Case in Point

Prolotherapy for Management of Myofascial Pain Syndrome

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This case details the treatment of a patient with myofascial pain syndrome who was unresponsive to conservative treatments but showed significant pain reduction following prolotherapy.

Myofascial pain syndrome (MPS) is a regional pain syndrome characterized by a trigger point in a taut band of skeletal muscle.[1] The key to identifying MPS in a patient is the presence of pain that radiates from the original trigger point in the muscle.

Traditional care modalities include physical therapy, such as massage, ultrasound, relaxation, and stretching exercises.[2] Medications that have been used to alleviate pain include nonsteroidal antiinflammatories (NSAIDs), acetaminophen, antidepressants, muscle relaxants, and opioids. Many patients find relief with dry needling, a procedure in which a needle is inserted into the skin and muscle directly at the trigger point, or injections of anesthetics, such as lidocaine. The goal of treatment is to reduce pain from the chronic strain of the affected muscle area.

Alternative treatments may also be used to manage various pain conditions. One example is prolotherapy, which involves injecting proliferative agents, such as dextrose and hypertonic saline, near ligaments and tendons.[3] The proliferative agents induce release of growth factors and assist in healing.[3] If the ligaments and tendons are strengthened around the joints, there will be increased joint stability, followed by improved muscle relaxation, and diminished pain from trigger points.[1] Prolotherapy has been used to treat the following pain conditions: tendonitis, migraines, osteoarthritis, sports injuries, degenerated joints, and ligament strains.[2]

This case describes a patient with complications who had chronic pain due to MFS for 15 years and was unresponsive to the abovementioned conservative treatments. Following 3 courses of prolotherapy, however, the patient experienced a significant reduction in pain and a decreased need for opiates. The patient was able to return to work as a military instructor.

INITIAL EXAMINATION

A 52-year-old white female was seen in the Chronic Pain Clinic at the VA Greater Los Angeles Hospital in Los Angeles, California, for long-standing "total body pain" of 15 years. Prior to the clinic visit, she was evaluated in the Rheumatology Clinic and diagnosed with fibromyalgia, a disorder characterized by chronic widespread pain with diffuse tender points.[4] The classic location of tender points are listed in Table 1. She described the pain as diffuse aches over joints of the upper and lower limbs and muscle pain in the back, chest, and legs. The pain increased with stress and fatigue and decreased with medication, rest, and relaxation. Pain intensity was rated between 3/10 to 8-9/10 without any specific trigger.

In addition to these symptoms, the patient's feet were constantly hot and burning with pain. Twice a month, the patient reported numbness that radiated from her feet to buttocks. She reported that the pain symptoms were worse when her body temperature increased to about 101 degrees. She was evaluated in the Women's Clinic for the fever, which was of unknown etiology; results from the physical workup were normal.

The patient's medical history included osteopenia, Addison disease, degenerative arthritis of the spine, sciatica, major depressive disorder, Sheehan syndrome (on chronic oral steroid management), military sexual trauma, and dyslipidemia. The patient's family history included a sister who has multiple sclerosis and a mother who has polymyalgia rheumatica.

Furthermore, the patient reported smoking 5 to 10 cigarettes per day, consuming 5 beers per week, and no use of recreational substances. She

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Table 1. Location of 18 tender points in patients with fibromyalgia[5]		
Right	**Left**	**Tender points on both the right and left sides of the human body**
X	X	1. Low cervical region (front neck area): between the transverse processes of C5-C7.
X	X	2. Second rib (front chest area): at second costochondral junctions.
X	X	3. Occiput (back of the neck): at suboccipital muscle insertions.
X	X	4. Trapezius muscle (back shoulder area): at midpoint of the upper border.
X	X	5. Supraspinatus muscle (shoulder blade area): above the medial border of the scapular spine.
X	X	6. Lateral epicondyle (elbow area): 2 cm distal to the lateral epicondyle.
X	X	7. Gluteal (rear end): at upper outer quadrant of the buttocks.
X	X	8. Greater trochanter (rear hip): posterior to the greater trochanteric prominence.
X	X	9. Knee (knee area): at the medial fat pad proximal to the joint line.

previously worked as a U.S. Air Force cadet instructor but was unable to continue due to worsening pain. She was previously married and has an estranged teenaged son. Two years before her visit to the pain clinic, she moved from the East Coast to California to live with her fiancé; however, their engagement did not work out because of trust issues.

