Case Report



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Free full manuscript: www.painphysicianjournal.com The shoulder joint is an enarthrodial or ball-and-socket joint. A complex network of anatomic structures endows the human shoulder with tremendous mobility, greater than any other joint in the body. Many pathologies can been found in those patients with chronic shoulder pain. The painful limitation of shoulder motion affects hand and arm motion as well; therefore, it significantly influences work performance and everyday activities as well as the quality of life. Therefore, the treatment of patients with chronic shoulder pain has major social and health economic implications.

In this article we present a patient with a complex history of shoulder pathology including 7 surgeries that left the patient with chronic debilitating shoulder pain.

She was suffering from chronic pain and limited mobility of the shoulder joint due to adhesive shoulder capsulitis. She was treated with a multimodality approach with the goals of increasing shoulder range of motion and decreasing her pain. This did not provide significant improvement. The suprascapular nerve supplies motor and sensory innervation to the shoulder, and can be easily accessible in the supraspinatus fossa. A suprascapular nerve block dramatically decreased her pain. This clinical observation along with confirmatory nerve block play an important role during the decision-making process for a trial period of electrical neuromodulation.

She was followed for 3 months after the permanent implantation of a suprascapular nerve stimulator. Her pain and shoulder range of motion in all planes improved dramatically.

Peripheral nerve stimulation (PNS) of the suprascapular nerve, in addition to multimodality pain management, is one approach to the difficult task of treating adhesive capsulitis with accompanying pain and the inability to move the shoulder.

We conducted a literature review on PubMed and found no case describing a similar patient to our knowledge.

Key words: Suprascapular nerve, neuromodulation, peripheral nerve stimulation, adhesive capsulitis, chronic shoulder pain

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he shoulder joint is an enarthrodial or balland-socket joint. The bones entering into its formation are the hemispherical head of the humerus and the shallow glenoid cavity of the scapula. The glenoidal labrum is a fibrocartilaginous rim attached around the margin of the glenoid cavity. It is triangular on section, deepens the articular cavity, and protects the edges of the bone.

The shoulder joint is capable of every variety of movement: flexion, extension, abduction, adduction, circumduction, and rotation.

When these movements of the arm are arrested in the shoulder joint by the contact of the bony surfaces, and full tension of the fibers of the capsule, still the arm has the capacity to be carried considerably farther by the movements of the scapula and slight motion at the acromioclavicular and sternoclavicular joints.

The suprascapular nerve is a mixed motor and sensory peripheral nerve formed from the union of C5 and C6, with occasional contribution from C4 in some variants.

It runs lateral beneath the trapezius and the omohyoideus, and enters the supraspinatus fossa. The transverse scapular ligament bridges the fossa over the nerve (Fig. 1).

In the suprascapular fossa, the nerve gives off 2 motor branches to the supraspinatus muscle and also sensory branches to the posterior glenohumeral capsule, acromioclavicular joint, and coracohumeral ligament. In 15% of patients, the suprascapular nerve receives cutaneous sensory fibers from the upper lateral arm (deltoid patch) (1).

Adhesive capsulitis is a common and painful condition in which the shoulder range of motion is greatly limited. The condition can be primary, in which there are no identifiable underlying conditions causing the pain and decreased mobility. It can also be secondary to underlying pathology, including biceps tendinopathy, diabetes mellitus, rotator cuff tendinopathy or



Fig. 1. In this ultrasound picture, the suprascapular artery (red arrow), the ligament along the notch (yellow arrow), and the suprascapular nerve are demonstrated (white arrow).

tear, subacromial bursitis, shoulder surgery or trauma, and inflammatory diseases (2).

Peripheral nerve electrical modulation has special role in chronic pain management. For specific nerves in the periphery causing intractable pain, peripheral nerve stimulation (PNS) has utility in treatment by blocking sodium channels and preventing action potential propagation. PNS also decreases the excitability of the nerve C fibers and modifies the release of gammaamino butyric acid (GABA), substance P, adrenaline, serotonin, and alanine (3).

The analgesic effect of the PNS is hypothesized to involve some of the central mechanisms as well as peripheral mechanisms.

