

(5) Too often the patient makes his own diagnosis as to the cure of his hernia (the swelling produced by the injection blocks the hernia. He then believes a cure has been obtained. When the edema and swelling subside he may find his hernia recurring. Actually his hernia was not cured and what we observe is a natural process, the absorption of the products of inflammation. Frequent examinations are necessary before we can be sure sufficient injections have been given).

ADVANTAGES.—(1) Patient is able to continue his regular occupation.

(2) No serious complications have resulted from the injection treatment.

(3) Patients suffering from constitutional diseases, where surgery is contraindicated, can receive treatment.

(4) In the recurrent herniae following operation, if the defect is not too large, this method offers the patient a way out of his difficulty if he does not wish another operation.

(5) Applicability to patients of advanced age (while difficulties have been experienced in closing herniae in the older age group that have been present many years, some excellent results have been obtained in aged patients).

CONCLUSIONS

The merits of hernioplasty versus the injection treatment is a question naturally asked. In some respects the problem is identical with the question of medical treatment versus surgery in the treatment of peptic ulcer. The medical treatment may require several months, the surgical often one operation. The impossibility of standardizing this method with respect to the number of injections and length of time treatment is required and also its ambulatory nature (success depending on the patient's cooperation) have been factors in many poor results. *Too much emphasis has been placed on the injected solution and not enough on a proper fitting of the truss.* The injection therapy has a place in the cure of hernia and instead of condemning it as quackery, surgeons should add it to their armamentarium in the treatment of hernia. The small hernia in the young individual offers the *ideal* case for treatment by this method.

THE INJECTION TREATMENT OF HERNIA

AN EVALUATION OF THE TECHNIC AND RESULTS

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THE technic which is employed at the Minneapolis General Hospital for the cure of hernia, by the injection method, carries out the same principles as those which are employed in the surgical treatment of this condition, *i.e.*,

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the closure of the defect through which the hernia passes and the occlusion of the hernial sac.

Whether or not these principles are accomplished by one method or another should make no essential difference as long as the risk of doing it is not increased and the end-results are satisfactory. Likewise the solution which is employed to cause the irritation, and thereby produce fibrous tissue hyperplasia, is of secondary importance as long as the solution does not produce too extensive damage to the tissues. There are some side-effects produced from the injection of some of the solutions, which have been employed for this purpose, which, though they may not be harmful, seem undesirable. Among these are excessive exudative reaction in the tissues following injection, pain produced from the injection and the danger of systemic reaction from an inadvertent intraperitoneal or intravenous injection.

There are a number of solutions which have been recommended for the injection treatment of hernia. These solutions are essentially of two different kinds: Those containing an acid in alcoholic solution or caustic salts (the principle ones of which are tannic acid, phenol and zinc sulphate) and those consisting of a mild soap solution. Most all of the solutions produce the desired irritation and the development of fibrous tissue but some of these present undesirable features because of their excessive irritating qualities, pain produced from their injection or danger from systemic reaction if inadvertently injected into the blood stream or peritoneal cavity. This is particularly true of the acid-alcohol solutions. It appears, from the evidence obtained at the Hernia Clinic of the Minneapolis General Hospital, that the mild soap solution which we have employed possesses advantages which have not been obtained from the use of the acid-alcohol mixtures.

FACTORS IN DETERMINING THE SELECTION OF CASES.—The selection of suitable cases for the injection is a large factor in the determination of the end-results. It is not presumed that every hernia can be cured by the injection method. On the other hand, an unwise selection of cases will materially decrease the percentage of cures and thereby detract from the true value of the method. Experience has taught the value of judicious selection. In order to be suitable for the injection treatment the hernia must be first reducible and capable of being retained with a properly fitting truss.

As the external ring is the only measurable criterion by which the suitable case can be selected, an effort has been made to determine, from this physical finding, those cases which are satisfactory subjects. If the external ring measures more than 3 cm. in diameter, it has been found that a cure is difficult to obtain. For that reason we have arbitrarily chosen to exclude from the injection treatment, individuals whose external ring is larger than 3 cm. in diameter.

Excessive obesity is also a contraindication for the injection treatment. It may be difficult to define at what stage a person may be considered excessively obese but for our purposes if the obesity is sufficient to make examina-

tion and identification of the inguinal anatomy difficult it is then sufficient to make a cure by the injection method unsatisfactory.