The patient, a slim, petite female, was dressed appropriately for the physical examinations. She was often depressed and cried during the sessions. Her vitals were consistently normal despite reports of low-grade fevers. Her musculoskeletal examination showed a normal range of motion in all joints of the upper and lower extremities. There were no joint effusions, increased warmth, or erythema in those regions. In addition, she had diffuse pain and tenderness over the bilateral upper trapezius (midway between neck and shoulder), gluteal (over piriformis muscles), lumbar paraspinal (L3 to S1), and sacroiliac (SI) ligament (over posterior superior iliac spine) areas. However, the tender points were not found over the bilateral suboccipital muscle insertions, costochondral junction, supraspinatus, distal lateral epicondyle, superior lateral gluteal areas, or medial knee. She had pain in 8 out of 18 preestablished tender points. This finding did not meet the criteria for fibromyalgia, which requires the presence of 11 out of 18 tender points listed in Table 1.[4]

Pressure over the bilateral upper trapezius and gluteal trigger point regions produced sharp pain radiating to the upper and lower extremities, respectively. The patient's test results were negative for both the straight-leg raise test and the flexion, abduction, external rotation test. Her neurologic examinations showed symmetrical reflexes in the bilateral upper and lower extremities and normal tone. Additionally, her test results were negative for the Hoffman and Babinski signs. Magnetic resonance imaging (MRI) of the spine revealed mild hypertrophic degenerative facet joint disease at L4-L5 and annular disc bulging at L4-L5, without other significant disc abnormality or significant central canal stenosis. Radiograph with flexion/extension views of the lumbar spine was normal without instability. Results of the electromyogram of the lower extremities were normal.

Based on the findings of trigger points on physical examination, the patient was given the diagnosis of MFS rather than fibromyalgia. The differences between MFS and fibromyalgia are described in Table 2. Her pain was attributed to multiple factors, including psychosocial stressors, deconditioning, and depression.

TREATMENT

During the course of treatment in the Chronic Pain Clinic, the patient received a multidisciplinary treatment that included therapies, oral medications, local muscle injections, and psychological counseling. In this time period, she was given various NSAIDs, muscle relaxants, opioids (extended-release morphine with oxycodone or hydrocodone for breakthrough pain), an anticonvulsant (gabapentin) for neuropathic pain, and antidepressants (fluoxetine, nortriptyline, trazodone, and venlafaxine) as adjuvant therapy. The nonpharmacologic management included ice and heat, physical therapy (myofascial release, posture corrections, stretches,

Table 2. The differences between myofascial pain syndrome (MPS) and fibromyalgia—MPS is often present in the fibromyalgia patient, but not all MPS patients have fibromyalgia

MPS	Fibromyalgia
Trigger points are painful points that radiate to distal areas in the body with pressure. Taut, ropy bands in the muscle may be palpated over trigger points throughout the body.	Tender points are painful areas over specific regions of the body. The pain does not spread or radiate distally.
Diagnosis requires the presence of any trigger points over a muscle group.	Diagnosis requires the presence of 11 of 18 preestablished tender points listed in Table 1.
Trigger points are usually localized to a specific muscle group, such as shoulder, back, neck, etc.	Tender points are diffuse and usually present in all 4 quadrants of the body (bilateral upper and lower parts of the human body).
Pain can be intermittent and is often associated with increased activity.	Pain is widespread, more or less continuous, and present for at least 3 months.
Pain is often associated with muscle, ligament, or tendon sprain. It is often a result of chronic trauma due to repetitive work injury or altered posture due to poor exercise.	Pain is often associated with depression, insomnia, and other psychological symptoms.
Treatment includes myofascial release, trigger point injections, stretching exercises, postural training, and strengthening exercises.	Treatment includes antidepressant medications, muscle relaxants, psychological counseling, and general conditioning exercises.

and general conditioning exercises), chiropractic therapy, and aquatic therapy. The abovementioned treatments yielded no long-term relief. The patient also received multiple trigger point injections to the upper and lower back areas (bilateral upper trapezius, bilateral rhomboids, and bilateral lumbar paraspinal muscles—L5/L4). The injections were performed using a 1.5-inch 25-gauge needle with a solution of 1 cc of 1% lidocaine to each trigger point along with dry needling. This regimen gave her effective but temporary relief for about 2 weeks. She also received injections with a combination of 1 cc of 1% lidocaine and 4 mg of methylprednisolone acetate injectable suspension to each trigger point site. However, the combination of lidocaine with a steroid was not as effective as the injection with lidocaine alone.

