce the suppuration.

“Since, however, the operations of Thomas Wood, Dowell, Wurtzer, and Gerdy, with all their various modifications, do not involve the internal, but only the external ring, they are not applicable to the oblique *Herniæ*, whatever little may be

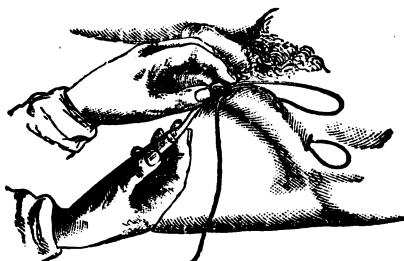


FIG. 28.—J. Wood's Operation.

said of their probable or possible value in the relief of the direct variety.

“*Operation of Wood*, of King's College Hospital, London. This operation consists of the ‘compression and closure of the tendinous sides of the hernial canal throughout its *entire* length’ (Fig 28). It differs from the older operations by being entirely subcutaneous, and by puncturing the sac only by a small valvular opening. The hernia being reduced, an incision through the scrotum is made by a tenotomy knife sufficient to introduce the forefinger and a needle. The fascia is then detached from the skin for the space of two square inches, and invaginated into the canal. The needle is now passed through

the conjoined tendon, upwards and inwards through the internal pillar of the external ring. A wire about two feet long is introduced into the needle and drawn out through the scrotal aperture, one end projecting from the puncture above. Then with the finger placed behind the external pillar, this pillar and Poupart's ligament are raised from the deeper structures. The needle is now passed below the internal ring and through Poupart's ligament to emerge at the puncture already made in the skin and the wire drawn back into the scrotal puncture. The sac is pinched up and the cord slipped back from it as in taking up varicose veins. The end of the inner wire is now hooked to the needle and drawn back across the sac. Both ends of the wire are then twisted together into the incision so as to twist the inclosed sac likewise while traction upon the loop invaginates the sac up into the canal. This loop is then joined to the two ends of the wire in an arch beneath which is a stout pad of lint. After 10—15 days the wire may be withdrawn. It is reported that 65—70 per cent. of the cases thus operated upon have been cured, although many of them have returned to their original state after the lapse of several years."

I would next to Wood's operation place my friend Dr. Dowell's operation, which he has very kindly written out for me to insert in this work in his own words.

MELROSE, MASS, July 17th 1850.

"DR. J. H. WARREN:

"DEAR SIR,

"Inclosed herewith I give you a synopsis of my *subcutaneous ligature* for the radical cure of Hernia. I commenced the investigation of the cure more particularly in 1858, and continued these investigations until in 1859, 10th Sept. in the night and in bed, thinking over an operation with Wackye's instrument I was going to perform next morning, I

planned the entire operation as I now perform it with slight modifications as to the needle and other details which I will give you as briefly as I can. I started well with the idea to cure Hernia; we must adopt some method *by which we can restore the natural supports to the abdomen.* That in operating for Strangulated Hernia it was often the case that within from one to two days the adhesions became so great that it was impossible to separate them without cutting, showing that to get adhesions it was not necessary to fasten the surfaces brought in contact, that *single contact with slight pressure would cause all peritoneal surfaces to unite.*

“The next question was how could we best do this, and at last I projected and had made in 1866 by Messrs. George Tiemann and Co., New York, the needle shown in Fig. 23, p. 99, with an eye in each end, which I have only changed since by adding an eye at one end. The needle is made first with a groove from eye to eye, or rather from point to point to keep it from bending or breaking. The needle is from four to six inches long. At first I had it only three inches and the eye in the centre, but I found this too short, and the eye in the centre prevented the reversing of the needle which acts as a weaver’s shuttle.

“*Operation.*—I prepare my patient by having his bowels moved several hours before the operation and the urine voided before going on the operating table. The parts are then shaved of all hair and three lines made with a pencil or ink, one immediately over the centre of the tumour; two about one or two inches on the sides of the first. Thus:—



FIG. 23.

For left inguinal the needle is then threaded with some strong thread, I usually use wrapping twine used in the drug-stores. I thread only one eye and twist the thread hard and use it. I have from one to seven silver wire ligatures ready, and after putting all the threads in I think necessary I replace them with the silver wire. Thus prepared, the patient is put under ether or chloroform. I now take the unthreaded end in my right-hand finger and thumb while I pick up the skin and cellular tissues with my left hand to remove it from the sac and tendons. I then put the threaded point below my left-hand finger and thumb and run it through the elevated portion of the skin and cellular tissue until the unthreaded end rests on the tendons just under the line on the right or left as the case may be. At this stage, still holding the needle, the Hernia is invaginated and the left index finger is put in to guide the needle under the tendons and from one side to the other until I bring out the unthreaded end in the line on the other side. I then pull on the unthreaded end until it gets loose above the tendons and then push back the threaded end to where I first started and the two ends of the ligature cross each other and are finally tied over a roll of adhesive plaster which I now mostly use, but a bougie or piece of wood or cork will answer, it simply being fastened as a quill-suture; but the adhesive plaster is soft and fits well, and I believe is the best thing I have used. I begin to put the ligatures in at the upper point of the rupture and continue them down until I have put in a sufficient number to close the rupture, using from one to seven according to the size of the opening. The ligatures have been left in from three to eight and some, in first case, fifteen days. The ligatures before tying are simply pulled up so as to close the wound, or bring its edges in contact with slight pressure; if they are made too tight they will cause suppuration, and perhaps a failure, as all my failures suppurated and as I

think by pulling the ligatures too tight. The ligatures are removed when I think I have produced sufficient inflammation to cause complete union, and this must be judged according to the case, but if no tendency to too much swelling leave them to seventh day at least. The bowels should again be moved before the ligatures are removed and a compressing bandage applied. Patient ought to keep quiet in bed for at least a week and avoid straining, coughing, laughing or anything that will press on the ring. I, last summer (1869), invented what I call my buggy spring truss to apply after these operations, to support the parts while they are tender and in all cases where the patient is only relieved. The spring is made rather thin and not very

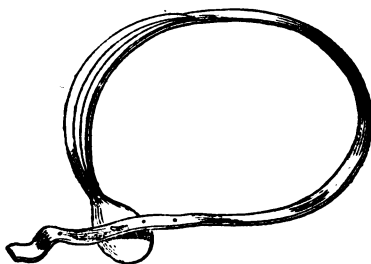


FIG. 30.—Dowell's Buggy Spring Truss.

strong; and two extra springs are put on over the main spring as the springs are fitted in a buggy (see Fig. 30). The whole is covered with soft leather, and adjusted over the rupture only making very light pressure and the springs prevent continuous pressure, but when there is a tendency to protrusion they become very strong and will not allow any protrusion sufficient to rerupture. This truss will be beneficial in the *subcutaneous injection method* as practised by yourself at the present. With the two methods *subcutaneous ligature* (a my operation) and *subcutaneous injection* as practised by yourself, with the aid of this truss, I sincerely believe all cases can be cured and without danger. The result of my operation

so far as I can learn is about as follows : one hundred and three cases treated by myself ; twenty-four cases partially relieved, two cases reported as made worse, one child died in seven days after operation, with congestion of the brain, but no doubt the chloroform and operation had something to do with the development of the fever which was of the malarial form of congestion of the brain. Cures seventy-six. So far as I know all these remain well, some have had partial return of the Hernia and wore trusses. Several were operated on twice and failed both times, I know no particular reason for the failures except the ligatures were put in too tight. The ligatures should be carefully cut just under the knot and at one side of the knot. If cut on the side or the knot cut off, when the quill is removed the ligatures become buried and cannot be removed, and have suppurated and caused a great deal of pain, and in almost every case a failure. This is a little thing, but is one of the most important in the whole operation. When the patient suffers any pain I give full doses of morphia and apply cold cloths or astringent washes with morphia over the ligatures. Where there is no pain I simply put a piece of lint over the ligatures and saturate it with collodion.

“ The operation above has been performed about two hundred times by different operators. Drs. Wilkins and Trubest, of Gobreston, Texas ; Drs. Worthington and Bibb, of Austin, Texas ; Dr. Powell, of Florence, Texas ; Dr. Ruskin, of Grose-buck, Texas ; Drs. Allis and Hunter, of Philadelphia ; Dr. Johnson, of Richmond, and many others. Their exact statistics are not at hand, but I believe they have had equal or even better success than myself, as I included in my list all the cases operated on in my experiments to perfect the operation. My greatest fear was of general peritonitis, but this has not happened in any case of mine. Some ask, do you inclose the spermatic cord in the ligatures ? No, never ; it is kept below the

ligatures by the invaginating finger. What about the arteries? I pay no attention to them, save but little if they are included in the ligatures. It does no harm. Now as to the comparison of the two operations. Subcutaneous ligature and subcutaneous injection, both have their special advantages and mutually aid each other. The subcutaneous injection is specially useful in Herniæ of small size and recent date, while the subcutaneous ligature is suitable to large Hernia and of long standing and as I believe contains the only principles of success in large Herniæ and of long standing.

“Yours most respectfully,

“GREENSVILLE DOWELL, M.D.”

DOWELL'S SUBCUTANÆOUS LIGATURE FOR THE CURE OF HERNIA.

“Patients prepared by moving the bowels a few hours before the operation. Urinating before going on the table. Parts shaved over the rupture. Three lines are then made over the rupture, one in centre, one on each side about one to two inches from centre line. Patient is then etherised. I then take my Hernia needle threaded with strong thread, twisted on the eye and well waxed. I then pinch up the skin and cellular tissues between the centre line and the one on the iliac side and then put the threaded end in the centre line and bring the threaded end out until the unthreaded end lies on the tendon outside of the rupture. At this stage the index finger of the left hand invaginates the sac and the threaded end is then pushed down into the peritoneum through the sides of the tendon. The end of the needle is then moved from side to side, to see if its point is loose, when it is passed under the invaginated sac to the opposite tendon, and then pushed forward to the inside line and out. In this stage I usually stop to see and

feel if the tendons on both sides are included in the body, if the needle end show the invaginated sac is not caught. If it is caught the needle must be pulled back and reinserted without catching the sac. This seen and done, the needle is pulled on until the threaded end comes above the inside tendons, when it is reversed and pushed out where we started, thus putting a ligature only around the tendons over neck of the sac. The first ligature is put up as high as possible and others afterwards until enough are put in to close the opening entirely. These ligatures are then replaced by silver wire as in the operation for vesico-vaginal fistula. These are all pulled up smooth and secured over a quill suture made with a small roll of adhesive plaster and the whole tied over the quill. I then put on lint wool saturate with collodion and let patient out from under the anæsthetic and put him to bed. If there should be pain I give him full doses of morphia and continue it. If much swelling occurs I apply cold cloths wet with sugar of lead and morphia. The ligatures are left in from three to eight days and then removed. Before removing, the patient's bowels are again moved ; after this the ligatures are taken out and compress with a figure-of-eight bandage is put on, and patient put to bed and kept quiet for a week or more when he is allowed to get up. I have invented, 1869, what I call my buggy-spring truss, to be put on and worn for a while until the parts get solid and firm. The buggy-spring truss is made by putting two additional springs over the bend around the ilium and held together as the springs of a buggy. The whole is covered with soft leather. The pads may be made of any shape or size that has been used, celluloid or hard rubber first made almost flat on its surface is the best. The bend of the spring is made more open than usual and should only press smoothly over the place when the patient is at rest but becomes very strong when there is a tendency to protrude. If it be desirable to wear it day and night the

springs are made only to reach the spine and not cross it. It is best to have a perineal strap, but in many cases this can be done away with.

“Yours respectfully,

“GREENSVILLE DOWELL, M.D.”

Before we come to speak of the method by injection I wish to refer to an operation by the *Antiseptic Use of the Carbolised Catgut Ligature*. For the purpose of explaining it, I, with the consent of the author, Dr. Henry O. Marcy, of Cambridge, Mass., reprint from the *Transactions of the American Medical Association*, 1878, the following essay.

“October 11, 1871, I read a paper before the Middlesex County Medical Society, which was afterward published in the Boston Medical and Surgical Journal, November 16, 1871, page 315, entitled ‘A New Use of Carbolised Catgut Ligatures.’ I there reported the two following cases, operated on for Strangulated Hernia.

“CASE I. ‘On the 19th of last February I was called in consultation by Dr. A. P. Clarke, of Cambridge, to see Mrs. M., aged sixty, who had for years suffered from Hernia. Five days previously she had been seized with severe pain in the inguinal region, accompanied with vomiting, and had been confined to her bed since that time.

“‘Long-continued and careful taxis had failed to reduce the hernia, and for twenty-four hours the vomiting had been stercoraceous, and the patient seemed *in extremis*. The hernial tumour was of the size of an egg, protruding from the external inguinal ring. A careful dissection exposed the sac, which was closely adherent to the surrounding parts. The constriction was in the ring, bounded below by Poupart’s ligament, and above by the transversalis fascia and conjoined tendon.

“‘The stricture was divided in the usual way, with the

hernial knife carefully introduced upon the finger. This was accomplished with some difficulty, owing to the constriction of the ring. The sac, unopened, was then pushed up with its contents into the abdominal cavity, and two stitches of medium-sized catgut ligature were taken directly through the walls of the ring. The wound was dressed antiseptically, and from Dr. Clarke's notes, taken at the time, I find that the patient complained of no pain, steadily progressed without accident, and was discharged, convalescent, March 12th, three weeks after the operation.

“The wound did not close entirely by first intention, but a careful daily examination showed no trace of the ligatures, and an abundant deposition of new tissue could be felt in the line of the opening about the walls of the ring. The result was a radical cure of the hernia, and a firm, hardened deposit may still be felt marking the closure. The ligatures were first suggested to my mind, because the patient suffered severely from an asthmatic cough, and it was at least desirable to secure a temporary strengthening of the weakened ring.’

“She died six years after the operation, and was troubled with the cough during the entire period, but had no return of the hernia.

“CASE II. ‘Mrs. L., aged forty-five, had been very much reduced by excessive menorrhagia, and upon March 10, 1871, my attention was called to an old, direct inguinal hernia of the left side, usually supported by a truss, which had come down the night previously and defied the patient's efforts to replace. After two attempts to reduce the hernia under ether had failed, assisted by Dr. W. W. Wellington, of Cambridge, I operated as in the first instance, dividing the constricting ring and replacing the sac and its contents unopened. Three carbolised ligatures were applied through the walls of the ring, and the wound was carefully dressed with carbolised lac plaster.

“As in the first case, there was complete absence of pain,

the wound united without suppuration, there was an abundant deposit of new material about the ring, and when last examined in June, the cicatrix was linear, but a firm, hard deposit of new tissue could be felt marking the site of the sutures.

“On the 7th of April my attention was called to the wound by the patient, who felt a slight uneasiness, and I discovered a small swelling in the cicatrix about the size of a bean; this, upon being opened, discharged a drop or two of pale, serous looking fluid, which microscopic examination proved free from pus cells, but it contained a few shreds of connective tissue, which appeared to be minute portions of one of the ligatures. The cure is radical, and in neither case has the patient used a truss since the operation.’

“I then say, as far as my observation has extended, this is a new use of the carbolised catgut ligatures, and suggests a still wider field for application. No method of operation for radical cure of Hernia appears more feasible, is probably attended with less danger, and at the same time affords a means of closing and strengthening the weakened ring, which is so desirable, and yet, with all the ingenious devices of surgery, is so difficult to obtain. As perhaps might have been expected, the article attracted very little attention, written by a young man fresh from his European studies and an ardent admirer of Professor Lister, whose views at the time, I believe, were not accepted by a single surgeon in the Boston district.

“In these days of improved means for the reduction of Hernia, by the use of ether, by aspiration, and by rest with the hips higher than the shoulders, with the ice-bag applied locally, the surgeon in private practice is called upon to operate for the relief of Strangulated Hernia much less frequently than formerly. As far as I remember, I have operated for Strangulated Hernia only four times since the publication of this paper, and these

cases were treated substantially as those above given. The last case, inasmuch as it affords the opportunity of showing the result anatomically, merits a careful study, and causes me to bring the subject to your attention now.

"Mrs. W., aged seventy, had been for many years an invalid from double inguinal Hernia, the right side being of such proportions that, after many endeavours to retain it by a truss, this appliance had been thrown aside as useless. On the left side was an irreducible omental hernia, at times complicated by the escape of a loop of the intestine through the ring. Nausea and vomiting had persisted for thirty-six hours before the operation.

"As usual, antiseptic precautions were used, with carbolised spray and careful dressings. After slightly enlarging the ring, the intestine was easily reduced, but the omental portion, the size of a small orange, presented a number of bleeding points upon its being unravelled, and was adherent to the walls of the ring. Because of this, the whole mass was tied with catgut and removed, the ring was carefully closed with catgut sutures of a large size, No. 2, I think, five in number. The wound healed by first intention throughout. Temperature never exceeded 99° F.

"The patient suffered no pain, and made a perfect recovery. She was allowed to get up in two weeks, and never wore a truss. She was so much pleased with her happy escape from danger and her complete cure that she besought the privilege of being operated upon for the radical cure of the right side. I tried again a series of trusses, but to no avail, and after careful reflection consented to perform the operation. This took place February 4, 1878. The abdominal wall was thin, the ring extremely large, and its pillars were attenuated. The sac was readily returned unopened, and sutures were used as upon the other side, perhaps eight in number. I included in my stitches

as much tissue as possible, but at the close of the operation felt the cure less satisfactory because there was so little material to fill in and support the weakened ring.

“The union was entirely by first intention, leaving, as before, a linear cicatrix which never suppurated. There was no elevation of temperature, and the patient made a rapid recovery. During the first week there was considerable swelling of the tissues about the ring; these parts were slightly tender upon pressure; and, what I believe to have been the thickened returned sac could be felt through the attenuated relaxed abdominal walls. The patient was kept in bed three weeks; but upon being permitted to get up it could be easily seen the cure was not complete, for there was impulse on coughing and a slight protrusion through the ring. She was fitted with a light truss, which easily retained the hernia, and was allowed to go about the house. She died suddenly, April 17, 1878, and the autopsy revealed an aneurism of the internal carotid of the right side, which had given rise to scarcely any symptom, except a gradual loss of vision of the right eye, but its existence had not been suspected.

“The specimen here presented shows the walls of the ring much thicker than before the operation, and its calibre diminished perhaps two-thirds. A light truss would probably have been sufficient easily to hold the parts in their proper relations.

“The use of animal ligatures in surgery is by no means new. In all probability catgut, the form of animal thread or ligature which has been most frequently used in modern times, was employed as surgical sutures eight or nine hundred years ago. The celebrated Arabic writer, Rhezius, who practised in Bagdad about A.D. 900, speaks of stitching up wounds of the abdomen with a thread made of the string of a lute or harp; and another Arabic author, Albucasis, who lived a century or two later,

alludes in the same class of injuries to stitching a wounded bowel with a fine thread made of the twisted intestine of an animal. The strings of the ancient Egyptian harp, and hence probably of the Arabic, were made of catgut. Homer, in the *Odyssey*, speaks of the strings of the old Greek harp as made of the twisted intestine of the sheep.

“To Dr. Physick, of Philadelphia, is undoubtedly due the honour of having first introduced animal ligatures into surgical practice. His ligatures were made of chamois leather. Silk may be considered an animal product, but however used, even when carbolised and inclosed in a wound which readily heals by first intention, the softened fibres usually act as an irritant, and are later discharged by the processes of suppuration. Animal tissues made but indifferent ligatures; and were practically long since abandoned. They were soft, slippery upon being immersed in water, and were by no means strong.

“To Professor Joseph Lister we are indebted for a most important modification of the catgut ligature. In his enthusiastic devotion to his new ideas of the possible repair of tissue, he had observed that, under antiseptic dressings, clots of blood and large pieces of dead skin and other tissues had disappeared without suppuration; therefore he inferred that small pieces of animal texture, if applied antiseptically, would be similarly disposed of. To make catgut antiseptic, he immersed it, as prepared for the violin, in a strong watery solution of carbolic acid, and noticing the changes which followed in its texture, after considerable variety of experiments, he gave us the ligatures as at present used. They are prepared by immersion of the gut in a mixture of five parts of fixed oil, olive or linseed, to one part of the crystallized acid, liquefied by the addition of five per cent. of water. After a few weeks' suspension in this fluid, the catgut becomes translucent, firm, hard, but moderately pliable, makes a strong knot, and upon immersion in water or

the fluids of the body, it undergoes no immediate change, and for days together the knots retain a firm hold.

“To show the importance of the proper preparation of the ligature, I quote from Professor Lister's original paper, published in the *Lancet*, April, 1869: ‘But for the sake of surgeons who may wish to prepare it for themselves, it is necessary to mention, in order to avoid disappointment, that the *essence* of the process is the *action of an emulsion of water and oil upon the animal tissue*. The same effect is produced upon the gut, though more slowly, by an emulsion formed by shaking up simple olive oil and water, as by one which contains carbolic acid.

“On the other hand, an oily solution of carbolic acid without water has no effect upon the gut beyond making it antiseptic, and if water be added only in the small proportion which the acid enables the oil to dissolve, though the gut is rendered supple, and acquires a dark tint from the colouring matter of the oil, it will be found, even after steeping for months in such a solution, that when transferred to water it swells up and becomes soft, opaque, and slippery, as if it had not been subjected to any preparation. How it is that an emulsion produces this remarkable change in the molecular constitution of the tissue I do not profess to understand. I was at first inclined to regard it as a closer aggregation of the particles, brought about by a kind of slow dying of the moistened gut in the oil, as the watery particles precipitate to the bottom of the vessel; but, not to mention other circumstances opposed to this view, the oil remains turbid for a very long time, the finer particles of water being extremely slow in precipitating, and if, after the lapse of weeks, a piece of dry unprepared gut is suspended in it, the thread is soon rendered soft and opaque by the very liquid in which gut which has been longer immersed is growing constantly firmer and more transparent.

“It is necessary that the gut be kept suspended so as not to

touch the bottom of the vessel, for any parts dipping into the layer of precipitated water would fail to undergo the change desired.

“The vessel containing the emulsion should be kept undisturbed, for if the water is shaken up with the oil the process is retarded. An elevated temperature, of about 100° F., seems for a while to promote the change, but ultimately leaves the gut in an unsatisfactory state compared with that obtained at an ordinary temperature; and conversely, some portions of gut which I have prepared in a room without a fire, in cold weather, at a temperature of about 46°, were in one week already in a trustworthy condition for surgical purposes. Hence the gut should be prepared in as cool a place as possible. The longer it is kept in emulsion the better the gut becomes. I once feared that in time it might grow too rigid for convenience, and possibly brittle also; but experience shows that this is not the case.

“When removed from the emulsion it soon dries in the air, but retains a considerable portion of its carbolic acid for several hours, so that no apprehension need be entertained of loss of its antiseptic property from exposure during the performance of an operation. In course of time it loses all the carbolic acid also, but retains permanently its altered molecular condition. If thus kept dry, as may prove the most convenient for the manufacturer on a large scale, it must be steeped thoroughly in some antiseptic lotion before its use. And for the surgeon the most convenient way will probably be to keep it always in the antiseptic emulsion, so as to be ready for use whenever it is required.’

“Dr. D. W. Cheever, of Boston, writes me under date of May 14, 1878: ‘I tried catgut for a radical cure of Hernia, but it was speedily absorbed and failed.’ He is unable to give me particulars with regard to the use of the ligatures.

"Dr. J. C. Warren wrote me a few day since : 'I should fear that they would not hold long enough to keep the parts in apposition until union becomes firm. We have given up their use at the Massachusetts General Hospital for this reason : they do not hold longer than four days.'

"I believe there are distinct limits to the usefulness of the catgut ligature, and if our profession early learns to know what these limits are, not only may the lives of our patients be less endangered, but an aid to surgery which now promises much of good will be rescued from wholesale condemnation and oblivion. In plastic operations, especially of mucous tissues, I would never think of using catgut ligatures.

"In wounds exposed to the air, or liable to suppuration, where the ligatures are soaked in fluid secretions, I am well aware the catgut knot is liable to become loose; but in the antiseptic ligation of vessels, or the closure of deep-seated tissues, it is far superior to any other. Here, when properly applied, it is open to few of the objections made. Owing to the firm character of the material, circulation of the inclosed part is more liable to be impeded than with silk ligatures, and hence care should be exercised; but within the limits here assigned, an experience of eight years justifies their use.

"Judging from my own observation I am inclined to believe the ligature properly, that is antiseptically, used is not absorbed at all, but is changed particle by particle, being in this way not revitalised but replaced by living tissue, thus producing a reinforced band of new connective tissue in place of the ligature itself.

"The specimens here shown I think demonstrate this. The one last operated on, February 5th, death taking place April 17th, namely, sixty-eight days after the operation, shows unmistakable thickening of the connective tissue about the ring; and there are yet seen, although preserved in a bichromate of

potassa solution, hence less distinctly than at the autopsy, traces of the ligatures. These are of a darker colour than the surrounding parts, retain imperfectly the shape of the ligature, and are of considerably greater density and firmness. Under the microscope they show only wavy bundles of connective tissue. In the older specimen operated on December 2d, after the lapse of four or five months, you can no longer trace constricting fibres in the shape of circumscribed bands, but you will find a firm reinforcement of the parts by connective tissue which certainly includes the walls of the ring, and hence we infer it is developed about, or transformed from the ligatures themselves. This quite accords with Mr. Lister's experiments in the ligature of arteries.

“From the article previously mentioned I quote as follows ‘Thirty days after the operation, the animal, a calf, which had continued in perfect health, was killed, and the parts removed for examination. On dissection I was struck with the entire absence of inflammatory thickening in the vicinity of the vessels, the cellular tissue being of perfectly normal softness and laxity. On exposing the artery itself, however, I was at first much surprised to see the ligatures still there, to all appearance as large as ever. But from my other experiments, it might have been anticipated that the ligatures of peritoneum and catgut placed on the calf's carotid would, after the expiration of a month, be found transformed into bands of living tissue. Such was in truth the case, as was apparent on closer examination’

“Mr. Fleming published in 1876, in the *Lancet*, a series of observations upon the ‘behaviour of carbolised catgut inserted among the living tissues,’ and gives his results confirmatory of such change. ‘A softening takes place from without in, the catgut breaking down and becoming infiltrated with cells. The mass into which it has been converted begins to metamorphose and is soon permeated with blood channels, and ultimately may

be described as a cast of the catgut in a kind of granulation tissue, freely supplied with blood-vessels, which in many of my sections are easily injected.' These views should not seem exceptional, when we remember many well-known facts, for example, that the revivifying of skin dead at least by separation for a considerable period, as in that from an amputated limb, goes on so uniformly that transplantation of it upon granulating surfaces, and these not best fitted for its growth, has now become a daily practice in surgery.

"Even the epithelial cells removed by a considerable distance from the circulation, and already dead, thus live again, and multiply so rapidly as to be of practical use in the repair of large denuded surfaces. The periosteum, as Ollier and others have shown in their experiments, may be also transplanted, and not only live but become an active factor in the reproduction of bone; and teeth have been removed, filled, and replaced, actually transplanted to other locations, and regained their lost relationship of nutrition.

"The spurs of the cock, as observed by Baronius, when transplanted to the comb, not only live, but remarkably increase in size, and when ingrafted into the ears of oxen, as is practised in Mexico, they attain a size truly wonderful.

"Mantegazza described and figured one of these spurs, which in its dry state weighed nearly one pound (396 grammes), was twenty-four centimetres in height, and twenty centimetres in width.

"If such wonderful activity of reproduction and growth are shown by these tissues, there would appear to be no reason why the cells of the fibrous tissues might not also undergo changes in nutrition equally remarkable, of which practical advantage may be taken.

"This is not the place, nor have we the time for a careful review of the history of the various devices suggested for

the radical cure of Hernia. For centuries this has been a prolific field for charlatans and for quacks of every description. Hernia-curers roamed over Europe a century ago, practising castration and various reckless and dangerous devices, at the cost of many lives, and, it is needless to say, with the performance of few cures.

“ Within the present century many of the best surgeons have given this subject careful study, and some of the most ingenious of surgical devices have been brought into requisition. Nearly all of them have sought to accomplish a cure by one of two ways: either by producing adhesive inflammation and obliteration of the sac, or by producing closure of the ring. Monsieur Bonnet inclosed the cord between pins fastened to rolls of linen. Gerdy plugged the ring with invaginated skin held by stitches, and afterwards with the object of correcting the tendency of the invaginated skin to be withdrawn, cut it free, and ended with a plastic operation, by raising a flap from below. This method was often successful in his hands, but its complication and dangers prevented its general adoption.

“ Belmas invented an instrument, consisting of a canula with stylets. Through the passage in the canula threads of gelatine were to be introduced and be ultimately absorbed, after having produced the requisite adhesive inflammation. Then he applied a truss.

“ The operations of Velpeau, Wützer, and Wood are better known. Mr. Wood operated about two hundred times, with the result of three deaths and about seventy-five per. cent. of reported cures. Acupuncture, a revival of the punctum aureum of the ancients, as practised by Dr. Pancoast of Philadelphia, though unsuccessful as a means of cure, suggested to him, as well as to Dr. Young of Tennessee, the use of subcutaneous injections of iodine or cantharides into the sac. A number of successful cases thus operated upon are reported.

"This method was practised for many years as a secret cure by Dr. Heaton of Boston, with reported success. Recently he has published a monograph upon Hernia, in which he gives a detailed account of his treatment and experience. He reports a large number of cures, and claims that his method is devoid of danger. It consists of a fluid extract of white oak bark injected with a hypodermic syringe into the sac.¹ This method has been tried with moderately successful results at the Boston City Hospital. By means of it, a considerable amount of thickening and narrowing of the ring is certainly produced.

