Technology Assessment Program
Office of Patient Care Services

Bibliography*: Prolotherapy for musculoskeletal pain

*Selected, quality filtered, not subject to external review

Policy Issue: Variability in practice exists in VA regarding the use of prolotherapy for treatment of musculoskeletal pain. Despite decades of existence and a growing interest in prolotherapy among practitioners of both traditional western medicine and complementary and alternative medicine, the clinical use of prolotherapy remains controversial and training for this treatment is not standardized. Evidence is needed to determine if prolotherapy is beneficial to VA patients.

This request is being handled by the VA Technology Assessment Advisory Group (TAAG) within OPCS, which was created to deliver evidence-based recommendations for use of new technologies in VA in a timely manner. As part of this process, the VA Technology Assessment Program (VATAP) is charged with providing the best available evidence to the TAAG within a brief time period. The evidence would help support guidance for use of prolotherapy in VA.

Background:[1] Prolotherapy is *"injection of any substance that promotes growth of normal cells, tissues or organs."* With respect to alleviating musculoskeletal pain, prolotherapy (also called ligament sclerotherapy, regenerative injection therapy, nonsurgical ligament reconstruction or proliferation therapy) is a nonsurgical alternative that involves injecting an irritant solution such as dextrose into muscle, joints or ligaments repeatedly for several treatments.

The mechanism of action behind prolotherapy is not well understood, but modern theory suggests that the injected substance (proliferant) is intended to mimic the natural healing process by initiating a local inflammatory response which triggers fibroplasia and collagen deposition, leading to proliferation and strengthening of new tissue, joint stability and, ultimately, a reduction in pain and dysfunction. Prolotherapy has been used in management of conditions including back pain, neck pain, headaches, arthritis, joint pain (knee and foot), and most recently anterior cruciate ligament laxity. Linetsky and Manchiakanti provide more detail of the multiple indications found in the literature for use of prolotherapy: [2]

- *"Painful enthesopathies, tendinosis or ligamentosis from overuse, occupational and postural conditions known as Repetitive Motion Disorders;*
- *Painful enthesopathies, tendinosis or ligamentosis secondary to sprains or strains;*
- *Painful hypermobility, instability and subluxation of the axial joints secondary to ligament laxity accompanied by restricted range of motion at reciprocal segment(s) that improve temporarily with manipulation;*
- *Vertebral compression fractures with a wedge deformity that exert additional stress on the posterior ligamento-tendinous complex;*
- *Recurrent painful rib subluxations at the costotransverse, costovertebral, sternochondral articulations;*
- *Osteoarthritis, spondylolysis and spondylolisthesis;*
- *Post surgical cervical, thoracic, and low back pain (with or without instrumentation);*
- *Posterior column sources of nociception refractory to steroid injections, nonsteroidal anti-inflammatory therapy (NSAID) and radiofrequency procedures;*
- *Enhancement of manipulative treatment and physiotherapy;*
- *Internal disc derangement."*

[1] http://www.aaomed.org/page.asp?id=88&name=Prolotherapy accessed April 15, 2008.
[2] Linetsky FS and Manchikanti L. Regenerative injection therapy for axial pain. Techniques in Regional Anesthesia and Pain Management 2005;9:40-49.

Regulation

Three categories of proliferants have been used in treatment of musculoskeletal pain, and most are dextrose-based:

- Irritants (eg. Phenol, tannic acid, and quinine);
- Osmotic shock agents (eg. Glucose, glycerin, ZnSO4);
- Chemotactic agents (eg. Sodium morrhuate).

The injected substances used in prolotherapy are already approved for injection by FDA, but not for prolotherapy. However, the drug solutions injected during prolotherapy are usually prepared by pharmacies or individual practitioners, and drug solutions prepared by such processes are not subjected to regulation by FDA.