Our case is an example of the use of PNS on the suprascapular nerve for intractable to conservative management and pharmacological resistant adhesive capsulitis. We conducted a literature review and found no case describing a similar patient to our knowledge.

CASE PRESENTATION

Our patient is a 39-year-old, right handed, female school teacher, who first presented to the orthopedic surgeon in 2011.

Beginning in 2010, the patient began to note an insidious onset of right shoulder pain. She underwent the first of an eventual 7 shoulder surgeries in 2010, for subacromial decompression SLAP "superior labral tear from anterior to posterior" repair. The progression of her shoulder pain continued unabated post-operatively, and so she underwent biceps tendon repair in early 2011. After shoulder immobilization for 6 weeks postoperatively, she was diagnosed with biceps tendinosis and underwent her third surgery for the tendinosis. Her problems with pain continued, and additionally she began to suffer from decreased range of motion due to adhesive capsulitis. She returned to the operating room for manipulation under anesthesia, and started a physical therapy regimen 3 times per week afterwards. Little improvement was seen with therapy, as her range of motion has actually decreased from 160 degrees forward flexion documented in her manipulation under anesthesia to 90 degrees maximum flexion upon presentation 2 months later. Her pain continued to persist, located over the entire shoulder and more on the anterolateral part of the shoulder, occasionally radiating to the elbow.

The aggressive physical therapy regimen was halted due to fear she was damaging her shoulder even more with activity, and after failing to improve with a glenohumeral intra-articular steroid injection, she underwent her fifth surgery in 2011 for tenodesis of the long tendon of the biceps and shoulder arthroscopy with resection of adhesions. During the surgery, the surgical team found a significant chondrolysis on the superior 2/3 of the glenoid and anterior ½ of the humeral head.

After surgery the pain remained unchanged. Due to severe chondrolysis of the glenohumeral joint and accompanying symptoms, she was offered a resurfacing hemiarthroplasty with glenoid reaming. She underwent the procedure in early 2012, and began physical therapy soon after. At her 6 weeks follow-up after shoulder hemiarthroplasty, she reported no improvement on her shoulder mobility and pain.

She was given a shoulder intra-articular corticosteroid injection with some pain improvement for 2 weeks.

The pain was diagnosed as residual pain from her biceps tenodesis, and so a seventh surgery was scheduled to debride the anterior shoulder scarring as well as the bicipital groove scarring.

After the debridement she was given physical therapy instructions for home execution, as well as a home Transcutaneous Electrical Nerve Stimulation (TENS) unit along with continued medication management. Her pain remained unchanged and all shoulder passive and active range of motion decreased dramatically during a 3 month follow-up after her last surgery.

After her protracted course, she was given a pain clinic referral with the diagnosis of persistent shoulder capsulitis. She describes the pain as 4 – 5/10 numerical pain rating score (NRS) baseline aching and throbbing pain in her right shoulder, that increases to 8/10 NPR with active motion and becomes sharp and shooting in quality. Her past medical history was noncontributory. She does not smoke and denies alcohol consumption or drug dependency. She is currently married and has great family support.

On physical exam, her right shoulder had well healed surgical scars with shoulder active range of motion of 70-degree forward flexion, 10 degrees on extension, internal rotation of 30 degrees and external rotation of 25 degrees, and shoulder abduction of 25 degrees. All of the right shoulder passive range of motion was limited by pain more so on abduction and external rotation.

The patient's history and physical exam were consistent with right shoulder adhesive capsulitis.

We implemented a multimodality treatment strategy, including a trial of a suprascapular nerve block.



Fig. 2. Location of 8 contact electrodes in the supraspinatus fossa.

After the suprascapular nerve block, her shoulder pain decreased to almost 50% of the base line and she was able to do limited active shoulder movement with some improvement of range of motion. We decided to repeat the suprascapular nerve block in several sessions along with aggressive physical therapy and a combined pharmacological approach of gabapentin, low dose amitriptyline, and tramadol.

A trial suprascapular nerve stimulation was then executed, resulting in significant pain reduction and improved range of motion. She was able to participate in physical therapy more efficiently with less pain and discouragement.

