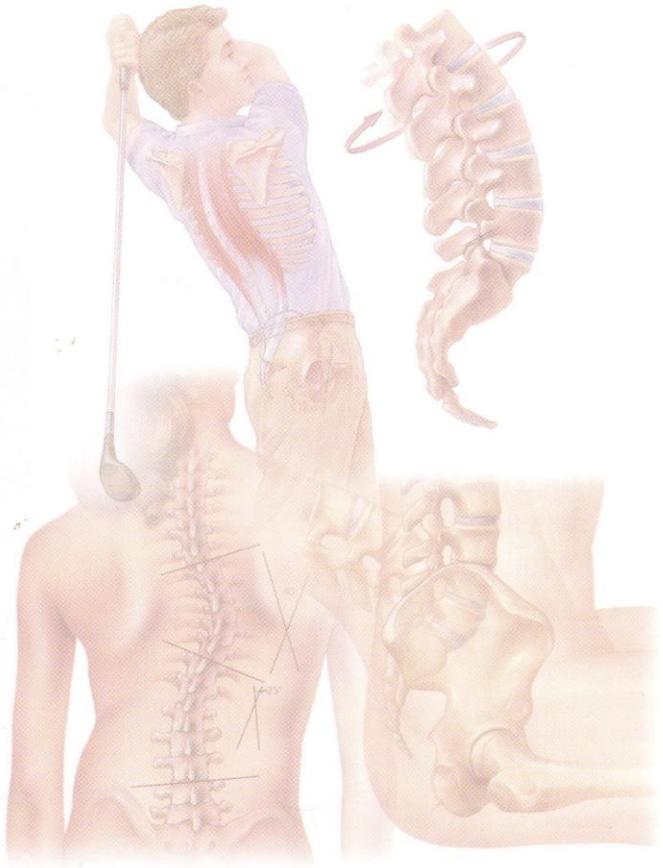
The Pain Clinic

A Multidisciplinary Approach to Acute & Chronic Pain Management

Statement of Purpose

Pain is a symptom, and the number one reason that a patient seeks medical care. To help you better deal with both acute and chronic pain management, this journal will present new protocols and therapies, new technology and procedures in a practical, clinical format. Too often, the management of pain is overlooked because so little is actually known about the pathophysiology and psychology of pain. As a result, many patients have prolonged healing and a delayed ability to return to their normal activities of daily living. The Pain Clinic will provide you with the latest developments and assist you in helping your patients.



Regenerative Injection Therapy For Low Back Pain

Injecting proliferating solutions into painful areas can relieve low back pain.

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Pain arising from the ligaments and tendons of the low back and pelvis is difficult to distinguish from other sources of low back pain by physical examination alone. Left unrecognized or untreated, traumatic or overuse injuries can linger indefinitely, leading to degenerative changes and significant disability.

One option for treating chronic low back pain is Regenerative Injection Therapy (RIT) also known as Prolotherapy. RIT/prolotherapy restores impaired elasticity and the tensile strength of connective tissue in posttraumatic or degenerative conditions, it works by just extending the proliferative stage of the healing regenerative process.

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Prolotherapy has been used for many years. In 1930, Leriche was the first to describe the injection of procaine hydrochloride (Novocain) at the fibro-osseous junctions for treatment and differential diagnosis of ligamentous sprains.[1] In 1936 and 1938, Haldeman described the injection of procaine into posterior sacroiliac ligaments for the treatment and differential diagnosis of low back pain.[2] In 1937, Gedney began to treat unstable painful sacroiliac joints with injections of procaine and a sclerosing solution.[3] One year later, Steindler, using a series of procaine injections, implicated interspinous, sacroiliac ligaments and facet joints as significant sources of low back pain.[4] In 1939, Kellgren published charts showing the distribution of pain arising from lumbar interspinous ligaments.[5] By 1956, Hackett had published maps of referred pain from the iliolumbar, posterior sacroiliac, sacrotuberous, and sacrospinous ligaments that could be treated using prolotherapy.[6] Yet despite this history and the well-known postulate that any innervated structure is a potential source of pain, only a small group of practitioners includes ligaments and tendons of the lower back in their differential diagnosis of low back pain.