Individuals who are required to strain at stool or while urinating; those with a chronic uncontrollable cough or any other condition which will produce abnormally increased intra-abdominal pressure are not accepted for the treatment until these factors have been controlled.

Age is not a factor. The young as well as the aged can be satisfactorily treated and cured. Syphilis, diabetes, hemophilia and a number of other diseases have been considered contraindications but these do not constitute absolute contraindications and may be left to the judgment of the physician.

Technic.—The accompanying drawings illustrate clearly the mechanics of depositing the solution in the proper position. The details of the technic have been more fully dealt with by Dr. Bratrud.

DIRECT INGUINAL HERNIA.—In cases of direct inguinal hernia the plane of the weakened transversalis fascia, overlying the lower half of Hesselbach's triangle, is infiltrated with the irritating solution by placing the injections successively, at two or three day intervals, in the areas indicated by the numerals 1 to 10 (Fig. 1). This accomplishes the purpose of closing the defect through which a direct hernia passes, just as is done at the surgical operation when suturing the conjoined tendon to Poupart's ligament, under the cord. In this type of hernia the sac drops back into the peritoneal cavity and is, presumably, eventually contracted and obliterated by the scar tissue which is formed above it in the plane of the transversalis fascia.

Twelve injections have been found to be the average number required for the direct inguinal hernia.

INDIRECT INGUINAL HERNIA.—In cases of indirect inguinal hernia the internal ring is first constricted by injections placed circumferentially around the cord at the point where it makes its exit from the abdominal cavity, as indicated in Fig. 2 by numerals 1, 2, and 3. This constriction of the internal ring accomplishes the same principle as is accomplished at the surgical operation when the internal ring is made narrower with the aid of a Coley's stitch. Subsequent injections are placed circumferentially around the cord, in the inguinal canal, as indicated in Fig. 2 by the numerals 4 to 10. These tend to constrict the inguinal canal just as is effected at the surgical operation when the fascia of the external oblique is sutured over the cord. A few additional injections are placed in the plane of the transversalis fascia just as is done for the direct inguinal hernia (Fig. 1). These latter strengthen the floor of the inguinal canal and are comparable to suturing, at operation, the conjoined tendon or one of the leaves of the external oblique fascia to Poupart's ligament, under the cord. It is important to place a few of these latter injections at the lower angle of Hesselbach's triangle, near the pubic tubercle, in order to reinforce this area, as is so often emphasized at the surgical operation when the young surgeon is taught to catch the first stitch directly into the pubic tubercle and fasten it to the apposing end of the ilio-inguinal ligament.

Those injections which are placed superficial to the cord but under the

fascia of the external oblique muscle (this being the most superficial position of the hernial sac) cause the inflammatory reaction to extend into the hernial sac and thereby occlude it as its two apposing surfaces become adherent to one another with newly formed fibrous tissue. This contention has been positively demonstrated in two cases which were pronounced cured of their hernia and who were subsequently explored during the performance of an incidental appendicectomy through a low transverse-oblique incision.⁹ In addition, proof has been afforded from the observation of several cases in which an hydrocele corresponded in position to the previous location of the hernial sac. The hydrocele fluid could not be forced back into the peritoneal cavity, indicating

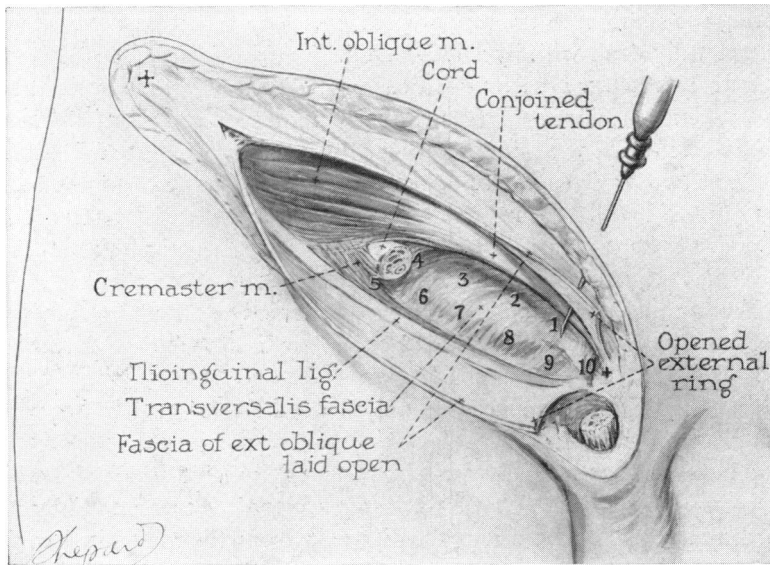


FIG. 1.—Method of injecting a direct inguinal hernia. The injections are made at the sites indicated by the numerals 1 to 10. These are in the plane of the transversalis fascia, lying below the level of the spermatic cord.

