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Case Report
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Suprascapular Nerve Continuous Radiofrequency Ablation in Hemiplegic Shoulder Pain – A Case Report of a New Therapeutical Approach?

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Abstract

Introduction: Hemiplegic Shoulder Pain (HSP) is the most common pain condition after stroke, imposing functional limitations and decreasing the quality of life. Among the different therapeutical strategies, radiofrequency has gained interest in the treatment of chronic shoulder pain, with results favoring its safety and efficacy.

Case Report: A 76-year-old-man with right hemiparesis, after a stroke, with no active shoulder girdle muscle activation presented in our rehabilitation center with a right HSP refractory to conservative and minimally invasive therapeutical strategies. In face of the absent of muscle activation, rather than pulsed, ultrasound-guided continuous radiofrequency ablation (cRF) of the suprascapular nerve was performed. The result was a complete pain remission (until the last medical evaluation at 12 weeks), improvement in shoulder passive range of motion and in passive functionality of the right upper limb. cRF seems effective and safe in the treatment of HSP when patients have no active shoulder girdle muscle activation.

Keywords: Hemiplegic shoulder pain; Continuous radiofrequency ablation

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Introduction

Hemiplegic Shoulder Pain (HSP) is the most common pain condition after stroke, with a prevalence of 16% to 84% [1]. Despite its high prevalence, diagnosis and treatment is complex due, in part, to its multi-factorial etiology. Disturbance of musculotendinous integrity and articular imbalance due to rotator cuff tears, Glenohumeral sub-luxation or adhesive capsulitis, biomechanical dysfunction due to paralysis and changes in muscle tone and peripheral or Central Nervous System (CNS) activity (complex regional pain syndrome type 1, peripheral nerve entrapment, neglect, sensory impairment, central pain, central sensitization) can be responsible for causing HSP [2].

This problem has an adverse effect on quality of life and rehabilitation outcomes on post-stroke patients and, despite different known management strategies; an optimal treatment approach has not yet been established [3].

Current management includes appropriate limb positioning, exercises, physical therapy modalities, upper limb supports, intra-articular corticosteroids, botulinum toxin injection, perineural injection therapy, and surgery [4]. Perineural injections with suprascapular nerve block (SSN) is a safe and effective treatment option for improving range of motion, pain and quality of life in stroke patients with HSP [5-9]. Blocking of SSN provides significant pain relief, as SSN contributes with 70% of the sensory innervation of shoulder joint [10], and is typically performed with local anesthetics, which due its duration cannot assure have long term effects. Alternatively, in the hope of providing longer pain relief, denervation of suprascapular nerve using pulsed or conventional thermal radiofrequency (RF) can be undertaken for this purpose. Radiofrequency has gained increasing interest in treatment of chronic shoulder pain, refractory to other therapeutic approaches with results supporting its safety and efficacy [11]. The main mechanisms of continuous radiofrequency ablation (cRF) is the generation of heat and electrical field in the surrounding tissue through alternating current that leads respectively to thermo-coagulation with destruction of neural tissue and neuromodulatory effect in the dorsal root ganglion [12]. Pulsed radiofrequency (pRF) is carried out at similar output intensity as cRF however it is performed in short pulsed to reduce

target temperature, which avoids higher temperatures that could lead to the destruction of neural tissue from thermal injury [13]. It is postulated that its mechanisms results from its neuromodulatory and sensitization effects, in the dorsal root ganglion and in C and Delta fibers; diminishing nociceptive neurotransmitters like glutamate, P substance and CGRP [14]. Suprascapular nerves contain motor fibers for supraspinatus and infraspinatus muscles that may be damaged with cRF and, for his reason, pRF has been used in management of chronic shoulder pain [9,15,16].

We report a case of chronic HSP, refractory to other therapeutic strategies, that was successfully managed with cRF. The lack of active motor recruitment of shoulder muscles, due to the stroke, was considered the main reason to proceed to cRF (instead of pRF) to confer a longer-term effect.

Case Report

We present a case of a 76-year-oldman, with history of hypertension, dyslipidemia and essential tremor and a hemorrhagic stroke 2 years before on left lenticulocapsular region that led to neuromotor sequelae of right hemiparesis.