Education and training

A survey of prolotherapy practitioners in the United States and Canada from two professional organizations regarding the safety of prolotherapy for spinal care found:[3]

- Ninety-eight percent held medical degrees (MD or DO), and 83% were board certified in related disciplines. Most learned the treatment approach through continuing education courses or observing a colleague. Respondents had a median of 10 years of experience, during which they had treated a median of 500 patients and given a median of 2000 treatments. Protocols used to administer prolotherapy vary, but the use of drug solutions containing ingredients previously associated with serious adverse events (eg. zinc) has been discontinued.
- The most commonly reported side effects were pain (70%), stiffness (25%), and bruising (5%).
- Of the 472 adverse events reported, the vast majority (80%) were related to needle injuries such as spinal headache (n = 164), pneumothorax (n=123), temporary systemic reactions such as anaphylaxis/cardiopulmonary events/shock/systemic toxicity (n = 73), nerve damage (n = 54), hemorrhage (n = 27), spinal cord insult (ie, meningitis, paralysis, spinal cord injury) (n = 9), and disk injury (n = 2). Adverse events related to prolotherapy for back and neck pain appear to be similar in nature to other widely used spinal injection procedures.
- To fully describe the adverse event profile of prolotherapy for back and neck pain, monitoring and recording of adverse events could be accomplished through independent audit of patient records or through prospective, multicenter, longitudinal cohort studies of patients receiving prolotherapy.

Organizations such as the American Association of Orthopedic Medicine (AAOM) advocate the use of prolotherapy and other integrative approaches for the nonsurgical treatment of musculoskeletal problems.[4] The AAOM has also been criticized for its support of prolotherapy in light of insufficient evidence.[5] In response to a growing interest in this intervention among its members, the board of the AAOM has created a certification program for prolotherapy for active, licensed members with a minimum of 100 course hours from AAOM-approved programs and at least three years of practicing prolotherapy. This certification program will establish a basic level of educational requirements for the field, but it will not evaluate expertise, judgment, or skill.[6]

[3] Dagenais S, Ogunseitan O, Haldeman S, et. al. Side effects and adverse events related to intraligamentous injection of sclerosing solutions (prolotherapy) for back and neck pain: a survey of practitioners. Arch Phys Med Rehabil July 2006;87:909-13.
[4] http://www.aaomed.org/page.asp?id=7&name=AAOM%20Organization accessed April 21, 2008.
[5] http://www.quackwatch.com/search/webglimpse.cgi?ID=1&query=prolotherapy accessed April 21, 2008.
[6] http://www.aaomed.org/newsletters/aaom_feb_news.html accessed April 22, 2008.

Reimbursement

There is inconsistent coverage for prolotherapy among local health plans, and in most cases prolotherapy is not a covered benefit. Several national payers have issued noncoverage decisions for prolotherapy, including:

- CMS National Coverage Decision for Prolotherapy, Joint Sclerotherapy, and Ligamentous Injections with Sclerosing Agents (150.7) Pub no. 100-3, version 1, 9/27/1999 states: *"The medical effectiveness of the above therapies has not been verified by scientifically controlled studies. Accordingly, reimbursement for these modalities should be denied on the ground that they are not reasonable and necessary as required by §1862(a)(1) of the Act."*
- CHAMPUS lists prolotherapy among its unproven drugs, devices or medical treatment or procedures which are excluded from CHAMPUS benefits.[7]
- AETNA considers prolotherapy experimental and investigational for any indication, because there is inadequate evidence of its effectiveness.[8]
- CIGNA HealthCare does not cover prolotherapy for any indication because it is considered experimental, investigational, or unproven, although coverage may vary among individual benefit plans.[9]

Methods: To meet the immediate information needs of its client, first VATAP queried members of the International Network of Agencies for Health Technology Assessment (INAHTA)[10] electronically via their listserv on April 9, 2008 for existing systematic reviews or reports in process on prolotherapy for musculoskeletal pain.