"In 1858 Dr. Gross, in two cases, cut down upon the ring and brought together its walls with silver sutures. A cure followed in both cases. In 1871 Dr. Van Best reported three cases operated on for radical cure by a subcutaneous sewing of the ring with salmon gut. Two of these cases were successful.

"Dr. G. Dowell, professor of surgery in Texas Medical College, published a treatise on Hernia in 1877, and describes a new method for its radical cure. He there reports sixty-eight cases with sixty permanent cures, and at the date of this publication, he informs me the number of his operations exceeds one hundred. By a needle of peculiar construction he subcutaneously sews the pillars of the ring with silver wire. The testimony of such an indefatigable student, with his very large experience and remarkable results, is of the greatest value.²

"Mr. Charles Steele, of Bristol, reported in the *British Medical Journal*, November 7, 1874, a successful case of radical cure of Hernia, which was operated on precisely as were my own cases. The patient was a boy of eight. The surgeon used two stitches

¹ The operation has often been thus misunderstood. The needle was not an ordinary hypodermic syringe but had a blunt needle with two orifices near the end, so that the fluid might be thrown at right-angles upon the rings and not into the sac.—J. H. W.

² Dr. D. informs me, July 3rd, 1880, that he succeeds in 80 per cent. of his cases.—J. H. W.

of catgut antiseptically, and union followed by first intention. After six months the hernia returned, and the operation was repeated. A truss was applied for safety. A perfect cure was effected, in the judgment of the operator, a year later.

“ Nearly all the late writers on surgery, such as Bryant and Erichsen, deprecate any attempt to secure the radical cure of Hernia, except in severe cases; and Mr. Bryant regards the supposed elongation of the mesenteric ligament as a probable cause of the imperfect results obtained by various operators, but he supports his proposition neither by theory nor by fact. If the operation which I have proposed is done properly, with antiseptic care, I believe that to a great extent it is devoid of danger. In a series of papers upon Strangulated Hernia, based upon one hundred operations performed by himself, published in the *British Medical Journal* for 1872, Sir James Paget, in advocating the replacing of the sac unopened, if possible, says: ‘ The structures divided externally to the sac are insignificant; and it might be difficult to name an operation less endangering either life or health than this would be. The peritoneum is not wounded; the intestine or omentum is not touched or exposed to the air; the wound may be small; any hæmorrhage may be easily stayed and must be all external. Thus the wound is favourable to speedy healing, and erysipelas, or any other mischief, is not likely to extend to the peritoneum.’

“ I would not appear over sanguine in the suggestion of any new method for the radical cure of Hernia. I am perfectly aware that this has ever been one of the most troublesome and unsatisfactory problems in surgery; and my experience has been too limited to prove little except possibilities.

“ However, I must claim a favourable consideration, on a legitimate field, for the use of the carbolised catgut ligature, at least in all cases of Strangulated Hernia where the wound can be closed. This method does not add to the dangers of the

operation, and is probably followed by a cure. In comparing the operation with that usually recommended, of subcutaneously stitching the ring with sutures of any material, it seems apparent that to cut down upon and expose the ring gives a much better opportunity of carefully closing it, refreshing its borders, and thus avoids injury to the spermatic cord, while it does not increase the danger of the patient."

The method by *injection* marks an epoch by itself in the history of the radical cure of Hernia. Velpeau is, without doubt, the first who ever injected for the radical cure, and says that "sensible like other practitioners of the want of a radical cure for Inguinal Hernia, and convinced, moreover, for a long time that we were wrong in abandoning indiscriminately all the trials which had this object in view, I also have endeavoured to arrive at it by a special method. The process which I have proposed is the same as that which is employed for the radical cure of hydrocele." In the early part of 1835 he had already conceived the idea of applying injections to the cure of Hernia, and in February and July, 1837, he performed successfully and without difficulty, the operation upon Herniæ with an iodine injection, first, however, *cutting down upon the parts*, but at the same time being very careful not to allow any of the injecting fluid to penetrate the peritoneal cavity. The injection was administered with "the canula of the trochar guided upon a blunt-pointed probe."

We find also that my esteemed and honoured countryman, the late Dr. Pancoast of Philadelphia, cured thirteen patients in 1836, and that later my beloved friend, the late Dr. J. Mason Warren of Boston, injected sulphuric ether with success. In 1846, Dr. W. H. Roberts of Alabama made his first hypodermic injection for Hernia with oil of cloves. His idea of this operation had been derived from a Dr. Woogencraft, as I am informed by Surgeon Billings of the U. S. Army.

But the honours of the *true* hypodermic injection without any preliminary incision, I think, after much careful research in the literature of surgery, belong to the late Dr. George Heaton of Boston, who, "after eight years of discouraging experiment, discovered a process which I call *the method of tedious irritation*,"¹ by the injection of a solution of quercus alba. Since he performed successful cures by his new method as early as 1840, and experimented as he tells us eight years previous to this, we are carried back to the year 1832, when he first conceived his operation. His first operations were with Dr. Jaynes of St. Louis.

In this brief sketch I have endeavoured to be impartial in my honour to the various operations, whether they are hypodermic or not. I would cast no reflections upon any one, nor at the same time endeavour to lessen whatever credit I think may justly belong to Heaton for bringing the operation to a full fruition and success. Previous operators have relied upon suppuration to produce their cures; Heaton tried to avoid it. In this is the element of his success, but as will be hereafter seen, I soon after taking up the operation, abandoned the simple fluid extract of oak bark which Heaton had used, and produced by a more stimulating preparation a much more abundant effusion of plasto-lymph. That, however, Heaton did by his simple injection, effect wonderful cures, can be doubted by none. The following is a fair example of his success.

A soldier by the name of Pitcher was ruptured in the femoral region at the battle of Big Bethel, and was discharged in the latter part of May from the United States service for physical disability caused by said rupture. Dr. Heaton operated upon him in June, and after the operation the man again enlisted as a soldier in the following September, and served his three years without sickness or return of his rupture. You who have been

¹ Heaton on Rupture.

with me in the United States service know that a soldier must be badly ruptured to be discharged from the army, and I will not weary you with more lengthy details. I examined this man in March, 1880, and he is still fully cured.

That Heaton also failed in some of his cases is also true. This all must expect, for one of the cardinal principles in surgery is that wounds will not always heal by the first or best intention, and that we never can certainly foretell the results of our best endeavours. Upon this point I will speak more at length further on. Here I trust I may be pardoned for inserting a clinical lecture delivered by Dr. William F. Janney, at the Philadelphia Hospital in January, 1880.

“GENTLEMEN:—I have the opportunity to-day of exhibiting to you a few cases of Inguinal Hernia, and by the consent of one of the patients who wished to be cured, I shall perform the operation of irritating the abdominal rings according to the Heatonish method, which method has been brought before the profession by Dr. Joseph H. Warren of Boston, in many articles in different medical journals and essays read before medical societies. I am not certain that Dr. Heaton deserves the credit of being the originator of the operation, but rather inclined to believe that to Professor Joseph Pancoast, Emeritus Professor of Anatomy, of the Jefferson Medical College, belongs the honour of being the first to attempt to cure Hernia by subcutaneous injection of an irritant into the inguinal canal. The records of the Philadelphia Hospital disclose the fact that Professor Pancoast, in 1836, injected into the inguinal canal and hernial sac Lugol's solution of iodine in thirteen cases of Inguinal Hernia, and that they were all cured of the hernia, and were retained on the farm attached to the hospital, and worked as farm labourers for some time. Some worked as long as one year after the operation without wearing a truss; and in no case did the hernia

return. It is with just pride that we claim this operation as a Philadelphia operation, and for a more detailed description of it I refer you to Pancoast's work on operative surgery.

"Heaton's claim I think will be recognised as a very slight modification of Professor Pancoast's, except that he used a concentrated extract of quercus alba, instead of Lugol's solution of iodine. The success of Professor Pancoast's cases did not make it a recognised operation by the surgeons of the country, but to Dr. Warren, of Boston, is justly due the credit and honour of making this operation an assured method of curing Hernia. In some cases the Hernia may return, but from my experience in this method I am well satisfied that fully seventy-five per cent. of all Hernias operated on in this way can be perfectly cured. Dr. Warren's position to this operation will be similar to that of the late Dr. Atlee to the operation of ovariectomy. These operations are two of the grandest achievements of surgery in the nineteenth century, and both by American surgeons. This patient that I show you has had right Inguinal Hernia for eighteen years, is a sailor by occupation, and is fifty years old. He was admitted to this hospital for medical treatment, and was transferred to the surgical wards, in order to have his hernia cured. I shall now use an instrument for this operation which was made for me by Mr. Gemrig, of this city, in April, 1869. It consists of a screw syringe so graduated, that when filled and ready for use, one quarter turn of the wheel will expel two drops of the fluid from the terminal end of the trocar. The trocar is a modification of Fitch's ovarian trocar. It consists of a hollow tube, that fits on the nipple of the syringe, and is about three inches in length, with a small orifice one-twentieth of an inch from the distal end; over this is a sheath or tube with a terminal point, similar to the cutting point of a hypodermic needle; this tube or sheath is somewhat shorter than the hollow probe attached to the syringe, and is fastened to the hollow probe

by a bayonet joint. The patient being placed on the table, his hips slightly raised and the instrument properly armed with a concentrated aqueous extract of quercus alba, and the cutting sheath unlocked, and the point pushed forward, so as to extend about one-fourth of an inch beyond the distal end of the hollow probe, thereby closing the orifice for the exit of the irritant. This operation, not being a painful one, we will not give the patient ether. Taking the instrument in the right hand with the left index finger, I invaginate the tissue of the upper part of the scrotum, and insert my finger into the external ring. I find that the hernia and sac have been reduced with my left index finger in the external ring in front of the cord, and pressing upon the outer portions of the pillars. I now insert the cutting point along my finger, and the pillars of the ring; then with my right index finger and thumb I gently unlock the cutting sheath, and push the hollow probe into the inguinal canal, thereby, as you observe, retracting the cutting edge along the hollow probe. I now have the probe in the inguinal canal, and as it is a perfectly smooth probe it can do no injury to the cord or adjacent parts of the canal. I now gently push it up to the internal ring, and by one quarter turn of the wheel I deposit two drops of the irritant on the internal ring, and with the end of the probe I rub it around the edges of the ring. I also move it to another part of the ring and emit two more drops, and gently rub it around this part of the ring. I have now applied six drops of the irritant to the internal ring. I withdraw the instrument, and apply in the same way the irritant to the external ring; having now applied ten drops to the external ring, I pull out the instrument, and apply a pad over the parts, and a bandage. You observe that this patient has not complained of pain. He will be placed in the ward, and kept in a reclining position for the period of two weeks.

“*February 6th*—I have now the pleasure of showing you the

patient operated on in January for the cure of hernia. You notice that he walks around the amphitheatre without any sign of Hernia. We will test the cure, by having him stand upon this table and then jumping down ; now by running up and down the steps, all of which has no effect upon the hernial rings. I think you may consider this man cured, but we will keep him under observation for some time yet.

“ May.—No sign of return of Hernia.”

Dr. Janney now says that hereafter in all his operations he shall in place of his syringe above described use my new instrument (to be described later on), as more effective, less dangerous, and in every way far preferable to any yet devised.

CHAPTER V.

AUTHOR'S OPERATION BY INJECTION.—I. GENERAL REMARKS.

II. AUTHOR'S MODIFICATIONS OF THE INJECTION METHOD.

III. AUTHOR'S OPERATION.

FROM what I have thus far said it will be seen that all of the operations, from that of Chauliac to that of Wood, are severe, and likely to be attended with great danger of life, if not absolute loss of it. It is no wonder then that Bryant and others should in their surgeries express great dread of the many so-called radical cures, and doubt their expediency and their value.

No such arguments can be used against the operation that I recommend, as no fatal results have ever occurred in any of the operations performed by the various surgeons who have attempted them. Nor are such results at all likely to occur unless the operator unwarrantably interferes with the work of nature set up by the injection, unless he makes the injection in the most bungling and careless manner, or unless he uses some improper instrument, such as a scarf or lancet-pointed needle, as some few have proposed to use. The use of all such instruments has been severely deprecated for reasons which will appear later.

As regards the objection that is often made that all such operations which concern the peritoneum are dangerous I cannot do better than quote Dr. Davenport, editor of *Heaton on Rupture*: "Although allusion has been frequently made to the

necessity of much caution in practising this method for the cure of rupture, in order to avoid inflammation, the risk in this respect is in reality a very slight one. In the first place, the profession have laboured for years under a groundless fear of abdominal inflammation, because they have confounded inflammation of the parietal wall of the abdomen, which is generally easily controlled, and can scarcely be called dangerous, with deep-seated peritoneal inflammation of the abdominal contents. In the second place, as a matter of fact and experience, no inflammation does occur if the operation be performed with even a reasonable amount of skill. No surgeon after the experience of a few cases will be deterred from trying the operation because of apprehension of this danger, unless perchance he wishes blindly to adhere to his preconceived ideas, and rest content with the unsatisfactory and evasive practice of treating rupture by ordering a truss. Such advice is often almost like recommending a man with a broken leg merely to get a crutch." By this the reader must not understand too much. We do not mean to say that inflammation is not excited by our injection, but that *peritoneal* inflammation is not set up. The inflammation that we excite is local in its nature, and rarely extends beyond the crest of the ileum.

Upon this point Professor Wood says: "On reading over the opinions of modern writers on Hernia one cannot but be struck with the importance they attach to the supposed dangers of meddling with the peritoneum and its offsets. Around this theory are grouped most of the objections to operative interferences. The theory alluded to seems to have been deduced from experience of operations performed upon this membrane in a state of disease or inflammation, or operations exposing it extensively to external influences. Hundreds of operations involving the healthy peritoneum, both upon Herniæ and under other circumstances without bad results, have been overlooked

or ignored. This prejudice is, I believe, at the bottom of most of the objections, as it formerly prevailed against early operation in cases of Strangulated Hernia. In the latter cases it seems to have generally given way, rendering it more easy to be dealt with in the former class. In a general way, inflammation of a parietal portion of the peritoneum has been confounded with that of the visceral layer or general inflammation of the cavity near the important nervous centres. A secluded portion has been invested with the attributes of the whole, a logical error not uncommon." To illustrate this matter by practical cases I insert the following paper upon the toleration of the peritoneum to resist injuries.

This has been a theme of great interest, from very earliest times to the present, the older writers often feeling very timid in their treatment of any injury or wound, small or great, that should occur to the peritoneum, and giving almost always unfavourable prognostications, even in the slightest and most trivial injury to this membrane. In many cases, however, the more ancient mode of combating inflammation of all kinds, and particularly of this membrane, did prove fatal, no matter how assiduously the antiphlogistic treatment, internal and external, was applied.

We are taught, however, by more modern surgery, that by the application of water and by the internal use of opium and veratrum viride, under proper hygienic rules, serious injuries of this membrane are not only combated, but brought to a more favourable issue.

This has been illustrated in our civil contest, and other late wars. The great tolerance of the membrane has been still further illustrated by that honoured son of Kentucky, Dr. McDowell, and by Drs. Atlee, of Philadelphia, Peaslee, of New Hampshire, Spencer Wells, of England, and other ovariologists, as well as by Dr. Heaton, in his numerous injections for the

radical cure of Hernia. I have heard from Dr. Heaton's own lips that—and so we are led to infer from his published work—he frequently punctured the peritoneum, both in the umbilical and inguinal region.

To illustrate this tolerance more fully, I would here relate a few instances of the many injuries to this membrane that I have known :—

In my earliest years Mr. —— called upon me. He had had the misfortune to receive a wound from a large rat-tail file, which struck him about three inches above the symphysis pubis. It punctured the superficial integuments and the bladder near its fundus.

Here, it is true, we had a favourable portion of the peritoneum wounded, as regards subsequent inflammation.

Although the man had acute cystitis from the injury, still, after the wound had discharged pus and urine for some time, he made a good recovery, without any peritonitis.

Another patient, in the year 1856, while in the delirium of fever, jumped from an attic window into the door yard, upon a stump covered with dry roots. As he fell he was impaled through the perineum to the rectum, and the walls of the abdomen were pierced in several places, just above the base of the bladder and the crest of the ileum, on the right side of the linea alba, by those small, dry rootlets, which were jagged and rough, and varied in size from a goose quill to half an inch in diameter.

Yet from all this serious injury, suffering as he was at the same time with typhoid fever, he made a good and successful recovery, suffering, however, for some months, from paralysis of the neck of the bladder.

Still further to illustrate, I will mention Mr. H., a case occurring in my practice on Christmas Eve, 1857. He was suffering from a wounded abdomen, which had been torn from the pubic

symphysis to nearly the ensiform cartilage, by a dull jack-knife used for the cutting of tobacco. From this wound most of the small intestines had escaped to the floor of a room covered with coal dust and the *débris* of a midnight carousal. After etherising my disembowelled patient, I passed the intestines through my hands, bathing off, with warm olive oil, the filth adhering to them, and closed the frightful wound by deep sutures and adhesive plaster. Over the abdomen I laid a cloth covering of cotton wool, and upon this placed a bladder filled with ice, which was frequently renewed. I placed the man in bed, administered thirty drops of laudanum and an injection to the rectum, and gave, I must confess, a most unfavourable prognosis. To my surprise, I found on my first dressing, forty-eight hours afterwards, that the wound had healed by the first intention, with no peritonitis or other intestinal or abdominal inflammation.

I may conclude these illustrations by mentioning a very remarkable case of rupture of the uterus, while in labour, and the escape of the child through the rent into the abdominal cavity. This resulted from a contracted pelvis. The woman had gone her full term, and the child, a large one, was extracted through the ruptured organ, a wound being made sufficiently large to admit the hand and arm of the gentleman with me, Dr. Benjamin Cushing, of Boston, so that I could feel his fingers and hand at the ensiform cartilage. You may judge of my surprise, when, on the following morning, entering the patient's room with my autopsy case under my arm, I found, not the fine subject for study which I had anticipated (but was happily disappointed in), but the patient sitting up in bed eating a bowl of gruel, and in the most cordial manner saluting me with the compliments of the opening day. This case was detailed at the time in the *Boston Medical and Surgical Journal*.

Suffice it to say that she made a rapid recovery, without

peritonitis, and in about the usual time as if she never had suffered from a ruptured uterus.

I therefore feel more confident at the present time, after the experience I have had, that if in any way, by accident, or in injecting, for cure, the hernial rings, whether in umbilical, inguinal or femoral, I pierce this membrane, unfavourable results will not necessarily occur. As yet I have never had a fatal result in any of the cases where I was led to suppose that I might have punctured the membrane. I would not, nor would I advise any one to puncture the peritoneum, however, if it can possibly be avoided.

I am a firm believer, as you may infer from reading these cases, in the application of cold water or ice, either in rubber bags or in bladders. I have never seen a case of peritonitis, arising from any injury, that was not followed by favourable results if these means were used to allay the inflammation, and I have yet to see a case requiring the application of poultices or hot fomentations to bring about such favourable results.

These applications of poultices for abdominal inflammations involving the bowels, peritoneum, and the uterus, have been, I believe, the bane of surgical treatment by ancient physicians, and by some physicians of the present day. They are unnecessary, unless there has been an open wound and suppuration, and even in these cases a large majority, I think, would be better cured by the applications of cold, either dry or moist.

I can conceive that there may be some exceptions to the universal use of these cold applications, and in these cases hot stupes of terebinth and opium combined with chloroform might be useful, as, for example, in the puerperal diseases of women, involving the uterus and its appendages, and attended with great tympanitis, and also in the tympanitic condition of enteric and gastric fever. Still I think it will be found that in very many of these cases the water or ice bags will be of the greatest

benefit in a successful treatment of all these inflammatory actions. At least I have so found it in my practice, and I moreover prefer the ice in a bladder to that in a rubber bag, because the tissues of the body take more kindly to an animal tissue than to a smooth, clammy, rubber surface.

Every surgeon who has had much to do with operations and wounds in the abdominal muscles and integuments, particularly in the inguinal and pelvic regions, must be struck with the vast amount of sero-plastic lymph poured out from any injury or wound of these parts. Even in the application of a blister to this portion of the body it will be noticed that we have a far greater amount of serum poured out than we do when one is placed upon almost any other part of the body.

In the injections into the hernial rings, for the cure of rupture, we take advantage of this, and in some cases we may have a full occlusion of the hernial rings, even after we have partially divided some of the muscles and ligaments for the release of the strangulated intestine, and we obtain a far more favourable result than perhaps might be reasonably expected from so severe an operation. This takes place from the adventitious tissue formed by the serum lymph, and from the cicatricial contraction of the wounded muscles; hence any irritation of these fibres, fascia lata, &c., by means of astringent fluids injected upon them, will be found to produce a free effusion of this lymph, which soon becomes organised, and unites the oblique internal and external transversalis and transversalis fascia, and so forth, fully together. The greater the amount of serous effusion, the more sure are we of obtaining this desirable result in the radical cure of Hernia.

I have become so familiar with this condition and abundant effusion, that I can usually judge whether I shall get an occlusion and union of the parts of the hernial rings in my operation for the cure of rupture, in the course of forty-eight

hours. After I have operated, should the effusion be slight, I do not anticipate a very satisfactory result, but, on the contrary, if it be abundant, I look, and generally not in vain, for a most favourable and permanent cure of the Hernia.

AUTHOR'S MODIFICATIONS OF THE INJECTION METHOD.

Having advanced thus far in our subject, I will, before describing the exact *modus operandi* of my improved operations, give a brief account of the way in which I was led to improve the instrument and fluid used by Dr. Heaton, with some remarks upon the proper and improper instruments used in the operation.

I began operating for the cure of Hernia soon after the death of Dr. Heaton.

The first patient was Mr. G——, aged twenty-three, with double direct Inguinal Hernia. I was assisted by Dr. Wm. Emery, of Boston, who was his physician at the time of the operation. The hernial ring on the right side had become dilated to the extent of about one and a quarter inches in diameter by the protrusion of the hernial sac and intestine. The hernia on this side had existed for over two years, and the tumour formed by the hernial protrusion was about the size of a goose-egg. The Hernia upon the left side had existed for about a year and a half, was about one inch in diameter, while the hernial protrusion was about one-half the size of the one on the right side. These herniæ being at times very painful, and almost impossible to be retained with the ordinary truss during the patient's daily labour, it was thought best to perform the Heatonian operation for hernia, which was done in the following manner. With the old instrument of Dr. Heaton, I injected on the right side about twenty minims of the fluid extract of quercus alba, which had been evaporated to the consistency of glycerine, and united

with an eighth of a grain of morphine; on the left side about fifteen drops.

In about six hours after the injection the patient began to grow feverish and restless; pulse running to about ninety, temperature about one hundred. This condition continued for about three days, when it began gradually to subside. The urine was passed naturally, and a natural passage of the bowels took place on the sixth day. There was some swelling and redness over the hernial ring, extending up over the abdomen obliquely to the crest of the ilium. Dr. Emery attended the case. I seeing the patient occasionally. He administered one-eighth of a grain of morphine at bed-time to secure rest, and cold water was constantly applied over the seat of operation by means of a compress. A rapid and successful recovery took place, with a perfect cure of the Hernia, and on the twenty-third day of



FIG. 31.—Heaton's Instrument, with Davy's Needle.

July the patient came to my office, when a temporary truss was ordered. This he was to wear for several months until we should conclude that the tissues had gained sufficient strength for him to dispense with it.

It will be seen from the nature of the case that I here felt obliged to use a much larger quantity of the extract of quercus alba than is recommended by the late Dr. Heaton in his work on the cure of rupture. The instrument, Fig. 31, too, with which he performed his operations, I found very much worn from constant use in his practice for the last thirty years, and very unfit for the purpose for which it was designed, since great manipulation was required to exclude the air from the barrel of the syringe, because of the loose and worn packing. The needle was pierced for the exit of the fluid with two small

holes about one-fourth of an inch from its point. In order, therefore, to apply the mixture thoroughly to all the circumference of the ring, internal and external, it was necessary to twist the needle around during the injection. The fact is, however, that this method of operating caused a very unequal distribution of the fluids upon the parts, and much pain and needless suffering to the patient.

I examined also the needle devised by Dr. Davenport, editor of *Heaton on Rupture*, and found his likewise had but two openings, with what I consider a very dangerous point, it being lancet-shaped, and liable to pierce the pubic and branches of the epigastric arteries, together with other vessels. It thus had not even the merits of Dr. Heaton's old needle,¹ which was in shape not unlike a bradawl at its point, and which, because not very sharp, easily glanced by any vessels it might meet in its passage through the integuments.

Accordingly, in my next case I had a needle made for me and pierced with four holes, the first two much nearer the point of the needle than in the old instrument. This new needle, I found, worked very much better, distributing the fluid more equally upon the internal and external ring, together with less turning of the needle in the integuments and consequently much less pain in the operation. With this needle, as I had improved it, I continued to perform several operations with much better success than with the needle devised by Dr. Heaton. Still when I came to operate for a very large double inguinal hernia, one direct and the other oblique, the distance through the integuments being greatly increased by adipose deposit, I found there was still a great amount of pain which I thought unnecessary, produced by the instrument—since, being rather blunt at the point, it met with considerable resistance in penetration.

¹ See Fig. of Heaton's case, letter *b* in Appendix.

When I came to make a second injection, which was necessary on the left side of this hernia, since the first injection did not succeed in causing the adventitious tissue to be thrown out so as fully to close the ring, I found much greater resistance in the integuments than before, they having become more firmly consolidated from the effect of the oak bark. The operation thus caused considerable pain, although no more than most patients could endure without etherisation.

I next turned my attention to find some means of penetrating the tissue into the hernial ring with less pain, and for this purpose devised a new instrument, Fig. 32. It consists of a glass barrel inclosed in silver, through whose fenestrated openings the fluid

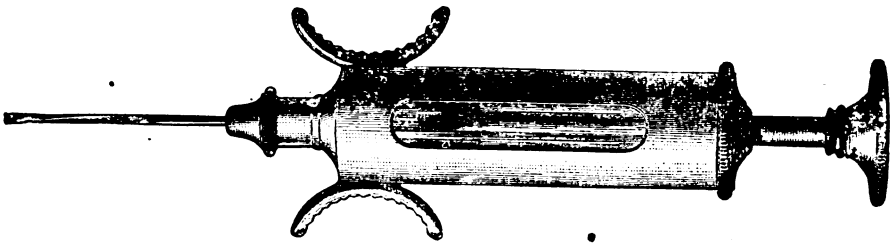


FIG. 32.—My First Instrument, with Revolving Needle.

can be seen and the presence of air-bubbles detected. The number of minims is also plainly indicated on the engraved glass barrel, so that we can measure the exact number of drops injected in any given operation. It has two semicircular handles on the lower end for holding the instrument conveniently and firmly during the operation.

If we next examine the needle or beak, we shall see that it is hollow, about one and three-quarter inches long, and that throughout its whole length it partakes of a spiral twist, so that it will, of necessity, revolve as it enters the tissue, and by such revolving penetrate the skin and other integuments much more readily than is possible with a straight, bluntly-pointed instrument. We can readily illustrate this by passing the improved

needle through a piece of parchment, and then by performing a similar operation with a straight needle pointed like a bradawl. The ease with which the fine needle penetrates compared with the resistance which the other meets, proves conclusively that the former instrument must do its work with much less pain than the latter. The secret of this is, that with the straight needle we get constant friction and bearing on the entire length of the needle during the whole operation, whereas with the spiral form of the needle the friction and pressure are on but a small portion of the body of the instrument at any one time, and are thus reduced to the minimum.

Then, again, it is to be observed that the needle, instead of being round, is of a flat, oval shape, and makes a wound of the same form, In this way there is a more ready coaptation of the wounded tissue than would be possible with a round puncture. The needle is pierced with ten openings upon its sides, which causes a more free and equal distribution of the fluid ejected. The difference between this and the hypodermic needle which I shall speak of later on, is that instead of the direct terminal uses of the fluid, we have it spread at right angles to the needle, and therefore gain a better distribution upon the hernial rings, internal and external, at the same time avoiding the application of the fluid to the peritoneum in which we wish to irritate as little as possible.

With the hypodermic syringe, however, the principal flow of the fluid would be upon the peritoneum, and not upon the parts intended to receive it, thus making the operation, in view of the small amount of fluid recommended, of limited and doubtful success. If we examine the attachment of this needle to the barrel of the syringe, we shall see, that the needle is held in place by a coupling and collar which allows it to revolve while on its passage through the integuments.

The head of the needle within this collar is rounded something

L

like the smaller end of an egg and on its bearings is in contact with a diamond or other hard stone which is concaved to fit accurately the convexity of the needle. In this way we avoid almost entirely the friction which would, if metal met metal, prevent the free revolution of the needle; and at the same time we render the joint sufficiently tight to prevent all leakage of the fluid as it passes from the chamber of the instrument into the needle.

Some improper instruments having been used in this operation I have to make the following general and important criticisms upon all sharp-pointed needles, like that on Fitch's trocar which has been used for the purpose, or like that devised by Dr. Janney of Philadelphia, previously described.

I do not wish to be considered an opposer of any other gentleman; on the contrary, nothing pleases me so much as to have others do this operation successfully. When, however, they attempt to do it, I do hope that they will select a proper and safe instrument to work with. If any one can devise a better instrument than has been devised, I, for one, should be happy to have him do it, and shall be happy to use it. But I hope they will be sure that it is safe, and that it gives honour to the good name of the operation, before they make it public as an improvement on both Dr. Heaton's instrument and my own, which are already in successful use. Therefore, as the only living man whom Dr. Heaton ever personally taught the operation as it was performed by him, I protest, in the name of humanity, against the use of any sharp, or angular-pointed needle in the operation, and I emphatically warn the profession to expect many unfavourable and even dangerous results from the use of such instruments; results which probably might have been a successful cure had proper instruments been used.