PERTINENT CLINICAL ANATOMY

The most current review of the gross anatomy of the lumbosacral and pelvic ligamentous complex was published by Willard in 1995.[7] He emphasized that various ligamentous and fascial structures of the lower back form a continuous connective tissue stocking surrounding and interconnecting various soft tissue and osseous structures. Each of these structures was preserved in place by Willard's dissection of the osseous components. Although each of the connective tissues has a slightly different biochemical structure, they blend at their boundaries and function as a single unit. On the cross-section view, the lumbar interspinous ligaments have a triangular shape, but from the lateral aspect, they appear as a fan-like arrangement of fibers. The interspinous ligaments are anchored anteriorly to the ligamentum flavum and posteriorly to the supraspinous ligament, which is attached to the thoracolumbar fascia.(fig. 1&2) The fan-like shape allows the interspinous ligaments to

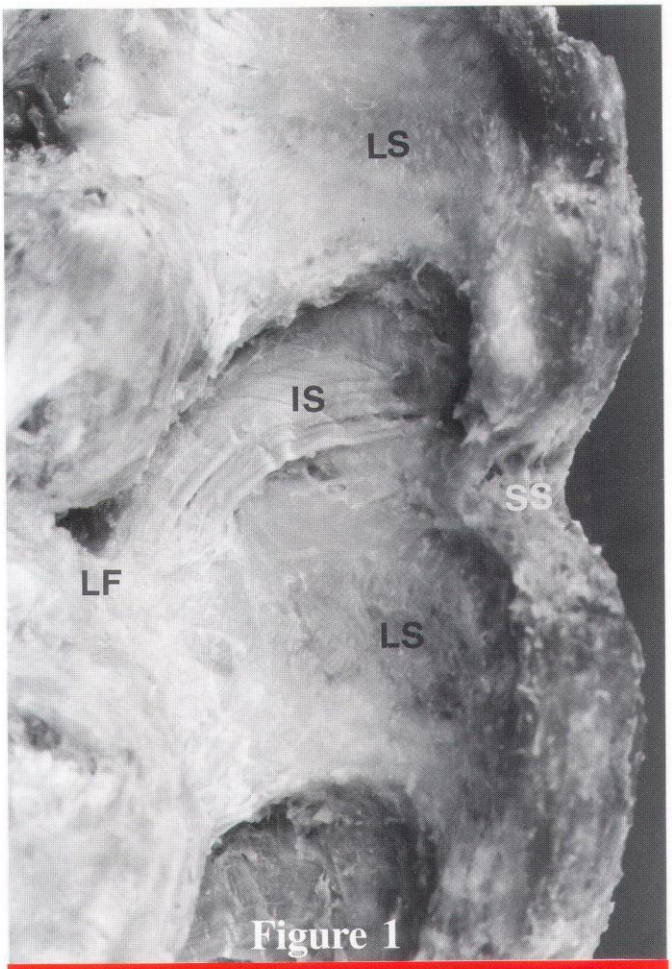


Figure 1

IS - Interspinous Ligament: Note the fan-like shape orientation of the collagenous fibers

LF - Ligamentum Flavum: The fibers of the interspinous ligament blend with LF fibers anteriorly

SS - Supraspinous Ligament: The fibers of the interspinous ligament blend with the **(SS)** fibers posteriorly, the latter is attached to the thoracolumbar fascia. This arrangement serves to transfer the tension from thoracolumbar fascia to ligmentum flavum

LS - Lumbar Spinous Process

expand without rupture when the lumbar vertebrae separate during flexion; it also transmits anteroposterior pull during flexion from the thoracolumbar fascia to the ligamentum flavum, preventing the latter from buckling into the spinal canal and helping align the lumbar vertebrae.[7] Chondrocytes are present along the osseous borders of the interspinous ligament, which predisposes this structure to chondrification after the third decade of life. Degenerative processes also promote chondrification.