During her enrollment in the Chronic Pain Clinic, the patient continued to seek medical care from her psychiatrist and primary care physician for psychotherapy and medical treatment. After 2 years of using traditional treatments and failing to obtain long-lasting pain relief, the physicians decided to try a course of prolotherapy to the trigger points over bilateral trapezius, gluteal, and SI ligament areas. This was performed with a 25-gauge needle injecting a solution of 1 cc of 50% dextrose mixed with 1 cc of 1% lidocaine into each of the trigger point areas. The patient tolerated the prolotherapy injection procedure well and reported improved symptoms within a few minutes after the injection. The immediate resolution of pain is most likely related to the lidocaine. Depending on the concentration of dextrose to lidocaine ratio and the patient's pain tolerance, some patients may develop local muscle soreness after the lidocaine solution wears off. This patient tolerated the injections with few adverse effects (AEs).

The patient continued to do well after 1 month, when she returned for her follow-up visit. After 2 additional injections at 1-month intervals, she reported that her mood improved as the pain level decreased, and she no longer experienced crying episodes. At that time, an examination showed persistent tenderness over the same trigger points; however, these areas were far less painful. The patient's pain level decreased from 8/10 to 3/10, and she was able to exercise regularly. After a course of 3 prolotherapy injections, the patient improved significantly. She was able to return to work, and the dosage of her opioid medication was reduced. Morphine sulfate sustained action 15 mg bid was reduced to once a day as needed. Oxycodone 5 mg tid was reduced to once a day as needed.

DISCUSSION

This case details prolotherapy treatment that resulted in effective pain relief in a patient with chronic MFS. Myofascial pain syndrome is among the most common disorders seen in pain clinics.[3] However, many patients with MFS also experience psychological symptoms, which may likely increase the perception of pain level. In this particular patient, conservative treatments alone were unsuccessful in treating the injury of the affected muscles caused by chronic strain with underlying deconditioning. Symptoms of depression, psychosocial stressors, and other comorbidities, such as Sheehan syndrome, contributed to her pain perception. Her chronic opioid treatment resulted in opioid tolerance and a possible opioid hypersensitivity syndrome, a condition which causes the body to become very sensitive to pain. Since the patient's pain was refractory to traditional treatment, an alternative approach was needed.

Prolotherapy at the trigger points—hypersensitive bundles of ligament, muscle fiber, or tendons that cause referred soreness and local soreness—may have strengthened the tissue by increasing its fibrous content.[2,3] Past studies done by Liu and colleagues regarding the treatment of prolotherapy on rabbit tendons showed increased ligament mass by 44% as well as increased strength by 28%.[6] This experiment provided further support for Hackett's 1955 study on the proliferation of rabbit tendons using prolotherapy.[7] In 1955, Dr. Hackett studied the effects of injecting a proliferant into rabbit tendons. He reported moderate infiltration of lymphocytes in the tissues within 48 hours of injection and fibroblastic organization and capillary proliferation within 2 weeks.[7]

Collagen plays a significant role in the formation of connective tissue—tendons, ligaments, muscle fascia, and joint capsular tissue—which holds the skeletal structure together.[3] When injured, the body produces collagen to heal the wound, but poor blood supply to connective tissues prolongs the healing process. Prolotherapy helps produce collagen through injections of mild natural dextrose or chemical irritants, which triggers the immune system's process to create collagen naturally.[3]

Some prolotherapists use mild chemical irritants, such as phenol, guaiacol, or tannic acid, to stimulate the healing mechanism.[3] These agents adhere to the walls of the cells wherever they are injected and cause inflammation. In addition, other prolotherapists use osmotic shock agents, which are simply compounds, such as dextrose and glycerine.[3] These substances are commonly used in treatment and are soluble in water and not toxic to the body. After having the initial desired effects, these compounds are easily excreted from the body. They function by causing water to flow out of the cells, leading to cellular dehydration, inflammation, and healing.

