

PERIPHERAL NERVE STIMULATION FOR CHEST WALL AND PERSISTENT SHOULDER PAIN AFTER REVERSE TOTAL SHOULDER ARTHROPLASTY: A CASE REPORT

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- Background:** Persistent pain after reverse total shoulder arthroplasty (RTSA) warrants evaluation for surgical and infectious causes. Peripheral nerve stimulation (PNS) may be considered when these causes have been assessed, but evidence for its use in chest wall and shoulder pain after RTSA is limited.
- Case Report:** A 70-year-old man had persistent right anterior shoulder pain and new chest wall pain after revision RTSA. Diagnostic testing did not establish a surgical or infectious cause. A right pectoral nerve (PECS I) block provided temporary relief. A temporary PNS lead was placed near the lateral pectoral nerve under ultrasound guidance. After lead removal at 60 days, he reported 90% pain reduction and improved daily activities at 3 and 4 months.
- Conclusions:** This case describes sustained patient-reported relief following temporary lateral pectoral nerve PNS. Further study is needed to determine its effectiveness for pain after RTSA.
- Key words:** Peripheral nerve stimulation, chronic pain, shoulder pain, chest wall pain, reverse total shoulder arthroplasty, PEC 1 block, lateral pectoral nerve, neuromodulation
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BACKGROUND

Reverse total shoulder arthroplasty (RTSA) is a common type of shoulder replacement (1). It is typically indicated for glenohumeral arthritis with massive rotator cuff tear, proximal humerus fracture, and failed anatomic total shoulder replacement (1). While shoulder arthroplasty generally improves function and relieves pain, reported complication rates of 10%–47% may contribute to persistent pain (2). Potential surgical and infectious causes should be evaluated.

Both anatomic total shoulder arthroplasty (TSA) and RTSA share complications such as infection, prosthetic loosening, rotator cuff failure, fracture, hematoma, and nerve injury (3). However, the frequency and type of adverse events can differ between the two procedures. For example, when comparing TSA to RTSA,

instability rates of 1% and 4.7% and periprosthetic infection rates of 1.2%–1.5% and 1%–10% have been reported respectively (4,5). Additionally, RTSA is associated with an increased risk of nerve injury compared to TSA (5). Meanwhile, complications specific to RTSA include acromion fracture, scapular notching, and conjoint tendinitis (6). Given the range of possible etiologies, an orthopedic evaluation is essential to evaluate the need for surgical or antimicrobial treatment before considering interventional pain modalities for chronic pain.

There is currently no consensus on interventional pain guidelines for treating new-onset chest wall or chronic shoulder pain following RTSA. Although evidence advises against the use of intra-articular steroids with a prosthesis, the selection of an interventional target

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and modality may be guided by anatomic knowledge and techniques utilized in other pain conditions (7). As noted, chest wall pain following RTSA has not been previously reported. However, regional anesthesia blockade techniques involving the intercostal, medial, and lateral pectoral nerves have demonstrated analgesia for chest wall and mastectomy-related pain. Meanwhile, the shoulder is innervated by the lateral pectoral, supra-scapular, axillary, and lower subscapular nerves (8). These nerves have been targeted for blockade, ablation, and peripheral stimulation in painful shoulder conditions. It is critical to weigh the risks and benefits of each interventional modality for a patient-centric approach.

Peripheral nerve stimulation is an emerging therapy for chronic pain, theorized to act on both peripheral and central pain pathways (9). There is some evidence to support its use in oncologic chest wall, malignant shoulder, and nonsurgical shoulder pain (8,10). For post-stroke shoulder pain, the evidence is fair to moderate (11). However, there is no literature describing peripheral nerve stimulation for new-onset chest wall pain or chronic persistent shoulder pain as a complication after reverse total shoulder arthroplasty. This case report describes a PEC 1 block approach for peripheral nerve stimulation placement to treat chest wall and chronic anterior shoulder pain after reverse total shoulder arthroplasty.