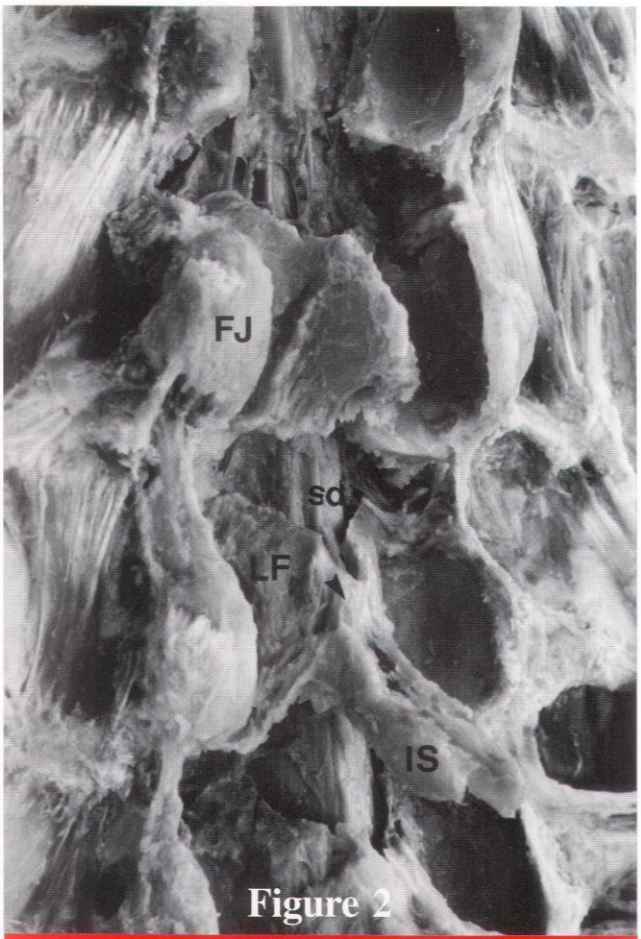


Figure 2

FJ - Facet Joint Capsule

LF - Ligamentum Flavum: The fibers of the interspinous ligament blend with LF fibers anteriorly

IS - Interspinous Ligament: Note that the osseous structures of the spinous processes have been carefully dissected. The continuity of the ligamentous stocking of the lumbar vertebrae are preserved in place, specifically the continuity of ligamentum flavum with the facet capsule (FJ) and interspinous ligaments **(IS)**.

sd - spinal dura

INNERVATION

All of the connective tissues in the lumbar area are well innervated by small-caliber primary afferent fibers, typical of those involved in nociception. Innervation of the posteriorly located lumbosacral and pelvic structures is important for differential diagnosis because by blocking off the structure proper or its nerve supply, the clinician can verify the precise structure that is causing pain. Structures treated by prolotherapy are innervated by the medial, intermediate, and lateral branches of the dorsal rami. The posterior zygapophyseal joint capsules, interspinous and supraspinous ligaments, medial tendon insertions of multifidi and interspinalis muscles, and medial insertions of thoracolumbar fascia are innervated by the medial branches of the dorsal rami.

Laterally located structures, such as the tendons of the iliocostalis muscle, are innervated by the lateral branches of the dorsal rami. No consensus exists on the innervation of the iliolumbar, sacroiliac, sacrotuberous, and sacrospinous ligaments. However, the dorsal rami from L3 through S3 may innervate these structures. Of importance for prolotherapy are the structures that insert or originate at the spinous and transverse processes, lamina and posterior facet joint capsules, posterior superior and inferior iliac spines, iliac crests, spinous processes of the sacrum, ischial tuberosity, lateral aspects of the inferior sacrum, trochanteric area, and hip joint capsule.[8,9]