Lest the profession should consider me over cautious in this matter I will refer to an incident during a recent visit I made

to New York. Dr. Post desired me to go to the Presbyterian Hospital to see a patient he had operated upon for Hernia, but in whom he had not ventured to make the injection from the surface, for fear of injuring the arteries and other vessels. He had therefore first cut down upon the rings with the scalpel, freely, and then injected. He was in dread of these sharp-pointed instruments, but thought my new-pointed instrument avoided the difficulty. If this skilful and veteran surgeon, famous for his successful operations, dreaded and did not dare use a sharp-pointed instrument, how much more should the mere tyro in surgery avoid their use? It is impossible to be too cautious in this region so rich in surgical anatomy.

In addition to this it should be stated that in my method of performing the operation, instead of applying the fluid to the internal hernial ring first, as in Dr. Heaton's operation, I reverse the process and do this last; for as soon as my needle has penetrated the tissues, I immediately begin to eject the fluid upon the external ring and its surrounding parts, and so continue until I reach the internal ring. After sufficiently bathing the latter with the fluid I withdraw the instrument, still continuing to eject.

In performing in this manner we complete the operation in one half the time employed by Dr. Heaton, and, comparatively speaking, with an absence of pain. At the same time we entirely avoid the sweeping motion of the needle described in Dr. Heaton's treatise, a process which I consider very much endangers the wounding or irritation of the muscular fibres and blood-vessels composing the rings.

Furthermore, the tissues being less likely to be serrated or irritated with my needle than with his, there is much less tendency to the formation of abscesses from such irritation than in the old operation.

I find, too, that the extract of oak bark employed by Dr.

Heaton is not well held in solution, being liable to much sediment, the powder forming granulations which do not readily pass through the syringe, and which, if ejected form a considerable irritation, and therefore a great tendency to abscesses. A better and safer formula is to evaporate the fluid extract of oak to about the consistency of glycerine, add sufficient absolute alcohol to reduce it about one-half, and then add about one-half a drachm of sulphuric ether to the half ounce of fluid. To this mixture I also add about two grains of sulphate of morphia, thus making one of the most perfect injecting fluids that I have thus far been able by numerous experiments to devise, combining the astringent effect of Dr. Heaton's extract of quercus alba, together with that of the German method of using alcohol alone, and producing the most favourable results in this operation of injecting the hernial rings for the radical cure.

The use of an ordinary hypodermic syringe would be, I consider, an operation attended with much danger, not only from the liability of penetrating a portion of the pubic and epigastric arteries, but also because the instrument would be a poor and feeble one for thorough and successful operations on Hernia, since it is well known that the needle has to act in some degree as a staff and guide in slightly lifting up, as it were, the integuments, which are often thick and supplemented by excessive adipose tissue.

I hardly need call the attention of any surgeon of prominence who keeps well up in the anatomy of these parts to the great danger of wounding the epigastric and pubic arteries and other blood-vessels and nerves by a sharp lancet or angular-pointed instrument. The cautious surgeon well knows that his patient might easily receive a dangerous wound here and bleed to death, perhaps, before it be discovered and secured. Hence, after what is known and has been said on the subject, a hypodermic syringe, or any thin and sharp-pointed instrument, will

appear extremely dangerous to most successful surgeons. I should suppose there was hardly a single maker of surgical instruments who would be a party to the manufacture of any such dangerous instruments, and much less that there was any surgeon who would attempt to use such foul implements on any human being.

Indeed, one of the many reasons why Dr. Heaton preferred a needle like a bradawl, with a round and somewhat blunted point, was that it would easily and safely glide off the coats of the vessels. In my instrument I further guarded against danger by a round and blunt-pointed needle, which would revolve in penetrating the tissues. In this way there is still less danger of wounds or unnecessary irritation than in Dr. Heaton's method of sweeping the needle around, so as to distribute the fluid equally upon all the parts. With my instrument the fluid is simply and completely distributed around the rings and canal during the act of entering and withdrawing the instrument, and there is no possible danger of injury to the parts during the operation.

There has been some misunderstanding too about the manner in which the injection should be given. From an ordinary hypodermic syringe the fluid will be injected straight forward, while Dr. Heaton strove to force his fluid in a *spray* at right-angles to the needle. This is an essential point in the operation, since it is the *hernial rings* and not the hernial sac that we desire to irritate.

Although it is high time that this operation should be better understood, still a thorough comprehension will neither lessen our great esteem for the more formal surgical operation for Strangulated Hernia, as now performed by all modern surgeons, nor will it be less essential for all practical surgeons thoroughly to understand this latter operation.

So long, however, as thousands upon thousands are ruptured

with reducible Herniæ, which have heretofore required all the ingenuity of mechanical art to support and retain within the abdominal cavity by bands of iron and steel, elastic fabrics, bone and ivory thereby endangering life by their liability to become strangulated, and often abruptly terminating existence by the strangulated intestines becoming sphacellated and gangrenous, before relief can be obtained by the surgeon's knife, or the more gentle operation of taxis ; so long as this is the case, the discovery of a permanent cure seems a most wonderful blessing for mankind.

Should I ever be disappointed in the success of this operation for the relief and cure of rupture, I should be the first to acknowledge it.

Allow me to add, I know of no operation in the annals of surgery that requires a more delicate touch, and finer manipulation in all its details, or a steadier and firmer hand in the operator, not even excepting the fine and graceful operation of cataract on the eye. What operation demands more care than passing a sharp-pointed instrument through the living tissue into the hernial ring, among numerous tissues, vessels, nerves, and surrounded by the peritoneal membrane ? I know of no operation more simple and painless, or that brings forth such rich results in relief, comfort, and almost certain cure in nearly every case when performed by a skilful operator, than this one for the cure of rupture. But when awkwardly and indifferently performed by one deficient in the anatomical and surgical knowledge proper for the undertaking of the operation, I know of no operation so fraught with danger to human life, and one so barren in results, and therefore disappointing to both physician and patient.

In regard to the duration of the after treatment, my experience has been, and it was the experience of Dr. Heaton, that the effusion of plasto-lymph around the parts is not sufficiently

organised in five or ten days after the operation into adherent and fibrous tissue, to bear any strain at all upon them. They would at once separate and give way. Dr. Heaton caused his cases to remain at rest at least ten or twelve days. That we know from his experience, and I can say the same has been the case in mine.

Finally, I wish to add a word of caution and advice to those who may have to do with this operation. Should the patient get up too soon after being operated upon, or make any undue exercise or exertions before the parts have acquired sufficient union, consolidation, and firmness, they will very readily become separated, and of course let the Hernia escape again; or, should there be union in the parts sufficient even to retain the Hernia within the abdominal rings, yet a secondary swelling may again appear in the track of the first swelling and inflammation which usually attends the primary operation.

This secondary swelling, more particularly if it follows after we have made two or three injections, which are often found necessary fully to close the hernial rings, will appear in any form of Inguinal Hernia very prominent over the seat of the injected parts, not unlike an inverted common saucer in size and appearance, extending along the oblique to the crest of the ilium, and will assume a dark maroon colour. If we now examine it, it will appear to the touch as though fluid or pus were present.

This is not, however, the case; it is only a slight effusion and exudation of plasmatic serum, together with some mingling with the discoloration produced by the extract of oak injected. If now we cut freely down, exposing these parts to view, we see that the tannin in the mixture injected has united with the exudation, causing the appearance of the tannate of albumen. This will show itself by the striated, shroudy, and granulated substance resembling dry blood when moistened again. If we should now constantly apply compresses of cold water and

allow the patient to remain in bed, on his back, this redness and swelling will generally, in the course of two weeks, entirely disappear.

Such cases, when fully over all inflammatory attacks, will be found to be stronger in the hernial rings than those which had only the primary inflammation following the injection, because this secondary inflammation more fully unites the parts inflamed by thickening an additional deposit of organised lymph over the seat of the operation. But we should not be misled by this inflammation and proceed at once to open this large swelling, as we thereby very greatly endanger the result of the primary operation for the relief of the rupture, and put the patient's life in great and needless danger.

We should patiently wait, and after a sufficient time, it will, if it be an abscess, converge, in the course of ten or twelve days, to about the size of a Seckel pear, and something like it in shape and appearance. Then, and not until then, we should proceed to open the swelling, and even then we should first be able to feel the fluctuation of the pus through the thinned walls of the abscess. And if still in doubt, from our diagnosis, whether it be an abscess or not, we should, before opening, pass into the swelling one of the finest needles of the aspirator.

Cold water is the best dressing, and all through the treatment, from the very beginning to the perfect recovery to the normal condition of the inflamed parts, neither lotions nor ointments are required.

Now, sometimes when we discharge a patient after this operation, he is commanded to wear a truss or bandage, not to lift or jump either from the cars or any other height, and to be very careful about any violent exercise whatever; all of which he promises to do. But the person so dismissed, cured to all appearances, will possibly feel so mighty and proud in his recovery that, although he may for a time follow the instructions,

he will some fine morning cough, perhaps, and force the abdominal parts down in order to see how strong he is in this region; or taking a peculiar delight now in examining what previous to the operation was so repulsive, he will try to lift a heavy weight, pull a hand-cart if he takes a notion, or see how high he can reach.

From these self-examinations he may feel satisfied that he is perfectly cured, and yet, in the very acts in the time of his unusual exertions, he has started and opened the adhesions formed in the hernial ring, and in the end his state will be nearly as bad as before; for upon the least yielding of these new adhesions the peritoneum and intestines will insinuate themselves through the most minute opening, and act like a wedge in forcing the parts asunder.

Had he been more cautious in following explicit directions, and waited a year or two before making violent exertions, he would never have had to bear a return of his rupture. Should a return of his Hernia unfortunately take place, another operation and injection will generally effect even a firmer closing of the rings than the first operation did, because of a decidedly greater condensation and stronger cohesion of the parts treated. But I am assured that he never again, in his joy, will experiment to see how perfectly he is cured.

Sometimes, after the hernial rings are closed, as Dr. Heaton says in his work, and as I myself have seen, portions of the hernial sac, particularly in cases of long standing, are fastened down in the folds of the rings and surrounding parts, after the operation for cure has been successfully applied, and this may lead the patient—nay, even the physician—to think that the hernia has not been in reality cured. If, however, as I have already said, the rupture remains closed for a year or so, the cure may be looked upon as certainly a permanent one.

Suppose, however, that this hernial sac can be passed readily

through the hernial rings, then a very slight amount of the injection will close the parts efficiently, leaving the patient much strengthened by the operation.

I wish to call attention again and especially to the fact, that although this operation is generally successful upon its first performance, yet it has sometimes to be repeated several times before we get a full and strong occlusion of the rings, particularly in herniæ of large and long standing. If, after we have once operated and have succeeded in partly closing the opening, we find we have not done it so as fully to effect a permanent cure, we must, after the lapse of eight or ten days, repeat the operation, and continue so to do until we have entirely closed the parts beyond danger of opening. Thus, by perseverance, and thus only, we shall in the end be delighted and rewarded by the perfect cure of almost every case we undertake.

Even after the patient has returned to his usual occupations, and has seemed, both to himself and the operator cured, upon the slightest indication of the return of his troubles he should at once present himself for examination, and, if necessary, another operation. Indeed, not only in this operation, but in all others in surgery that may be presented to me for treatment, I could not positively, and under all circumstances, warrant a permanent cure any more than if I performed ovariectomy or the amputation of a limb, for it is well known that from some unforeseen circumstances in the operation, or in the conduct of the patient submitted, success may not always and with certainty follow a good and legitimate attempt at relief.

AUTHOR'S OPERATION.

With all due deference to the many and honoured operators for the cure of Hernia, I now give my *improved* operation, with a description of my new instrument and injecting fluid. While

I make no claim to originality beyond whatever originality is required to perfect and bring to a scientific development what before, in a crude and imperfect form had worked many good results, I am encouraged to present whatever I have done because of the very general interest shown by the profession in my own country and in other countries, in what I have already given them in the medical journals. My method of performing and presenting the operation would seem to be more acceptable to the better and greater part of the profession than previous operations, if I can judge by the letters of congratulation I receive from distinguished surgeons of this and other countries, fully approving the operation as safer and freer from the following complications than all operations heretofore proposed. Thus far I have not had a single fatal case, and the worst case I have had was an old congenital hernia cited in the report of interesting cases (see p. 192, operations 3, 4, 5) read before the Suffolk District Medical Society.

The operation is here given with some slight increase of matter, being nearly as read before the British Medical Association at Cambridge, 12th August, 1880; and presented before the Académie de Médecine, 31st August, 1883.

It gives me great pleasure to have the honour of addressing you at this, the annual meeting of your venerable Association, on the treatment of Hernia by a new method, by means of an instrument and injecting fluid of my own devising.

As many of you are aware, I have written considerably on this subject, and by means of the various medical journals, the so-called radical cure of rupture has been circulated through the medical profession, and caused no little interest. But I do not like the term "radical" as applied to this or any other operation, for it is not euphonious, and is distasteful to the true surgeon, sounding as it does of charlatanism. It sounds unprofessional to all preconceived ideas of medical and surgical

science, and in my humble opinion it should not be so much as named among us in speaking of this or any other operation. Let us in speaking of this operation call it by its true name, an operation for Hernia by injecting the hernial rings.

I am aware that some of the most honoured men that have brightened the pages of surgical literature or taught in our Universities have applied the term radical to the operation for Hernia, but notwithstanding this I would take exception to the time-honoured precedent, and in accordance with the present spirit of medical and surgical art, call this operation by its true name, trusting that we shall be quite as successful in curing and relieving our patients as we should under the irregular name of radical cure. In all my future papers and work upon Hernia I will join hands with the profession and erase the objectionable word, and will speak of treating and curing ruptures by this method as we do of any operation devised for the cure of any affection.

I would here take the liberty of expressing at this time my most sincere thanks to the distinguished profession of London, New York, and Boston, as well as to the profession generally in my own country and Europe, for their kind criticisms and consideration of me in presenting my imperfect papers on Hernia, which are given while engaged with many cares incident to an active professional life.

In presenting this paper, I wish to say that in giving my new instrument and method to the profession, that I do not wish to detract any credit from the late Dr. George Heaton, of Boston, nor underestimate his valuable work on rupture, or the great labour and pains of his late co-editor, the refined and scholarly Dr. Davenport.

On the contrary, I look up to Dr. Heaton, not only as my former master and instructor in this operation, but as one from whom I gained all my inspiration for my present and future

efforts in developing and demonstrating this, as yet, as I feel, imperfect operation on Hernia. To Dr. George Heaton will always belong the honour of first injecting the hernial rings with fluid extract of oak bark, *Quercus alba*, for the radical cure of rupture, if he was not the first to inject hypodermically.

I am, as will be seen, working over the field of operation of Hernia, trying to perfect and improve any deficiencies which I find in the treatment by injections, and it will be my greatest desire to be candid and truthful in all that I do and present to my medical brethren; and may I not hope with their kind assistance to accomplish much in this operation, which does not as yet seem to be fully understood by the profession or appreciated as it probably should be?

The following is a short description of new syringe and instrument for injecting the hernial rings in the cure of Hernia.

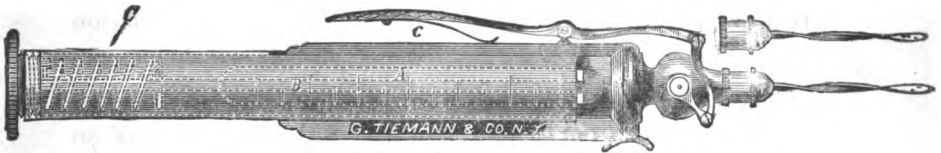


FIG. 33.

The instrument which I show you consists of a barrel, A, holding about sixty minims. This barrel is of glass, accurately fitted within a cylinder of silver, which is fenestrated with two openings to present a view of the barrel and its contents. The barrel is graduated, each degree indicating ten minims. The piston B works by a spring c, very tightly, within this tube, so as to exclude all air possible. The lower end D of the piston is slightly concaved. At the bottom of the interior of the glass barrel there is a ring E, one-eighth of an inch in thickness, made of soft rubber, for an air chamber, with a hole in its centre for the exit of the fluid.

On the lower exterior end of the barrel will be seen a convenient semi-circular handle, with the concave side roughened to give a firm hold for the finger and thumb of the operator.

A valve is situated just below the bottom of the barrel and rubber chamber, and is opened and shut by pressure on the lever *c*. We thus have perfect management, both of the amount of the fluid to be injected and of the time when it shall be injected. Below this valve is a diamond, or other hard stone, concaved to fit exactly the convex head of the needle which plays upon it.

The needles are flattish, oval in shape, and are twisted throughout their entire length. They are of three sizes. No. 1 is one and a quarter inch in length, size two and a half American scale; No. 2 is one and three-eighths in length, size two and three-quarters American scale; No. 3 is one and a half inch in length, and size three. It should be remembered that, from their peculiar form and twist, they make an incision only about one-half the size of round needles which measure the same on the scale. The twist of the needles also varies. No. 1 is twisted to revolve once in penetrating one-fourth of an inch, No. 2 once in penetrating one-half an inch, and No. 3 once in penetrating three-quarters of an inch. I use No. 1 in operations on umbilical Hernia and other Herniæ where the tissues are thin. It is therefore small, and has a quick twist because it is necessary that the needle in penetrating should make a full revolution, so as to distribute the fluid on the parts to be irritated by the injection. No. 2 is for use in operating on the majority of small and recent Herniæ. No. 3 is for use on large and long-standing ruptures, where the needle must traverse tissue generally much thicker than in the other cases mentioned, and often surrounded by adipose deposit. The needle has a round shank, playing through a collar, which is

attached by a screw thread to the neck of the barrel. This needle does not bore in passing, but turns round in a spiral manner as it advances, and the same can be said of all the other instruments to be hereafter described, except the aspirating needle, which is twisted in through the tissues by slight pressure and revolving it at the same time.

I have said that there was a rubber cushion at the bottom of the glass tube. This cushion remedies the defect common to hypodermic as well as all other syringes, for it forms an air chamber which arrests the passage out of any air that may be in the barrel, and there is always more or less, and this would be injected with the fluid. It also acts very effectually in stopping the farther action of the piston after all the fluid has been injected.

The method of using the instrument is as follows. With the valve closed, the needle is inserted in the fluid to be used. The valve is now opened by slight pressure upon the lever. The pressure being continued, the piston can be retracted, and the barrel will be consequently filled with the fluid. The valve is then allowed to close, and the instrument is charged for use.

Having selected the most suitable point over the rings to be injected, we now thrust the needle slowly and gently, but at the same time firmly, through the integuments. During this act the needle revolves because of its twisted form. As soon as it has passed through the integuments, pressure is made upon the spring, which opens the valve, and allows the fluid in the barrel to flow as slowly and in such quantities as the operator may in any given case think necessary. The quantity used can, of course, always be known by the engraved scale on the barrel.

ANATOMY OF FEMORAL AND INGUINAL HERNIA.

The real and essential anatomy of the parts where our seat of operation lies, we find to be the following:

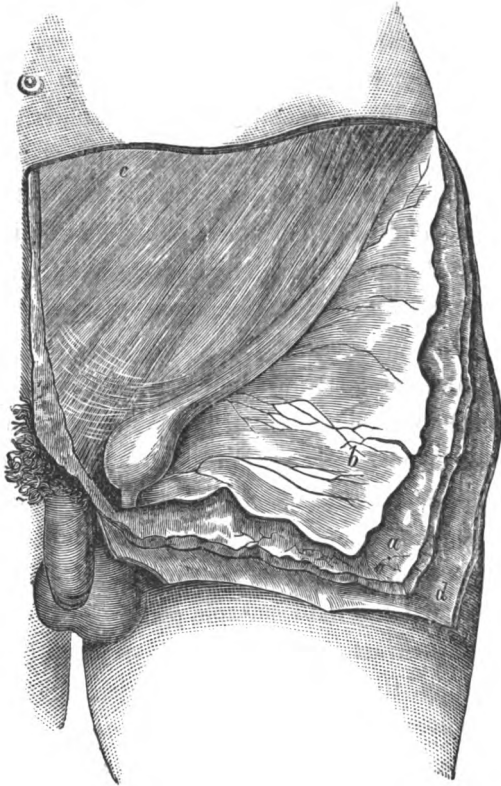


Fig. 84.

Shows the anatomical relation and coverings of Oblique Hernia. *b*, transversalis fascia; *c*, peritoneum; *a*, muscles, internal oblique transversalis, and external oblique; *d*, external integuments. These illustrations were drawn under Mr. Cooper's directions from my friend Dr. John Wood's work on Rupture, who very kindly permitted me to make use of them for this work.

The inguinal or spermatic canal begins at the internal abdominal ring, its length being about one and a half inches. It

serves for passage of the spermatic cord in the male and the round ligament with its vessels in the female. Its boundaries are :

In front.—Tendon of external oblique muscle, lower border of internal oblique and a small portion of the cremaster muscle.

Behind.—Fascia transversalis, conjoined tendon of internal oblique and transversalis muscles, and the triangular fascia.

Above.—Arched border of transversalis muscle.

Below.—Poupart's ligament.

This inguinal canal is of great surgical importance on account of its being the channel through which inguinal Hernia escapes from the abdomen. Inguinal Herniæ are of two kinds, oblique and direct. The former enters the inguinal canal through the internal abdominal ring, passing obliquely along the canal and through the external ring to descend into the scrotum. Direct inguinal Hernia escapes from the abdomen at Hesselbach's triangle and passes through the external ring.

Hesselbach's triangle is situated at the lower part of the abdominal wall on either side. Its boundaries are :

Externally.—Epigastric artery.

Internally.—Outer margin of rectus.

Below.—Poupart's ligament.

The following are the coverings of the two varieties of inguinal Hernia, commencing at the surface :

Oblique.

1. Skin.
2. Superficial fascia.
3. Intercolumnar fascia.
4. Cremaster muscles.
5. Fascia transversalis.
6. Sub-serous cellular tissue.
7. Peritoneum.

Direct.

1. Skin.
2. Superficial fascia.
3. Intercolumnar fascia.
4. Conjoined tendon of internal oblique and transversalis muscles.
5. Fascia transversalis.
6. Sub-serous cellular tissue.
7. Peritoneum.

FEMORAL HERNIA.

The crural or femoral canal is a funnel-shaped interval which exists within the femoral sheath between its inner walls and the femoral vein, and is the space into which the sac of femoral hernia is protruded. It is limited above by the crural or femoral

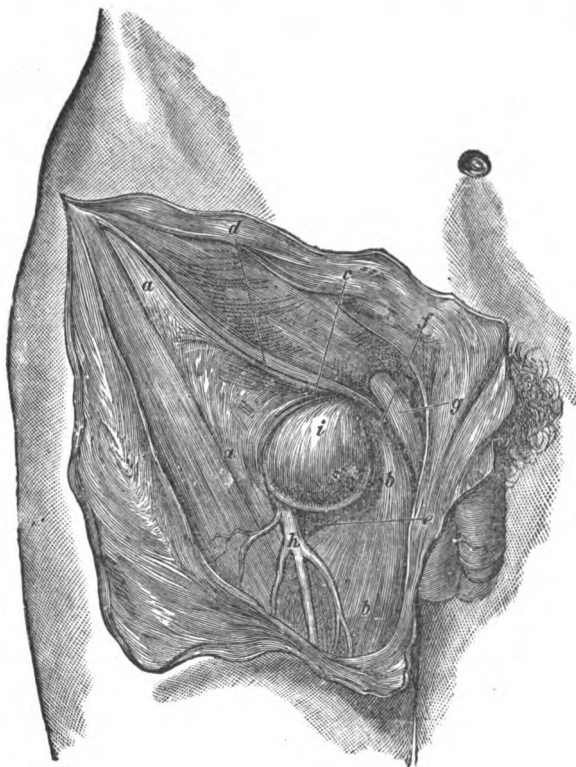


FIG. 35.—Femoral Hernia.

ring and is lost below by the adhesion of the sheath to the coats of the vessels. In the normal state, the canal is occupied by loose cellular tissue and numerous lymphatic vessels which perforate the cribriform fascia covering the saphenous opening in the

fascialata and the walls of the sheath to reach a lymphatic gland situated at the crural ring. This gland is retained in its position by a thin layer of sub-serous cellular tissue—septum crurale—which together with the peritoneum separates the canal from the abdominal cavity. The crural ring is the point where femoral Hernia leaves the abdomen, and is the most frequent seat of strangulation. Its boundaries are:—

In front.—Poupart's ligament.

Behind.—Ileo-pectineal line, and body of pubic bone.

Externally.—Femoral vein.

Internally.—The sharp margin of Gimbernat's ligament.

The coverings of femoral Hernia commencing at the surface are:

1. Skin.
2. Superficial fascia.
3. Cribriform fascia.
4. Femoral sheath or fascia propria.
5. Septum crurale or sub-serous cellular tissue.
6. Peritoneum.

THE POSITION FOR OPERATION IN THE CURE OF HERNIA BY SUBCUTANEOUS INJECTIONS.

I usually perform this operation on a table made of white wood, for the sake of lightness, about six feet long and one foot wide. It is supported by three pairs of legs, which at the foot are two feet four inches high, and at the head two feet high, while the central ones are nineteen inches high. These legs diverge from the middle line of table to give the greatest possible stability.

There are four leaves attached to the top of the table, two on either side; that is, each leaf is about three feet long and six inches wide. The two leaves at the head of the table are spread open for the patient to lie upon, while the two at the foot are allowed to hang at the sides of the table. On these latter

leaves is placed a foot-rest for the patient, so that his limbs may be in a proper position for a convenient operation. These leaves, as well as the legs, are hinged to fold up, and are properly braced to be held in position during the operation.

The table has in its centre, and about three feet from the lower end, an oval opening six inches in diameter, around which the surface has been bevelled to fit accurately the patient's sacrum and hips.

The table being first covered with sheets or blankets, or, if necessary, a rubber cloth, the patient is laid upon it with the head upon the lower end of the table. In this position the spine partakes of the curvature of the table top, the pelvis and hips being elevated.

If desired, a small pillow can be laid under the head so as not to elevate the shoulders unduly. The patient is now in position for the operation in umbilical, inguinal, and femoral Hernia a position clearly the most favourable for the entire relaxation of the spinal, abdominal, and limb muscles. The Herniæ may now be returned within the abdominal cavity, where they will remain on account of the position of the patient, and can be at once operated upon.

This table can also be used in the treatment of uterine diseases and for operations on the anus, by placing a staff at the foot of the highest end of the inclined top on which to suspend a fountain syringe, bucket, or other vessel. The patient will be found to lie on this table in the very best possible position for the treatment of such cases on account of the concavity of the table from head to foot, and the circular orifice will allow all overflow to escape, thus keeping the patient clean and dry.

I now prefer and use the Goodwin invalid bedstead in my operations in place of this table, as I find it better adapted and much more convenient while operating, and the patient is not obliged to be moved afterwards till able to be up again, and

the desired elevation can be obtained, as the foot and head can be lowered or raised to any height and firmly remain so long as we wish by the means of a canvas bottom that is pierced with a hole, so that the bed-pan can be used without any trouble for all the calls of nature.

OPERATION FOR INGUINAL HERNIA.

The patient is first placed upon this table, or, if the table be not at hand, upon a bed, in which case the hips should be elevated by a pillow, whilst the head and shoulders should be allowed to fall somewhat lower in order to produce a slight curvature of the spine and a relaxation of the abdominal muscles.

If a bed is used, the legs of the patient should now be drawn up, but if the table is used, this same position is gained by the foot rest below the surface of the table.

The patient being thus in a relaxed yet firm position, we seek the Hernia to be operated upon, and, after reducing the protruded intestinal sac and omentum by taxis, we pass the left middle finger up the spermatic canal until we come to the inguinal ring, and by slightly raising the end of the middle finger as above mentioned, the same is felt by the forefinger, which also helps us to indicate the exact point, and guide to insert the point of the instrument. Having ascertained that the ring is well open and free from attachments or adhesions to the returned sac, we begin to insert the needle at the lower portion of the ring, where we feel its edges through the abdominal parietes.¹

The needle should always enter this lower portion of the ring, as in passing obliquely upwards and backwards it is less likely to wound either column of the internal ring. Great care should

¹ All the sac that can be put back free from adhesions must be returned. If it is firmly bound down the injecting fluids should be freely distributed around it as thoroughly as possible.

be taken in inserting it through the integuments and superficial fascia, so as not to wound the external pillar, but to enter the

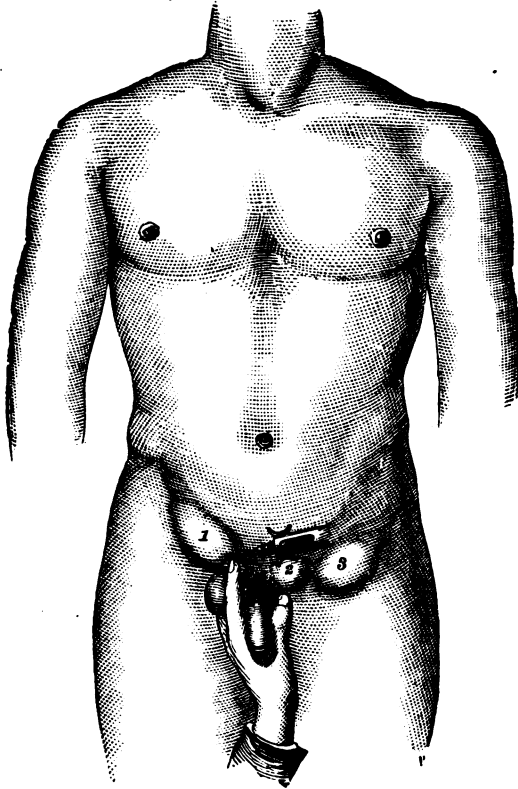


FIG. 86.—The three most common forms of Hernia, in the order of their occurrence in the male, are (1) Oblique Inguinal; (2) Direct Inguinal; (3) Femoral.¹

canal at once. The needle then should never be passed in a perpendicular direction, as there is thus danger of wound-

¹ The artist has drawn the instrument too nearly horizontal, so that it appears as if it were entering the left groin. The instrument should lie across the thumb of the left hand between the first and second joints, making an angle of about forty degrees when the needle first enters. After passing the superficial integuments the instrument should be depressed so that the needle may pass freely into the rings along the superior surface of the spermatic cord, taking care not to wound the cord.

ing the spermatic cord, but it should receive the necessary obliquity as soon as we feel that it has passed through the integuments. We can diagnose the position of the needle when first entering, by passing the left fore or little finger up with the invaginated scrotum upon it. When we have passed the needle through the integuments, we begin to open the valve and slowly push the needle in the direction already indicated. As the needle is thus inserted, it revolves and injects the fluid in sufficient quantities to cover well the external and internal rings.¹ The needle is now slowly withdrawn, still injecting fluid in its backward motion. As soon as the needle is withdrawn, pressure is made with the end of the fingers over the wound and rings for five or ten minutes, until the smarting and throbbing pain subsides.

