Neuromodulation of Suprascapular Nerve for Chronic Shoulder Pain: Literature Review

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Background

Chronic shoulder pain, persisting for six months or more, presents a complex musculoskeletal challenge with origins ranging from rotator cuff disorders to neuroinflammation. Despite conventional treatments, a subset known as chronic shoulder pain (CSP) proves resistant to standard interventions. Conditions like rotator cuff disorders, glenohumeral instability, and adhesive capsulitis contribute to CSP, necessitating innovative approaches for effective management. At the core of shoulder innervation is the suprascapular nerve (SSN), crucial for motor and sensory functions. Originating from the upper trunk of the brachial plexus, the SSN not only innervates muscles but also provides sensory perception to joints. Neuromodulation techniques, such as peripheral nerve stimulation (PNS) and pulsed radiofrequency (p-RF), show promise. PNS, by blocking sodium channels and modulating nerve C fibers, holds potential for alleviating intractable pain. Targeted p-RF application to the SSN, responsible for 70% of shoulder sensory innervation, is particularly noteworthy. While alternatives like steroid injections offer short-term relief, surgical neurectomy poses risks. Therefore, peripheral nerve electrical modulation, especially focusing on the suprascapular nerve, plays a distinctive role in the comprehensive management of chronic shoulder pain.

Methods

A comprehensive scientific literature search was conducted through specialized databases such as MEDLINE, EMBASE, CINAHL, PubMed, MedlinePlus, PsycINFO, and Cochrane Library. The search terms used to retrieve the relevant literature in each of these databases were "neuromodulation" AND "suprascapular nerve" AND "chronic shoulder pain".

Results/Evidence Table

Study	Therapy or Exposure	Outcome/Results
Retrospective Case Series	- 4 patients with chronic shoulder pain - Pulsed radiofrequency of SSN (PRF) or peripheral nerve stimulation (PNS)	- Two patients underwent PNS: complete pain resolution, sustained functional improvement - Two patients underwent PRF: initial relief, pain regressed back to baseline, minimal functional improvement - Peripheral nerve stimulation is effective for chronic shoulder pain, limited effectiveness of pulsed radiofrequency in chronic shoulder pain
Case Report	- 1 patient with prior cervical spinal stenosis - Suprascapular nerve block and neurostimulation	- Substantial and sustained pain reduction (VAS 0.5) over 9 months; Improved quality of life; - Ceased reliance on pain medication
Retrospective Study	- 31 patients with partial rotator cuff tear - Ultrasound-guided pulsed radiofrequency of suprascapular nerve	- Significant reduction in NRS scores at 3 weeks (2.90) and 6 months (3.22) compared to pre-procedural (7.32) - Likert scale revealed high patient satisfaction at 3 weeks (71%) and 6 months (68%) - No adverse effects or complications were observed
Case Study	- 1 patient with multiple failed shoulder surgeries - Suprascapular nerve stimulation implant	- Marked pain alleviation and enhanced function; 95% patient satisfaction
Retrospective Study	- 31 patients with chronic shoulder pain - Received pulsed radiofrequency treatment along with Dexamethasone	- Significant VAS score reduction scores at 3 weeks (2.90) and 6 months (3.22), high patient satisfaction at 3 weeks (71%) and 6 months (68%) - Tailored effectiveness for different shoulder patholiges (rotator cuff> adhesive capsulitis > AC joint)
Case Series	- 2 patients with rotator cuff pathology, deemed not suitable for surgery - Peripheral nerve stimulation targeting suprascapular and axillary nerves	- Patient 1: 100% pain relief during treatment, sustained 90% relief post-treatment and significantly reduced his opioids (20MME to 5MME) - Patient 2: 80% pain relief during treatment, sustained 80% relief post-treatment and reduced his opioid medication usage (30MME to 15MME)
Prospective Study	- 11 patients with adhesive capsulitis or rotator cuff tear - Pulsed radiofrequency of suprascapular nerve	- The pre-diagnostic block VAS score of 6.4±1.49 reduced to 1.0±0.73 and 1.5±1.23 at 6 and 9 months post-PRF procedure - Results showed significant pain relief in all patients at the 6-month follow-up, and at the 9-month follow-up, 10 patients (90.9%) reported significant pain relief - 63.6% of patients reported a notable improvement in shoulder function (OSS score ≥40) at both the 6- and 9-month follow-ups.

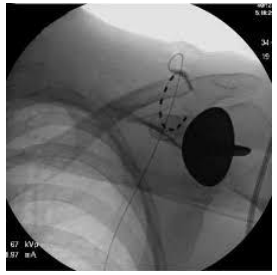

Figure 1. Peripheral Nerve Stimulation targeting suprascapular nerve

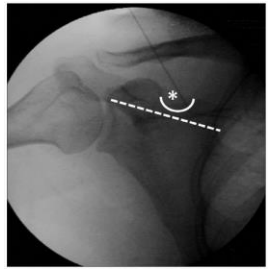

Figure 2. Pulsed Radiofrequency of suprascapular nerve

Discussion and Conclusions

In conclusion, these studies collectively support the use of peripheral nerve neuromodulation, particularly targeting the suprascapular nerve, as a promising intervention for chronic shoulder pain. While variations in response exist, the overall positive outcomes and sustained effects observed across diverse patient profiles highlight the potential of this approach in improving the quality of life for individuals suffering from this debilitating condition. Further research and larger-scale studies will be essential in confirming and expanding upon these promising findings.

References

Chitneni, A., Hasoon, J., Urits, I., Viswanath, O., Berger, A., & Kaye, A. (2022). Peripheral Nerve Stimulation for Chronic Shoulder Pain Due to Rotator Cuff Pathology. *Orthopedic reviews*, *14*(3), 37494.
Dey S. (2021). Comparing neuromodulation modalities involving the suprascapular nerve in chronic refractory shoulder pain: retrospective case series and literature review. *Clinics in shoulder and elbow*, *24*(1), 36–41.
Elahi, F., & Reddy, C. G. (2014). Neuromodulation of the suprascapular nerve. *Pain physician*, *17*(6), E769–E773.
Jang, J. S., Choi, H. J., Kang, S. H., Yang, J. S., Lee, J. J., & Hwang, S. M. (2013). Effect of pulsed radiofrequency neuromodulation on clinical improvements in the patients of chronic intractable shoulder pain. *Journal of Korean Neurosurgical Society*, *54*(6), 507–510.
Kurt, E., van Eijk, T., Henssen, D., Arnts, I., & Steegers, M. (2016). Neuromodulation of the Suprascapular Nerve. *Pain physician*, *19*(1), E235–E239.
Sinha, P., Sarkar, B., Goswami, S., Ray Karmakar, P., Dasgupta, S. R., & Basu, S. (2020). Effectiveness of Combination of Ultrasonography-Guided Pulsed Radiofrequency Neuromodulation With Steroid at the Suprascapular Nerve in Chronic Shoulder Pain. *Pain practice : the official journal of World Institute of Pain*, *20*(1), 16–23.