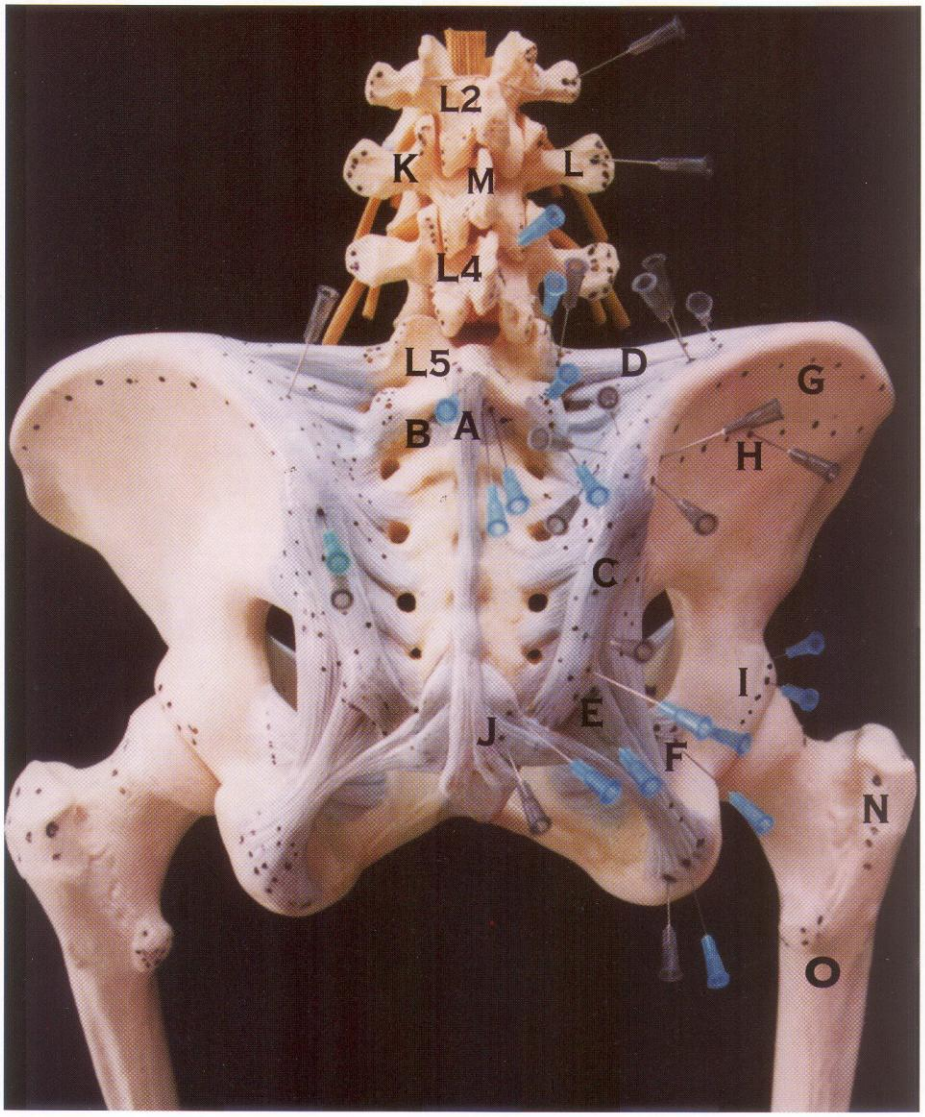
TYPES OF LOW BACK INJURIES TREATED WITH RIT/PROLOTHERAPY

RIT/Prolotherapy can be used to treat sacroiliac sprains or strains, hyperextension or hyperflexion injuries, lumbar facet syndrome, failed back syndrome,[10] straight back syndrome, regional myofacial pain syndrome, fibromyalgia, spondylolysis, spondylolisthesis, compression fractures and lumbar enthesopathy (a painful degenerative process that results in deposition of poorly organized granulation tissue and fatty degeneration at the fibro-osseous or fibromuscular interface and leads to loss of function).[11-13]

When sprains or strains occur in the appendicular ligaments or muscles and tendons, they are considered separate injures and classified as first, second, or third degree depending on their severity. However, clinicians do not agree on the classification of sprains and strains occurring in the vertebral and paravertebral ligaments and tendons, and definitions of and distinctions between these two injuries are vague.[14] The healing process for sprains, strains, and overuse injuries to ligaments or tendons begins with migration of inflammatory cells to the injured site. This, in turn, signals migration of fibroblasts to the same site and triggers production of procollagen.

Figure 3

Black dots represent most common sites for droplet infiltration of prolotherating solutions



A - Supraspinous ligament
B - Interspinous ligament
C - Sacroiliac ligament
D - Iliolumbar ligament
E - Sacrotuberous ligament
F - Sacrospinous ligament
G - Sites of insertion of gluteus maximus short tendons
H - Sites of insertion of gluteus medius short tendons
I - Sites of acetabular attachment of hip joint capsule
J - Sacrococcygeal ligament
K - Facet joint capsule
L - Site of medial insertion of anterior layer of thoracolumbar fascia sheet and intertransverse ligaments at the tips of transverse process
L2-L5 - Lumbar vertebrae
M - Apex of spinous process insertions of supraspinous ligament and dorsal layer of thoracolumbar fascia.
N - Site of trochanteric attachment of gluteal tendons
Some needles are also shown in position for injections that are usually performed in a fan- or cone-wise fashion utilizing withdrawal and reinsertion of the needle.
O - Lesser trochanter

The procollagen cleaves to form collagen, which lines up with the collagen of the connective tissue in the area of injury. In the last stage of healing, the repaired tissue contracts to restore tissue integrity. Natural healing can return local connective tissue to its pre-injury length but to only 50% to 70% of its pre-injury tensile strength.[11]

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Chronic sprains and strains, overuse injuries, and repetitive motion disorders may represent a failure of the normal connective tissue repair process. Biopsies of tissue from such injuries show disorganized collagen, excessive matrix tissue, insufficient elastin, disorganized mesenchymal cells, vascular buds with an incomplete lumen, and fewer white blood cells.