About 1 year after the stroke, the patient was referred for medical consultation in our rehabilitation center. In term of impairments, he had no active movements in the right upper limb, except elbow flexors which described partial range of movement but unable to overcome gravity, and in the globally of the right lower limb he was able to overcome some resistance in partial range of the movement. He did not have function of the right upper limb and walked with tripod assistance on the left side. He scored 86/126 in the Functional Independence Measure (FIM) instrument. His main complains was pain in his right shoulder that commenced 5 months before, without associated traumatic events. The pain was persistent, scored 8 out of 10 on Numeric Pain Rating Scale (NRS), had projection to the elbow and was aggravated with minimally passive shoulder mobilization. This pain had functional repercussions causing limitation in hygiene and dressing of the right upper limb. On clinical examination, he had no signs of GU sub-luxation and he had limitation and marked pain on passive range of motion (pROM); lateral elevation: 70°, external rotation: 0° and adduction/internal rotation reaching femoral great trochanter. The treatment management of this case was done initially with ultrasound-guided block of the suprascapular nerve with ropivacaine 2% and ultrasound intra-articular injection of 2cc of methylprednisolone. The patient participated afterwards in a 15-session rehabilitation program with physical therapy modalities and therapeutical exercise focused on right upper limb passive mobilization. The patient was re-evaluated 6 weeks after and at that time he reported a partial improvement in pROM and rated shoulder pain as 5 on NRS. Considering the spasticity component, ultrasound toxin botulinum injection (abobotulinum toxin A) was performed 4 month later in posterior deltoid (100 U), sub-scapularis (100 U), teres major (100 U), dorsalis major (100 U) resulting in further pROM improvement, however shoulder pain persisted, scoring 7 on NRS. Since the patient had a significant improvement with the anesthetic block and considering that no active motor function was preserved on shoulder muscles, an ultrasound-guided cRF of the suprascapular nerve was performed to promote a longer-term therapeutic effect (Figure 1). A 100 mm long RF needle with 10 mm active tip was advanced under ultrasound guidance toward the scapular notch. After appropriate positioning of the needle into the suprascapular notch, RF probe was inserted and checked for stimulation. Sensory stimulus

Figure 1: Ultrasound-guided cRF of the suprascapular nerve.

was delivered to the suprascapular nerve with the RF generator at a frequency of 50 Hz, pulse width of 0.2 ms to elicit paresthesia in the shoulder joint between 0.3-0.5 volt. Motor stimulation was tested at 2 Hz, 0.2 ms, and 0.4 to 0.5 V which elicited contractions in the infraspinatus and supraspinatus muscles. After that anesthetic block of SSN with 2 cc of lidocaine was performed followed by one cycle of 90 seconds cRF keeping the temperature constant at 80°C. After the procedure, pain was ranked 0 out 10 on NRS and the patient improved pROM on physical examination (lateral elevation until 110º, external rotation until 30º and internal rotation until L1 vertebrae was possible without any pain). The absence of shoulder pain (0 on NRS) was maintained in 6 and 12 weeks (time of last medical evaluation), without the need of analgesic consumption. Patient also reported significant improvements in hygiene and dressing of the right upper limb due to the painless passive mobilization.

Discussion

This clinical case is a demonstration of complex management of HSP in which ultrasound-guided cRF of the scapular nerve was an effective intervention for pain resolution, contributing to functional improvement. HSP is often underestimated and untreated, interferes with rehabilitation and is a frequent cause of detriment in quality of life and disability. Our approach in this case was multimodal and consisted in physical therapy modalities, pharmacotherapy and minimal invasive procedures (nerve blockage, intra-articular corticosteroid and toxin botulinum injections) considering the multi-factorial etiology of this condition.

To the best of our knowledge, this is the first case report that used cRF to treat HSP. In other trials [15,16] and case series [9] patients were treated with pRF which promoted improvements in pain and pROM of the affected shoulder. Simopoulos et al., [17] reported relief of chronic shoulder pain until 18 months after cRF in other shoulder conditions than HSP. We belief that patients with HSP, without active motor recruitment of shoulder muscles, benefit more with cRF, because neuro-destructive effects provide longer-lasting pain relief compared to pRF, which theorically provides only a neuromodulatory effect. The magnitude of pain reduction was greater with cRF in relation to SSN anesthetic block in 6 weeks after the procedure, possibly due to short-term efficacy of anesthetic effect. A similar finding was reported by Alanby et al., [15] using pRF treatment in HSP.

It is important to try anesthetic SSN block as an indicator of the effectiveness of treating HSP with cRF. Since suprascapular nerve is thought to constitute approximately 70% of the sensorial fibers of the shoulder joint, other neural structures like the Axillary Nerve (AN) can also mediate shoulder pain [18]. As an example, Yang C.

et al., [16] reported efficacy on pain relief in HSP after combining AN and SSN treatment with pRF. Therefore, it is important to study the efficacy between interventions with RF of SSN in isolation or in combination with the AN.

The use of ultrasound to guide this intervention has many advantages considering that is cost effective, safe and provides real time imaging, allowing a more accurate and closer placement of the needle tip to the SSN.

Regarding the increase in pROM after cRFA, it is interpreted in the context of pain relief, which allowed better mobilization for hygiene and dressing activities in this patient contributing to a better quality of life. Thus, cRF treatment of SSN might be proposed as a treatment option in stroke rehabilitation to optimize functionality, particularly to facilitate shoulder mobilization and neuromotor techniques, in patients with HSP. However, it is important to emphasize that this should not be an isolated strategy in management of HSP, once it is also important to combine other therapeutical modalities to tackle associated problems such as physical rehabilitation and antispastic drugs to optimize mobility and activity and orthosis to improve articular stabilization.

Conclusion

Ultrasound guided cRF of SSN was an effective treatment in reducing pain in this case of chronic HSP until at least 12 weeks after. In HSP, with no active shoulder muscle recruitment, cRF can be offered as a valid therapeutic option in the treatment of pain refractory to other strategies and possibly, providing longer lasting pain relief. Proper management of HSP is fundamental to optimize rehabilitation, functionality and quality of life of stroke patients.

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