Now a pad about three by four inches and three-quarters in thickness is made by folding a linen napkin once or more. This pad should be immersed in cold water and applied, gentle pressure being at the same time constantly exerted until the bandage, which should be double and three or four inches wide, is passed round the body and firmly secured by pinning. In double Hernia this bandage should be kept from slipping upward by two perineal bands beginning at the crests of the ileum and pinned near the symphysis pubis in front.

The patient is now placed in bed with his legs side by side and should remain upon his back in this position for from twenty-four to forty-eight hours. He should not be allowed to rise in voiding urine or attending to other calls of nature but the bed-pan should be used for such natural calls.

¹ In most cases ten to twenty-five drops will be sufficient. It will be remembered by those present at my operation, August 19th, 1880, at Guy's Hospital, where the ring was very large, as demonstrated by Mr. Bryant and Mr. Smith of the Seamen's Hospital, that I was obliged to use thirty drops in this case.

OPERATION FOR FEMORAL HERNIÆ.

Same position of the patient as above. Having ascertained by diagnosis whether the Hernia be femoral or inguinal, that is, having found the relation the Hernia bears to Poupart's ligament (femoral Herniæ lying below this ligament and inguinal Herniæ above), and having selected the position of the saphenous opening to which we are easily guided, if the femoral Hernia has emerged from the femoral canal, the operation is performed in a manner similar to that in inguinal Hernia.

This saphenous opening we can usually locate by pressure in the thigh below Poupart's ligament and about three-quarters of

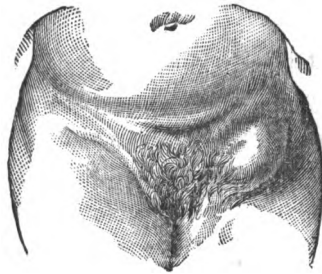


FIG. 37.—Femoral Hernia as usually seen in female.

an inch to the inner side of the femoral artery. Over it usually lies a lymphatic gland, which is much enlarged if a truss has been worn.

In most cases the sharp edges of the falciform process or fascia lata which may be thickened and hypertrophied from friction. This is formed by friction of the truss and the Hernia, and forms our landmark, for its curve is peculiar and not readily mistakable in making our definition. For similar operation see *Heaton on Rupture*.

The Hernia having now been reduced and the forefinger pressed against the outer edge of the falciform process, the

needle of the instrument is inserted into the canal just above the saphenous vein and on the inner side of the femoral vein which is held to one side by the finger, care being taken not to forget the femoral vein that often lies posterior to the hernial membrane. The needle thus enters the femoral canal external to the hernial membrane.

The irritation applied to the crural ring should be slight, as femoral Hernia will not require so much of an irritant as an inguinal one of nearly the same size. The pad and bandage are applied similarly to those in inguinal Hernia, only run the Spica bandage as seen in Fig. 38.

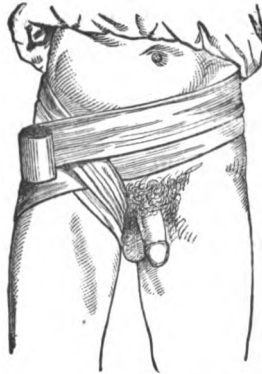


FIG. 38.—Spica Bandage.

Of all *Herniæ*, femoral are the most difficult to cure by this operation, especially in females, as they require the utmost skill and care on the part of the operator, because of the extreme length of the ligaments which make up the crural ring, and because of the immediate relation of the femoral veins and arteries, and because in large and long standing *Herniæ* the sac is often ramified by branches of large veins and arteries, together with lymphatics.

OPERATION FOR UMBILICAL HERNIA.

From the ease of diagnosis this will not require any lengthy description. The patient is placed upon his back as in femoral Hernia, except that the feet may be slightly elevated. The finest needle which revolves once in going one-half of an inch, is selected and passed to the centre. As soon as it has penetrated the integuments, we deliver the injection with some force upon the edges of the ring by throwing the valve wide open.

Care should be taken in this operation not to puncture the peritoneum. Where the integuments are very thin and the Hernia small, as in children, the hernial rings should be seized with a pair of dressing forceps and elevated while the needle is passing through them. In extreme and old Herniæ of this kind, two or even three points may be selected for injecting the irritant. This is necessary in cases of extreme size, in order that the liquid may bathe the edges of this enlarged umbilical ring. The bandage and pressure is the same as in the other cases mentioned.

In addition to these usual injections into the hernial rings, I have found when the opening in the rings has been very large, the following plan of reinforcing the ordinary effects of our operation to be of great value. While withdrawing my needle after the primary injection, I allow sufficient fluid to escape into the superficial parts to create a more or less permanent swelling over the rings. This has a tendency to form a large tumourification over the seat of operation, and acts not only as an additional support, but also as a compress just where we most need and desire pressure. This contracted thickening of the tissues will remain in this state for months, and adds much to the success of the operation.

• One might think at first, from this swelling, that we were dealing with an abscess produced by our injection, but this is

not so. On the other hand, we often do get small superficial abscesses similar to those following the hypodermic injection of morphine or ergot; but these are of short duration, seldom larger than a pea, and after ten to fifteen days may be pricked. They will exude their contents—usually a mixture of bloody serum mingled with our injecting fluid—and in a short time will readily heal.

This modification of our usual operation is especially effective when the patient is very spare and thin over and in the vicinity of the hernial protrusion, when we are dealing with either inguinal or femoral *Herniæ*. From this it will be evident that in all cases of umbilical *Herniæ* it will always be best to inject the superficial tissues, because the integumentary coverings are so thin and require so much the more the additional cicatricial thickening.

If upon the day following the operation of injection we find there has not resulted a sufficient flow of lymph, we can readily excite a greater flow by pressing the ends of the fingers into the external ring, pushing all the external integuments down upon the internal ring, and when our fingers are in this position, by rubbing and twisting the integuments between them with more or less force. This rubbing should never be repeated after the first day succeeding the operation; and in consequence of its necessity, we should warn our patient that he must remain at rest a day or two longer than if the rubbing had not been made.

Heaton, to supplement his injection, was in the habit of serrating the columns of the internal ring with the point of his needle. We should, however, remember that if this manœuvre be carried to too great an extent, the result might be that inflammation would set in rather than the effusion of lymph, that we might seriously injure the peritoneum, or that we might cut some important vessel from which a severe, if not fatal hæmorrhage might take place. It is not a procedure that I

should recommend any one to adopt, as with my more stimulating injecting fluid, and the after operation of rubbing, I can with more safety and surety obtain far better results.

At the risk of repetition I will, at this point, institute a comparison between the effects produced by the old fluid of Heaton and the new mixture of my own. The application of a mustard paste to the surface of the skin will excite a great amount of irritation, and what might have been called, by older writers, a dry and local inflammation. If in place of the mustard we apply a blistering plaster of cantharides, we shall get a greater amount of lymph effusion with far less soreness, tenderness, and inflammation of the surrounding tissues. From this I intend the inference to be drawn that mere soreness and tenderness of the rings is no criterion that the operation of injecting the hernial rings has been successful in occluding the hernial opening. On the other hand, the success of the operation depends entirely upon the effusion of lymph sufficient to produce new tissue in the rings. Of the amount of this effusion we can judge by the soft and fluctuating appearance of the swelling over the seat of our operation, feeling like fluid beneath the folds of a thick rubber bag.

AFTER TREATMENT.

From six to eight hours after the injection, an increase of temperature, a slight increase of pulse and a feverish condition showing a slight constitutional disturbance will set in and continue usually from three to four days, when it will be found gradually to subside. The patient should have a light liquid diet, and, unless otherwise indicated, should have cold water constantly applied by means of a compress, from beginning to end. Morphine or some other anodyne can be administered to secure quiet. The bowels should not be moved, if possible, until the sixth or seventh day, and then by some gentle cath-

artic. Fluid as drink can be had *ad libitum* in the way of cold water, but no stimulants of any kind except under the utmost urgency, and on no account is tobacco to be used.

This treatment should be continued for at least a week or ten days, the patient lying in bed and as much as possible upon his back. The first four days he should remain constantly upon the back, as any other position might injure the process of adhesion of the rings caused by the irritant.

This is an operation which, if it should not be successful, has put the patient to but little pain, inconvenience, or danger; and should we not fully succeed, we have not left our patient worse than we found him, as there is always a partial if not a full occlusion of the rings, and so if we do not fully close them, we have somewhat benefited the patient. This cannot be said of many other operations performed for the relief of Hernia.

It now, perhaps, would not be out of place to consider the various kinds of Hernia which would promise the most favourable results from this operation in our next chapter. See Sec. II.

In performing this operation it is not desirable to use ether, as it is apt to excite vomiting, and I only resort to it with the very timid and sensitive. It will be found more necessary to etherise in children and women than in men, to overcome their fear rather than from any pain they would experience in the operation.

Chloral hydrate may be given a few hours before the operation with almost as good results as those obtained from ether, producing sleep and freedom from pain and fear.

Great care also should be taken not to allow the patient to stand upon his feet too soon, as from past experience I am convinced that very few cases which have needed a second operation after they have in the opinion of the physician and the patient himself, completely healed, would have required a repetition of the injection, had they been more prudent and

been content to remain quiet a little longer. Do not be too anxious then to see the results of the operation, but let nature take her time in occluding the rings.

Moreover, when we allow the patient to stand upon his feet for the first time, we should support the injected parts with the tips of the fingers and on no condition remove this support while he is standing. He should not be allowed to cough, bear down or make any undue exertions for two or three months, at least.

A bandage or truss should now be worn for from three months to a year or even longer, if the patient follows any occupation where great violence or powerful exertion is liable to occur. After this if the rings remain occluded and firm he may dispense with the truss or bandage.

ON OBSERVING CASES.

From a careful watch kept over the after history of cases we have operated upon, we shall probably from every case learn something new and valuable to us which will be of perhaps incalculable benefit to us in some future operation. I have yet to see two *Herniæ* precisely alike in every particular. Although the kinds of *Herniæ* usually met are few the variations upon these few kinds are indefinite in number and appearance.

Examine each case carefully, study it in its minutest detail, mark well all the surrounding and attending circumstances, whether the *Herniæ* be large or small, painful or not, congenital or accidental, age of patient at the time the *Herniæ* first appeared and at the time of operation, history of the *Hernia*, habits and occupation of the patient and whether there is any hereditary disposition to *Hernia* in the family.

Carefully noting all these points we are enabled to treat the patient and the *Hernia* more intelligently and carefully than if we knew nothing more than the mere fact that a *Hernia* exists upon which we are requested to operate.

CHAPTER VI.

GENERAL REMARKS.—I. SELECTION OF PATIENTS. II. KINDS OF HERNIA BEST TREATED. III. PERCENTAGE OF CURES. IV. CAUSES OF FAILURE. V. RECORD OF INTERESTING CASES.

I.—SELECTION OF PATIENTS.

A CAREFUL discrimination between the different conditions of the Herniæ and of the patients to be operated upon should always be most scrupulously made if we would have success attend our efforts for relief and cure. The operation I present is no more adapted indiscriminately to all suffering from Hernia than is any other surgical operation for the relief of any other bodily affliction. No surgeon in capital operations would think of disregarding the physical condition and attendant circumstances of a patient submitting himself for treatment. Why should this disregard be so common in the treatment of Hernia? I am convinced that the vast majority of Hernia cases are treated in just this careless way, and that in this method of treatment lies the secret of the poor success of many of the operations.

This subject has never to my knowledge been stated, discussed or emphasised in any essay or work on Hernia, and I am more and more surprised every day to think that such an important and indispensable element of the operation should be allowed to pass unnoticed by the many writers upon the subject.

Although Dr. Heaton said nothing of this in his work I am convinced from my personal friendship and intimacy with him that he always made a careful selection of his cases and that in this was one secret of his success. When speaking of his invariable success he was in the habit of giving me a peculiar wise and knowing look of the eye, and he would say that he cured all, or about all, that he *would* operate on. At that time I did not attach much importance to this expression, but now that I have been operating myself I think I see the meaning. The selection of his cases was the great and only secret that he withheld from the profession. He often ridiculed the idea of the indiscriminate application of the method of injection to any and all cases of rupture, saying that the general health of the patient had much to do with the success of the operation.

I am sorry that in his work on rupture he still preferred to keep this important portion of his secret to himself. From what I have already said I think the reader can safely judge that I am perfectly free and open in the whole operation, and that I am desirous that the operation shall stand and be criticised only upon its *true* and tried merits. I would under no consideration lead a single operator astray in the operation whether by being too self-confident or by unfairly and with prejudice and concealment stating my candid views upon the subject. What I seek is that mystery may be removed from the operation.

When this operation is attempted upon persons in poor and indifferent health or of great delicacy enfeebled by age or a broken constitution, upon those who have lived lives of intemperance and debauchery or who are suffering from syphilis or scrofulous affections, upon those living in crowded and unhealthy places as in the filth and poverty of a great city, upon those in hospitals, or public institutions as almshouses, jails, places of detention, or prisons, or upon poorly nourished

and anæmic persons and upon dispensary patients the prognosis will be very unfavourable and the chances of success very small and uncertain.

On the other hand we may expect to get the best and most successful results with the least trouble and vexation from the operation when it is performed upon persons in a high state of health, muscular strength and vigour, upon those who live in the country, or who are in the habit of being in the open air much of their time. I find persons who are in the following out-of-door occupations to be the most favourable to receive the operation for Hernia, and I have endeavoured to arrange the list in a careful order placing the occupations that promise the greatest health in their successive order: Farmers, country gentlemen and their domestics, teamsters, lumbermen, sportsmen, soldiers, sailors and marines, masons, carpenters, civil engineers, men employed on railways, and professional men.

II.—KINDS OF HERNIA BEST TREATED.

Having now spoken of those upon whom this operation is likely to succeed, it now, perhaps, would not be out of place to consider the various kinds of Hernia which would promise the most favourable results from this operation.

In accidental or congenital Hernia in persons between the ages of four and twenty years, the most favourable results may be expected. Unless the Hernia be large and of long standing, the injection need not be very stimulating. The youngest child I have operated upon was four years of age. This was a very delicate operation for a large umbilical Hernia, which was not easily controlled by mechanical means, owing to its size and extensive protrusion. The operation resulted in a cure. I would not advise the operation for femoral or inguinal Hernia unless the patient was at least five or six years of age, preferably ten or twelve. In the cases of these little patients a

properly fitting truss, which may itself effect cure, should usually be tried first, unless the child be very nervous or the parts so irritable as to render the truss or other support intolerable.

After the age of twenty-one the cure is more difficult. Satisfactory results are only to be obtained by the use of a more stimulating injection. More than one injection is often required. The older the patient and the larger the Hernia, the greater the difficulties become, though enormously large Herniæ, such as, to all appearance, would preclude reasonable hope of cure in accordance with our previous ideas, may now be relieved or cured. Almost certainly if we do not succeed in closing the hernial rings, we may cause a certain amount of contraction and a corresponding degree of relief, if not of cure; at least the patient will be benefited rather than injured by the operation. Some patients even say that they would gladly submit to the operation once in a few months rather than suffer the hernial protrusion. The opinion of certain critics that the operation, if unsuccessful, would do harm by leaving the edges of the rings fringed and jagged, and sensitive, may be safely left to the honest opinions of such gentlemen as may give the matter their careful consideration. The absence of cutting and irritation of the surrounding parts with the knife, or sharp instrument, is opposed to this criticism. The parts, after the operation, naturally become infiltrated, from the internal to the external rings, with plastic lymph. Should this give way, which may possibly occur, the previously agglutinated parts, we may presume, would remain as smooth and free as before the operation.

I have never seen a case once fully cured by this operation in which the relief has not been permanent. Even partial contraction of the rings certainly favours more or less retention of the Hernia within the abdominal cavity. I have never

observed a case in which reabsorption of the effused lymph had taken place, although subsequent rupture of the new plastic formation may occur. But in my experience, at least, it has not occurred to its former extent. I now refer to cases operated upon by Dr. Heaton, in which his plan, his instrument, and his mixture were employed. In these cases I believe the cure would have been perfect had the treatment been repeated once or twice.

In my personal experience I have yet to see a case of relapse, after a cure has been perfected, nor do I believe such a case will occur except in extreme old and congenital Hernia, or as the result of undue straining due to convulsions, or to any other cause. Inguinal Hernia, direct or oblique, is most easily treated by this operation, and a favourable result is most nearly certain. Umbilical Hernia, in respect of results, stands next to the inguinal. The most uncertain variety, and the most dangerous to treat, is the femoral, which will be found to require much less fluid in proportion to its size than any other variety. I have expressed the opinion that ten drops injected into the femoral, are equal in irritative power to twenty drops in inguinal or umbilical Hernia. Old ruptures with thickened sac and adhesions are more difficult to manage, owing to their attachments. In such cases, after reducing as much as possible, do not inject the sac all around, but throw the greater portion of the fluid upon the superior part of the adhering sac, so as to get abundant effusion to form attachments on the upper surface of the protruding sac. By this means we shall more probably secure both occlusion and contraction of the rings. This is because the superior parts of the hernial rings generally give way first, on account of contraction of the abdominal muscles. In such cases more or less bulging of the parts after the operation will generally be present, an appearance which may wrongly be considered by the inexperienced an

evidence of failure. Close examination, however, will show that the protruding intestines are held securely in place. This bulging may be expected in all cases of old or long-standing rupture, because the muscles and integuments which have been so long distended by the protruding Hernia, naturally remain pendent.

I desire to lay additional stress upon the fact that this latter class of Herniæ should receive the most stimulating fluid to produce an effusion that would be at all effective in forming adequate adhesions. Repeated injection will also be required more frequently. The cases most difficult to effect a cure upon are those of old congenital Herniæ in patients over forty. In these cases the pressure of the abdominal viscera has been so strong at the superior portion of the internal and external rings that the two rings have practically been fused, so to speak, into one, and the surrounding muscular fibres have been changed into an unyielding condensed tissue. Upon this structure no fluid injection whatever is to be relied upon as capable of producing much exudation of plasma. The adhesions, therefore, would be very delicate, and it is questionable whether such adhesions and contractions would form in these cases, even though the patient were kept quiet for a considerable time. I am now engaged in the study of these doubtful cases, and have devised a procedure which seems to have promise of success. Should it succeed, I shall present it to the profession at a future time.

When the Hernia is in a state of inflammation from whatever cause, whether from the galling of a truss, or from an irritation produced by the reduction of a strangulation, or by the more or less forcible attempts to reduce an irreducible Hernia by dilating the rings after the manner of M. Vidal, no operative procedure by injection should be attempted. We should wait until the inflammation has subsided.

If the rupture is of long standing, is very large, and

accompanied with a greatly thickened sac of omentum, it would not be advisable to return the omentum with the intestines, particularly if it has formed adhesions and attachments around the rings and other parts. By attempting to return it we should almost inevitably stretch and enlarge the hernial rings that are about to endeavour to contract by our injection. Therefore it would be far better to excise the protruded portion of it, and to apply a carbolised ligature just above the point of excision. A dull knife, or the herniotomy saw of my device (see Fig. 73 Appendix for description and cut) will be found of very great advantage in dividing this omentum. After it has been sufficiently reduced in size to be returned into the abdominal cavity with the intestines, we may paint the parts with the fluid described under the treatment of strangulated Hernia, and proceed to dress and bandage as I have directed in reducible Hernia (see p. 169 and Fig. 39).

In brief and to recapitulate:

Congenital Herniæ of all kinds in children from five to twenty years of age are very favourable, and almost effectually cured by this operation. No child under four years of age should undergo this operation except in extreme cases.

Herniæ, caused by accidents, when of short duration, even when quite large, are very effectually and generally cured by this operation.

Herniæ that have been caused by over-exertion such as convulsions, child-bearing, and the like, and which have existed over twenty years, can also be generally cured, requiring, however, more than one injection usually. The longer their duration and extent the more liable are we to be obliged to perform repeated injections in order to fully close the ring.

Congenital Herniæ of large size and long standing are difficult to successfully relieve and cure, unless we make several injections, although I operated this summer (1879) on a double

congenital Hernia (inguinal), one ring being two inches in diameter and the other one and a half inches. The one was fully closed with the primary operation, and the larger opening was closed by two injections. At the time of operating, the patient told me his Hernia had existed for eighteen years, but after he was cured he informed me that his mother said that he was born ruptured, he being at this time upwards of forty years old.

I speak of this case here to show what this operation is capable of doing. This patient was formerly not able to retain the Hernia on one side, it being so large, and the rings were so thin and the integuments so dilated that it would bulge out over the support which he was obliged to wear constantly. Yet the bowels of this patient are, to-day, retained within the abdomen, and he is very comfortable, although as a precautionary measure he is to wear for a year or more, as may be necessary, a very delicate and soft French spring truss of Tiemann's importation or manufacture. From such results as these I have astonished myself, perhaps, more than anyone else, as previous to my experiments and trials of the operation I could not believe that it was possible to produce such favourable results.

III.—PERCENTAGE OF CURES.

It will be seen from what I have said that Dr. Heaton professed hardly ever to have had a failure. Although he was remarkably successful yet I know he did have failures, especially in the last year of his life, because I have already met such cases, have operated on some of them, and shall operate on others in the near future. Dr. Janney, of Philadelphia, who next to me has now operated on the greatest number of patients by this subcutaneous method, thinks that he may fairly and without exaggeration claim 75 per cent. of cures. How many out of any given number of persons can receive a permanent

cure by the method of operation as I do it I am not at present able to say with exactness. I can however make an estimate based upon the cases I have thus far treated, and should judge that fully 80—85 per cent. of all I have operated on have been successfully cured. I base this high estimation upon the more stimulating fluid that I use, and the method of using it, as well as in the careful after-treatment. If such success shall continue to attend my efforts, and the efforts of those who may take up the operation, I shall certainly think that I have not in vain called the attention of the profession to the value of the cure by subcutaneous injection. Time and trial is the only means of settling this matter satisfactorily and conclusively. In all cases remember never to *warrant* a cure. Such confidence is beyond the bounds of all professional propriety.

IV.—CAUSES OF FAILURE.

Many who undertake to perform this operation will perhaps meet with failures upon their first attempts, and thus be ready to condemn the operation as useless, and think it overrated by the author and by those who may have been equally successful. They will imagine that we are too sanguine in our expectations, and referring to all the operations hitherto attempted from Celsus to Wood will class them and this in the same category as dangerous, seriously liable to failure, and outside the doors of legitimate surgery. They will not stop to consider that their ill success may be from fault of the operator, and not of the operation, but will jump at once to their hasty conclusion.

I have already spoken of the cause of failure as a result of performing the operation upon subjects not fitted to receive the full benefits of the injection. To show how little the operators upon Hernia have considered this matter I will mention the following instance.

While I was recently present at St. Albans, Vermont, to read a paper before the Vermont State Medical Society, a Professor in the Vermont University of Medicine, and also in one of the New York Schools of Medicine, told me that he should operate on every one that would let him. He said he had already operated once on a child without good results, and wished to know why I would not operate upon a child that was among other patients there presented to me to illustrate my method of cure. I told him the case was a very improper one. The child was only about three years of age, and the Hernia being an oblique inguinal, the spermatic and inguinal canal was not large enough to admit the middle finger freely into it. Besides all this, the child was nervous and uncontrollable, so that it would have been impossible to keep it still without opiates long enough to effect a consolidation of the lymph effused, even if we could have succeeded in producing such an effusion, which in a majority of these young cases is very doubtful.

Now this professor is one of the best surgeons in New York city, very highly esteemed by me, and has performed many fine and difficult surgical operations that are a credit to the profession he so ably adorns. This very fact that gentlemen of such distinction do not comprehend this operation, leads me more to the conclusion that the profession at large do not comprehend it, to say the least, any more fully.

Another cause of failure is that we may not have used a fluid for the injection that was sufficiently stimulating to agglutinise the parts around the rings, or if we use a proper fluid we may use too little to produce the desired effect. If on the contrary we use too much, we shall run into the danger of producing abscesses and suppuration, which is fatal to tissue formation from lymph. Sufficient compress may not have been made over the parts operated upon, the patient's bowels may

have been moved too soon, absolute rest may not have been enforced for the first four or five days succeeding the operation, so that the primary stage of tissue formation shall not be in the least disturbed, the patient may have been made to cough or perform some muscular exertion too soon after the operation, or, as I have before insisted, an improper instrument may have been employed. From all of these causes, it may happen that the injection will not be followed by success.

To illustrate how inconsiderate some may be in the after treatment, I mention the following incident selected from the many that could be cited. The gentleman under whose professional care I left the patient that I operated upon in St. Albans, June 15th, 1880, wrote me, July 3rd, as follows:—

“DEAR SIR,—The man J. B. on whom you operated is apparently well. I kept him on his back eight days; then put on the truss. There has been no appearance of the Hernia thus far. I had him cough the other day with bearing down without bringing down the gut.

“Yours truly,

“G. D.”

Such heedlessness is provoking, and contrary to all my advice. It is a wonder that such experimental coughing and bearing down does not often bring down the Hernia again in spite of all we have done for its retention.

One more cause of failure must be mentioned even at the risk of seeming to speak of a point so simple as to be almost self-evident. After all that has been said and written upon Hernia, many do not select, or seem to know, the precise locality or the proper part where to introduce the injection. Some have even thought that we could cure a Femoral Hernia by injecting above Poupart's ligament. The merest tyro knows better. Others have asked whether the injection is to be thrown into the *sac* or

into the spermatic cord. I am sorry to say that both these methods have been tried and success foolishly awaited.

V.—RECORD OF INTERESTING CASES.

In order to emphasise what can be done by this operation of injection, and to present a record of some very interesting cases, I insert, with a few changes to adapt it to book form, a paper read by me before the Otsego County Medical Society of New York, and before the Suffolk District Medical Society of Boston, Mass :—

When we consider the terrible distress this complaint of Hernia entails upon humanity, is it any wonder that a vast army of our fellow beings, rather than submit to the knife and the painful operations now performed for the cure of Hernia, seek relief at the hands of irregular and often itinerant practitioners, who by flaming advertisements and artful promises offer sure and painless cures, only to entrap, and so to say, devour their innocent victims, like the wolf in the fable? In view of such impostors and impositions, is it not high time that every son—I was about to add every daughter—of Esculapius should heartily aid every honest endeavour you or I or any member of the regular profession may make to develop, in an open and legitimate manner, an operation that has been many times performed with success? Nay, more, are we not in duty bound to the cause of science to endorse and encourage all such efforts, at least so far as they rest upon a true surgical principle and possess the merit of an honourable attempt to advance the medical and surgical art?

Many have been the attempts in the past to operate for the cure of Hernia by injection, and among the operators we find the noted names of Velpeau, Pancoast, J. Mason Warren, and others. While one discovered this important principle, and another that, none except Heaton ventured to inject hypoder-

mically without first cutting down upon the parts, and none were so successful as to warrant us in saying that they had really discovered a radical and lasting cure, except Dr. Heaton.

But because Dr. J. Mason Warren successfully injected sulphuric ether in one case (see *Observations on Surgery*, page 166), I am not bound to use only sulphuric ether in my injections; because Schwalbe, of Germany, injects alcohol, and Heaton oak bark, I am not bound to use either alone, if I can find a better formula. We all must reason for ourselves, and I feel confident that by combining ether, alcohol, oak bark, and morphia, in my injecting mixture, I occlude the rings with less disturbance of the constitution and of the heart's action, than where a single fluid is used alone. I wish to say just here, that at the time when I made up my formula I knew nothing of the use of sulphuric ether by Dr. Warren, or of alcohol by Dr. Schwalbe, in the cure of Hernia. (Although it is a strange coincidence, the idea was as truly original with me as it had been with them.) I recall one of my cases where the pulsation, which just before the time of operation was eighty per minute, fell after the operation about ten beats, and continued to fall, until in an hour it was sixty-five. While, then, this mixture exerts a sedative influence on the arterial system, its stimulating properties cause a rapid and localised effusion of lymph where it is desired for the organisation of new tissue.

In developing the operation, as I have said, I have not been necessarily the apostle or disciple of any one, nor have I felt myself bound by the teachings or examples of any one, except so far as I recognised that true principles and worthy precepts had been given. I present it to you simply on its merits, and ask only that you fairly investigate its principle and results before passing judgment on it.