Searches

Searches of the literature for prolotherapy were carried out on MEDLINE, EMBASE, CurrentContents, Science Citation Index, BIOSIS, and the Cochrane Library. Searches were also performed on allied and complementary medicine databases: EMCare, Allied & Complementary Medicine, TGG Health & Wellness Database, and MANTIS. The searches encompassed the years 1976 to the present using search terms: prolotherap? OR (proliferant? AND chronic pain. These searches yielded 58 citations dating from 1976 to the present.

Additional searches looked for regulatory mention of specific proliferants on nine regulatory information databases on Dialog®: tannic acid OR quinine OR osmotic shock agent? OR chemotactic? agent? OR sodium morrhuate; they yielded no relevant citations.

Inclusion criteria

Criteria for inclusion of studies in this review were:

- The most recent systematic reviews or health technology assessments (HTA) on prolotherapy for musculoskeletal pain (to eliminate redundancy with earlier publications);
- For primary studies of prolotherapy for musculoskeletal pain:
    - not included in existing systematic reviews or HTAs;
    - at least ten human subjects in each treatment arm;
    - full text to capture study details sufficient for table abstraction;

[7] Civilian Health and Medical Program of the Uniformed Services (CHAMPUS). Exclusion of Unproven Drugs, Devices and Medical Treatments and Procedures. Code of Federal Regulations. 32CFR199.4. July 1, 2006.

[8] http://www.aetna.com/cpb/medical/data/200_299/0207.html AETNA clinical policy bulletin. 0207. Accessed April 18, 2008.

[9] http://www.cigna.com/customer_care/healthcare_professional/coverage_positions/medical/mm_0006_coveragepositioncriteria_prolotherapy.pdf accessed April 18, 2008.

[10] www.inahta.org

- o the most recent or largest version of a study from the same investigators (to eliminate redundancy).

Case reports, meeting abstracts and articles not published in English were excluded from review. One reviewer (Adams) selected citations for full-text retrieval, reviewed all articles, abstracted information, and prepared this review.

Results: The searches and manual searching of end references of retrieved articles identified 58 references, of which 24 were retrieved for further review as potentially relevant background material or research for inclusion in this review. Queries to HTA colleagues produced a 2005 summary of existing evidence of prolotherapy for an interventional pain management guideline for New Zealand's Accident Compensation Corporation, which recommended that prolotherapy not be used alone for treatment of low back pain and prolotherapy not be used for treatment of finger and thumb osteoarthritis.[11]

VATAP identified two recent qualitative systematic reviews (Rabago 2005; Dagenais 2008) (see Table 1). Rabago (2005) reviewed all indications and all study types in the peer reviewed literature for treating musculoskeletal pain with prolotherapy; they found evidence for low back pain and osteoarthritis of the finger and knee. Dagenais (2008) considered only RCTs of prolotherapy for chronic low back pain. In both reviews, a quantitative synthesis (eg. meta-analysis) was not possible because of difference in protocols across studies.

VATAP searches updated the two systematic reviews with three new case series that met inclusion criteria and studied indications for: chronic whiplash (Hooper 2007); chronic groin pain (Topol 2005); and chronic spinal pain (Hooper 2004) (see Table 2). These case series represent results of prolotherapy treatment for patients in whom conservative and other interventional procedures had failed.

Abstracts of all included reviews and studies in this report are presented in the End References.

[11] http://www.acc.co.nz/For-providers/Interventional-Pain-Management/Interventions/Intervention-Index/WCM1_033913 accessed April 22, 2008.