CASE PRESENTATION

Patient Description

A 70-year-old man with chronic obstructive pulmonary disease (COPD), immunoglobulin G monoclonal gammopathy of undetermined significance (IgG MGUS), and non-small cell lung cancer underwent right RTSA on October 2, 2018, and revision on October 4, 2022. Orthopedic surgery referred him for persistent right anterior shoulder pain.

Case History

The patient underwent successful right reverse total shoulder arthroplasty in October 2018. After a mechanical fall, he suffered anterior shoulder pain, which was noted at 3-month orthopedic follow-up. Due to pain and instability from chronic subscapularis rupture, he had a revision of the reverse total shoulder arthroplasty in October 2022.

At 6-month orthopedic follow-up, the patient reported pain relief from a preoperative interscalene

block. However, after the local anesthetic wore off, a new pain pattern began. He reported continued right anterior shoulder pain with new chest wall pain. The pain was recalcitrant to lidocaine patch, diclofenac, antibiotics, and hydromorphone. Diagnostic tests including serology, joint aspiration, radiography, and computed tomography were inconclusive. The pain was described as focal, nonradiating, constant sharp and stabbing, with an intensity of 8/10. Pain limited range of motion but he was able to abduct the right shoulder.

The patient was referred to Pain Management. He received an ultrasound-guided right pectoral nerve (PECS I) block in May 2023. The block provided significant relief for the duration of local anesthetic action but was not sustained.

PHYSICAL EXAMINATION

General: Well nourished and well developed, in no acute distress

Respiratory: Nonlabored breathing on room air

Cardiovascular: No edema or cyanosis

Skin: No appreciable rashes or skin breakdown, chest wall port present

Musculoskeletal: No significant pain or tenderness to palpation in the posterolateral shoulder or over the scapula

Tender to palpation over the right anterior shoulder

Exquisite tenderness of the right pectoralis major

Right anterior chest wall pain lateral to port

Right shoulder abduction to 90°, flexion to 110°

Diagnostic Tests

Serology, January 2023:

White blood cell count: 9

Hemoglobin: 13.9

Platelet count: 324

Erythrocyte sedimentation rate: 42

C-reactive protein: 16.3

Joint aspiration and culture, March 2023: Negative

Radiography, February 2023:

1. Uncomplicated reverse right total shoulder arthroplasty with no acromial or scapular spine fracture
2. Unchanged enthesopathy versus calcification tendinopathy at the origin of the anterior deltoid
3. Enthesophyte versus calcific tendinopathy at the origin of the coracobrachialis and short head of the biceps tendon

Computed tomography, March 2023:

Status post right reverse total shoulder arthroplasty without radiographic finding of complication or acute abnormality.

Treatment Plan

PNS of the lateral pectoral nerve using a PECS I block approach under ultrasound guidance.

Expected Outcome

Prolonged pain relief based on the response to the PECS I block.

Peripheral Nerve Stimulation Using a PECS I Block Approach

Before administration of local anesthetic, the painful region was carefully outlined with a marker. The patient was placed in the supine position with shoulder abduction and supported with padding for comfort. Appropriate skin, bony landmarks, and pertinent vascular structures were identified with a linear ultrasound transducer. The skin was prepped and draped in sterile fashion. A SPRINT® Peripheral Nerve Stimulation (PNS) System (SPR Therapeutics, Cleveland, OH) was used for temporary peripheral nerve stimulation.

After identifying and marking the intended target along the course of the right lateral pectoral nerve, the skin around the planned entry point and the subcutaneous tissues were injected with local anesthetic. Utilizing an in-plane ultrasound-guided approach, the needle was moved into the PECS I plane between the pectoralis major and minor. The PECS I plane was hydrodissected to allow for lead placement (Fig. 1).

A percutaneous sleeve and stimulating probe lead introduction system were assembled, inserted, and advanced along the intended course of the right lateral pectoral nerve, taking care to maintain the proper depth of insertion as the introducer was advanced under direct ultrasound guidance. The introducer needle was delivered to a location in proximity to the nerve, remaining superficial to the pleura. The stimulating probe was removed from the introducer and a percutaneous lead was guided through the needle and delivered to a location near the nerve. Final location was verified and documented with ultrasound.