I think I know somewhat of the conservativeness of the better part of our profession, and while I am, upon proper grounds, the

most conservative of conservatives, I do not believe it fair or just to be unreasonably prejudiced. Judging from the history of medicine and surgery, I feel very confident that when this operation is examined in its details and thoroughly understood, it will be accepted as one of the most legitimate operations for cure of Hernia. I do this operation as we perform all surgical operations, as an experiment (for we should always remember that every operation in surgery is on this principle).

I cannot with regard to truth and modesty, boldly assert such favourable terminations in *all* of my operations as we are led to infer by Dr. Heaton, in his work upon Hernia and in his reply to the committee sent him by the American Medical Association. Although he boasted so freely, yet you and the medical gentlemen in every city in the country *know* that he did not cure all upon whom he operated. There are some half dozen whom he attempted to cure, who are to present themselves to me for operation; one in particular, to whom Dr. Heaton said: "You see that sun shine? well, just as sure as that *sun shines* I *can* and *will cure* you."

I also find much in his book that is vague and unreliable, and might, if implicitly followed, lead one astray in the operation. I have the best of reasons for saying that had he lived he would, in a future edition, have corrected many statements, particularly in regard to the inflammation set up. This I know from going over the whole ground with him personally. Indeed, he greatly regretted that he had ever given the operation to the profession, from the fear that all would not fully comprehend his meaning, and that some one would use a dangerous-pointed instrument and bring discredit upon his pet operation, and, possibly, seriously injure or even kill a patient.

He would again and again refer to these hypodermic needles, spear- and lancet-shaped instruments, in terms far from commendatory, saying, "They will yet cut some artery so minute

that it will escape their notice at the time, the patient will bleed to death, and then they will condemn me and my operation."

I have thought that perhaps the best way for me to show you the merits of this operation for the cure of Hernia is to tell you of its success in my experience. I will therefore detail a few of my cases very carefully.

OPERATIONS NOS. 1, 2.—On July 10th, 1879, I operated upon Mr. G., aged twenty-three, for double inguinal Hernia direct, on both sides. The openings in the rings were one and a quarter inches and one inch, respectively. I injected about twenty minims into the larger rupture, which was on the right side, and fifteen minims into the smaller one, on the left side. After going through the ordinary course of a slight feverish condition, with an increase of temperature for three or four days, the case made the usual recovery, by perfect occlusion of the hernial rings and retention of the intestines within the abdominal cavity.

The patient appeared at the expiration of ten or twelve days as if he had never been ruptured, and no one would have known that he had ever been, unless by previous knowledge of the fact. The cure was simply perfect, without even the bulging of the integuments that we often see when by this operation a cure has been effected in large Herniæ.

The patient being a labourer, dusting and washing cars, I thought it best for him to remove the bandage which we had applied while he was undergoing the treatment, and wear a truss. I therefore ordered a double, hard rubber truss, thinking that this would give him the best security and freedom from accidents.

For this truss I sent him to an old friend of mine, a regularly educated and once practising physician, but now the head of one of our largest surgical instrument establishments in this country. With this patient I sent a note telling the doctor that I had just operated on the man for the cure of a double Hernia, and

requesting him to fit the case with a nice, suitable truss. After the patient had the truss put on by my friend, the doctor, he returned to me, and as it was not a suitable one I sent him back to the same place for a better one.

As I saw no more of him I supposed, from my long experience with the manufacturing establishment, that he had been properly fitted the second time. On the contrary, to my mortification and chagrin, I was soon told by the attending physician that this second truss was no better than the first, but that when the man sat down, it would strike against the back of the chair, and be thrown forward off the seat of the rupture, and thus would not support and sustain the weakened rings. Of course, our whole design in ordering it was to sustain these rings, as the adhesions had not yet become sufficiently strong fully to resist the pressure of the intestines and other parts against them.

His physician stated, also, that the patient said that the doctor, when he fitted him, made him strain, force down and cough all he could.¹ By such treatment there was naturally produced some protrusion of the parts, and I said that if he had not by this means re-ruptured the man I should think it almost a miracle. As, moreover, he assumed the liberty with this patient to tell him he was not cured, I took it rather ill at first.

Now I hear you say if this had been my patient I should have been indignant at such proceedings on the part of my friend the doctor, particularly after I had written to him that the operation had just been performed, and after I had in the most friendly manner possible requested him to fit the patient with great care. Please defer, for one moment, your harsh criticism, for in the first place the doctor did in this case just what most of us might

¹ This story should be taken with a grain of allowance, as my friend, who adjusted the truss, says he thinks the patient brought this condition of his rupture on himself, and I certainly would credit the doctor sooner than any patient.

have done under similar circumstances. The patient is said to be cured, and to all appearance is cured (I may add that I truly think that this man was cured, and that such was also the opinion and belief of his attending physician); now I say, this being the case, the doctor did not stop to consider, it may be, the young and tender state of the united tissues, any more than many others would. This is an operation all are not conversant with, and just how strong the parts are and how far they will bear straining, all are not supposed to know at present.

Suppose, too, on the other hand, we were a dealer, fitting, for example, a wooden leg, and wishing to sell, would it not be natural for us, regardless of the very recent cicatrice, to cause the patient to force his amputated limb into the artificial one, and to try and convince him that he could walk more miles without fatigue with this leg than with the one lost in battle?

No, gentlemen, I do not blame my friend for thus treating my patient, and it is with no ill feeling that I refer to the matter at this time, although it is true that this was my first operation for the radical cure of Hernia, and naturally a pet one. I speak of the case to show that it proves one thing certain, viz.: that a great amount of violent treatment can sometimes be endured immediately after the operation without a new rupture taking place; for with this man one side, strange to say, did not move or protrude in the least, while the other did.

Still, I would not advise much violence to be done to the tissues while they are in a fresh state of adhesion, since their condition soon after, nay, for months after the operation, may be compared to freshly-glued pieces of wood. It is true, there will immediately be some adhesion, so as to hold them together, but if any force, even of a very slight nature, be at once applied, it will cause them to part. Should, however, a longer time be allowed to elapse before force is applied, the pieces will be found adhering so firmly that the fibres themselves will

separate sooner than allow the wood to part. Just so is it with the tissues of the body after this operation. The tenor of adhesiveness of the rings and surrounding parts is at first slight, but after a period of time the new formation of adhesive fibres will often be found stronger in cohesion, because of their contraction and consolidation, than any other part of the dependent tissues composing the rings.

This case is instructive, then, in three ways: *First*, it shows how a severe Hernia may be successfully cured: *secondly*, how much ill treatment a Hernia thus cured may sometimes endure; *thirdly*, how easily this relief may be forfeited by interference with the process of healing, whether in fitting a truss or by making the patients cough, force down or strain in any way, to gratify a mere idle curiosity.

OPERATIONS Nos, 3, 4, and 5.—This case is a unique one, and in many respects more instructive than any we may ever meet again. Mr. P., aged between forty-five and fifty, applied to the late Dr. Heaton for an operation, but for some reason was deferred. After Dr. Heaton's demise the gentleman presented himself to me for the operation, telling me that he had been ruptured for eighteen years and that Dr. Heaton had promised to operate on him. I examined him, and frankly told him that I did not have much faith that he could be cured by the operation, but that if he wanted me to try to effect relief I would do so, with the distinct understanding that I did not know what the result would be, and that I would not, on any account warrant the least relief or cure.

Accordingly, on the 25th of July, 1879, at 220 Harrison Avenue, formerly occupied by Dr. Heaton as his hospital, I operated on the man for two of the largest Herniæ I have ever seen. They were double inguinal, on the left side with a ring two inches in diameter, on the right side with a ring one and a half inches in diameter. He said it had been well nigh im-

possible to retain the bowels in their proper cavity by any or all artificial means, and so great had been his pain that he was constantly longing for the time to come when he could lie down, to ease his sufferings. At the time of operation he was wearing a very large elastic abdominal supporter and truss combined, although neither this nor the "hundred different trusses he had at home" could retain the ruptures in their proper position, because, as he expressed it, the *Herniæ* were so large, especially on the left side, that they would "boil over" any truss that was applied. It is needless to say that the patient was suffering not only this physical anguish, but also mental depression.

In my operation I found it necessary, on account of the greatly dilated rings, to inject a larger amount of quercus alba than usual. About eight hours after the injection the pulse and temperature began to rise, reaching their maximum on the second and third day. On these days the temperature was 99.5° and the pulse about 90. They now began to diminish until on the fifth day only a slight increase over the normal condition was noticeable. On the same day he had a free evacuation of the bowels, from a dose of seidlitz powder.

During all the time since the operation the urine was passed normally, and he complained very little of pain, except in the immediate vicinity of the rings, where the injection had been made.

On the eighth day after the operation the swelling, which at its maximum had extended up as high as the crest of the ileum, running along the oblique muscles on both sides, had wholly disappeared. There was no tenderness around the umbilicus, nor any indication of inflammation of the peritoneum, except in a very limited spot around the rings. The hernial sac on both sides was enormously enlarged and thickened, and on the left side bound down by some adhesion. Upon examining the patient in the erect position, I found the *Herniæ* well retained in the

abdominal cavity and the rings firmly and well filled, except in a small portion of the superior part on the left side.

Fearing this might dilate, and finally allow a hernial protrusion, I operated again on August 2nd, on the left side, to guard against such an accident. This second injection produced phases similar to those in the first operation, with a little greater swelling, but on August 11th the swelling began to pass away, and everything to assume a normal condition. Now, standing my patient upon his feet, there was no protrusion on either side, and I thought of discharging him in a few days, cured of a most remarkable Hernia. I therefore allowed him to sit up, for an hour or two daily, but on the 13th I found that he had extended my hour of allowance to the liberty of sitting up from morning till night. Secondary swelling immediately began to appear, but from the applications of cold water and enforced recumbent position, they had diminished on the next day to about a normal state.

The man was continually anxious to return to his home, in Lawrence, but both I and the matron urged upon him the expediency of remaining at rest a few days longer. I told him that there was danger that the effort of the journey might produce an abscess, or even loss of life. In spite, however, of all our arguments and persuasions, go he would, and go he did, assuming to himself all responsibility and risk in such a reckless act. Accordingly, at noon on the fourteenth he left our care for his home. In consequence of this exertion there was, as we anticipated, a return of the swelling and the formation of an abscess. He was treated very successfully in his trouble by Dr. G. W. Garland, as the following letter will show:—

LAWRENCE, *Sept. 15th, 1879.*

“DR. J. H. WARREN—

“DEAR SIR,—Mr. P. came to Lawrence Thursday, August 14th. I saw him the following Friday. It was perfectly

apparent at that time that he was to have an abscess. It was opened August 20th, under ether and a disinfectant spray. An opening was made large enough to explore the bottom with the finger, which seemed firm. The abscess proper was quite as large as a common saucer, and swelling, tenderness and pain extended up the groin as far as the crest of the ilium; another abscess formed in the scrotum, just above the testicles and over the cord, which was opened August the 30th; still another was opened September 10th, just above the original one. The one on the scrotum has healed, the others are doing finely. A large portion of dead tissue came from the floor of the main abscess. The surrounding induration has been treated with tincture of iodine, and both hot and cold lotions, and is quite rapidly subsiding.

“ I have neglected to mention that after Sunday, the 17th, a severe fever followed a chill for a day or two. There is no protrusion of the Herniæ, and the case, for so bad a one, is doing well. Mr. P. is to go to Andover next Wednesday, P.M., a mile and a half from Lawrence. He is gaining strength fast.

“ Very truly yours,

“ G. W. GARLAND, M.D.”

On September 26th, Mr. P. called at my office, and I found that the principal abscess had been just above the seat of my operation, and was still slightly discharging, as was also the one in the upper part of the scrotum. There was considerable induration and a large cicatricial indentation of the parts around the lower portion of the ring, extending down to the spermatic cord. There was a slight protrusion of the upper portion of the omentum, but no sign that the intestines had descended through the ring. I ordered cold compresses, with proper supporting bandages, and enjoined absolute quiet, in bed. He now regrets

that he did not remain longer in Boston, instead of hurrying home.

On October 8th I again examined him, and found the swelling and congestion still existing, although greatly diminished. I found that instead of a good supporting bandage he had applied a very frail and wholly inadequate affair, and I now applied a delicate, French double truss, and ordered frequent bathing of the parts in cold water and carbolic acid. It will be remembered that he told me at the time of my first operation on him that he had been ruptured eighteen years. He now told me that his mother had informed him that he had been born ruptured, and that his father had taken him when a child to have a truss adjusted. I told him that had I known this before I operated I should on no account have taken the risk of operating on such an enormous congenital Hernia. My operation in this case had been performed with the simple extract of quercus alba and morphine that Dr. Heaton recommended, but with a needle of the Doctor's that I had improved by making two more orifices near the point.

Although performed with so unsatisfactory a needle and mixture, it establishes three very important points: first, it gives us the pathology of such cases soon after the operation; second, it shows how very important it is, if we would escape dangerous consequences, to insist upon and enforce rest in the recumbent position, together with constant applications of cold water at the least appearance of a secondary swelling and inflammatory process; third, it shows what a wonderful result can be obtained by the operation in cases hitherto deemed incurable, as *e.g.*, congenital and enormously large Herniæ.

January 29th, 1880. I examined this patient, and find he is perfectly cured on one side; on the other side there is some omentum, protruding, which will require another injection, and with the mixture I am now using I hope to fully close up the

rings, as it is more stimulating than the mixture of Heaton that I used in my operation on him. He is very anxious to have me try again, which I promised to do as soon as I think proper.

OPERATIONS Nos. 6, 7.—Having found these cases so fruitful in instruction and encouragement, I undertook my sixth operation with increased confidence. Mr. M., aged sixty-two, had been ruptured when eleven years old. This rupture, oblique inguina on the left side, continued to enlarge until he was twenty-one or more.

For nine or ten years it gave so little trouble that he did not think it necessary to wear a truss. Ever after that time, however, he wore one, until July 30th, 1879, the day I operated on him. The hernia was an inch and a half in diameter, and protruded about the size of a duck's egg. I injected twenty minims of fluid extract of quercus alba with one tenth grain of morphia. He went through the customary phases—slight rise in temperature and pulse, then a gradual subsidence—until, after eight or ten days, he returned to his normal condition. On the 11th of August, only twelve days after the operation, he rode out, free from his rupture, without even the slightest bulging of the tissues so long dilated.

We have now come to the interesting and instructive part of the case. I have said that so far as I could ascertain by careful examination, in the erect and recumbent position, the ring was entirely occluded with firm surrounding parts.

The confidence both of myself and of the patient in the perfect results of the operation was so great that it is true we applied only a supporting bandage, and the man returned to his usual occupation. In this condition he remained for nearly two months, when, relaxing in his attention to the proper support, he suffered a slight protrusion of the ring and at the same time a descending of the sac.

To remedy this protrusion I re-injected him on October 6th, with my mixture of quercus alba, alcohol, morphia and sulphuric ether. This injection created a slight local disturbance, but no increase of pulse or temperature, and produced a further contraction of the ring. Although it was not so fully contracted as after the first operation, still it was sufficiently contracted to retain the hernia within the abdominal cavity. Unwilling longer to risk a bandage, I ordered a light and soft French spring truss, to wear six or eight months, which he continued to wear until December 9th, when he again presented himself to me, and this time with a strangulated Hernia on the right side. It was a most curious case.

I reduced this new rupture and fitted the man with a soft double French truss. Having much soreness on this right side, extending down to the spermatic cord, he was ordered to resume the recumbent position in bed.

In spite of various soothing applications the pain continued for several days, extending now to the testes and scrotum, producing intense neuralgia in the former, with irritation and swelling. This state of affairs lasted with more or less acuteness until December 23rd, when I applied a bandage with compress, and allowed him to go to his office. I applied the compress bandage instead of the truss, from fear that too severe a pressure on the springs of the truss might produce violent irritation of the still tender parts. During all this time since the operation for Hernia I made frequent examinations, and found that since the last injection the ring on the left side had continued constantly to contract, so that the man may now consider himself healed on that side, at least.

The lesson here to be learned is, *first*, that had he been more careful, after once firmly closing the ring, to support it properly for a little length of time, so that nature might complete the consolidation, we should never have needed to make a second

injection ; *secondly*, that the patient must be made to be careful of himself until nature has done her work, and that he must not unwarrantably presume upon his perfect recovery until several months have elapsed ; *thirdly*, that for a long period after the injection the fibres of the surrounding parts continue to contract and consolidate, so that cases where we at first may be inclined to think we have not yet obtained a full occlusion may ultimately, if properly attended and cared for, become perfectly healed. Finally, we can again see that the long duration of Hernia is no bar to a radical cure by injection. For this patient has been ruptured forty-two years.

The first of these operations I performed with the old original needle of Dr. Heaton ; the two latter with his needle as I had improved it by adding more orifices for the exit of the fluid. I have detailed them minutely and fully, that you may see what great obstacles lie in our path, and how the slightest inattention or carelessness, either on the part of the operator or the patient, may cause a deal of trouble, not to say danger. It cannot be too solemnly impressed upon the patient that the success of the after treatment, (and that means the success of the whole operation) depends as much upon him as upon the operator. If, then, we retain all the valuable instruction these unfavourable symptoms inculcate, we may with a little cheerful perseverance wonderfully triumph by our success.

I will now give a few of the cases that I have had since the time that I reduced the operation to a more scientific basis, as I believe, by perfecting both the instrument and the injecting fluid (see New York *Medical Record* of October 18th, 1879). It will be seen that with this new instrument and fluid I encounter less danger, cause less constitutional disturbance, less unnecessary irritation and more intense local action where it is needed, and there alone, than could ever be possible by the crude methods formerly used.

OPERATION No. 8.—F. M., aged twenty-eight, had for two or three years suffered intensely, and had consulted several physicians, some treating him for disease of the liver, others for disease of the kidneys and bladder. The true seat of distress was an inguinal Hernia upon the right side, which was very annoying and painful, since the Hernia was exceedingly sensitive and irritable.

I found the protrusion was slight, with a ring about one inch by half an inch in dimension, and operated on it for radical cure, on September 6th. The patient made a rapid and full recovery, and sixteen days after the operation accompanied me to New York. Among the physicians who there examined him was Dr. R. F. Weir, who was fully convinced that there was a complete occlusion of the hernial ring. The man was ordered to wear a bandage, and was then discharged from my care. I saw this patient on January 24th; he is still free from his rupture.

OPERATION No. 9.—L. B., aged four years, was, after etherisation, operated on, November 4th, for a congenital umbilical Hernia, about three-quarters of an inch in diameter, and in appearance and size not unlike a red acorn. I injected eight to ten drops of the mixture. Passing through the usual slight feverish excitation, she was discharged from my care after two weeks' time, fully cured.

OPERATION No. 10.—On December 18th I operated upon J. R., aged forty-one, for direct inguinal Hernia on the right side. The opening was in size one inch by three-quarters of an inch, and had existed for more than two years. I was assisted by Dr. Joseph Redfearn, Jun., of Ashland, whose patient the gentleman was. I injected about fifteen minims of the mixture. The only pain was a sharp smarting for about five minutes after the operation, and on January 1st Dr. Redfearn and myself examined him, and were satisfied that the man had

fully recovered, with a perfect occlusion of the ring, and was ready to be discharged. I had a note from him on January 13th, and he is well and free from all trouble from his Hernia.

OPERATION No. 11.—Mrs. M., aged fifty-six, had had a femoral Hernia on the right side for more than thirty years. The opening through the tissues was flat oval, about one inch and a quarter by three-quarters of an inch, with a protrusion the size of a large goose egg. On December 25th I operated upon her, injecting about ten drops. She had just recovered from typhoid pneumonia, and still had a slight cold, so that it was only at her urgent request that I operated when I did. The smarting pain from the injection was very severe for five or ten minutes. On the second morning after the operation her cold was much worse, attended with pleurisy on the left side and a heavy cough, and her food had caused her to vomit. For three or four days her temperature was 100 and her pulse about 95, but whether from the fever or the injection could not be determined. On January 6th I caused her to assume the erect position, and found the rings occluded and the intestines completely retained in their cavity. So firmly occluded are the rings that, as she is rather fleshy, a little dimple is seen over the seat of the operation.

January 15th. She is cured of rupture.

OPERATION No. 12.—Mrs. L., aged forty-five, of delicate constitution, had a very painful Hernia on the right side, which had been strangulated three times, twice with great danger to her life. The Hernia had existed for fifteen years, occurring from a strain in child-bearing. It was very painful, and protruded about the size of a common cowry. There were two openings through the crural ring, the larger, from which the protrusion took place, near the femoral vessels. This opening was about three-quarters of an inch in length and measured three-eighths of an inch in width.

I operated by injecting about ten drops of my usual mixture. She was in the evening but slightly feverish, with pulse about normal, 78. The next day the parts about the ring were tender, and covered with a profuse effusion of lymph. She suffered great pain through the back, right hip and limb, owing much, as she thought, to the constrained position of lying on her back, as she had often suffered equally severely for months at a time. A pill of extract of hyoscyamus, lettuce and morphia was given her, to secure rest and ease from the pain. Third day—Her temperature and pulse are about the same as on yesterday. I afterwards found that the cause of her pain was her periodical turns appearing. Upon examination, January 12th, the rings were found perfectly occluded and she cured of her hernia.

July 10th. She is free and cured from her painful Hernia, and a happy woman.

In all these operations I find that in order to insure success I must produce a certain, though limited, amount of inflammation of the surrounding parts. You will see that I have aimed to produce this. Dr. Heaton considered the inflammation very dangerous, and said that in his operations it seldom occurred. He meant peritoneal inflammation. Dr. Davenport,¹ editor of Dr. H.'s work, as directed by Dr. H., worked up a sort of pathology, to the effect that only, "tendinous irritation," as they call it, was caused, and no inflammation. I find that Dr. Heaton was mistaken in his pathology, as it is impossible to contract and occlude the rings without an inflammation, to cause an effusion of plasto-lymph. I learned, too, from Dr. Heaton's old matron, a very intelligent woman in such matters, that Dr. H. always got more extensive inflammation, swelling, and often abscesses,

¹ No disrespect is here intended to so good a man as Dr. Davenport, but this is nevertheless a fact, as told me by his cousin, Dr. D., of Boston, who said he knew that Dr. Davenport had to work up a sort of pathology to meet the statements of Dr. H. in his operations.

when he was successful, than I ever get in my cases. This excessive inflammation was probably due to the crude injecting mixture and instrument which he used. Indeed, I am often led to wonder that he ever succeeded with his operations at all.

I have now gone over all the ground that Dr. Heaton passed over, and have performed upon all the various kinds of Hernia which he operated upon, and I feel confident that my results, to say the least, have been as successful as his, in the same given number of cases.

In fact, the question whether Dr. Heaton ever cured any one of rupture, has been asked by those whose opinion is entitled to much weight. I can answer in the affirmative, because I have examined a large number of those upon whom he has operated for Herniæ of from one to twenty years' standing.

That he failed in many cases is also true. But in all his failures we should find, if we traced the operation, that there was only a slight infusion and only the most limited amount of inflammation, or what in his work is styled tendinous irritation. It is a well-known fact, that if we would produce a blister with cantharides, for instance, we must, in order to get an effusion of plasto-lymph, destroy the cuticle and create a given amount of inflammation. The same holds good in this operation. The parts must receive a certain amount of irritation from some stimulating material, to excite the secretion of this lymph. The more plentiful the effusion the more sure we are of strong adhesions and attachments, which will organise into fibrous bands, not unlike the cicatrice of a severe scald or burn. This draws and binds together the hernial rings and surrounding parts, and when properly performed retains the hernial protrusion in its proper cavity, more firmly than ever before, in many cases.

You will see that I have given you the history of twelve operations on genuine ruptures of various kinds. This does not include all that I have operated upon, but only a few interesting

cases. Of these twelve the first two were partial failures, and one later on. Two of these are soon to be re-operated upon, and I have no doubt that, with the mixture of such a stimulating nature as I now use, they will be permanently cured by the second injection. I have some doubts as to the possibility of retaining the large congenital Hernia, but as the patient is very anxious for another operation, I presume I shall try it. I have freely expressed all my doubts to him, but unless I operate upon him he will not be contented, nor shall we know whether such cases can be successfully treated. This includes all the unfavourable cases that I have had in my operations thus far. I might cite many other successful cases, but I have presented a sufficient number to give an idea of the results of the operation.

You will see, gentlemen, that I have felt it my duty to develop this operation with open hands, concealing nothing, but recording careful observations on all my cases, keeping nothing to myself in a selfish way, but offering everything in my power to the profession, in order to establish a legitimate operation. Others may have undertaken to relieve the ruptured sufferers by methods known only to themselves; I am determined to do what I can to demonstrate to myself, and I trust to you, that this operation, when properly performed, possesses many advantages over every other now known for the cure of this distressing malady. Whatever discouragements, whatever obstacles, whatever successes I have met, all have been freely given to the scientific advancement of surgical knowledge. To say that this operation for the radical cure is simple, and when carefully used by skilful operators presents no greater danger and no more unsuccessful results than other well-known surgical operations, is only the barest justice to its past and present success.

I am, therefore, encouraged to hope that other members of the profession will test it in the course of their practice, and

present us with reports upon the cases, that we may all, dispassionately and without prejudice, judge of its true value.

In reply to the gentleman who has performed Wood's operation successfully with wire, catgut, or pins, while these ligatures or the pressure of a truss may cause suppuration and an absorption or melting away, as he termed it, of the plasto-lymph effused, still I must maintain that the condition of the parts and the materials that I use produce very different effects, in the quantity of lymph effused, as well as in the permanency of the effusion. As this gentleman has never performed the operation for the cure by injection of the hernial rings, I cannot take his statements as of any authority in regard to the melting away of the lymph after my operation, whatever may have been the results, good or indifferent, after his operations by other methods.

Another gentleman's experience of twelve operations, with only one success, goes only to substantiate more fully what I discovered after my second operation, that a more stimulating mixture was required and a better instrument than the one recommended by Dr. Heaton. Another disadvantage he might have had is that his patients occurring in hospital practice were anæmic, not properly nourished, and therefore not in so favourable a condition as regards their systems as those in private practice.

Whenever Dr. Heaton's instrument and mixture are used the results will be very uncertain and unsatisfactory; although an abundant inflammation will be set up, the effusion of lymph will be proportionally small. In fact, the great cause of failure is not in all cases, as is commonly supposed, the lack of proper after-support, but that the lymph attachment is severed by muscular contractions, and the lymph readily absorbed.

I am not at all astonished at the questions asked as to my operation, when I talk with gentlemen at our medical meetings

and read the numerous letters of inquiry which I receive. For if one has not seen the operation and had it explained to him, he can have only the faintest conception of it, be he ever so good a surgeon or operator in general surgery.

Physicians and surgeons of no little renown have asked me if I pass the needle through the scrotum and follow up on the spermatic cord? Another asks if I go through the columns, and at precisely what point I cut through the rings? Some think there must be great danger in operating on Umbilical Hernia, since, as they say, we penetrate the peritoneum. In reality, the needle is not passed either into or on to the peritoneum.

Others think the inguinal region must be dangerous, because of the numerous vessels and nerves. The truth is that the umbilical region is the safest region to operate upon, inguinal less safe, and femoral the most dangerous. None should operate upon the latter, unless they are experienced.

Upon infants, as I have before said, I have never operated. The youngest patient was four years old. Mechanical appliances, such as a good truss or elastic bandage, I have found productive of good results.

I prefer a bullet, partially flattened and fastened to a linen bandage, because the compression of the abdominal muscles by the elastic bandage prevents their development, and consequently the closure of the rings, and also that these muscles are liable to be thinned by the constant pressure and for ever weakened.

In conclusion, I would say that above all the congratulations from gentlemen of note in the profession, the resolutions and the honorary membership of the Medical Society of Otsego County, New York, I esteem the commendation of my friend, Dr. B. Codman, who has, as is well known throughout this country, for many years attended to the mechanical treatment

of Hernia. He says, "I believe you have at last perfected this operation, and I know that with your instrument and fluid you will be successful in the treatment of Hernia by injection, and will have greater success than has been hitherto met with by any one ; with the adjustment of a proper temporary truss after the operation, a permanent closure of the rings will crown your efforts, and you will receive your reward from an appreciative profession."

CHAPTER VII.

TREATMENT OF STRANGULATED HERNIA.—TAXIS.

THE treatment of Strangulated Hernia is one of the most important of surgical operations. We have not only to effect a reduction of the strangulated intestine and to remove the constriction, but also to treat the peritonitis. We accomplish the reduction by the operation of *taxis*, by which we mean all the manual methods used for the purpose of returning the protruding intestine into the abdominal cavity. The peritonitis may be excited either by the compression caused by the strangulation or by the attempts and efforts at reduction. We may in some cases have to deal with a peritonitis, the result of strangulation, increased by a peritonitis, the result of taxis. The taxis, however, when properly done, is rarely, if ever fatal, if a judicious after treatment be adopted.

The following valuable hints from Birkitt, I trust I may be pardoned for extracting verbatim.

“The principal circumstances to which attention should be directed are as follows :

“1. The kind of variety or the Hernia regarded in its anatomical relations.

“2. The duration of its existence ; whether it be of old standing and slow formation, or of recent and sudden development.

"3. The constitutional condition of the patient at the immediate moment, as influenced by the present illness. The hour at which vomiting commenced; and the variations which have taken place in the composition of the fluids vomited, should be determined with exactitude.

"4. The state of the tumour. Its usual size when not causing illness; its bulk before vomiting commenced; the changes which have taken place in it during this stage; the pains to which it gives rise, if merely local or extending into the abdomen, with or without manipulation; the condition of its coverings; its probable contents, so far as may be conjectured by the evidence, assisted by touch and sight.

"5. The treatment already adopted by the patient, the friends, or other persons before the observation of the surgeon."

