



Prolotherapy : Basic Principles

Prolotherapy is a technique that stimulates the body to repair the painful area when the natural healing process needs a little assistance. Because ligaments and tendons generally have a poor blood supply, incomplete healing is common after injury. Incomplete healing results in the normally taut, strong bands of fibrous or connective tissue becoming relaxed and weak. The relaxed and inefficient ligament or tendon then becomes the source of chronic pain and weakness.

The basic mechanism of prolotherapy is simple. A substance is injected into the affected ligaments or tendons, which stimulates the development and recruitment of stem cells. This triggers a wound healing cascade, resulting in the deposition of new collagen which then shrinks as it matures. The shrinking collagen tightens the ligament that was injected and makes it stronger.

The technique involves the injection of a proliferant (a combination of dextrose and procaine) that causes an inflammatory response which "turns on" the healing process. The growth of new ligament and tendon tissue is then stimulated. The ligaments and tendons produced after prolotherapy appear much the same as normal tissues, except that they are thicker, stronger, and contain fibers of varying thickness, testifying to the new and ongoing creation of tissue. The ligament and tendon tissue which forms as a result of prolotherapy is up to 40% stronger in some cases.

Research has demonstrated that prolotherapy strengthens and stabilizes tendons, ligaments, and joints., significantly reducing pain, and reversing the progression of osteoarthritis and degenerative conditions of tendons and ligaments. The overall result is improved functional capacity, irrespective of age.

Several excellent studies published in the last few years in respected specialty journals that have shown beneficial results to prolotherapy (1,2,3,4). In addition, the Mayo Clinic Health Letter spoke positively about prolotherapy and its future.(5) There have been two review articles recently published indicating significant benefits from prolotherapy and chapters are included in two newly published pain management textbooks (6,7,8,9).

References:

1. Topol, Gaston A,MD, Reeves, K. Dean, MD, Hassanein, K.M, PhD., "Efficacy of Dextrose Prolotherapy in Elite Male Kicking-Sport Athletes with Chronic Groin Pain", Arch Phys Med Rehabil , Vol 86, April, 2005.
2. Ohberg, Lars, Alfredson, H, "Sclerosing Therapy in Chronic Achilles Tendon Insertional Pain—Results of a Pilot Study", Knee Surg Sports Traumatol Arthrosc, (2003) 11:pp.339-343.
3. Centeno, Christopher, MD, Elliott, James, MSPT, et. Al, "Fluoroscopically Guided Cervical Prolotherapy for Instability with Blinded Pre and Post Radiographic Reading", Pain Physician, 2005;8:67-72.
4. Wilkinson, Harold, MD, PhD. 'Injection Therapy for Enthesopathies Causing Axial Spine Pain and 'The Failed Back Syndrome:' A Single Blinded, Randomized and Cross-Over Study", Pain Physician, 2005;8:167-173.
5. Mayo Clinic Health Letter, Volume 23, Number 4, April, 2005
6. Dagenais, Simon, DC, PhD., Haldeman, Scott, DC, MD, Wooley, J, DC, "Intraligamentous Injection of Sclerosing Solutions (Prolotherapy) for Spinal Pain: A Critical Review of the Literature", The Spine Journal 5 (2005) 310-328.
7. Rabago, David, MD, Best, Thomas, MD, et. al, A systematic Review of Prolotherapy for Chronic Musculoskeletal Pain", Clinical Journal of Sports Medicine, Vol 15, Number 5, September, 2005.
8. Linetsky, Felix, MD., Miquel, R, MD, Saberski, L., MD, "Pain Management with Regenerative Injection Therapy (RIT), Pain Management, A Practical Guide for Clinicians, Sixth Edition, American Academy of Pain Management, CRC Press, 2002, pp. 381-402
9. Linetsky, Felix, MD, Eek, B, MD, Derby, R, MD, Parris, C.V.W., MD, "Regenerative Injection Therapy", Low Back Pain, Diagnosis and Treatment, Interventional Pain Management, ASIPP Publishing, 2002, pp. 519-540.

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FAQ's

DO PROLOTHERAPY INJECTIONS HURT ?

"Do they hurt?" every new patient asks, as sweat begins to form on the patient's forehead and palms as the needle approaches its target. All doctors were probably taught the appropriate answer to this question in medical school. "It hurts a little."

Some people have many Prolotherapy injections and do not flinch, while others receive a few shots and have a rough time.

The needle piercing through the skin is the most painful part of the procedure. This can often be reduced through pre anaesthetizing the area and proper injection technique

Ninety-nine percent of our patients receive the treatments without pain killers and do just fine.

WHAT CAN PATIENTS EXPECT AFTER PROLOTHERAPY INJECTIONS?