Table 1. Most recent systematic reviews of prolotherapy for chronic musculoskeletal pain

Citation/ Indications covered	Results	Conclusions
Rabago 2005 • Finger and knee osteosrthritis • Low back pain	Evidence from case reports, case series, nonrandomized controlled studies, and RCTs published through 2004 were synthesized qualitatively. • Data from 34 case reports and case series and 2 nonrandomized controlled trials published through 2004 suggest prolotherapy is efficacious for many musculoskeletal conditions; results may reflect discrete subject selection and protocols tailored to patients. Results from 6 RCTs are conflicting: • Two RCTs on osteoarthritis reported decreased pain, increased range of motion, and increased patellofemoral cartilage thickness after prolotherapy. • Two RCTs on low back pain reported significant improvements in pain and disability compared with control subjects, whereas 2 did not. • All studies had significant methodological limitations.	*"Conclusive data for PrT [prolotherapy] as a treatment of musculoskeletal pain and joint laxity are lacking. Prolotherapy appears safe when performed by an experienced clinician. Significant methodological limitations exist in all studies published to date. Positive results have been reported in nonrandomized studies. Positive results compared with saline controls have also been reported in RCTs. However, it is unclear which patients might benefit most from PrT. Future studies that allow physical examination findings to be used as inclusion criteria, and that compare PrT to noninjection therapy, could clarify whether PrT can have an independent, beneficial role in the treatment of musculoskeletal pain."*
Dagenais 2008 Chronic low back pain (CLBP)	Evidence from systematic reviews, clinical practice guidelines, or RCTs of prolotherapy for CLBP > 3 months with clinically relevant outcomes reported, published in English from 1997-2007 were synthesized qualitatively. Authors identified 4 systematic reviews (including Rabago 2005) and 5 RCTs for review.	*"Prolotherapy is one of a number of treatments recommended for the treatment of CLBP. It has a prolonged history of use, a reasonable but not proven theoretical basis, a low complication rate, and conflicting evidence of efficacy. A possible dose-response effect or the combination with other interventions such as SMT may explain the conflicting results of RCTs. Two of the RCTs in which prolotherapy was administered using six weekly injections of 20 to 30 ml dextrose.glycerin.phenol. lidocaine with SMT [spinal manipulation therapy] and exercise had positive results, suggesting this particular intervention protocol is worth considering for patients with CLBP who are refractory to other approaches. At this time there is no evidence of efficacy for prolotherapy injections alone without cointerventions.* *There is sufficient interest and utilization of this procedure to warrant further investigation. Future studies are needed to support or refute the positive results obtained in some of the prior RCTs while addressing some of the methodological weaknesses by minimizing difference between the intervention and control groups. Other studies are also needed to establish the safety of common prolotherapy solutions, and determine the optimal dose and number of injection sessions required."*

Table 2. Case series of prolotherapy for treatment of musculoskeletal pain published subsequent to systematic reviews listed in Table 1.