A permanent right suprascapular nerve peripheral stimulation implant was executed in an outpatient surgery clinic using ultrasound guidance. The patient was brought to the operating room, and under monitored anesthetic care, we used an 8 contact lead (Medtronic compact 1X8 low impedance 3778-75) and we were able to demonstrate the benefit of pain reduction on the operating room table similar to the trial period (Fig. 2).

On her 3 month follow-up she rated her pain 1-2 NPR with activity. She no longer had pain at rest. On physical examination she was able to do right shoulder forward flexion of 130 degrees, 45 degrees of extension, 90 degrees thumbs up abduction, and internal and external rotation of 45 degrees. She was very happy with the range of motion and pain control. She

rated her satisfaction as 95% with the treatment.

Discussion

The diagnosis and classification of shoulder pain is not uniform. Acute shoulder pain is caused by periarticular, glenohumeral, and regional (other than shoulder) disorders.

Chronic intractable shoulder pain remains a daily struggle for those afflicted with it and a daily challenge to those who choose to treat it.

Not uncommonly, conventional pharmacotherapy may either have side effects or be ineffective. Physical therapy is often abandoned because of persistent intolerable pain, and a progressive decline in range of motion and function ensues. Once the patient exhausts the conventional options of physical therapy, anti-inflammatory medications, intra-articular injections, and corrective/reconstructive surgery, persistent pain is not uncommonly managed with long-term opioids. In reality, few patients are referred to pain management clinics.

Radiofrequency lesioning, cryoablation, and chemical neurolysis (phenol, alcohol) of the suprascapular nerve for chronic shoulder pain may provide a longer duration of pain improvement (4). The goals of the treatment are to decrease pain and increase function. These goals are not always achievable.

Peripheral nerve electrical neuromodulation is an established modality in the treatment of chronic pain.

The first permanent implantation of a peripheral nerve electrode for long-term analgesia described by Sweet, was done in October of 1965 (5). Since then, PNS has been applied to treat pain in several pain syndromes, including CRPS I and II, plexus avulsion, operative trauma, entrapment neuropathies, and injection injuries. The analgesic effect of PNS is hypothesized to involve some of the central mechanisms as well as peripheral mechanisms. The studies showed that stimulation of a peripheral nerve resulted in the loss of sensory perception in that nerve's distribution and a loss of the A-d component in the compound action potential recording of said nerve. They suggested that a peripheral axonal blockade was responsible for the above findings. The repeated electrical stimulation of peripheral nerves resulted in excitation failure of C fibers, followed to a lesser extent by excitation failure in A fibers (6).

Paresthesia during PNS, quite contrary to spinal cord stimulation, is not common. Similar to spinal cord neuromodulation, the mechanisms of action for the paresthesia patterns and pain relief obtained from this therapy are not completely understood, but would appear to involve some of the central or peripheral elements, like spinal segmental stimulation, dermatomal stimulation, myotomal stimulation, sympathetic stimulation, and local blood flow alteration.

Over the last decade ultrasound-guided percutaneous placement of electrodes has gain popularity. Prior to ultrasound-guided percutaneous nerve stimulation placement, the trial was performed using a permanent electrode and required surgical exposure of the nerve. However, with ultrasound guidance, a clinician can easily insert the percutaneous lead through one needle entry.

CONCLUSION

Spinal cord stimulation and PNS are 2 modalities that when used appropriately can provide long-term pain relief in implanted patients.

We cannot propose clinical selection criteria for chronic shoulder pain management based on this case report; however, we believe that multimodality pain management including, but not limited to, utilizing antiepileptic antalgic drugs, antidepressant antalgic medications, aggressive physical therapy, and using techniques like biofeedback should be implemented as soon as clinically indicated.

Physicians may select a patient who has chronic intractable shoulder pain refractory to other therapies as a potential candidate for suprascapular nerve stimulation.

Temporary relief from a local anesthetic block, especially when pain relief can be reproducible by repeat nerve blocks, may be an important sign during the decision-making process for permanent implantation of a PNS.

The presence of objective evidence of psychological contraindications and drug habituation should be considered as some of the most serious red flags during the process of elimination from candidacy for permanent implantation of the electrical nerve stimulation.

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