After the procedure, most patients feel a fullness and numbness in the areas injected. Often, pain is relieved for several hours because of the local anesthetic that is injected along with the proliferant. The pain will usually become evident several hours later and usually peaks in 3-8 hours, although some patients never experience much discomfort at all. Discomfort at the injection sites may last 24 – 48 hours prior to the pain intensity lessening. The discomfort will continue to decrease over the next 3-7 days. Approximately 60% of the healing occurs in the first three weeks, while the remainder takes place over the next 6-8 weeks. The injections are usually repeated every 1-3 weeks, with 3-4 injections being performed at each area. Patients normally notice the greatest improvement 3-6 months after completing the injection series. Occasionally, repeat procedures may be needed if significant dysfunction still persists 6 months after the injections are completed.

DOES ANY OTHER TREATMENT NEED TO BE DONE ALONG WITH THE PROLOTHERAPY?

Joint mobilization is a very important adjunct to Prolotherapy treatments. In order for the damaged structural elements to heal properly, the joints they support must be in correct anatomical alignment. Patients are encouraged to have chiropractic adjustments or physical therapy joint mobilizations performed just prior to and 1-2 weeks after injections. After the individual injections, patients are encouraged to complete regular flexibility and stretching exercises. However, they are advised to limit stress of the injected area as this may prevent proper healing from taking place. Once sufficient healing has taken place (4-5 weeks), more strenuous exercise may begin under supervision, including strengthening and stabilization exercises. Supplements are also recommended to take before and during Prolotherapy injections. These include glucosamine, chondroitin, Vitamin C, and multi-vitamin/minerals. In addition, a diet high in lean protein and omega 3 fatty acids is extremely beneficial.



ARE ALL PATIENTS WITH CHRONIC PAIN CANDIDATES FOR PROLOTHERAPY INJECTIONS?

THE PERSON WHO RESPONDS TO PROLOTHERAPY IS THE ONE WHOSE PAIN IS DUE TO LIGAMENT AND TENDON LAXITY.

Proper patient selection is crucial to the success of Prolotherapy treatment. Prospective patients must have a structural problem with a ligament(s), tendon, or joint capsule causing much of their pain. Patients require a healthy healing potential and a strong immune system to benefit from this treatment. Good nutrition, exercise, and sleep habits are very important.

Poor prognosis is associated with patients who have primary discogenic or radicular (nerve) pain. Individuals who are alcohol or drug abusers, heavy smokers, suffer from chronic illnesses, including diabetes and immunosuppressive diseases, are bedridden with chronic pain, have secondary gain issues, or have a pain scale totally out of proportion to the clinical findings also do not do well with Prolotherapy.

In the patients we have treated with prolotherapy who also see a chiropractor, we are universally told how wonderful their alignment is after prolotherapy. What likely happens is that by tightening up the ligaments that hold the vertebrae in place, the alignment improves on its own without manipulation.

WHEN AND WHEN NOT TO INJECT

The only diseases that cause inflammation for which Prolotherapy may not be appropriate are the autoimmune diseases, such as rheumatoid arthritis and systemic lupus erythematosus.

HOW MANY TREATMENTS?

Every Prolotherapy doctor has patients who required many treatments. By and large, however, most people usually require four or five sessions. For an athlete who has had an injury for just a few months (or less) and is in excellent shape, the number of sessions may be even less. If someone comes to our office and is not significantly better by the third session, we will usually try increasing the strength of the solution or recommend doing some diagnostic nutritional/hormonal testing to see if we can find the reason why the person is a slow healer.

Generally two out of three patients feel some pain relief with the first Prolotherapy treatment session.

RISKS OF PROLOTHERAPY

Because Prolotherapy causes inflammation, the person will often note some bruising, pain, stiffness and swelling in the area after receiving Prolotherapy. Typically this lasts 1 to 7 days. On rare occasions it lasts longer. Lasting longer is not necessarily bad, some people just inflame more easily. Since the treatment works by inflammation, lingering pain after Prolotherapy can be a sign of healing. Prolotherapy should not cause excessive, severe pain. Severe pain after Prolotherapy, especially accompanied by a fever, could indicate an infection.



Prolotherapy Can Help You If...