Study attributes	Hooper 2007	Topol 2005	Hooper 2004
Indication	Chronic whiplash	Chronic groin pain from osteitis pubis and/or adductor tendinopathy	Chronic low back pain (CLBP)
Intervention (prolotherapy protocol)	• Intraarticular prolotherapy with 0.5-1.0 ml of 20% dextrose solution with 1% lidocaine under fluoroscopy • Manual physiotherapy continued with prolotherapy	• 12.5% dextrose and 0.5 % lidocaine given monthly until resolution of pain either on outcome scales, palpation or isometric contraction • Tx discontinued after no improvement after 2 consecutive prolotherapy tx	• 20% dextrose and 0.75% xylocaine solution weekly X 3 wks • Set of 3 injections repeated in 1 mo. If needed or monthly depending on pain tolerance • Exercise, manipulation and trigger point injection continued before and during injection
Study group	• 18 subjects who failed other conservative therapy eg PT, massage, acupuncture, and periarticular prolotherapy • 6/18 had radiofrequency neurotomy to joint	• Elite kicking sport athletes • All men • Nonresponsive to PT or graded reintroduction into sport activity • Mean time with groin pain=15.5 mo. (range, 6-60 mo)	• 238 consecutive patients seen in prolotherapy clinic • Patients who did not recover with exercise, manipulation, and dry needling of trigger points, and who showed laxity in spine, iliolumbar ligament or sacroiliac ligament
Sample size	N=15 completed tx with 18 total neck sides for analysis	N=22	N=177 completed tx and questionnaire
Length of follow up	2, 6, 12 months	• 1 and 6 mo after tx completion • Mean=17 mo (range 6 to 32 mo)	Mean length=9 months ± 5 months
Outcome measure(s)	Mean Neck Disability Index (NDI)	• 7 point visual analog scale (VAS) for pain • Nirschl Pain Phase Scale (NPPS) for functional impairment	• Subjective level of pain, activities of daily living (ADL) on 5 point scale • Ability to work
Results	• NDI pre-tx = 24.71 vs. post-tx = 14.21 (2 months), 13.45 (6 months), 10.94 (12 months). • Average change NDI=13.77 ($p<0.0001$) baseline versus 12 months. • Better outcomes observed in patients w/ PT than those without PT. • Women needed more injections (5.4) than men (3.2) p=0.0003.	• Mean # tx given= 2.8 • Mean reduction in pain on VAS improved from 6.3+/-1.4 to 1.0+/-2.4 (P <.001) • NPPS score improved from mean 5.3+/-0.7 to 0.8+/-1.9 (P <.001). • 20/24 had no pain and 22/24 were unrestricted with sports at final data collection	• 91.0% of patients reported reduction in level of pain; • 84.8% of patients reported improvement in ADL • 84.3% reported an improvement in ability to work. • Women required on average three more injections than men. • Cervical spine response rates were lower than thoracic or lumbar spine. • No complications from treatment were noted.
Conflict of interest statement?	• Yes= no conflict of interest • Authors provided funding for the study	Yes=no conflict of interest	No statement present

Conclusions/discussion: Although proponents have advocated the use of prolotherapy for a range of indications, relatively few clinical uses have been studied systematically or published in the peer-reviewed literature. Results of the most recent systematic reviews are inconclusive for demonstrating the effectiveness of prolotherapy for treatment of musculoskeletal pain, and new evidence from case series would not alter these conclusions. The majority of published experimental studies have included conservative therapy with prolotherapy for relief of chronic low back pain, and to a lesser extent, osteoarthritis of the knee with varying results. Sample sizes have been insufficient on which to base national policy decisions.

The existing evidence base shows wide variation in patient selection criteria. In case series, findings from physical examination by a prolotherapist are part of the inclusion criteria, whereas all RCT entry criteria were diagnosis-driven. The positive results seen in these case series may, in part, reflect careful selection criteria that a prolotherapist would employ in clinical practice using both diagnostic and examination findings.

Greater attention needs to be paid to using an appropriate control group. RCTs to date have employed control therapies with injection, which may invoke a response irrespective of injectant used, resulting in similar clinical improvement observed across study arms, while other RCTs have used control groups with very different treatment regimens such that it is not possible to attribute improvement in outcomes to prolotherapy alone.

Prolotherapy appears to have a safety profile comparable to that of other needling procedures, when performed by a skilled prolotherapist, but treatment protocols varied considerably across studies. Up to now, education and training for prolotherapists have relied on continuing education programs and mentoring and have not been standardized.

Prolotherapy along with conservative interventions (eg. physiotherapy) appears to offer some pain relief when administered by a skilled prolotherapist in patients with low back pain who are refractory to other treatments, but its independent role in these patients remains to be determined. Given the increasing interest in this intervention, additional research and monitoring are warranted to clarify the safety profile and to determine the optimal proliferant, dosage and schedule, appropriate patient selection criteria, and the independent role of prolotherapy for a number of indications for which there are limited nonsurgical options for persons seeking chronic pain relief.

Ongoing clinical trials of prolotherapy should help define its clinical use (source: www.clinicaltrials.gov) :

- Joint Injections for Osteoarthritic Knee Pain. Sponsored by the National Center for Complementary and Alternative Medicine. Consists of 2 blinded injection arms and a non-binded physical therapy arm. Phase I and II. NCT00085722.
- Efficacy Study of Prolotherapy vs Corticosteroid for Tennis Elbow. Conducted by Spaulding Rehab Hospital. Phase III. NCT00160303.