that the neck of the herinal sac had been occluded. These hydroceles have all been aspirated (the diagnosis thereby confirmed) and a small quantity of the irritating solution injected into their lumen, eventually resulting in their complete and permanent eradication.

In both the direct and indirect inguinal hernia the external ring is made smaller by injections placed around the margin of the external ring, in the plane of the fascia of the external oblique (Fig. 3).

The average number of injections for the cure of indirect inguinal hernia has been found to be 10. Some cases have been cured with fewer injections, whereas others have required as many as 20 to 30 injections. These latter are, no doubt, some of the cases which did not receive the injections in the proper position or were patients in whom it would have been better to have recommended surgical operation.

GENERAL CONSIDERATIONS AND PRECAUTIONS.—The approach to the in-

INJECTION TREATMENT OF HERNIA

guinal region is made from above downward, with the needle held at an angle of 40° with the skin of the abdomen. This approach, we feel, avoids the danger of entering the peritoneal cavity, as at this location the peritoneal cavity slopes away from the surface plane of the abdominal wall. There are certain definite symptoms produced if the needle encroaches upon the peritoneum or the spermatic cord. If the peritoneum is punctured, or touched with the needle point, the patient experiences pain throughout the lower part of the abdomen and reflexly tenses the lower abdominal muscles with a quick sudden jerk. If the injection is continued and the solution deposited into the peritoneum the patient will experience a shock-like reaction, with cold sweat,

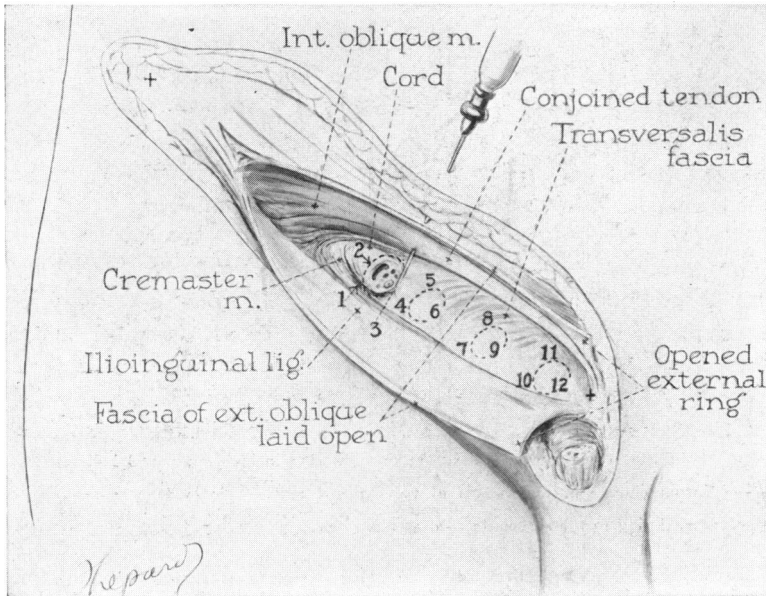


FIG. 2.—Method of injecting an indirect inguinal hernia. The injections are made circumferentially around the cord, as indicated by the numerals 1 to 12. The first three injections are made around the internal ring. Subsequent injections are placed around the spermatic cord. A few additional injections are placed in the plane of the transversalis fascia as indicated in Fig. 1, particularly at the sites indicated by numerals 1, 2, 8, 9, and 10. (These drawings are a copy of those which have been previously published in the *Southern Surgeon*.)

slow pulse, pain and rigidity of the lower abdominal muscles. These symptoms will subside within 20 or 30 minutes and leave no residual effects unless the solution has entered the peritoneal cavity, in which event the symptoms will persist for two or three days, eventually subsiding without harmful effects. This complication requires observation but no surgical intervention unless the bowel appears to have been injured. If the spermatic cord has been punctured the patient will experience pain which radiates into the penis or testicle. If the solution is injected into the cord an induration of the cord will result. If the tannic acid-alcohol solution is injected intravenously, an accident which may occur inadvertently, the patient will experience a shock-like reaction which may rightfully give cause for a great deal of apprehension.