Inflammation is the body's response to injuries and is described by the buildup of leukocytes, fluid, cytokines (inflammatory mediators), and blood flow to the site of damage.[3] Inflammation creates pain, indicating that the body's healing mechanisms are occurring. Injecting the proliferant stimulates the inflammatory process, causing an influx of cytokines and growth factors, which creates new tissues and repairs the damage.[3] The inflammatory process is thought to alleviate pain by creating new tissues in the area of the trigger points. Since ligaments and tendons have limited blood supply, prevention of the initial inflammatory response may interfere with the healing cycle and, thus, the body's attempt to heal. Injured tendons or muscles that do not heal completely are more likely to sustain injury with daily activities, resulting in chronic inflammation and, therefore, chronic pain. Thus, treating the resultant inflammatory process with antiinflammatory drugs (NSAIDS and steroids) can reduce the pain symptoms, but treating the underlying cause of pain, such as the weakened structure, is equally important. In addition, this patient was on chronic steroid treatment for Sheehan syndrome. Chronic steroid use is expected to weaken tendons and ligaments, impairing the healing process.[10] While the healing effects of prolotherapy can be reduced by steroid use, this alternative treatment may have provided tissue healing and pain relief in the patient.

CONCLUSION

This case demonstrates the potential value of prolotherapy in treating chronic pain, especially when all other treatment options have been exhausted. This patient also had complex medical and psychosocial factors that likely contributed to her overall pain concerns. Resolution or improvement of any of these factors is expected to improve her pain symptoms. However, despite continued medical treatments and psychological counseling, the patient's pain symptoms were not effectively managed. In addition, she reported no changes in her social situation during the course of treatment. After 2 years, she expressed frustration with the lack of progress and was receptive to trying alternative treatment options. The concept of treatment using proliferative agents was new to her, and the placebo effect likely played a role in her responses to this treatment. Nevertheless, it is believed that

her ability to return to her usual work duties contributed positively to her overall sense of well-being, and thus improved her coping abilities.

The authors believe that prolotherapy has relatively low risks and minimal AEs. Thus, it is important for clinicians to be aware of this alternative treatment option. Additional studies will be needed to determine the value of prolotherapy for management of MFS.

Author disclosures

The authors report no actual or potential conflicts of interest with regard to this article.

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REFERENCES

1. Hou CR, Tsai LC, Cheng KF, Chung KC, Hong CZ. Immediate effects of various physical therapeutic modalities on cervical myofascial pain and trigger-point sensitivity. *Arch Phys Med Rehabil*. 2002;83(10):1406-1414.
2. Treatment of Myofascial Pain Syndrome. Caring Medical & Rehabilitation Services website. http://www.caringmedical.com/condition_details/Myofascial_Pain_Syndrome.htm. Accessed October 29, 2012.
3. Darrow M. Prolotherapy: Living Pain-Free. Los Angeles, CA: Protex Press; 2004.
4. Wolfe F, Clauw DJ, Fitzcharles MA, et al. The American College of Rheumatology preliminary diagnostic criteria for fibromyalgia and measurement of symptom severity. Arthritis Care Res. 2010;62(5):600-610.
5. Diagnosing Fibromyalgia. Fibromyalgia Information Foundation website. http://www.myalgia.com/Diagnosis/Diagnosis.htm. Accessed October 29, 2012.
6. Liu Y, Tipton C, Matthes R, Bedford TG, Maynard JA, Walmar HC. An in situ study of the influence of a sclerosing solution in rabbit medial collateral ligaments and its junction strength. *Connect Tissue Res*. 1983;11(2-3):95-102.
7. Hackett GS, Henderson DG. Joint stabilization; an experimental, histologic study with comments on the clinical application in ligament proliferation. *Am J Surg*. 1955;89(5):968-973.
8. What are Fibromyalgia Trigger Points? Fibromyalgia Advisor website. http://www.fibromyalgia-advisor.com/fibromyalgia-trigger-points.html. Accessed November 5, 2012.
9. Hauser RA, Hauser MA. Prolo Your Pain Away! Curing Chronic Pain With Prolotherapy. 2nd ed. Oak Park, IL: Beulah Land Press; 2004.
10. An Alternative to Cortisone Shots. Prolotherapy Information by Ross Hauser, MD, website. http://www.prolonews.com/prolotherapy_e-newsletters_cortisone_shots.htm. Accessed October 30, 2012.