In employing the taxis it is necessary, *firstly*, to have the bladder evacuated either naturally or by the catheter, and also the rectum; *secondly*, to gain a relaxation of the abdominal muscles, and *thirdly*, it is always advisable to administer an anæsthetic and preferably sulphuric ether.

The position to gain the relaxation of the abdominal muscles is important. After placing the patient upon his back with a pillow under his buttocks to elevate the pelvis, and with his head and shoulders raised, the thighs should be flexed by bending them up at nearly right angles to the trunk, and slightly rotating them inward.

The surgeon, getting into the position which gives him the greatest control of the tumour and the freest action of his hands, should make gentle manipulation upon the tumour for from two to five minutes, when, if reduction be not effected, he should try the application of cold to the parts. This application can be made with powdered ice, and sometimes by pouring a small stream of ice water from a considerable height upon the tumour and surrounding parts. . The tumour can now be gently

squeezed between the thumb and finger and drawn outward to relieve the gut of its cramped position before renewing our manipulations. Should this not succeed we may, after a few minutes of rest, pour sulphuric ether upon the parts and fan it to cause a rapid evaporation. This evaporation causing intense cold contracts the superficial integuments, the sac and the included intestines much more rapidly than it does the solid fibrous Poupart's ligament; hence if we immediately apply gentle taxis we may often succeed in reducing cases hitherto supposed to be irreducible without the use of the knife. Changing the position of the patient from side to side will often aid in reduction by the specific gravity of the parts tending to suck the intestines into their proper cavity. If this be not sufficient to accomplish our purpose, the injection of large amounts of hot water per rectum is useful by distending the intestines and dragging them into the abdomen.¹

To obtain a proper relaxation of muscles it has been recommended to use blood-letting to the point of fainting, to inject an infusion of tobacco or to administer tartarised antimony, opium, *cannabis indicus*, *hyacynus*, *stramonium*, or *belladonna*. But although these have all been tried with more or less success,

¹ Another method has been devised and successfully applied to irreducible *Herniæ* by my distinguished friend J. Collins Warren, editor of the *Boston Medical and Surgical Journal*, and Professor of Surgery at the Harvard Medical School. His plan is to use a "rubber water bag externally inelastic, but containing an elastic lining inclosing a space to which water or air could be admitted by a tube." To this a stout T bandage is sewed to secure it in the scrotum, and when once buckled in place it is pressed firmly down upon the pillars of the ring by thick wooden pads. Water may now be forced in at any desired pressure and continued for any length of time. It is indeed a great improvement over the simple rubber bandage devised by *Maissonneuve*. If uniformly successful it will give us a fair prospect of relieving many cases hitherto incurable except by the more serious operations of *herniotomy*, because, manifestly, if *Herniæ* hitherto irreducible may be reduced they will then be subject to the same conditions of treatment as the reducible.

they are not measures which in these days of anæsthetic I would recommend, since by anæsthetic we gain a greater relaxation of the muscular system than is otherwise possible, and avoid the deteriorating and exhaustive influences of these drugs I have mentioned.

The taxis should be continued at intervals of a few minutes for from thirty minutes to three hours according to the alarming symptoms, the condition and vitality of the patient, and the length of time since the Hernia became strangulated. Of these the surgeon can judge when called to the case. In general we may say that we can treat old and large Herniæ, accompanied by omentum and occurring in persons of advanced years, with greater impunity by prolonged manipulation than small Herniæ with very acute symptoms. These symptoms will have shown themselves by violent retching, pain in the parts, and a feverish excitement of the system accompanied by giddiness or delirium. Femoral Herniæ are to be treated with the greatest gentleness as with too violent pressure and manipulation there is great danger of rupturing and fatally injuring the intestines. Of all this let the younger men of the profession take good warning. In treating a strangulated Hernia let no undue violence be used. It can do no good and may result in extreme danger to the life of the patient from the forcible constriction of the inflamed intestine against the constricting ring. If the inflamed state has passed to gangrene we should never attempt the taxis for fear of fatal peritonitis. From the observation of many years I am convinced that the taxis is often too long continued before resorting to the operation of kelotomy, and I feel as confident that thousands of lives that are lost might have been saved by employing this operation in due season. The following quotation from *Surgical Anatomy*, by William Anderson, will illustrate my point. "I know of no excuse that would apologise for the delay which we generally witness before this

operation is resorted to, or which would authorise the surgeon who is to be the operator in allowing half a dozen consultants to take their turn in squeezing the tumour under the pretence of giving full trial to the taxis."

To illustrate a position for the patient, which in my opinion is very favourable for the operation of taxis, as well as to show the permanency of the ordinary operation by injection, I give the following rare form of femoral Hernia occurring in a patient of mine previously operated upon for inguinal Hernia upon the same side.

The history of this case is as follows : Mrs. M. L. L. of Athol, Mass., aged forty-five, was ruptured, at the time or soon after the birth of a child, some ten or twelve years ago. On right side the Hernia was oblique inguinal with protrusion of the size of an English walnut. It had been strangulated twice, both times with near loss of her life. It was reduced once by H. A. Dean, M.D., a cautious and skilful medical gentleman of fine scientific attainments in the profession, and the second time by Dr. Lynde in company with the above-named physician.

Dr. L. is also a physician and surgeon highly esteemed in the profession as an expert diagnostician. These gentlemen saw the patient soon after the Hernia became strangulated, and after etherisation succeeded with some difficulty in reducing the rupture by taxis.

This Hernia was very painful and difficult to retain with a truss. At the suggestion of her physician she applied to me for a cure by injection. Being on my vacation I did not see her until my return in the fall of 1879. It still gave her great pain and was very sore from the truss. I operated on her in the first part of January, 1880, with success, by injecting fifteen drops of fluid extract of quercus alba, alcohol, ether, and morphia. This Hernia was well retained and the rings occluded. In the early part of May, 1880, she had an attack of colic.

She felt something give way, and soon after had pains and symptoms of strangulated Hernia. Dr. Lynde being called tried to reduce the Hernia by taxis. After continuing his attempts for the greater part of a day, he thought that as I had once operated on her she had better again come under my care. As the seat of rupture and strangulation was not well defined, he in his diagnosis leaned to the opinion that it was an oblique inguinal, the same that had twice before been reduced and on which I had operated; but was not certain since my operation had left more or less cicatricial tissue, and had therefore a tendency to blind completely the seat of strangulation. This with the peculiar form of rupture was sufficient to lead the most experienced astray in his diagnosis.

The patient arrived in great pain in the night of April 29; with parts much inflamed and swollen. With the assistance of Dr. Broughton, I placed her under the influence of ether, and upon a most careful and thorough examination by both of us, we found the rupture was femoral, and about $2\frac{1}{2}$ inches from the oblique inguinal that I had succeeded in curing. It had descended on the outer side of the femoral vessels and beneath the femoral artery, the pulsations of which could be distinctly felt. The sac was preceded for a distance by the sheath of the pectineus muscle. After it had passed down beneath the femoral vessels it turned a short angle toward the left side, the largest part of the swelling being immediately beneath the seat of her former Hernia.

This diagnosis was qualified differentially by a most thorough examination, with some efforts to reduce it through the inguinal rings. Finding no opening, since the rings, as I have before said, were firmly occluded, I began to investigate and examine the crural ring, and soon discovered the seat of strangulation, as I have above stated, firmly held.

It should be borne in mind that the diagnosis was much more

than usually obscured by the parts being so inflamed and swollen. After placing the patient in every conceivable position, such as elevation of hips, curvature of spine, limbs flexed on abdomen, &c., and after working with great earnestness at reduction by taxis without gaining in the least on the strangulation, I thought of suspension. The patient being very slight, the limbs were seized under the knees by Dr. B., who stood over her, and I again worked with great ardour, but failed to gain any reduction of the strangulation. I was about to perform kelotomy on her, when, after further consideration of the anatomy, it occurred to me that if I forcibly flexed the thigh toward the left shoulder it would bring the obturator and other muscles, together with Poupart's and Gimbernat's ligaments, into a greater state of relaxation. On the first trial in this position of the parts, the Hernia was returned into the abdominal cavity, to the delightful sensation that rejoices the anxious heart of the operator.

On June 13, I was at Athol to operate upon this femoral Hernia. As the patient was not properly situated in her household affairs, the operation was deferred until the coming autumn. At that time I examined her in the presence of her attending physician, Dr. Lynde, and before Drs. Oliver and Parsons, of Athol, and Dr. Alcott, of an adjoining town, and demonstrated to their perfect satisfaction the seat of the oblique inguinal and of the late strangulated femoral Hernia. The latter was still somewhat tender from the strangulations as well as from our efforts at reduction several weeks before. This shows, also, better than anything I have yet seen, the permanency of my operation on reducible Herniæ by injection, for there must have been considerable force upon all the parts before she became ruptured in the femoral region. Still the injected rings of my first operations remained firm and strong, and to-day retain the rupture without any protrusion whatever.

This then is a very instructive case, first, in proving my

operation to be permanent, and secondly, in being a form of femoral Hernia seldom seen. Even the older writers have diagnosed or mentioned this form of Hernia very rarely, Velpeau and Cooper giving only two or three instances of this peculiar form. Thirdly, it will always serve as a guide to me in Hernia of this form, by teaching me to throw the leg of the patient toward the left shoulder, if the rupture be on the right side, and *vice versâ* if on the left side, and to flex the thigh forcibly on the abdomen. Since this will give us the greatest possible relaxation of the muscles and ligaments that hold the intestines in strangulation, and allow by this relaxed state an easy reduction.

If, for study, one will take the cadaver and experiment he will find this position the very best for reduction. I would state that this form of strangulated Hernia is rather difficult to handle by injections, owing to the close proximity of the vessels supplying these parts, sometimes further complicated by fine branches of the obturator and epigastric arteries which are thrown immediately over the point of rupture just beneath Poupart's ligament and at the angle formed by this and Gimbernat's ligament, at or near the junction of the pectineus and other muscles in this triangle. Greater care must be used in the operation for this form of Hernia than in any other, from the liability to penetrate these blood-vessels. Study well each individual case before proceeding to operate, or you will certainly do more mischief and harm than good to the patient submitted to the operation by injection for the cure of femoral Hernia by closing the crural ring.

Finally, after we have exhausted every effort of taxis by the various means above mentioned, before resorting to herniotomy we must consider whether it is not best to apply the aspirating needle (Fig. 40) to the distended sac and intestine, since by relieving the tumefaction of gas or other matter we can often

quite readily reduce the strangulated parts. For this purpose I use a needle of my own device, of a thin oval section, which will be found very advantageous since coaptation of the wound takes place much more readily than when the common needle, round in section, is used. This is apparent to any one conversant with the wounds made by a round or flat oval instrument,

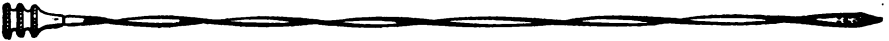


FIG. 39.—Aspirating Needle.

When we are obliged to cut down upon the parts, to return strangulated Herniæ, it will often be found the best way to evacuate the gas and fluid which may be present in the sac before we divide Poupart's ligament, as by so doing we may be able to return the strangulated parts without carrying an incision so far into the parts, owing to the diminished volume of the tumefaction.



FIG. 40.—The first Aspirating Needle for tapping hernical sac in cases of Strangulated Hernia.

This fig. represents a trocar, invented by a farmer in Athol, Mass., to relieve himself of Strangulated Hernia while his physician was gone to get his instruments to perform herniotomy. The patient thought he would tap the tumefaction, and by so doing reduce the rupture, in which he fully succeeded. This is one of the earliest uses of the aspirating needle being applied to restore Strangulated Hernia. It was given to me by Dr. James Oliver, of Athol. He said the patient made use of it on himself twenty-eight years ago, as above described.

CHAPTER VIII.

KELOTOMY, OR HERNIOTOMY.

If taxis does not succeed, and the more serious operations of kelotomy or herniotomy be decided to be employed, it is *ordinarily* performed in the following manner, although I have some suggestions and improvements that very much simplify the operation. Always supposing the patient to be under the influence of an anæsthetic, the patient is placed upon his back in much the same position as in taxis.

The bladder being evacuated, and the pubic parts shaved, the first step is to make an incision through the skin and superficial fascia over the prominence of the tumour, beginning at the superior extremity, and terminating near the base, and varying in length from an inch and a half to three inches, according to the size of the Hernia. This incision may be linear, crucial, Y-shaped, or of the shape of an inverted V, and is to be made through layer upon layer of coverings until the hernial sac is reached, the groove director being used to bring to view the deeper seated structures, and it being always a good rule to have a large external wound, but as small an internal one as possible. "In inguinal Herniæ this incision should be made along the line of the inguinal canal, from the internal to below the external ring; in femoral, over or on the inner side of the crural ring, either in a vertical or oblique direction, in the course

of Poupart's ligament, the former being preferable."¹ The sac will appear to our view of a bluish and vascular appearance in recent Herniæ; thick and opaque in older Herniæ. It should now be pinched between the thumb and finger, and the opposing surfaces rubbed against one another which could not be done were it anything beside the sac. The diagnosis can be confirmed by pricking the sac with a small needle. If this puncture be followed by a few drops of serous fluid our previous diagnosis will be confirmed. An opening is now made into the sac just

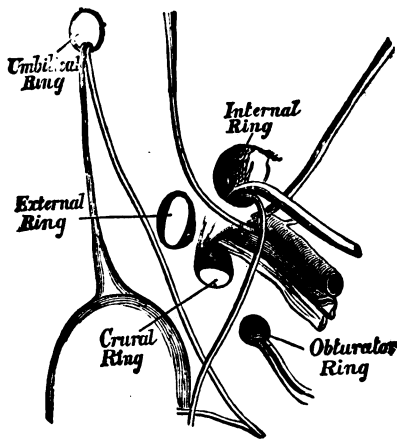


FIG. 41.

large enough to admit the point of the director, and the division carried upward and then downward, allowing at the same time the escape of the contents of the sac. In recent strangulations this fluid is small and sometimes absent; so that we should be guarded not to carry our dissection to too great an extent. The fore-finger is now introduced as far as possible to search for the seat of obstruction at the superior part of the sac. The probe pointed bistoury is carried flatwise along beneath the stricture which is divided by bringing the edge of the knife against it.

¹ Bryant.

An absolute rule should be observed as to the direction in which this incision is to be made. We wish to avoid the epigastric artery. In an oblique inguinal, the artery is internal to the neck of the sac; in direct, it is external to the sac, but since old oblique Herniæ so often simulate direct Herniæ in appearance, the safest rule for cutting is to cut neither outward nor inward but directly upward.

Usually only a very slight incision will be necessary, perhaps only a line and a half in length.¹ After removing the dislocated viscera and sac from the seat of strangulation, we carefully replace all the abdominal parts that have escaped, that being reduced first which protruded last, and of course the bowel before the omentum. The wound is now drawn together by sutures, and the dressing completed by adhesive plaster, compress and a spica bandage.² The patient should now be made as comfortable as possible in bed, cold water slightly acidulated with carbolic acid being applied under the compress, and renewed from time to time. Morphine or opium should be administered, both to secure rest and also to secure the patient against that inflammation always to be dreaded—peritonitis. The spica bandage and compress should be continued until the patient can bear the pressure of a truss, when a properly adjusted one should be applied and worn.

A few of the many modifications of directors and herniotomes are here illustrated. Some are very useful, while others

¹ In our operation of Kelotomy always remember that it only requires the cutting or severing but a few fibres of Poupart's ligament, and it is astonishing how very small an amount of this ligament, on becoming divided, will release a strangulated sac or intestine, so as to be readily reduced into the abdominal cavity. Bear in mind while dividing this ligament to cut as little as possible, for too much cutting here leaves our patient in a much worse condition for the descent of his rupture than before strangulation, and more liable to become again strangulated by a too free division of these ligaments.

² See figure of spica bandage on page 169.

HERNIA.

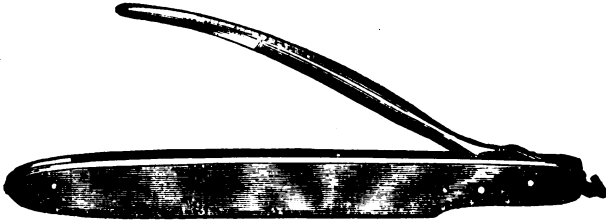


FIG. 42.—Cooper's Hernia Knife.

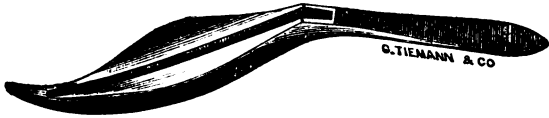


FIG. 43.—Peter's Hernia Director.

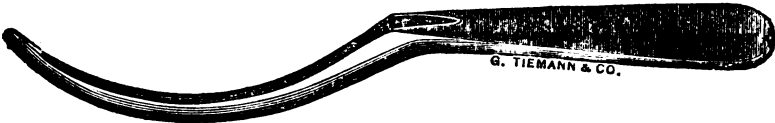


FIG. 44.—Hernia Director.

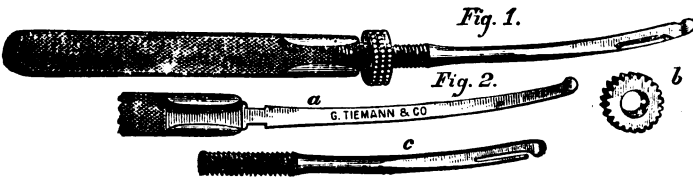


FIG. 45.—Allis' Herniotome.



FIG. 46.—Levi's Director.



FIG. 47.—Stewart's Hernia Knife.



FIG. 48.—Kinge's Hernia Director.

are seldom resorted to. The author's instrument (p. 239) will take the place of all of them, as it simplifies the operation and gives great security from dangerous consequences. All that is absolutely necessary to use, I find, is a short bistoury, Dr. Golding Bird's Percian forceps, needles armed with silver wire or carbolized cat-gut, and my herniatome. No director is needed as the herniatome combines director and knife.

OPERATION WITHOUT OPENING THE SAC.

The return of the hernial sac is not prevented merely by the narrowness of the constriction; it may also be due to adhesions which have formed either between the intestines and sac, or between the sac and the adjoining tissues. The existence of these anatomical and pathological adhesions led early operators to the belief that it was necessary, in these cases at least, to open the sac. Later surgeons have for many years, however, realised the dangers of such an operation, and have come to believe that there is not so urgent a necessity as was formerly supposed. They divide the stricture external to or without opening the sac. By this means the peritoneal cavity is not exposed, the danger from peritonitis is reduced, the inflamed intestine is not exposed to the atmosphere or to the hands of the operator, and the risk of hæmorrhage into the peritoneal cavity, from arteries that have been cut is entirely absent. To say, however, that the sac is never to be opened, would be in my opinion as erroneous a conclusion as to say that the sac is always to be opened. Exceptional cases may occur in which the adhesions may be so firmly knit together that they cannot be broken unless the sac be opened. Here, as in every operation, there is the greatest demand for exact anatomical knowledge, for cool and deliberate judgment, for delicacy of manipulation,

and for refraining as much as possible from interference with the tissues surrounding our seat of operation.

The first to employ this operation of dividing the stricture without opening the sac was Jean Louis Petit. In his *Traité des Maladies Chirurgicales*, published in 1774 as a posthumous work, he says he operated in this way more than thirty years before 1750, and goes on to say, "Let us ask ourselves the question, of what use is it to open the sac? The only purposes that I know of are to expose the intestine and omentum in order to



FIG. 49.—Key's Director passed beneath the seat of stricture of a Strangulated Femoral Hernia, outside of the sac beneath the fascia propria.

remedy morbid changes, if there should be any, to separate these parts if they should have become adherent, and to be able to handle the intestine, and push back hardened fæces or foreign substances. Now I except these cases; in all others, which are far more numerous, why open the sac? There is no indication for such a proceeding; while, on the other hand, the obvious advantages of omitting it are that we avoid exposing the protruded parts to the air, and escape the risk of wounding them; moreover, I shall show that, in respect to the consequence of the operation, it is desirable that the sac should not have been

opened. From these several considerations I conclude that it is better to enlarge the ring on the outside than from the inside of the sac." In all these arguments he is sustained by Sir Astley Cooper, who frequently in practice and in lecture advocated the method.

Petit's operation was as follows. Dissecting down to the sac, where it passes out from the ring, he insinuated between the ring and the sac a flat grooved director curved toward its end. A bistoury carried along the groove divided what was thus raised. If this division be not sufficient, it may be repeated until sufficient space has been made to allow reduction.



FIG. 50.—Direct Inguinal Hernia.

"Mr. Key recommends in inguinal hernia a mode of proceeding by which the surgeon may be enabled to divide the stricture either at the internal or external ring. He makes an incision of an inch and a half over the neck of the tumour, so as to lay bare the lower portion of the external oblique tendon, where it forms the ring. A small opening should then be made in the tendon just above the ring: by introducing the director it will be found whether the stricture is at the lower or upper opening. In the former case the director is carried under the margin of the tendon, which is then divided to a sufficient extent. If the

stricture should be at the upper opening, the incision in the aponeurosis of the obliquus externus must be enlarged so as to expose the lower margin of the two succeeding muscles with some fibres of the cremaster. The latter may be separated by the end of the director, which should be carried under the end of the transversus, the instrument being depressed upon the sac in order to carry its point under the border of the muscle, which may be divided to the required extent."

As to the statement which Petit so wisely made in his day, that the necessity of opening the sac because of adhesions, &c.,

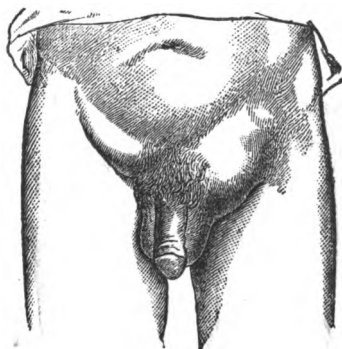


FIG. 51.—Oblique Inguinal Hernia.
Bubonocals on right side, but passing through external ring on left.

was the decided exception to the general rule of cases, Dupreyten, in 1818, estimated that "six times out of nine strangulation is caused by the neck of the sac. Not much later H. Bérard raised the proportion to eight out of nine, and ultimately Maligne maintained, in 1840, that genuine strangulation was always caused by the neck, and that the cases of supposed strangulation by the rings were cases of inflammation of the hernial sac." E. Coulson (*Arch-Gén.* 1863, I., 273 &c.) in recommending the operation *without* opening the sac, advises that when the hernia is very large, and when the symptoms are more those of inflammation or gangrene than strangulation, or when

large adhesions have been formed, the intestine should not be reduced, but watched so that the sac may, upon emergency, be immediately opened.

TREATMENT AS GIVEN BY BERNARD AND HUETTE.

I have found the description of the operations upon strangulated Hernia, both the taxis and kelotomy, so admirably and clearly stated by Claude Bernard and Charles Huette (de Montargis) in their *Médecine Opératoire* that I have ventured to translate it in full. I trust this description will be as interesting and instructive to the reader as it has been to me.

“The operation for the reduction of strangulated Hernia was proposed and described for the first time by Franco in 1561. Adopted and practised latter by Ambroise Paré, and perfected and described as an operative method by Dionis.

“The instruments are as follows:—an ordinary straight bistoury, a convex bistoury, a probe-pointed bistoury, or Pott’s or Cooper’s herniotomy knife. These bistouries have been variously modified, a director, a pair of blunt scissors, and several dissecting forceps. Several fine sponges are necessary to soak up the blood during the operation; finally various pieces of dressing, lint, compresses, wax, &c.

“The operator places himself at the right of the patient having assistants at his side, and at the left of the patient to hold the instruments, to sop up the blood, and to take part in the operation as there is need.

“This operation having for its end the removal of the strangulation, by section of the opening which causes it, is composed of several stages, in which successive incisions are made. First, the skin. Second, the subcutaneous envelopes of the hernia. Third, the hernial sac. Fourth, the constricting ring. Fifth, the reduction of the bowels.

“First.—*Incision of the Skin.* The incision should be made following the great diameter of the tumour, and proportional in extent to the volume of the Hernia. It can be made from within outwards; or from without inwards; when the skin is intimately united to the envelopes of the Hernia and cannot be detached by wrinkling. In this case it is necessary to make the incision with great precaution, and slowly to deepen it little by little. The essential point is not to cut the intestine. When the skin is soft, adhering but slightly to the deep parts, it is preferable to raise a fold of skin from the upper part of the tumour. The operator seizes one extremity of this fold, an assistant holding the other, and makes an incision from without inwards, or better from within outwards by entering the bistoury to its base, the edge upwards.

“This first incision has to do with the skin only, and should exceed the tumour in height and depth by a centimetre. It is sometimes necessary to make a crucial or T-shaped incision.

“After the incision of the skin, several small superficial arteries give off blood. Before continuing the operation, it is well to arrest this slight hæmorrhage by torsion and cold lotions.

“Second.—*Incision of the Subcutaneous Envelopes of the Sac.*—Much precaution and great delicacy of hand is required at this step. Some operators cut directly from without inwards, holding the bistoury like a fiddle-bow, the edge upon the tumour. The surer method is to raise the thin folds which envelope the Hernia, with a pair of pincers, and to make a horizontal incision, withdrawing each fold by the pincers. Then a director is introduced at the small opening thus made and pushed under the folds to the extremity of the tumour, and the bistoury, with its edge upwards, directed by the groove in the director, divides the envelopes of the Hernia down to the sac safely and without peril. Blunt scissors may also be employed.

“The number of these envelopes are variable. We have enume-

rated and described these in treating of the surgical anatomy of the inguinal and crural region. But the age of the Hernia, the duration of the Hernia, &c., so modify the relations and nature of these envelopes that the normal anatomy cannot serve as a guide in investigations, and it is often extremely difficult to find the sac in the midst of the abnormal layers produced by the hernia.

“Serous cysts, deposits of fat, gangliotic abscesses, old sacs, &c. &c., may obscure the operation, and cause perilous uncertainty to the most experienced hand. Several signs are characteristic of the sac, viz., a smooth and polished surface, a spherical form, a fluctuation caused by an accumulation of lymph, the omentum or the intestine seen by transparency, &c.

“Third.—*Incision of Sac.*—The sac being found beyond a doubt, must be incised with care, in order not to wound the intestine. For this a fold of the sac between the circumvolutions of the intestine, or rather at the level of a portion of the omentum, is raised by pincers. This stage of the operation is rendered easy in the majority of cases by the lymph which bathes and distends the interior of the sac. An incision is made close to the pincers so as to make an opening through which to introduce the director, guided by which the sac is opened through its whole visible length, first above, then below. This opening ought to be made as much as possible forward and a little outward. It is of importance then to prove that the sac is opened. A certain quantity of lymph which escapes after the incision, the easiness of exploring the interior of the sac, with the director or the finger, when no adherence with the intestine exists; the intestine or the omentum floating freely and not adherent except at a point corresponding to the abdominal ring; all these signs together leave no doubt as to the nature of the sac which has been opened. Some *Herniæ*, *Hernia* of the *cæcum*, for example, have no sac at all. When

this particular embarrassment occurs, which is extremely rare, it is always easy to recognise the intestines from the structure of its investments. In the more ordinary cases the intestine appears of a variable colour, according to the duration of the strangulation. Its surface is vascular, its colour is a reddish-brown more or less deepened, and marked in several places by a layer of plastic lymph. The omentum can be easily unfolded when it has contracted no adherence.

“Fourth.—*Kelotomy*.—Before proceeding to the division of the constricting ring, exploration of the neck of the sac should be made with the finger, and traction should be carefully made upon the intestinal protrusion, in order to effect reduction without kelotomy if possible.

“The situation of the strangulation being well known, and kelotomy judged indispensable, the operation can be performed in two ways.

“1. By cutting the constricting ring at the side where one does not expect the presence of vessels.

“2. By making several incisions at different points over the seat of the strangulation; these multiple incisions extending but a short distance, were adopted as a method by M. Vidal (de Cassis).

“Kelotomy is practised with a probe-pointed, straight, convex or concave bistoury. The straight probe-pointed bistoury is generally preferred, with the blade surrounded by a piece of tape, leaving bare only one or two centimetres of the extreme edge of the instrument which ought to be entered under the constricting ring. The bistoury may be guided by the index finger, or by a director. When the extremity of the finger cannot be pushed as far as the obstruction, the director must be used; but if the nail can be introduced under the frenum, the bistoury can be guided along upon the finger, at first flat then raised on edge, and the back of the instrument pushed by the

finger on which it rests, divides the constricting ring. The index finger can then be entered still more deeply, and the division carried still farther.

“During the operation, the assistants keep apart the lips of the wound and hold back the intestines, which surrounding the blade of the instrument, might be wounded and hinder the operation.

“M. Vidal has prepared a grooved spatula to guide the bistoury. This director is extremely useful when it is impossible to follow the course of the bistoury with the eye. The end of the director is first passed between the hernial protrusion, and the part causing strangulation. The grooved face is turned upward towards the part which is to be divided, and on this face the bistoury is pushed forward, with the blade lying flat so that the edge cannot act in any way. In division the bistoury is turned upon its axis in such a manner as to raise the bistoury on edge, scraping as well as cutting the ring. This director protects the intestines from the edge of the blade, and keeps them at a distance.

“We have said before that reduction should be tried before division is performed, but we must not forget that the location of the strangulation is more often at the neck of the sac than at the aponeurotic ring. On this account the Hernia may be reduced with the sac, and yet the strangulation may exist at the neck after the reduction into the abdomen. It is of importance therefore to be well assured of the precise location of the strangulation, and not to forget that some hernial sacs have multiple necks, and that the location of the strangulation may be very extended, and reach as far as the superior ring of the inguinal canal. Only by feeling and successive divisions can the operator discover the difficulties which may complicate the operation.