- Your pain is from a tendon or ligament injury

Prolotherapy is the only treatment that stimulates an inflammatory response in the body that causes the re-growth and strengthening of ligaments and tendons.
- Your pain is from degenerative arthritis and you have >75% range of motion

Instability of joints contributes to the progression of degenerative arthritis. If you have most of your range of motion intact prolotherapy can create stability and improve the function of joints and decrease symptoms of arthritis. Even if your range of motion is <75% prolotherapy may still be your best therapeutic option.
- Pain is your only major health concern

Even though prolotherapy is an extremely safe treatment it is important to be fit enough for treatment and to rule out other contributing factors for your pain other than instability.
- You have clicking in your joint that is causing pain

Poor stability in the joint leads to joint dysfunction and wear and tear. Prolotherapy increases the stability of the joint to improve joint function.
- Certain activities increase pain

The activities that cause pain put strains on certain parts of the joint that are unstable. Prolotherapy re-stabilizes the joint, which decreases pain through all ranges of motion.
- You have muscle spasms as part of your pain

Muscle spasms often occur as a protective response around a joint that is lax. By stabilizing the joint, prolotherapy can reduce or eliminate spasms.
- Your pain is better with rest

Unstable joints typically get worse with motion due to the extra strain placed on them. When stability in the joint is increased after prolotherapy treatment less pain is felt with motion.
- MRI and X-rays show nothing significant

This type of imaging rules out factors other than joint instability that may be causing your pain. MRI and X-rays are not necessary before treatment in most cases when a thorough physical exam is performed.
- Your sensation is normal

Normal sensation indicates that there has been no damage to the nervous system by factors other than joint instability.



RESEARCH

1. Hyaluronic Acid (Joint Lubricant) Production Increases With Exposure to Dextrose (Glucose) or Glucosamine. Both glucose (dextrose) and glucosamine increase hyaluronic acid production by synovial (joint lining) tissue from human knees.

Uitterlinden EJ; Koevoet JL; Verkoelen CF; Bierma-Zeinstra SM; Jahr H; Weinans H; Verhaar JA; van Osch GJ. Glucosamine increases hyaluronic acid production in human osteoarthritic synovium explants [pub ahead of print] BMC Musculoskelet Disord (), Sep 11 2008, 9(1) p120.

2. Growth Factor Production Occurs Promptly After Exposure By A Variety of Body Cells to Dextrose and Thus Would Be Expected to Increase Hyaluronic Acid Production as Well. Cells often produce growth factors which cause their own repair and multiplication. Ligament and tendon and cartilage cells are stimulated to produce the key growth factors for repair and replication by exposure to as little as 0.6% dextrose. Note also that growth factors for bone ARE NOT stimulated by dextrose exposure. Therefore there is no concern about causing spur formation of bony responses to dextrose.

Reeves KD Topol GA Fullerton BD Evidence-based regenerative injection therapy (prolotherapy) in sports medicine. In Seidenberg PH, Beutler PI. (Eds). The Sports Medicine Resource Manual. Saunders (Elsevier); 2008: 611-619.

3. 10% Dextrose injection protects cartilage in rabbits after cutting the ACL.

Park Y, Lim S, Lee I, Lee T, Kim T, Han JS. Intra-articular injection of a nutritive mixture solution protects articular cartilage from osteoarthritic progression induced by anterior cruciate ligament transection in mature rabbits: a randomized controlled trial. Arthritis Research & Therapy 2007. 9(1):R8

4. Injection of 20% dextrose in normal Achilles tendon led to an increase in fibril diameter and fibroblast proliferation in rats, and this was not stopped by oral NSAIDs. Needling and/or dextrose effects cause proliferation via mechanisms which are not merely inflammatory.

Kim HJ, Kim SH, Yun DH, Lee KS, Jeong TS. The Effects of Anti-inflammatory Drugs on Histologic Findings of the Experimental Prolotherapy Model. J Korean Acad Rehab Med. 2006 Aug;30(4):378-384

5. Injection of either 10% dextrose or autologous serum, but not saline, led to tissue regeneration in artificially created "holes" in cartilage in rabbit knee.

Kim SA, Kim EH, Kim SY, Lee SY, Yoon JN, Lee YK. The Effects of Hyperosmolar Dextrose and Autologous Serum Injection in the Experimental Articular Defect of Rabbit. J. Korean Acad Rehabil Med 2006 Apr;30(2):173-178. Korean

6. 10% dextrose injection superior to hypotonic lidocaine injection in advanced Knee OA. The hypotonic solution was not likely a placebo solution intraarticularly (see details), and had considerable effects on pain and range also in this population with advanced OA (35/111 bone on bone)

Reeves KD Hassanein K Randomized prospective double-blind placebo-controlled study of dextrose prolotherapy for knee osteoarthritis with or without ACL laxity. Alt Ther Hlth Med 2000;6(2):37-46

7. 10% dextrose superior to hypotonic lidocaine in finger and thumb OA. Injection was primarily periarticular here (medial and lateral) and in this study 10% dextrose was superior with no obvious effect of control solution.

Reeves KD, Hassanein K. Randomized prospective placebo controlled double blind study of dextrose prolotherapy for osteoarthritic thumbs and finger (DIP, PIP and Trapeziometacarpal) joints: Evidence of Clinical Efficacy. Jnl Alt Compl Med 2000;6(4):311-320.