Additional scientific study is needed in the area of chronic low back pain, which represents a substantial burden to veterans and to the general population at large and where the preponderance of evidence exists on which to build a sound foundation of knowledge.

End References (Studies cited in Tables 1 and 2)

Dagenais, S., J. Mayer, et al. "Evidence-informed management of chronic low back pain with prolotherapy." Spine J. 2008;**8**(1): 203-12.

Hooper, R. A. and M. Ding "Retrospective case series on patients with chronic spinal pain treated with dextrose prolotherapy." Journal of alternative and complementary medicine. 2004;**10**(4): 670-4.
OBJECTIVES: To determine the clinical benefits of dextrose prolotherapy in patients with chronic spinal pain. DESIGN: Retrospective case series. SETTING/LOCATION: During the first 2 years at an outpatient prolotherapy clinic. SUBJECTS: One hundred and seventy-seven (177) consecutive patients with a history of chronic spinal pain completed prolotherapy treatment and were followed for a period ranging from 2 months to 2.5 years. INTERVENTIONS: Patients were treated with a proliferant solution containing 20% dextrose and 0 .75% xylocaine. One half milliliter (0.5 mL) of proliferant was injected into the facet capsules of the cervical, thoracic, and lumbar spine, or combinations of the three areas. The iliolumbar and dorsal sacroiliac ligaments were also injected in patient with low back pain. Injections were typically done on a weekly basis for up to 3 weeks. A set of three injections was repeated in 1 month's time if needed. OUTCOME MEASURES: Level of pain, and improvement in activities of daily living were measured on a five-point scale. Improvement in ability to work was also assessed. RESULTS: Ninety-one percent (91.0%) of patients reported reduction in level of pain; 84.8% of patients reported improvement in activities of daily living, and 84.3% reported an improvement in ability to work. Women required on average, three more injections than men. Cervical spine response rates were lower than thoracic or lumbar spine. No complications from treatment were noted. CONCLUSIONS: Dextrose prolotherapy appears to be a safe and effective method for treating chronic spinal pain that merits further investigation. Future studies need to consider differences in gender response rates.

Hooper, RA, Frizzell JB, Faris P. "Case series on chronic whiplash related neck pain treated with intraarticular zygapophysial joint regeneration injection therapy." Pain physician . 2007;**10**(2): 313-8.
BACKGROUND: Although in clinical use, there is only 1 published case report on the efficacy of intraarticular regeneration injection therapy (RIT) (a.k.a. prolotherapy). This report supports a rationale for future clinical trials of this technique. OBJECTIVE: To assess the efficacy of intraarticular zygapophysial joint RIT in patients with chronic whiplash related neck pain that failed other conservative and interventional procedures. Patients were treated with intraarticular RIT and reassessed over 1 year. DESIGN: Retrospective case review of prospective data. MATERIALS and METHODS: Eighteen consecutive patients were treated with intraarticular prolotherapy by placing 0.5 - 1mL of 20% dextrose solution into each zygapophysial joint, after confirmation of intraarticular location with radiographic contrast, using 25-gauge spinal needles and fluoroscopic guidance. Solution was prepared by diluting D50W with 1% lidocaine. RESULTS: Fifteen patients completed treatment. Three patients had bilateral treatment, leaving 18 sides for analysis. Mean Neck Disability Index (NDI) pre-treatment was 24.71 and decreased post-treatment to 14.21 (2 months), 13.45 (6 months), 10.94 (12 months). Average change NDI=13.77 ($p<0.0001$) baseline versus 12 months. Symptoms for 14 patients were from motor vehicle accident, of which 13 were in litigation. Patients attending physiotherapy over the course of treatment had better outcomes than those without physiotherapy. Women needed more injections (5.4) than men (3.2) $p=0.0003$. CONCLUSION: Intraarticular RIT improved pain and function in this case series. The procedure appears safe, more effective than periarticular RIT, and lasted as long, or longer, than those patients with previous radiofrequency neurotomy. Concurrent physiotherapy helped reduce post-procedure neck stiffness. Future trials should consider gender wh en deciding how many treatments to administer. Litigation was not a barrier to recovery.