“There is much difference among authors, concerning the

direction and the extent of the division. When the strangulation is located at the exterior ring, and the neck of the sac can be drawn out of the canal, the division is always easy and without danger to the epigastric artery. But when the strangulation is deeper, the impossibility of knowing whether the hernia is internal or external, ought to render the operator prudent. The division above is less dangerous to the organs which must to be respected. At no part should the incision be more than four millimetres, in order to avoid puncturing the artery. In the case of external Hernia, the division being from without safely admits of a larger incision, which should always be proportional to the organs to be reduced. To obtain these results it is often preferable to resort to the multiple method adapted by M. Vidal.

“*Multiple Division.*—When it is necessary to greatly dilate the abnormal opening, in order to avoid a too extensive incision, causing danger of hæmorrhage, M. Vidal proposes to make three, four, or a greater number of incisions of two to three millimetres.

“*Method of M. Malgaigne.*—M. Malgaigne makes the incision not in the sac and scrotum, but at the place where the strangulation appears to be located, prolonging the incision above and below to an extent which the obesity of the subject and the volume of the Hernia demands. All the tissues are then divided as far as the peritoneum, and on this account there is nothing to be feared from the vessels which one has under his eyes or puts aside at will. If it is discovered that the strangulation is caused by a fibrous opening the Hernia is reduced without touching the sac. If not, the neck of the sac is divided by short cuts from without inwards; or better if the stricture is very firm, a small incision is made either above or below the neck of the sac, which is raised by the director which guides the incision.

“M. Malgaigne found by this proceeding, before all things, the

advantage of allowing the surgeon to see what he had done ; in the second place, of reaching the strangulation by the shortest road and the least possible incision ; thirdly, respecting the scrotum and sac, and avoiding suppuration and cicatrisation of a wound entirely useless.

“ In support of his method, M. Malgaigne cites a case of very voluminous scrotal Hernia. The neck of the sac was located at the level of the abdominal ring ; the neck of the sac was opened and the sac refilled, the first day with a certain quantity of liquid, which was re-absorbed in a measure, when the inflammation of the upper wound was allayed, and the wound healed without accident.

“ Fifth.—*Reduction.*—In the case of intestinal Hernia, when the intestine is healthy, it is necessary to draw it a little forward to break up any adhesences which may exist, when they are weak ; to cause by gentle pressure, the gas which fills the intestine, to pass into the abdomen, and to return the portion of the intestine near the ring portion by portion. If the intestines are accompanied by a portion of the omentum, this is reduced last.

“ When gangrene has begun in a portion of the intestine, the indications to be followed are various, according to the extent of the disease. If any doubt exists as to the existence of gangrene, M. Vidal advises that an incision be made with the bistoury, upon the diseased intestine, of small extent and very superficial. If circulation is active, a large drop of blood immediately forms at the small wound ; if on the contrary the intestine is gangrened, the surface of the wound remains dry. In the first case the intestine is reduced, in the second not. In case of doubt the gangrened portions should be retained at the level of the ring. If there is gangrene, the fæcal matter can escape at the abdominal opening.

“ When the intestine is gangrened to a large extent, we must

retain the two healthy ends at the ring to facilitate the passage of faecal matter at the superior end from the abdominal opening, so as to establish an artificial anus which will heal later. It may be possible to excise the gangrened parts, and after reuniting the healthy parts, to reduce the intestine as a whole.

“When it is necessary to establish an artificial anus, the adherences which unite the end of the intestine to the neck of the sac must be gently broken up. The destruction of these adherences will allow the intestine to enter the abdomen. If the strangulation prevents the faecal matter from escaping freely, a speculum may be introduced at the superior end of the intestine, and if this introduction is impossible on account of the adherences which must be regarded, division should be made, with precaution, in front of the sac.

“Gangrene of the omentum, according to the extent and volume of the omentum involved, requires various methods of operation. When the gangrened portion is sufficiently extensive the omentum is unplaited, divided at the level of the healthy parts, and after the ligature of the vessels, secured at the opening of the ring.

“*Crural Hernia.*—When the cæcum and the superior iliac region of the colon are involved by their extra peritoneal part, they form a Hernia without a sac. Beyond this exceptional case, Crural Hernia is composed almost of the same elements as Inguinal Hernia. They are first directed downward in the sheath of the femoral vessels, then across the lamina of the fascial crebriformis; then its direction changes, and it remounts toward the abdomen under the skin and the layers of the subcutaneous tissue.

“In the majority of cases the neck of the sac is formed at the level of the opening of the fascia crebriformis, and here also the strangulation takes place caused by the aponeurotic ring of the fascia crebriformis. But when the strangulation takes place at

the superior orifice of the canal, or in the canal, it is always the neck which is strangulated. (Malgaigne.)

“That which we have said of taxis in the case of Inguinal Hernia being applicable to Crural Hernia, we will not review it. We will only observe that it is necessary for the Herniæ to follow in a reversed way the sinuosities which they have traversed.

“*Kelotomy*.—A simple or reversed T-shaped incision is made according to the needs, parallel to the great diameter of the tumour. The different tissues which cover the Hernia having but little thickness, we must proceed with great precaution, and it is often impossible to raise a fold of skin from the surface of the tumour. The ‘fascia propria’ which covers the sac is very slight, and may be taken for the sac itself; and some fatty collections lining the sac, and seen by transparency under the fascia propria, may be mistaken for the omentum, and render this error easy. It is of importance, then, that the incision of the layers which cover the Hernia should be made with caution, and division should never be performed from the exterior of the sac when the neck of the sac is the cause of strangulation. Recent researches of modern surgery have caused the older methods of kelotomy to be given up. The works of M. Derneaux have shown that the location of the strangulation was at the aponeurotic ring of the fascia crebri-formis, and that the neck of the sac never caused strangulation of the Hernia. We can therefore with safety make an incision from without at the upper part, but below we might meet the saphenous vein. If after the division of the aponeurotic ring it is proved that the neck of the sac causes the strangulation, we can easily draw it forward and divide it.

“*Umbilical Hernia—Kelotomy*.—Umbilical Hernia may become obstructed or strangulated, and call for the operation of kelotomy.

“We must remember that the envelopes are very fine, and

that the sac contains but little lymph. These particulars render the operation difficult.

“The operator very carefully makes an incision of a + or or T shape. Umbilical Hernia being seldom strangulated at the neck of the sac, some authors recommend only a division of the fibrous ring without touching the sac, in order not to expose the peritoneum to inflammation. This should be followed in the case of large Herniæ when it is not necessary to lay bare the intestine.

“A multiple division is preferable to single division, and if only a single incision is necessary, it should be directed upwards and to the left, in order to avoid the course of the urachus and the umbilical vessels.”

John Gay's, M.D. Operation for Femoral Rupture.—Published London, 1848.—To more fully illustrate the operation of Herniotomy in femoral Hernia I would here introduce his operation from his work on femoral rupture, by giving the following description and illustrations reproduced by Mr. Cooper. The operation of Dr. J. Gay has certainly no little merit, and some slight drawbacks when reduced to actual practice which I will not stop to discuss at present.

These drawings are made by Mr. Oxenham, and are greatly to be admired for their great beauty and finish. Mr. Oxenham was a student of Mr. J. D. Cooper, 188, Strand, and I think he does him great credit.

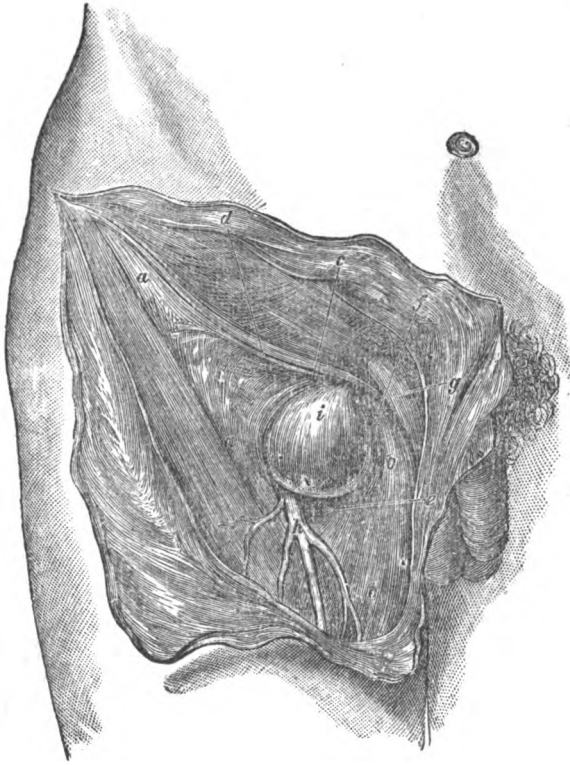


FIG. 52.

The hernial sac and parts, the subject of this drawing, were discovered in the course of a dissection. The tumour did not present those external indications that led to a suspicion of its existence, until the superficial and cellular fasciæ had been cut through. The engraving was made from a cast and drawing of the parts taken by Mr. E. Wilson, and is well adapted to show the parts prior to their alterations by the process of disease. The sac is denuded of its fascia propria. Any further description, but for the sake of junior students, would be superfluous.

- a a.—Upper layer of the iliac portion of fascia lata
 - b b.—Pubic portion of the same fascia, or *pectineal fascia*, forming the floor of the *femoral fossa*.
 - c.—Fascial process, and portion of the border of the saphenous opening.
 - d.—External or semilunar portion of the same border.
 - e.—Burn's ligament, or pubic portion of the arch formed by the lower border of the same opening.
 - f.—Interior pillar of the external abdominal ring; or that portion of the crural arch which terminates upon the tuberosity of the pubis and adjoining portion of the ilio-pectineal ridge.
 - g.—Spermatic cord.
 - h.—Saphenous vein.
 - i.—Hernial tumour.
- ▲ black line shows the situation and direction of the incision which is made through the integuments into the *femoral fossa*, for the new operation.

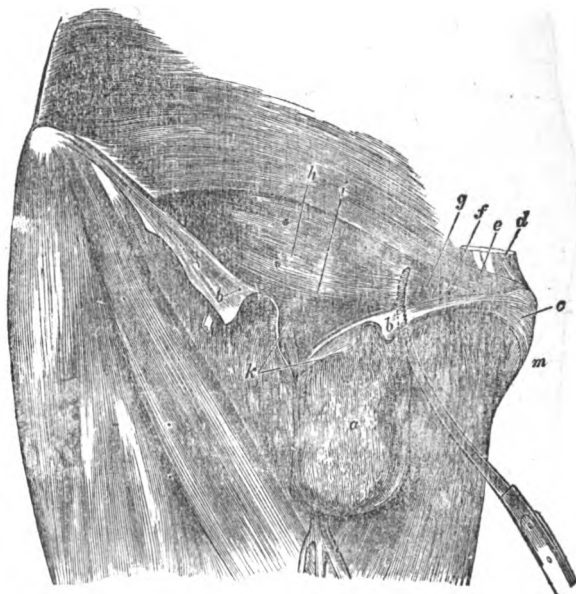


FIG. 53.

Represents a hernial tumour and the adjacent parts of the thigh, as they are displayed by the removal of the superficial fascia and the contents of the *femoral fossa*. The crural arch and upper layer of the iliac portion of the fascia lata have been divided and turned back, to show the deep layer of that fascia, and its relations to Hey's ligament. The knife is passed from the femoral fossa behind those seats of stricture, which are here seen.

- a.—The hernial tumour with its cribriform covering.
- bb.—The crural arch divided and turned back.
- c.—Pubic insertion of the tendon of the external oblique muscle.
- d.—Tendon of rectus.
- e.—Pubic attachment of the conjoined tendons of the internal oblique and transversalis muscles.
- f.—Portion of Gimbernat's ligament, formed by the outer pillar of the external abdominal ring.
- g.—Portion of Gimbernat's ligament, formed by the falciform process of the fascia lata.
- h.—Situation of the band of fibres belonging to the internal inguinal ligament of Haselbach, below the *under layer* of the iliac fascia lata.
- i.—The femoral, or Hey's ligament; or the *deep crural arch*.
- k.—Upper lamina of the iliac portion of the fascia lata, divided vertically, and thrown back, in order to display the *deep lamina*, with Hey's ligament, and its continuity to the arched margin of the internal oblique muscle.
- l.—The femoral fossa.
- m.—Process from the deep abdominal fascia which completes the upper arched border of the saphenous opening on the pubic side.

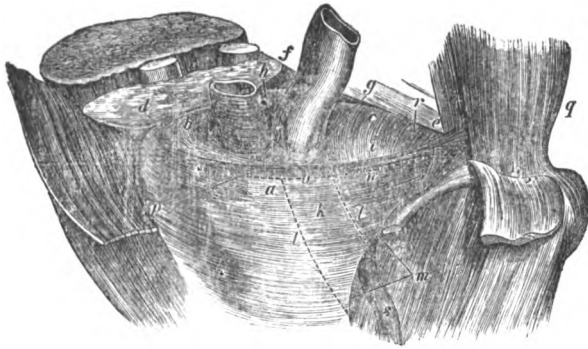


FIG. 54.

- a.—The front wall of the femoral sheath, as displayed on the careful removal of the iliac fascia lata.
- b, c.—Its iliac and pubic walls.
- d, e, f.—The angles formed by the union of these walls.
- g, h.—The septa by which the sheath is divided.
- i.—The upper orifice of the crural canal, or crural ring.
- k.—The venous compartment of the sheath.
- l, l'.—Lines showing the direction of the septa of the sheath.—the outer one being between the artery and vein.
- m.—The front wall, in of the lower orifice of the sheath.
- n.—The crural canal.
- o.—Dotted line, showing the relative position of Hey's ligament to the front wall of the sheath.
- p.—The band of fibres appertaining to the front wall of the sheath, described as the "fibres crassiores" of the ligu-mental inguinal of Lescage.
- q.—Tendon of the rectus.
- r.—The pubic margin of the crural ring: the septum crural has been pushed before a hernial sac, by which the canal has been occupied.
- a.—The terminal portion of the saphenous vein

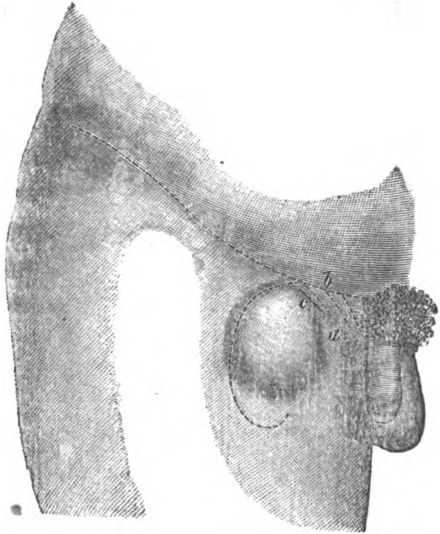


FIG. 55.

- The front of the thigh, with a hernial tumour, with dotted lines showing the situation of the crural arch, and the margin of the saphenous ring.
- a.—Edge of process of fascia lata.
 - b.—Situation of the spermatic cord.
 - c.—A line representing the seat and direction of the external wound for the new method of operating.
- The line of incision r presented in Fig. 53 is, in some instances, white; in others, black.

AUTHOR'S MODIFICATION OF THE OPERATION OF KELOTOMY.

Before closing the abdominal walls that we have divided in our operation with the knife, I would recommend that we apply to the edges of the rings Lugol's solution of iodine, the fluid extract of white oak bark, or the following, which I think far superior:—

℞ Ext. Quercus Albæ, grs. xii.
 Proof Spirit, ℥j.
 Morp. Sulph. grs. iv.
 Sulph. Ether, ℥iv.

M.

This mixture is to be applied with a long soft camel's hair brush, or by means of a bit of absorbent cotton, and will cause an effusion of lymph over the wounded parts, which effusion will consolidate the rings with new tissue not unlike the results of our operation on reducible Hernia by subcutaneous injection. Whether by this means we obtain a cure or not, we shall at least do no harm from our simple application, and may dispense with the succeeding subcutaneous injection.

Dr. Derby, of Vermont, has succeeded in effecting a cure in a strangulated Hernia by means of the application of iodine, which I have mentioned.

In case we use iodine, or the preparation of oak bark I have given, I would advise that we apply no moisture on our compress for the first twenty-four hours. Powdered ice in a bladder, or rubber bag, would be preferable as an application if inflammation sets in or is feared; in fact I think very highly of such an application as a constant dressing in all cases of inflammation after any surgical operation of any importance over the abdominal region.

NEW HERNIOTOMY KNIFE.

In place of the ordinary Herniotomy knife I have adopted an instrument devised by myself, and here figured.

In shape it is like a bistoury of the ordinary form, as made by Milliken of London. Instead of a cutting blade, I have adapted to it the narrow saw used by Dr. George F. Shrady, surgeon to the Presbyterian Hospital of New York. This saw can be withdrawn into the hollow shaft of the instrument, which can then be used as an ordinary groove director. When it has been introduced beneath the ligament to be cut, this saw can be pushed forward and used to make our necessary incision.

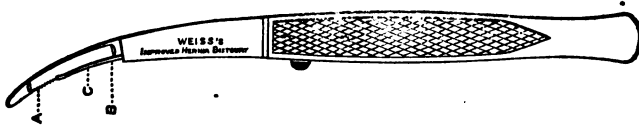


FIG. 56.—This is a probe-pointed bistoury, having the edge *a* serrated and protected by a sliding rod *c* which keeps it from cutting during its introduction, but is withdrawn when the desired region is reached.

We shall, by this means, serrate the ligament instead of cutting it smoothly, and shall avoid, or at least lessen, the danger of severing the epigastric, or obturator arteries, or branches from them.

The ligaments being roughened will consolidate under the effusions of lymph much more readily than they would if the cut had been smooth and the arteries, should they happen to be injured or severed will from their lacerated edges contract like the edges of a lacerated wound with very little hæmorrhage and danger to the patient. Such minute details if we would meet success should always be as faithfully attended to as the major and seemingly more important steps in the operation. To illustrate the safety of these operations where the ligature of arteries is not so indispensable as once was thought, I insert the

following quotations, upon surgical operations without ligatures from one of my communications to the *Boston Medical and Surgical Journal*. This only brings to our notice the old and well known fact of the contractility of lacerated vessels when severed by sawing or tearing them asunder.

In 1872, Mrs. —, of Kittery, Maine, aged about thirty-eight, of light, sanguine complexion, mother of two children, had a tumour of the left breast about the size of a duck's egg, which began soon after the cessation of lactation with her last child. This tumour made its appearance on the inner side of the left breast just below the nipple, which felt hard and doughy to the touch. The nipple was retracted, and there was a deep, dark areola around it. Her suffering was so great that she was unable to sleep, and it had occasioned a general loss of appetite and strength.

She was placed under the influence of ether, and the usual elliptical incisions were made. In so doing branches of the inferior mammary artery were laid bare, and traction was made upon them previous to their general division with a saw-like movement of the bistoury. Retraction of these arteries took place, completely closing them against any hæmorrhage. Some slight hæmorrhage from smaller vessels was controlled by torsion. The parts were now brought together without the use of any ligatures. The wound was closed with five silver sutures and adhesive plaster, and healed almost entirely by first intention.

In the fall of 1878 a young girl from Attleboro', aged fifteen or sixteen, received an injury by a stone thrown against her breast, where a hard swelling arose and developed into a cystic adenocèle. The whole breast became much enlarged, swollen, and painful just above the nipple. The tumour and the hard swelling continuing to grow in spite of treatment, it was decided to amputate the breast. Being called to perform the

operation, I proceeded after etherisation to remove the greater portion of the breast by making semi-elliptical incisions, keeping the vessels well on the stretch. Her attending physician wrote me that the entire wound healed by the first intention, or at the primary dressing without any suppuration. This patient being young and in vigorous health, well nourished, and with breasts enormously large, the circulation was very free, and the tendency to hæmorrhage much greater than in the first case, where continued suffering had caused a reduction in the vital forces, and at the same time enfeebled the circulation.

This operation shows the contractile power of the muscular coats of the arteries when traction is made on them before their division. To illustrate still further how much can be done in many operations without the use of ligatures by taking advantage of this contractile power of the arteries I will relate the following case:—

Mrs. H., of Concord, Mass., aged sixty-eight, on November 7, 1878, consulted me for a large fatty, bell-shaped, fibroid tumour which grew from the glutæus maximus, was suspended by a pedicle of about two and a half inches in diameter, and extended nearly to her knee on the left side. It had existed over twenty-five years, and a portion of the inferior part had sloughed obliquely off, leaving a large ulcerated surface which was discharging a very offensive fluid. The constant weight—about three pounds—had caused a prolapsus uteri, together with a partial prolapsus of the anus and bladder. This tumour, from its discharge and the burden of carrying it, as the patient was very slight in stature,—was very weakening and enfeebling.

On the 12th of November, after etherisation, I operated on the tumour, with the assistance of Dr. E. B. Webb, of Boston, by making two longitudinal elliptical incisions as close as convenient to the pedicle, and removing all the attachments except where the arteries ramified into the substance of the tumour.

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These arteries were very large, and accompanied by a vein fully equal in size. Before the final division of the vessels I made retraction, placing them greatly on the stretch, and then proceeded slowly to divide them with a saw-like motion, as related above. Full contraction and closure of the arteries took place. The wound was now brought together, and coaptation effected by silver sutures and Dr. Martin's United States army adhesive plaster. It healed almost entirely from the first dressing, excepting a small portion, about three quarters of an inch of the lower part of the incision, which was designedly left open for drainage, and so kept by a few threads of coarse saddler's silk. The patient in two weeks was able to return home perfectly healed, with her prolapsed organs restored to their natural conditions, the uterus being supported with a Hodge's hard rubber pessary. She was ordered to take quinine and iron, and when she visited me in the winter she had gained so much flesh and strength that she considered herself comparatively young again.

Neither in major nor minor operations have I had secondary hæmorrhage by this method so frequently as when I have been obliged to resort to ligatures, and I have had better success in the healing, since the parts so brought together have generally united by first intention. My attention was called to this contractility of the arteries from the fact that in early life I noticed that in many lacerated wounds we have but little hæmorrhage where we should have supposed from the size of the arteries that there would be much, and that such wounds, when proper coaptation could be had,—when freed from dust and oil,—would generally heal by first intention; but where ligatures, even though small, were used in fresh wounds, suppuration took place almost invariably.

CHAPTER IX.

TRUSSES.

I AM more and more convinced that so important a matter as the proper fitting of a truss has been most terribly overlooked by the medical and surgical profession, and that it should receive more careful and personal attention at their hands. Who in our profession if called to adjust a fractured limb would think of referring his patient to the care of the mere mechanic who may make splints or to the dealer who may vend them, and feel that he had done all that was necessary and right, or that could be expected of him? If no surgeon would think of excusing such criminal conduct in the case of a fracture, which will heal with the most limited amount of surgical supervision, why should it be considered unprofessional to adjust the truss which may have to be worn for years or even for a lifetime, and which if improperly fitted may endanger life far more than protect it? Has not this very important matter been left altogether too long—to our shame be it said—in the control of the manufacturer and the vendor?

I feel confident that I do not draw an exaggerated picture when I say that many a patient when he has asked where or how to get a truss has been told by his medical adviser to “go to Mr. —, druggist, who has them for sale, for as I was coming by his store this morning I saw some fine ones there made by a celebrated maker, I at this moment forget who, but you

can easily find them, for the leather covering is stamped all over with bright gilt letters. I know you will get a good fit there, for Mr. — used to be a cooper, and of course he is used to fitting any body or thing that needs hooping."

Many are the patients that call upon me wearing barbarous appliances, that I certainly would not think of putting upon a brute animal. Let me give one instance. Last winter a poor deluded man came to me wearing a contrivance with four rollers similar to those used on parlour skates. These were applied as a pad to a spring, as stiff and hard as the hoop upon an oaken cask, and the whole was adjusted by heavy straps of stout leather around the body, and having the usual perineal attachment. It pressed so hard that I have often wondered how it was possible that the circulation could act in the large blood-vessels of the lower limb. More than all, it was a very imperfect fit. The swollen and excoriated skin that these implements of torture produce in order, as the dealers say, to produce a *radical* cure will, I think, if my previous arguments have not been sufficient, show why I object to the term as applied to an exact and scientific surgical operation. The agony these poor sufferers endure is only helped along by the extreme delicacy which many of them feel to confess that they are afflicted with a disease, which for purposes of selfish and sordid gain the dealers in trusses often call an immoral disease. Immoral indeed! Would that half the ills of mortals were as free from taint and immorality!

It will readily be understood that in this general condemnation I do not condemn those dealers in these articles who are known to be proper men with honest principles, and who endeavour to fit a truss as the physician may direct. To such men, generally to be found, I should have no hesitation in recommending patients for a proper instrument (Fig. 57).

A properly fitting truss should combine lightness, strength,

and elasticity, so that it can be worn with grace and ease by the patient, and retain his hernia always within the proper place. The steel should be the finest, and as elastic as the mainspring of a watch (Fig. 58). Such a spring can be worn with ease, and is at the same time capable of exerting sufficient force to retain the hernia. A truss like this is now easily obtained from any of our first-class instrument makers, and no others should ever be recommended to be used. Such makers' firms are Codman and

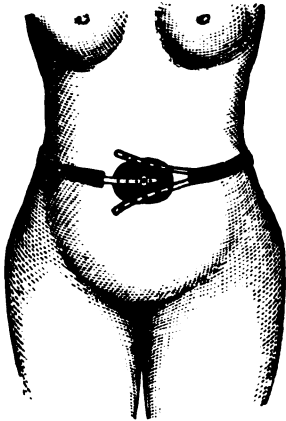


FIG. 57.—Proper position for Umbilical Truss.

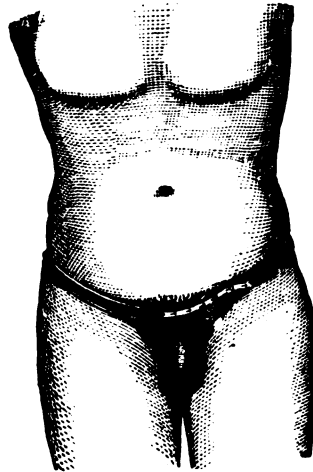


FIG. 58.—Proper position for Truss in Inguinal Hernia.

Shurtleff, of Boston; Tiemann and Co., of New York; Milliken, of London; and Charviere, of Paris. Their styles are numerous, but for effective service the truss should be as plain and as little ornamented as possible. Instruments like these will usually not disappoint us in performing all that is recommended for them, and of course the patient is not endangered by the truss slipping or giving way should he jump or make any sudden movement of the body. It would be well if the patient could always have an extra one at hand, especially in

travelling, so that he may be forearmed in case of any possible emergency.

For a few practical hints upon trusses, their various patterns, and their application, I refer to a paper written for this work by my friend Dr. Benj. S. Codman, of the firm of Codman and Shurtleff, and a gentleman whose experience in this matter we all highly value, from the fact that he has received a regular medical and surgical education, and has spent nearly a lifetime in the proper adjustment of trusses.

“Human ingenuity has ever been taxed to its uttermost to invent a truss, supporter, or appliance, comfortably to restrain and hold this uncomfortable protruberance of the abdominal viscera.

“In the great world's Exposition in Paris in 1867, in the ‘Surgical Department,’ was to be seen a collection, both ‘ancient and modern,’ of these appliances, which served well to mark the improvement that has been made in their manufacture. Yet we must still look forward, as perfection has not yet been attained, and until it has, we must continue to use the best attainable substitute.

“Which is the best truss? Year after year the cry has been raised, ‘I have found it;’ and a new patent truss has been launched forth, with the promise of meeting every want, and being capable of curing the most obstinate cases of Hernia; only too soon, alas, to disappoint this large class of suffering humanity with its utter failure, and only to see their fond hopes dashed to the ground.

“Trusses are a necessity, and the surgeon should study to meet the want, and thoroughly to understand the anatomy of Hernia, so that he can recommend the most suitable instrument, and the proper person to make the application if he is unable to attend to it personally.

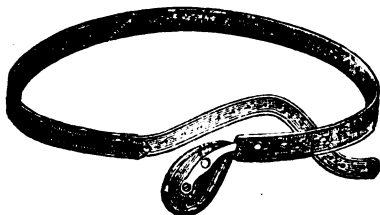
“The best truss is the one best adapted to the case; and when

we say that, we mean that age, sex, and condition are to be considered.

“Is it proper to apply a truss to a very young infant with congenital Hernia? Yes; and the sooner the better, provided it is skilfully done, as the rings contract if properly supported, and the bowels enlarge, so as not to easily force through the inguinal or femoral openings (Fig. 59).

“Trusses for infancy and childhood should be light, springy, and delicate. Children wearing napkins should have the pad constructed of black ebony or ivory, for the following reasons: such pads never change their form; they are more durable, as a soft chamois-covered pad becomes wet with urine, and fœtid,

FIG. 59.



Spiral Spring Pad.

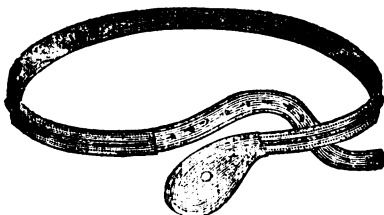
and falls to pieces in a few weeks; and, better than all, the hard pad holds better, is smooth and less irritable, and in many cases will permanently close the rings, and obviate the necessity of a second truss. But to do this the case will require careful watching on the part of both doctor and parents. If parents think a hand-pad is too hard, it may be safe to allow them to place beneath the pad a few layers of an old soft linen handkerchief, which can be changed as circumstances require.

“The surgeon may direct to whom to go and the kind of truss best adapted to the case; but after all, so much depends on the right application and nice adaptation that no one should be patronised or allowed to apply trusses but the most experienced; and if he has made this affliction a life study, and has had

the advantage of a medical and surgical education, so much the better for the patient.