The intravenous injection of the soap solution gives the patient the taste of soap and a tingling sensation of the body from which they recovered within a few minutes.

The use of a local anesthetic, preliminary to the injection, has not been considered advisable as it may disguise the signs, as mentioned above, which would otherwise help to avoid a misplaced injection. In using the soap

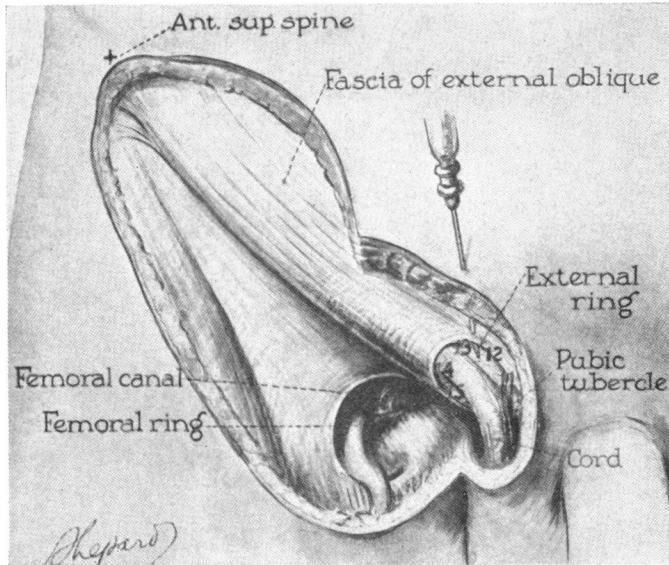


FIG. 3.—Method of injecting the external ring in both direct and indirect inguinal herniae. Note how the needle passes first through the fascia of the external oblique at the margin of the external ring. This is done so as to get the solution below the external spermatic fascia which passes from the external ring to the spermatic cord at this point.

solution the pain from its injection is so mild that it has never been considered necessary to use a local anesthetic. The tannic acid-alcohol or the zinc sulphate solutions produce so much pain from their injection that it is often difficult to obtain a continued cooperation of the patient unless a local anesthetic is injected a few minutes before.

END-RESULTS.—It is of interest to mention the statistics of Wollermann¹¹ who made a comparison of the injection method with those of the surgical operation (Table I).

TABLE I

	Injection Method	Operative Method
Total number of cases treated	2,949	1,140
Exaggerated reaction and swelling without suppuration	33	130
Prolonged suppuration (deep abscesses, fecal fistula, etc.)	20 (.7%)	23
Testicular atrophy	2 (.07%)	5
Deaths	1 (.04%)	5

The average incidence of cures, as compiled from the figures cited in the literature by Kretzschmar, Mayer,⁸ Campos and Subirachs,⁴ Jameson, Wolfe,¹⁰ Wyss,¹² Gray,⁷ Wollermann,¹¹ and Bratrud, totaling 6,550 cases, was 92.6 per cent. The results which we have obtained by questionnaire from 23 doctors revealed 2,216 cases treated and controlled. Eighty-five per cent of these were cured.

A review of the cases at the Minneapolis General Hospital revealed 804 individuals with 1,025 herniae. In 213 of these patients treatment was advised but not given because the patients did not return; 115 patients were referred directly for surgical operation since it was felt that in these patients the hernia would not respond favorably to the injection treatment; 97 of the patients have not received sufficient treatment to be pronounced cured. Some of these have not returned for more treatments and may be cured but have not been included in the known results because we have not been able to obtain a final check up. Cures have been obtained in 379 patients with 445 herniae. Eleven have failed to respond to the treatments. The cure of these cases has been determined by personal follow up observation. No patient has been pronounced cured until the check up examination has revealed "no impulse" for a period of six months after the last treatment and until the patient has been without his truss for at least four months. No deaths have occurred in any of the treated cases.