The repetitive microtrauma apparently exceeds the connective tissue's capability for repair. (Connective tissue is bradytropic, meaning its capability for repair is slower than that of muscle tissue.)[11-13]

Given the underlying pathology of chronic strains, sprains, and overuse injuries, nonsteroidal anti-inflammatory drugs are unlikely to be effective. Instead, a reasonable treatment approach is to stimulate an inflammatory-mediated response to trigger production of fibroblasts, which in turn will trigger the synthesis of procollagen-containing matrix. Collagen eventually converts from type I to type III and aligns with the existing connective tissue fibers.[11-13]

INDICATIONS AND CONTRAINDICATIONS

RIT/Prolotherapy is indicated for: (1) painful recurrent somatic dysfunction that improves temporarily with manipulation; (2) local tenderness to palpation; (3) hypermobility accompanied by a restricted range of motion at reciprocal motion segment(s); and (4) abolishment of pain after diagnostic local anesthetic block of the structures involved.[6,16,17]

Contraindications for prolotherapy are: (1) recent onset of a progressive neurologic deficit, including but not limited to severe intractable cephalgia, unilaterally dilated pupils, bladder dysfunction, and bowel incontinence; (2) severe exacerbation of pain after injection of a local anesthetic, resembling a reflex sympathetic dystrophy pattern; (3) paraspinal neoplastic lesions involving the musculature and osseous structures; (4) no improvement after local anesthetic injections; and (5) allergy to local anesthetics or proliferant solutions. Prolotherapy also should not be used in patients who request heavy sedation or large doses of narcotics before or after the prolotherapy procedure.

RADIOLOGIC EVALUATION BEFORE RIT/PROLOTHERAPY

Before undergoing RIT/Prolotherapy, patients must undergo a radiologic evaluation that includes, at a minimum, recent plain radiographic studies. Contrary to prevailing opinion, early radiologic investigation of painful vertebral and paravertebral areas is of benefit, including the use of plain radiography, magnetic resonance imaging, computed tomography, and bone scans when indicated.[15] Plain radiographs may detect structural or positional osseous abnormalities, anterior or posterior listhesis on lateral views (flexion, extension), or degenerative changes in general and deformity of zygapophyseal articulations in particular. Magnetic resonance imaging may detect intervertebral disk pathology, enthesopathy, ligamentous injury,

Before undergoing regenerative injection therapy, patients must undergo a radiologic evaluation.

interspinous bursitis, zygapophyseal joint disease, and bone contusion, fracture, or metastases. It is also used to evaluate the neural foramina and exclude spinal cord disease. A computed tomographic scan may detect small avulsion fractures of the facets, laminar fracture, fracture of vertebral bodies and pedicles, or degenerative changes. A bone scan is useful for assessing the entire skeleton to rule out a metabolically active disease process.

SAFE INJECTION SITES

The most common area of needle insertion for prolotherapy (Fig.3), as well as for local anesthetic blocks, is the fibro-osseous junction, also called the enthesis, (the site of attachment of tendons, ligaments, and fascia to bone).[6,11,16-18] The fibromuscular junction is another important site for injection but requires experience and a good "needle feel." For less experienced practitioners, droplet infiltrations of a local anesthetic in a cone- or fan-wise fashion at the fibromuscular interface are appropriate.

Although blocking the medial branches of the dorsal rami at the roots of the lumbar transverse processes may relieve pain, it also may implicate the wrong structures as the primary source of pain. For this reason, the original approach advocated by Kellgren[5] and supported by Hackett[6] is anatomically a more proper one. In addition, infiltrating the lateral aspects of the tips of the spinous processes is often necessary for diagnostic and therapeutic purposes.

If pain persists after injection of the median and paramedian structures, such as the interspinous ligaments and medial insertions of mulifidi and erector spinae tendons, injection of the laterally located structures should be considered.

MANAGING POST-PROCEDURAL PAIN

Immediately after undergoing prolotherapy, some patients experience pain. More common, though, is a sensation of stiffness and fullness at the injected areas. For most patients, acetaminophen provides sufficient pain relief after prolotherapy. However, between 30% and 35% of patients require opioid derivatives, such as acetaminophen-propoxyphene napsylate (Darvocet N1OO); Tylenol with codeine; hydrocodone bitartrate (Lortab 7.5 or Lortab 10), or acetaminophen-hydrocodone bitartrate (Vicodin ES or Vicodin HP) for several days post-injection. From an economic perspective, Vicodin HP and Lortab 10 are less expensive because patients can break the tablet in half and this half dose usually provides adequate pain relief.
Some patients may require muscle relaxants after prolotherapy. Baclofen (Lioresal) usually is sufficient for controlling muscle spasms. On rare occasions, the post-injection reaction must be modified or eliminated. In such cases, a short course of a nonsteroidal anti-inflammatory drug, one that the patient has tolerated previously, at usual clinical doses can be used.

CONCLUSION

RJT/prolotherapy can be performed in an ambulatory setting, provided the practitioner is thoroughly familiar with the regional anatomy to be treated.[17] Clinicians well versed in the use of RJT/prolotherapy may have ample opportunity to use this technique for relieving low back pain.

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The author would like to extend special thanks to Pamala Ward for her invaluable help in the preparation of this manuscript.

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