“The cuts in this work illustrate only a few of the many kinds of trusses, all of which have had their day as ‘patent trusses,’ but are now common property and subserve a general good purpose. (Fig. 60.)

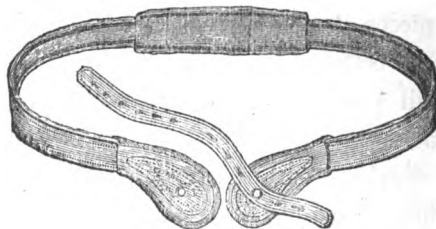
FIG. 60.



Single French Style or Long Pad.

“The French style of truss is a popular truss. It has a light elastic spring and a soft stuffed pad. It affords gentle but firm support to the hernial rings and the lateral muscles, and for persons of either sex advanced in life, or of delicate health, it serves an admirable purpose. It is strongly recommended for

FIG. 61.



Double French Style.

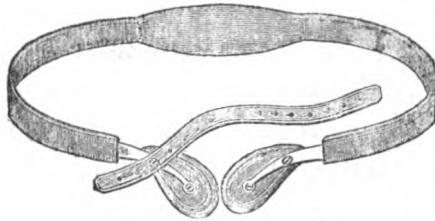
wear after the operation by injection until the parts become firmly united. (Fig. 61.)

“The Ratchet truss is emphatically the working man’s truss, for its construction, strength of spring, and its adaptability. It is the truss generally sold to the country druggist, because it

meets more wants than any other, and because of its easy applicability. Discretion ought always to be used.

“Take the case of a porter with a bad Scrotal Hernia, who has to shoulder a Saratoga trunk and carry it to the fourth story of a mammoth hotel. He must have a truss that will meet every demand of his case. The same is true of an express-man, ever handling heavy boxes and goods. (Fig. 62.)

“The Ball and Socket truss has been for many years a popular truss, and will always take its place among the good appliances. It seems to be the happy medium between the French style and the Ratchet truss. The ball and socket movement to the pad allows the truss to become self-adapting to any position of



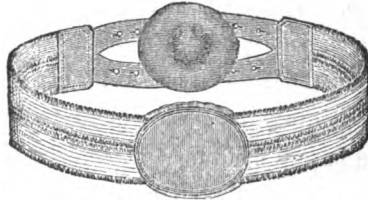
Double Spiral Spring Pad.

the body, such as stooping, mounting a ladder, &c. It has a light flexible spring, is capable of good work, and gives great satisfaction to those who use it.

“Umbilical trusses may be mentioned. We will begin with the treatment of infants. If our nurses were thoroughly educated, and applied a suitable bandage at the first dressing, the truss-maker’s services would rarely ever be needed. Light steel springs covered with soft leather, with a small convex pad, may serve a good purpose; but we find a better substitute in a small flat pad (Fig. 63) a little larger than a silver dollar, with a small convexity in the centre. It should not be too convex or pointed, as that would tend to open rather than contract the orifice. It will give a gentle pressure like the human thumb,

hold the Hernia, allow the ring to contract, and entirely cure the difficulty. This pad may have an elastic band passing round the body, with leather ends, to be secured to two small nobs on the front pad. Great care should be exercised in no

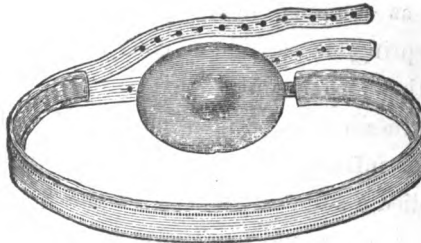
FIG. 63.



Child's Umbilical Belt, elastic.

stretching the elastic more than just enough to keep the appliance in its place (Fig. 64). In the adult we find the most distressing cases of Umbilical Hernia in obese women, many of them the size of an infant's head. Steel spring trusses as a general thing do not meet these cases. The best thing for such cases is a wide French twilled drilling abdominal supporter, say eight or ten inches wide in front, to fit and support the entire

FIG. 64



Adult Umbilical Truss.

abdomen, passing around the body, and fastened on the sides with four elastic straps and buckles. The next step is to have a large centre pad, to suit the case, stretched to the inner side of the supporter. The pressure is controlled by the elastic side straps.

“There are, of course, many good and useful kinds of trusses not mentioned. My object has been to point out a few only that can safely be relied upon. In cases of inguinal and femoral rupture there is one principle necessary for a good truss, viz.—the inward and upward, or in other words the lifting power of the pad. As the inguinal and femoral rings are always above the pubic bone the pads should be so adapted as to cover the rings securely, always above the bone. Although there may be some exceptions to this general rule, they are so rare that at this time we will not stop to mention them, as my sole object is to give a few practical hints how to meet a want or an emergency until the time shall come when all shall be convinced that *surgery has provided* in the cure by injecting the hernial rings *a substitute for trusses and appliances*, and until those who are afflicted shall come and be thus healed of their distressing malady.”

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Braithwaite's Retrospect, Jan. 1879, p. 137.

(Official Alcohol as a Stimulant. Med. & Surgical Reporter, Aug. 9, 1879.)

Strangulated Hernia relieved by stretching the Abdominal Rings. Ibid, Oct. 18, 1879.

Strangulated Hernia treated by New Method. Ibid, Oct. 25, 1879.

Schwalbe of Germany used Ethylic Alcohol. See No. 61, 1879, of the Algm. Med. Central Zeitung, Berlin.

A FEW OF THE OPERATORS ON HERNIA.

OLD METHODS.

Schmucker.
Langenbeck.
Richter.
L'Estrange.

Petit in 1718.
Rareton in 1750 revived Petit's
method.
Franco, 1561.

MODERN METHODS.

Schuh.
Belmas.
Signoroni.
Gerard
Baron Linten of Brussels.
J. Birkett.
T. Bryant.
F. H. Hamilton.

Sir A. Cooper.
Sir W. W. Fergusonson.
G. Pollock.
T. Holmes.
C. Heath.
A. Scarpa.
Frorieps.
C. Dowell.

PLUGGING AND INVAGINATION.

Gerdy, Wurtzer, 1838, followed by Rothmund in Munich and Sigmund in Vienna, brought to this country by Spencer Wells in 1854, and advocated by Redfern Davies and others.

D. Hayes Agnew.
Mosmer.

Arnsby.
Riggs.

LIQATURE.

John Wood of London (King's College Hospital.)

SCARIFYING THE NECK AND COMPRESSION.

Alphonse Guérin.

ACUPUNCTURE.

Bonnet of Lyons.

HARE-LIP SUTURE.

Prof. S. R. Beckwith (Homeopath.) of Cleveland, O.

SUBCUTANEOUS SUTURE WITH SILK BRAID.

Thomas Wood of Cincinnati, O.

INJECTION.

Velpeau.
Joseph Pancoast.
Geo. Heaton.
W. H. Roberts.

Woogencraft.
Bowman of Kentucky.
Schwalbe.
Wm. Janney

And many others.

APPENDIX.

APPENDIX.

AFTER I had devised my instrument for Hernia and applied it in practice, I soon ascertained that this spiral-shaped needle passed with such ease through the tissues, that it could be applied to a number of surgical instruments with marked advantage. I began to experiment upon a needle for aspirators; being of the same



FIG. 66.—Aspirating Needle.

spiral form they easily penetrate every kind of tissue, muscle, ligament, tendon, &c., and remain at any depth and position where we place them. As I have said in my work on Hernia, they are very useful in tapping all deep-seated abscesses, effusions about the pericardium, knee-joint, &c. They are made from the smallest size of the aspirator in general use, revolving once in one half an inch to those of No. 10 revolving once in two inches, and can be used as a trocar for hydrocele, if desired. They can be adjusted upon an ordinary Davidson's syringe, or upon the common aspirating syringe.



FIG. 67.—Trocar.

Trocars, made of the ordinary sizes with flat oval and spirally-twisted point, revolving upon a staff, which may be withdrawn

after the introduction or the point to open as on the tubes for stone in bladder, below described, will be found very useful in paracentesis thoracis, because, the point being flat, they pass through the intercostal spaces very easily and resist expulsion by any muscular contraction. They will also be found useful in ascites, and in

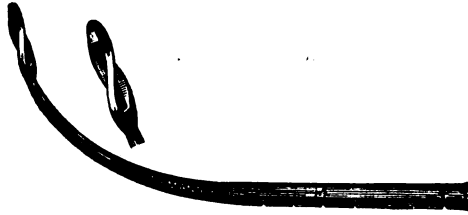


FIG. 68.—Uterine Sound.

tapping ovarian dropsical cysts, since they run less danger of tearing the membrane of the cyst than do ordinary trocars or of the overflow of the cystic fluid into the abdominal cavity.

The same kind of a point applied to an ordinary uterine sound will be found very useful in treating uterine diseases; applied to a malleable shaft it will be also useful in probing fistula *in ano*; attached to an ordinary probe, and tipped with a drop of unglazed



FIG. 69.—Catheters with vermicular point.—sound for urethra.

porcelain, will readily detect the presence of lead in probing gunshot wounds, being scratched and blackened by the foreign body; or for a probe in general use for the field or pocket case.

The same combination of the screw and wedge has been applied to sounds and catheters, and by its peculiar spiral motion it avoids to a very great extent the friction met with in using the ordinary sound and dilator of Otis and others in common use, since but a

small portion of the urothral canal is in contact with the instrument at any one time. It will be seen that it partakes of the spiral twist in common with my new aspirator and syringe for injecting hernia. This new idea in surgical instruments was suggested to me while treating an old and difficult stricture last spring. I found that I could introduce the ordinary dilator with much greater ease and with far less pain by giving it a twisting motion. I think you will find, if any of you have under treatment long and tortuous strictures, that this dilator will glide through with great ease, and will fully accomplish its purpose with much less pain than the sounds in general use.

These instruments can be obtained of the varied sizes which are in general use, American or French scale.

CASE I. On January 12th Mr. — applied to me with a very severe stricture of several years' standing. He was unable to pass a stream of water larger than a small knitting-needle. It was impossible to introduce the smallest sound through the stricture without the greatest pain, and it had been said by several physicians who had attempted it that, owing to the extent of the contracted and strictured canal, it would be impossible to pass again a catheter or sound. I passed this instrument which I now show you with such little pain to the patient that he asked if I had really penetrated through the stricture. Upon learning that I had, he said he never had one introduced so easily and successfully before.

The vermicular catheter is in shape like the catheter in common use except at its point. This point is about one and three-tenths centimetres long, of the same peculiar wedge shape, and revolves in precisely the same manner as the vermicular sound and dilator. On account of its shape and power of revolving it is passed through and made to dilate the urethra with very little friction, and of course with far less difficulty, and with little or no pain when compared with the usual catheters.

CASE II. Mr. B—, aged sixty-six, has had an enlarged prostate, and for many years has passed his water with great difficulty, and in a very small and irregular stream. The parts were so compressed by this enlarged gland that it was impossible to introduce a common catheter or a soft rubber bougie, No. 9 French or No. 6

American scale, yet this vermicular catheter passed with perfect ease and without pain into the bladder. It has to be used only once to show its superiority over every other catheter in the ease and freedom from pain with which it penetrates the strictured parts during catheterisation.¹ These catheters are made for both male and female.

They are introduced in the ordinary way, the staff being held firmly in the hand; but the withdrawal should be gradual, little force being used in order that the mucous membrane may not close around the vermicular point by any possible means.

In the many diseases of the uterus requiring dilation of the cervix and uterine canal, a dilator made to revolve like the sounds above described, but larger and somewhat thicker through its centre, and fastened to an adjustable handle, will be found equally



FIG. 70.—Bigelow's.
FIG. 71.—Thompson's curve.

advantageous. These dilators should vary in size from 10 to 30, and can be made of white metal or hard rubber.

The same shaped dilators, but of larger size, varying from 20 to 60, can be used for dilation of the stricture of the œsophagus and anus. The handles should be about sixteen inches long and two in number, one straight, the other of the proper curvature, for insertion into the œsophagus.

A cap made in this spiral form and adjusted over and upon the end of Sir Henry Thompson's, or the Bigelow tube, used for the removal of *débris* after the operation of lithophaxy will be found to allow a much larger tube to be passed through the neck of the bladder and urethra, and with far greater ease than would be

¹ Mr. Bryant demonstrated this at Guy's Hospital, where he used these instruments in two cases of stricture, in the presence of a number of gentlemen, using the few instruments which I happened to have with me.

possible with the ordinary instrument, even of a smaller size. After the tube has entered the bladder the cap is opened off from the end by a concealed spring in the hinge, and then from its peculiar shape can be used as a ladle to gather up the *débris* which is to be drawn through the tube by the aspirator. If this instrument is successful in performing all I expect it will I shall call this the Thompson American Tube, in honour to Sir Henry. This is made by Messrs. Weiss and Son, London.

Thus far the shape of the instruments has gone much beyond my expectations in its effectual results. It allows the instruments to be applied with great ease, very little pain to the patient, and very little injury to the parts. They are manufactured, and for sale by Tiemann and Co., of New York.

After devising the tube, figured below, for the removal of a crushed stone from the bladder, I planned another tube differing



FIG. 72.

in its details. It will be remembered by those members of the British Medical Association who saw my various instruments, that this particular tube had a tip, one half of which was thrown back, by a spring in the hinge, after it had entered the bladder, so as to allow the crushed stone to pass freely through the tube; the other half being unjointed, and serving as a scoop to take up any particles remaining in the bladder. The improved tube has the same tip, and there is a flat steel wire attached to the jointed portion, passing through the tube and having a screw cut upon its free end so that the end may be opened or closed at will by means of a thumb-screw. By this means pieces of stone may be caught and removed, and the same principle may be used for the removal of polypi; or for the removal of shot or bullets from the wounds of the chest or abdomen, having the advantage over the common

forceps that the bullet will readily fall into the spoon-like jaws and be withdrawn with great ease. By varying the size it can be used for the nasal cavities or the ear, and by passing a piece of cotton or sponge through the canula any medication desired may be applied to the internal parts. The instrument will be particularly useful in uterine cases and ulcerations of the rectum, as being closed it enters very smoothly and easily, and allows the medication to be thoroughly applied to the interior of this organ, the mother of so many painful ills, many of them indeed real, but many imaginary either to physician or patient.

The same principle may be used for extracting foreign bodies from the œsophagus and bladder; and by placing mirrors in the tube it will serve as a laryngoscope, the unjointed half of the tip carrying the first mirror.

In calling attention to these instruments with either revolving or fixed vermicular points I would lay claim to them all as being entirely original with me, and as such I give them freely to the profession, for proper use, wherever they can be applied to alleviate human suffering, and all I ask of those who may use them as already made or as modified, is that they may retain my name as the first designer. I am led to make these remarks and suggestions on account of the advice of some in the profession to patent these instruments, which is very far from being my intention; as to my ideas, the profession is the last place to look for self-aggrandisement, and I would advise any one intending to enter the profession for any such personal motive to consider well before he takes any steps, and choose some occupation where his motives will be more highly esteemed.

I took the idea of the herniotomy knife, which I here illustrate,

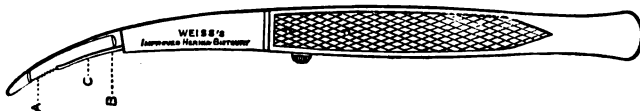


FIG. 73.—Weiss's Hernia Bistoury.

from my friend Mr. Bryant's work. It is a sheathed knife, the blade of which has been serrated and slightly modified in other respects by Messrs. Weiss and Son, so as to adapt it to divide

Poupart's ligament by sawing instead of cutting, and by this means avoiding hæmorrhage to a very great extent.

The following formulæ I find to be the best injection :—

For infants and children to the age of five, for accidental or congenital Herniæ, use the aqueous extract of oak bark of Dr. Heaton's formula.

For children of five to fifteen years of age, extract of oak bark distilled to the consistency of glycerine, with ten drops to the drachm of sulphuric ether.

For old and long standing Herniæ, congenital or otherwise, I find the latter extract of oak bark, with one drachm of absolute alcohol to four of the extract, and one drachm of sulphuric ether, with one or two grains of sulphate of morphia, gives me the best results in my operation.

Or if we wish to vary the above, the following is a good formula suitable to the large majority of cases presented for operation :—

R Fluid Ext. White Oak Bark (*Quercus alba*), ʒiv .
 Reduced by distillation to ʒi .
 Alcohol 90°, ʒiii .
 Ether Sulph. ʒii .
 Morphia Sulph. gr. ii.
Sig. injecto 10 to 25 drops.

HEATON'S FORMULA.

R Fluid Ext. White Oak Bark, ʒi .
 Solid Ext. White Oak Bark, gr. xiv .
 Morphia Sulph. gr. ii.
Sig. injecto 8 to 10 drops

The inclosed case of instruments belong to the late Geo. Heaton, M.D., of Boston, Mass., U.S.A., and contain all the instruments used by him in his treatment of Hernia. At his decease they were given to me by his wife and daughter, and at my suggestion are placed in the Museum of the Royal Chirurgical Society, to perpetuate his memory by ever remaining there, amongst the many other instruments devised for the relief of human suffering by those whose names are inscribed upon the roll of honour of this highly

respected and venerable society. In behalf of the above-mentioned wife and daughter, I present this little case of instruments to the society, to be for ever kept and exposed to view with similar objects; and in accordance with the wishes of his heirs, give the

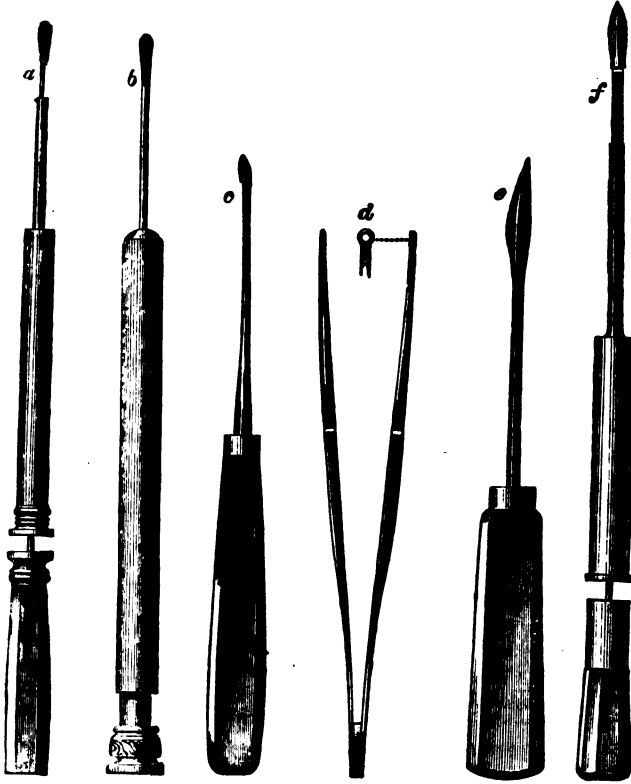


FIG. 74.

- (a)—Instrument for injecting the solid extract of Oak Bark, which he seldom used.
 (b)—Syringe for injecting the fluid extract of White Oak Bark, with which he effected the most of his cures.
 (c, d, e)—Instruments used in the operation of variocèle.
 (f)—An instrument which acted as a scarificator, and at the same time was used to introduce the solid extract.

following short notice of the instruments and operation used and devised by Dr. Heaton for the cure of Hernia by subcutaneous injection of the fluid extract of White Oak Bark (*Quercus alba*), strengthened by the addition of fourteen (14) grains of the solid

extract of *Quercus alba* to the ounce of fluid. His method was to inject eight (8) or ten (10) drops of this mixture into the hernial rings, and by this means, for more than forty (40) years, he was successful in curing a vast number of all kinds of Herniæ affecting persons of all nationalities, classes, and ages.

Dr. Heaton was born in Thetford, Vermont, U.S.A., in 1809. His parents were natives of that state, and were of pure English descent. George went to the common Town School, and by dint of hard work in teaching and study fitted for college. He graduated as M.D. from Dartmouth Medical College in 1831, but I find by the records that he passed his examinations satisfactorily in 1830. He first practised his profession in Alton, Illinois, but soon went to St. Louis, Missouri, where he resumed his operation for Hernia, which he had first taken up in Alton. We next find him in Boston, in 1842, struggling to develop his operation, and to interest the profession in it. Being coldly treated by the profession there, he went to London, where he met with a cordial reception, and gained the attention of the profession. Sir William Fergusson, and others, took him kindly by the hand, and introduced him to the profession of London, and he was induced by them to operate, successfully, in the various hospitals. He was highly honoured by them, and made a member of the Royal Chirurgical Society, and of the Westminster and London Society. Crossing over to Paris, he was well received by the faculty there, and made a member of the Parisian Medical Society, and after a short stay here he returned to Boston. He again began to operate, with his courage and strength renewed by his success in Europe, and he continued his work till near the time of his death, in July 1879. His success was very great, as he effected cures in hundreds of cases, as many now living can testify.

He married, quite early in life, Miss M. Emerson, the daughter of Dr. Emerson, the honoured president of the Massachusetts Medical Society. This marriage was blessed by the birth of children. Charles, his son, took his degree of A.B. at Harvard University, and the degree of M.D. at Harvard Medical School. He served with honour as Surgeon in the U.S. Army, but during this service he contracted Bright's disease, which caused his death some eight (8) or ten (10) years before his father. His second

T

child, Laura E., a lady of culture and refinement, married an educated and wealthy gentleman, by the name of Sturtevant, of Boston.

Dr. Heaton, after the loss of his darling and promising son, whom he had fondly hoped would be his staff in his old age, was afflicted with heart disease, caused by grief; and at the age of seventy died of cystitis in July 1879, leaving a widow and one daughter, and many patients and friends, to mourn his loss. He died respected and honoured, leaving no little wealth, mostly accumulated by successful operations in various branches of surgery.

APPENDIX TO AMERICAN EDITION.

After devoting much thought and study to the subject of Hernia, the author would take this opportunity to state the following conclusions: In small herniæ or bubonocèles occurring in patients from four to twenty years of age, who otherwise enjoy good health, an injection of iodine, sulphuric ether, alcohol, oak bark, or, as one surgeon writes me, of sulphate of zinc — fifteen grains to the ounce of water — will generally effect a cure, if all the directions I have given are carefully followed out in every particular. In very large herniæ, or those of long standing, the cure will be more difficult of accomplishment, and we cannot expect a permanent cure so confidently as in the simpler cases of small and recent herniæ. The cure can be accomplished only by impressing upon both the patient and ourselves that the action of any fluid we may elect is only the primary step in the operation, remembering that with a stimulating fluid we are hastening, with some degree of certainty, what might take place more slowly under the wearing of a truss. I would add that my experience with various instruments and injecting fluids leads me to believe that the use of the instrument and mixture devised and recommended by the author, together with the various improvements and modifications suggested in this work, will, in all cases, give the greatest freedom from danger and assurance of success in the treatment of Hernia by the subcutaneous method of Dr. Joseph Pancoast, as practised for many years by the late Dr. George Heaton.

These large and old herniæ may require several injections before we effect a cure. The injections should be repeated once in three to six or eight months, or upon the least signs of any weakening of the parts. As soon after the operation as possible a good truss of steel, or an elastic bandage with proper pads, should be applied. This should be worn constantly while in the upright position. The patient should wear a truss and remain under our observation for a year or more, and be carefully examined from time to time, so that successive irritation and inflammation of the parts may be made, if necessary, either by gentle pressure or by a new injection if needed. If we treat our cases with judgment, taking all

possible care and pains, we shall by perseverance be rewarded with the cure of many unpromising cases, but if, according to the method of one *author*, we inject only a *little* fluid, use only a *cloth* bandage and discharge the patient after a few days have elapsed as cured, we shall be most certainly disappointed.

To facilitate the operation still more I would present to your attention the following remarks upon bandages:—

BANDAGES.

As the bandages and compressing pads are a very important factor in obtaining satisfactory results in this operation, a few words upon this point seem to be necessary. It will be found that a strong elastic bandage, or, still better, one of pure rubber, will be of very great advantage in maintaining perfect compression of the parts during all of the treatment. Such a bandage does not slacken by stretching, as does ordinary cotton or linen cloth. It should not be drawn very tight for the first four or five days. After this time, if the swelling and inflammation be not too great, the bandage may be tightened so as to compress a little more severely, but not enough to give rise to much pain or discomfort.

We should always remember that pressure is of the greatest importance in obtaining a successful issue in many operations, and particularly in this operation under consideration. Nothing can equal this rubber bandage for obtaining a firm, but gentle, pressure.

This bandage, when pure rubber, should be 6 or 8 feet long, and 3 or 3 1-2 inches wide, and of the thickness usually in use.

It can have a tape attached to one end, sufficient in length to pass around the body and be tied above the symphysis pubis in a bow knot. Before applying the bandage I usually apply a thin piece of coarse cotton or linen cloth next the parts, to absorb perspiration and give a more agreeable sensation than the clammy rubber would give. In adjusting this rubber bandage we can, by passing the fingers beneath it, judge the amount of pressure proper to apply. This same equal pressure can be maintained, as we pass the bandage around the body twice or more.

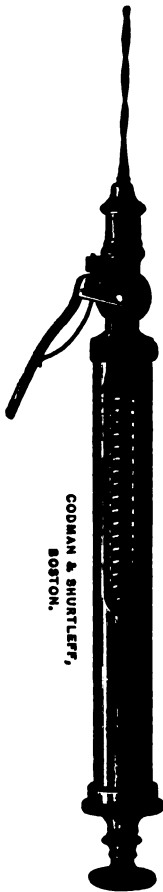
The elastic webbing is too thick and bungling to be adjusted well, so that I have abandoned its use in these operations. The perineal bandage, I prefer, should be made of cotton flannel, as it is much softer. Those who prefer linen will find that a little cotton rolled within it will make it far easier to the patient.

The head of this bandage should be fastened over the trochanter and brought not too spirally around the hip, and fastened by passing it under the rubber bandage, and bringing the end over to make a loop, that can be pinned in front by the ordinary safety pins. It should not be drawn so tight as to narrow or contract the rubber bandage. A linen napkin, folded so as to be about three or four inches wide and forming a compress about one-half an inch in thickness, will be found to make a satisfactory compress.

A NEW INSTRUMENT.

Being desirous of having a lighter and less complicated instrument for performing the operation of subcutaneous injections, I have devised the instrument here figured. This was made for me by Messrs. Codman and Shurtleff of Boston, and Milliken and Down of London. It is equally as effective as the one figured and described on page 157, and is not a quarter part as expensive. In general appearance it is similar to my first syringe (figured on page 144). It has a valve by which we can control the fluid, the head of the needle revolves on a ruby, and a spiral spring upon the piston within the barrel forces the plunger down upon the fluid, ejecting it through the valve. A screw on the piston, similar to that seen on the common hypodermic syringe, regulaets, with great certainty, the number of drops of fluid we wish to use.

This is my latest device, and it is very much lighter, and more fully under control of the operator, than any of my previous instruments.



From information which I have obtained from records and documents, and other sources, I am convinced that the honor of the discovery of the subcutaneous operation and method of curing Hernia, by injection, belongs rightly to my esteemed and distinguished fellow-countryman, PROFESSOR JOSEPH PANCOAST, M.D., at that time Surgeon in the Philadelphia Hospital, who operated on thirteen cases of Hernia, in 1836, using Lugol's solution of iodine, or tincture of cantharides, drams ss. *Vide* page 283 of the "Treatise upon Operative Surgery," by Joseph Pancoast, M.D., 1844. The instrument there figured and described is similar to the one used by Dr. Heaton in his first operation, in 1840-41. *Vide* present work, page 272, fig. 74a. Dr. Heaton experimented with Lugol's solution of iodine, tincture of cantharides, essential oils, and various other liquids; but soon abandoned these for the extract of *Quercus alba*, which he injected with a syringe of his own invention. *Vide* page 272, fig. 74 b).

In the present work I have given to Dr. Heaton the honor and credit of being the originator of the method of injection for the cure of Hernia; but I am convinced that the first operator who used this method was Professor Joseph Pancoast, and to him belongs the honor of originating it. Dr. Heaton, by experimentation, found a fluid more suitable for the purpose than that used by Professor Pancoast.

In honor of Professor Pancoast, who originated the method of injection, I would most respectfully suggest the propriety of calling the operation the "Pancoast Operation for the Cure of Hernia by the Subcutaneous Method."

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Page 273, 16th line from bottom, read Royal Medical and Chirurgical Society.

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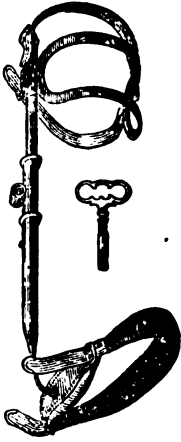
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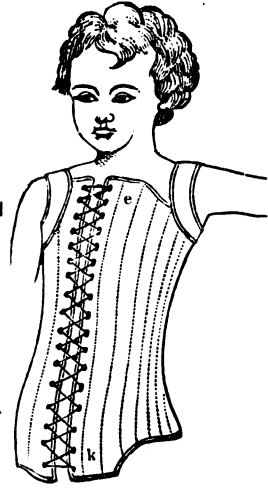
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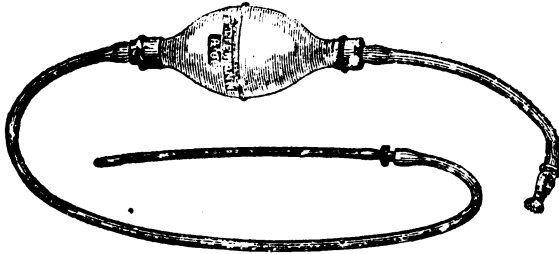
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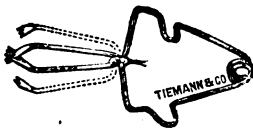
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