8. Dextrose 25% injection in chronic Achilles strain resulted in ultrasound documented healing.

Maxwell NJ, Ryan MB, Taunton JE, Gillies JH, Wong AD. Sonographically guided intratendinous injection of hyperosmolar dextrose to treat chronic tendinosis of the Achilles tendon: a pilot study. JR Am J Roentgenol. 2007 Oct;189(4):W215-20.

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9. Dextrose 10-25% tightens loose ACL

Reeves KD Hassanein K Long term effects of dextrose prolotherapy for anterior cruciate ligament laxity: A prospective and consecutive patient study. *Alt Ther Hlth Med* May-Jun 2003, 9(3): p58-62.

10. Dextrose Injection for Groin Pain and Sports Hernia in Elite Athletes. Dextrose 12.5% injection returns 66/72 elite rugby and soccer players to full sport who were prevented from high level

Topol GA, Reeves KD: Regenerative injection of elite athletes with career-altering chronic groin pain who fail conservative treatment: a consecutive case series. *Am J Phys Med Rehabil*

11. Dextrose injection for chronic pain after coccyx fracture. Treatment of coccygodynia after fracture was the subject of a consecutive patient study recently published in the *Journal of Orthopedic Surgery*. 30 out of 37 patients with chronic non-responding coccygodynia responded to 2 injections of 20% dextrose. The recommendation was a trial of dextrose prolotherapy prior to proceeding to coccygectomy.

Khan SA; Kumar A; Varshney MK; Trikha V; Yadav CS: Dextrose prolotherapy for recalcitrant coccygodynia [In Process Citation] *J Orthop Surg (Hong Kong) (China)*, Apr 2008, 16(1) p27-9.

12. Dextrose injection markedly improves laxity testing of the SI joint.

25 consecutive patients with chronic low back pain localized to the SI joint region (posterior superior iliac spine) and positive on examination test for sacroiliac laxity/pain source were treated with 3 injections at 6 week intervals using 17% dextrose with CT guidance in the ligament and specifically not inside the joint itself. 12 month followup data revealed that the SI laxity maneuver score improved from a mean of 7.2 to 2.2 at 1 years ($p < .001$), the Quebec Pain Disability Scale improved from 57.7 to 39.5 ($p = .002$), the Roland Morris Back Pain Questionnaire improved from 13.3 to 7.2 ($p = .001$) and the Roland Morris Multi Form Questionnaire improved from 146.5 to 108.6 to 12 months. ($P = .016$)

Cusi M; Saunders J; Hungerford B; Wisbey-Roth T; Lucas P; Wilson S. The use of prolotherapy in the sacro-iliac joint. [E pub ahead of print] *Br J Sports Med (England)*, Published On line Apr 9 2008, doi:10.1136/bjism.2007.042044.

13. 141 consecutive patients with elbow epicondylar pain.

All failed a standardized physical therapy protocol and a variety of other nonoperative treatments. Either PRP injection of bupivacaine with 15 in the active group and 5 in the control group. Only 8 week followup with 60% improvement versus 16% in control. (Non blinded control). At 6 months 81% improvement. (All patients included) and at 12 months minimum 93% improvement. Blinding did not occur at IRB request, accounting in part of the very small control group. All had pain over medial or lateral epicondyle (14/15 lateral) and pain at the elbow with resistance of either resisted flexion or extension respectively. The number of patients that were able to be contacted was not mentioned. Nevertheless results were impressive. Noted is that a blinded clinical trial was approved and status of this is not clear.

Mishra A, Pavelko T. Treatment of chronic elbow tendinosis with buffered platelet-rich plasma. *American Journal of Sports Medicine* Dec 2006 Volume 34: 1774-1778

14. 177 consecutive patients with chronic spinal pain were injected with dextrose 20% in facet capsule at effected levels as determined by palpation. (cervical, thoracic, lumbar) lliolumbar and SI ligaments injected in those with low back pain. Weekly injection up to 3 within a 1 month period. Outcome measures included levels of pain, ADL and work ability on a 5 point scale each. 91% had reduced pain, 84% had improvement in work ability and 85% could do self care more easily.

Hooper RA; Ding M Retrospective case series on patients with chronic spinal pain treated with dextrose prolotherapy *J Altern Complement Med (United States)*, Aug 2004, 10(4) p670-4

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15. Healing of a medial meniscus tear.

The medial meniscus of the knee is a non-linear structure. Dr. Fullerton published examples of regeneration from dextrose injection, including an example of repair of a tear in the medial meniscus. Image B was actually taken after one injection and Image D after 3 injections, with the obvious tear closing in favor of meniscus tissue with normal appearance. The patient stopped having symptoms, the McMurray test became negative and the meniscus also healed according to pre and post MRI scans.

Fullerton BD. High-Resolution Ultrasound and Magnetic Resonance Imaging to Document Tissue Repair After Prolotherapy Arch PM&R 2008. 89(2):377-385