The introducer needle was removed, and the exposed end of the lead was attached to an external stimulator.

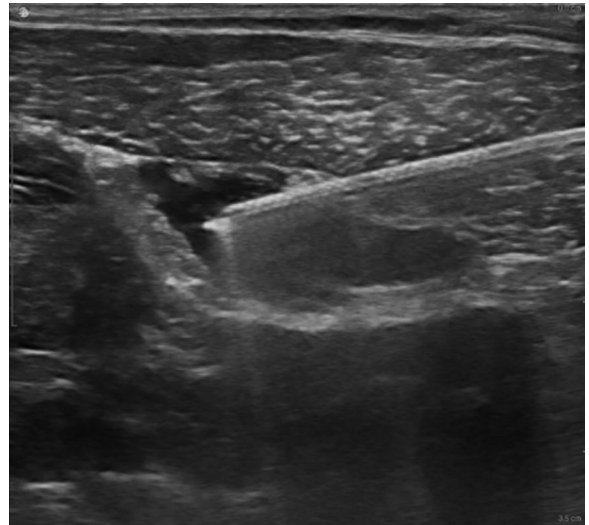


Fig. 1. Hydrodissection of the PECS I plane for PNS lead placement

Paresthesia mapping was not performed because of the fluid pocket created for lead placement.

The lead was anchored at the skin, threaded into the connector block, and attached to the external stimulator. The site was covered with a sterile occlusive dressing. Vital signs and comfort were monitored.

Outcome

The patient reported substantial pain relief at 1 week and 2 months. After removal of the 60-day lead, he reported 90% pain reduction in combined anterior shoulder and chest-wall pain compared with baseline and improved activities of daily living at 3 months. He reported continued benefit at 4 months after lead removal.

DISCUSSION

Nerve injury is a recognized complication of shoulder arthroplasty and occurs more frequently with the reverse total shoulder arthroplasty (RTSA). Direct mechanisms of injury include surgical dissection, retractor-related compression, and trauma from interscalene nerve block (12). Indirect mechanisms may involve excessive traction or thermal injury secondary to cement extrusion (12). Although the axillary nerve is the most commonly affected individual nerve in RTSA, injury to the brachial plexus and its branches should also be considered. Among these, the upper trunk is most frequently involved, followed by the middle trunk (13).

The lateral pectoral nerve, a branch of the lateral cord receiving contributions from both the upper and middle trunk, may also be susceptible to injury and warrants consideration (14).

An interscalene block targets the C5, C6, and occasionally the C7 nerve roots. Given the lateral pectoral nerve's origin from the upper and middle trunks, pain relief during the duration of anesthetic action was expected. The successful PECS I block further supports this as the patient's pain distribution involved the anterosuperior shoulder and chest wall which may receive innervation by the articular branch of the lateral pectoral nerve (15). This nerve has been implicated in chest wall and upper extremity nociception and has been targeted for neural blockade in both breast and shoulder surgery (16). Consequently, neuromodulation strategies such as targeted peripheral nerve stimulation which has shown sustained analgesic benefit in conditions such as post-amputation and back pain represent a viable therapeutic option in this context

(17,18). The observed analgesic relief after lead extraction may reflect peripherally induced reconditioning of the central nervous system (19). Published evidence on PNS for chest wall or shoulder pain after RTSA remains limited.

CONCLUSIONS

Persistent pain is a commonly reported complication of reverse total shoulder arthroplasty. It is essential to rule out various surgical and infectious causes before considering interventional pain treatments. After these causes are assessed, the pain distribution may help identify a peripheral nerve target. The lateral pectoral nerve should be considered for anterosuperior shoulder or chest wall pain. This nerve is involved in nociception and is a target for the PECS I block for breast and shoulder surgeries. Peripheral nerve stimulation may be a viable option for prolonged analgesic treatment as it has shown potential for sustained relief in other painful conditions.