If only the controlled cases are calculated, 97.6 per cent cures are obtained. Comparing these figures with those which are reported from the surgical treatment, in which statistics ranging from 3 to 30 per cent of recurrences are recorded, it would seem that the injection method offers some advantages. Gibson and Felter,⁶ reviewing 1,618 surgical cases, found recurrences in 2.9 per cent. Cattell and Anderson⁵ found 6.7 per cent recurrences with unilateral hernia and 18.1 per cent with bilateral herniae. Block² made a study of a large series of European cases and found recurrences in 3.5 per cent of the herniae treated by surgery. Andrews and Bissell,¹ from a review of cases treated at the Johns Hopkins Hospital, the Massachusetts General Hospital and the Presbyterian Hospital in New York found that recurrences ranged from 4.1 to 32 per cent with an average of 20 per cent.

COMPLICATIONS AND SEQUELAE.—Seventy-eight of the 445 cured herniae reported in this paper developed complications, or sequelae, at one time or another during the course of treatment. These complications were as follows: Induration of the cord, 44 cases; superficial ulceration of the skin, as a result of the truss irritation, eight cases; severe pain, suggesting peritoneal irritation, ten cases; chemical peritonitis, two cases; hydrocele of the cord, seven cases; local abscess, two cases; dermatitis, one case. The first three of these complications are of no prognostic significance. The induration of the cord might be compared to the induration of the wound, following surgery. It is rare that anyone ever mentions this as a surgical complication. It adds no difficulties to the healing and does not endanger the life or health of the individual. In fact it probably indicates that the hernial sac is being obliterated by fibrous

tissue formation between its two apposing surfaces. There is histologic evidence to substantiate this contention, as has been shown in a previous publication.⁹ Superficial ulceration of the skin, from the truss irritation, would occur whether or not the injections were given. Pain from the injection, too close to the peritoneum, is comparable to the pain which is experienced when the peritoneum is pulled upon at the time of operation if local anesthesia is being used. Therefore, if these three sequelae are excluded from the list of complications so as to make a series which can be compared with the surgical complications, we find the incidence of 4 per cent.

Gibson and Felter reviewed 1,618 surgical operations for hernia. They found complicating factors in 368 of these. Some of these untoward results were evidently not the direct result of the surgical operation. Among these were pneumonia, 34 cases; bronchitis, three cases; cough, 30 cases; infarcts, eight cases; pulmonary tuberculosis, five cases; epididymitis, two cases; varicocele, 23 cases; hydrocele, 74 cases; laryngitis, empyema and influenza, each one case. Among the cases which appear to have followed as a direct result of the surgical operation there were 70 cases of wound infection; 59 hematomata; 21 orchitis; two accidental incisions of the bladder, and one each of accidental cutting of the spermatic cord, a large artery, and the sigmoid colon. If these latter complications are included among the complicating cases so as to make it comparable to our injected cases it is found that the incidence of complications from the operation is 9.7 per cent. This figure represents a little more than twice as great an incidence of complications as that which we have observed from the injection treatment.

CONCLUSIONS

With these briefly stated facts, comparing the surgical results and complications with those from the injection method, it appears that the injection method offers a procedure, to the medical profession, which should have a very decided value in the treatment of carefully selected cases of hernia. The technic is not difficult and can be acquired by anyone who wishes to take a little time to study the method. It must be carefully performed, however, in order to obtain the most satisfactory results.

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STERILITY FOLLOWING THE INJECTION TREATMENT OF HERNIA

A DETERMINATION OF ITS INCIDENCE

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STERILITY has been impugned as a complication of the injection treatment of inguinal hernia in the male. This suggestion occasioned the writer to investigate the potential sterility of patients with bilateral inguinal herniae who had been subjected to this type of treatment. No one has apparently deemed it necessary to inquire into the question of possible sterility following the operative repair of hernia. That the possibility for such an occurrence exists is evident in that in large series of operations, undertaken for the cure of indirect inguinal hernia, postoperative swelling of the testis appears as a complication in about 6 per cent of cases; such postoperative testicular swelling leaves the patient with an indurated, enlarged, or atrophic testis (Taylor,⁸ Cattell and Anderson¹). The occasional swelling of the spermatic cord accompanying the injection treatment of hernia prompts this investigation.

The problem of impotence is not to be confused with that of sterility. Impotence is a disturbance of function; sterility a failure of reproduction. A man may be impotent but fertile, and *vice versa*. Impotence presents varying degrees of disturbance of normal coitus, from premature ejaculation to total loss of erection. The causes of impotence may be primary or functional (loss of potency from psychic inhibitions) or secondary to organic pathology

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