Rabago, D, Best TM, Beamsley M, Patterson J. "A systematic review of prolotherapy for chronic musculoskeletal pain." Clinical Journal of Sport Medicine. 2005;**15**(5): 376-380.
OBJECTIVE: Prolotherapy, an injection-based treatment of chronic musculoskeletal pain, has grown in popularity and has received significant recent attention. The objective of this review is to determine the effectiveness of prolotherapy for treatment of chronic musculoskeletal pain. DATA SOURCES: We

searched Medline, PreMedline, Embase, CINAHL, and Allied and Complementary Medicine with search strategies using all current and historical names for prolotherapy and injectants. Reference sections of included articles were scanned, and content area specialists were consulted. STUDY SELECTION: All published studies involving human subjects and assessing prolotherapy were included. MAIN RESULTS: Data from 34 case reports and case series and 2 nonrandomized controlled trials suggest prolotherapy is efficacious for many musculoskeletal conditions. However, results from 6 randomized controlled trials (RCTs) are conflicting. Two RCTs on osteoarthritis reported decreased pain, increased range of motion, and increased patellofemoral cartilage thickness after prolotherapy. Two RCTs on low back pain reported significant improvements in pain and disability compared with control subjects, whereas 2 did not. All studies had significant methodological limitations. CONCLUSIONS: There are limited high-quality data supporting the use of prolotherapy in the treatment of musculoskeletal pain or sport-related soft tissue injuries. Positive results compared with controls have been reported in nonrandomized and randomized controlled trials. Further investigation with high-quality randomized controlled trials with noninjection control arms in studies specific to sport-related and musculoskeletal conditions is necessary to determine the efficacy of prolotherapy.

Topol GA, Reeves KD, Hassanein KM. "Efficacy of dextrose prolotherapy in elite male kicking-sport athletes with chronic groin pain." Archives of physical medicine and rehabilitation. 2005;**86**(4): 697-702. OBJECTIVE: To determine the efficacy of simple dextrose prolotherapy in elite kicking-sport athletes with chronic groin pain from osteitis pubis and/or adductor tendinopathy. DESIGN: Consecutive case series. SETTING: Orthopedic and trauma institute in Argentina. PARTICIPANTS: Twenty-two rugby and 2 soccer players with chronic groin pain that prevented full sports participation and who were nonresponsive both to therapy and to a graded reintroduction into sports activity. INTERVENTION: Monthly injection of 12.5% dextrose and 0.5% lidocaine into the thigh adductor origins, suprapubic abdominal insertions, and symphysis pubis, depending on palpation tenderness. Injections were given until complete resolution of pain or lack of improvement for 2 consecutive treatments. MAIN OUTCOME MEASURES: Visual analog scale (VAS) for pain with sports and the Nirschl Pain Phase Scale (NPPS), a measure of functional impairment from pain. RESULTS: The final data collection point was 6 to 32 months after treatment (mean, 17 mo). A mean of 2.8 treatments were given. The mean reduction in pain during sports, as measured by the VAS, improved from 6.3+/-1.4 to 1.0+/-2.4 (P <.001), and the mean reduction in NPPS score improved from 5.3+/-0.7 to 0.8+/-1.9 (P <.001). Twenty of 24 patients had no pain and 22 of 24 were unrestricted with sports at final data collection. CONCLUSIONS: Dextrose prolotherapy showed marked efficacy for chronic groin pain in this group of elite rugby and soccer athletes.

Bibliography*: Prolotherapy for musculoskeletal pain

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