REFERENCES

1. Kozak T, Bauer S, Walch G, et al. An update on reverse total shoulder arthroplasty: Current indications, new designs, same old problems. *EFORT Open Rev* 2021; 6:189-201.
2. Gabriel S, Tucker T, Boin MA. A narrative review of noninfected painful total shoulder arthroplasty: Evaluation and treatment. *Ann Jt* 2023; 8:16.
3. Hagedorn JM, Pittelkow TP, Bendel MA, et al. The painful shoulder arthroplasty: Appropriate work-up and review of interventional pain treatments. *JSES Rev Rep Tech* 2022; 2:269-276.
4. Fossati C, Vitale M, Forin Valvecchi T, et al. Management of painful shoulder arthroplasty: A narrative review. *Pain Ther* 2020; 9:427-439.
5. Parisien RL, Yi PH, Hou L, et al. The risk of nerve injury during anatomical and reverse total shoulder arthroplasty: An intraoperative neuromonitoring study. *J Shoulder Elbow Surg* 2016; 25:1122-1127.
6. Tashjian RZ, Frandsen JJ, Christensen GV, et al. Conjoint tendon release for persistent anterior shoulder pain following reverse total shoulder arthroplasty. *JSES Int* 2020; 4:975-978.
7. Cancienne JM, Werner BC. The risk of early infection following intra-articular corticosteroid injection following shoulder arthroplasty. *Shoulder Elbow* 2021; 13:605-609.
8. Laumonerie P, Dalmas Y, Tibbo ME, et al. Sensory innervation of the human shoulder joint: The three bridges to break. *J Shoulder Elbow Surg* 2020; 29:e499-e507.
9. Lin T, Gargya A, Singh H, et al. Mechanism of peripheral nerve stimulation in chronic pain. *Pain Med* 2020; 21:S6-S12.
10. Abdullah NM, Jenkinson RH, Deer TR, et al. Treatment of chest wall pain syndrome from oncologic etiology with neuromodulation: A narrative review. *Interv Pain Med* 2023; 2:100255.
11. Mazzola A, Spinner D. Ultrasound-guided peripheral nerve stimulation for shoulder pain: Anatomic review and assessment of the current clinical evidence. *Pain Physician* 2020; 23:E461-E474.
12. Vajapey SP, Contreras ES, Cvetanovich GL, et al. Neurologic complications in primary anatomic and reverse total shoulder arthroplasty: A review. *J Clin Orthop Trauma* 2021; 20:101475.
13. Lynch NM, Cofield RH, Silbert PL, et al. Neurologic complications after total shoulder arthroplasty. *J Shoulder Elbow Surg* 1996; 5:53-61.
14. LiBrizzi CL, Rojas J, Joseph J, et al. Incidence of clinically evident isolated axillary nerve injury in 869 primary anatomic and reverse total shoulder arthroplasties without routine identification of the axillary nerve. *JSES Open Access* 2019; 3:48-53.
15. Nam YS, Panchal K, Kim IB, et al. Anatomical study of the articular branch of the lateral pectoral nerve to the shoulder joint. *Knee Surg Sports Traumatol Arthrosc* 2016; 24:3820-3827.
16. Bossolasco M, Fenoglio LM. Yet another PECS usage: A continuous PECS block for anterior shoulder surgery. *J Anaesthesiol Clin Pharmacol* 2018; 34:569-570.
17. Gilmore C, Ilfeld B, Rosenow J, et al. Percutaneous peripheral nerve stimulation for the treatment of chronic neuropathic post-amputation pain: A multicenter, randomized, placebo-controlled trial. *Reg Anesth Pain Med* 2019; 44:637-645.
18. Gilmore CA, Kapural L, McGee MJ, et al. Percutaneous peripheral nerve stimulation for the treatment of chronic low back pain provides sustained relief. *Neuromodulation* 2019; 22:615-620.
19. Deer TR, Eldabe S, Falowski SM, et al. Peripherally induced reconditioning of the central nervous system: A proposed mechanistic theory for sustained relief of chronic pain with percutaneous peripheral nerve stimulation. *J Pain Res* 2021; 14:721-736.

