Fluoroscopic-guided quadrilateral space block for the treatment of quadrilateral space syndrome - A case report

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ABSTRACT

We report a case of a 48-year-old female who presented four months following a low-energy trauma with symptoms most consistent with adhesive capsulitis. An MRI demonstrated extensive patchy areas of intramuscular edema-like signal involving the lateral head of the deltoid with associated muscle atrophy, in keeping with a subacute denervation injury. She was diagnosed with quadrilateral space syndrome (QSS) and successfully treated with an fluoroscopic-guided corticosteroid injection. At her two-year follow-up, the patient had regained full function and had no lasting symptoms. Non-specific symptoms like ill-defined shoulder pain, decreased motor function, and weakness can delay the diagnosis and management of QSS. As there is a lack of a good diagnostic study, fluoroscopic-guided quadrilateral space block should be considered should the diagnosis fit a patient's clinical profile, as this has the potential to be both diagnostic and therapeutic.

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1. Introduction

Quadrilateral space syndrome (QSS) is a relatively rare condition that develops secondary to axillary nerve and posterior humeral circumflex artery (PHCa) compression within the quadrilateral space. This syndrome is often difficult to diagnose given its non-specific signs and symptoms and lack of a good diagnostic study. Patients are reported to present with intermittent insidious onset of poorly localized shoulder pain, and at times present with deltoid and teres minor denervation.^{1,2}

In this case report, we present the clinical history, diagnostic workup, treatment, and two-year follow-up outcomes of a 48-year-old female who presented to our academic centre with symptoms in keeping with adhesive capsulitis. She was eventually diagnosed with QSS and successfully treated with an fluoroscopic-guided quadrilateral space block. The purpose of this case report is to present an unusual case of QSS following a low-energy trauma. To the best of our knowledge, this is the first report describing fluoroscopic-guided quadrilateral space block for the treatment of QSS.

The patient was informed that data concerning the case would be submitted for publication. Informed consent was obtained prior to the publication of this case report.

2. Case presentation

A 48-year old active, right hand dominant woman presented to our orthopedic clinic following four months of worsening left shoulder pain, decreased function, and weakness. Her symptoms began after her dog accidentally struck her posterior shoulder while jumping into bed. She described experiencing a sudden “jolt” of pain, and thereafter began developing soreness to her entire shoulder. Over the course of the following months, her pain and function would continue to deteriorate despite appropriate conservative management including aggressive physiotherapy. She denied any specific exacerbating or relieving factors regarding the pain.

Her past medical history was notable for previous gynaecological surgeries. She denied any previous injuries or surgeries to her left shoulder. Physical examination was difficult due to exquisite tenderness on palpation of shoulder. She was reluctant in allowing our team to palpate her shoulder and scapula given the pain this caused. She presented with pseudoparalysis on active and passive range of motion (ROM), where she displayed 30° of forward

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shoulder flexion and 10° of external rotation. Sensory testing was notable for subjective diffuse paresthesias in the left arm, in a non-dermatomal pattern. She postured with an elevated scapula. She was otherwise neurovascularly intact distally, with normal function of her elbow and hand.

Initial radiographs demonstrated a smooth bony excrescence arising from the posterior aspect of her proximal humerus. To further assess this, a computed tomography scan of her left shoulder was performed. A sessile osteochondroma was confirmed along the posterior aspect of the proximal humerus. However, as the pain was out of keeping with the location of this lesion, a magnetic resonance imaging (MRI) was ordered to rule out other causes of shoulder/arm pain. Findings showing poorly-defined, feathery edema-like signal in the deltoid and teres minor muscles consistent with subacute denervation injury from QSS (Fig. 1), in addition to features consistent with adhesive capsulitis. As the numbness was not consistent with any peripheral nerve or dermatomes, and due to the MRI findings being suggestive of QSS, no EMG studies were ordered.

She was referred for a diagnostic/therapeutic left quadrilateral space block performed under fluoroscopy (Fig. 2). A fluoroscopically-guided technique was devised via a posterior approach. Using sterile technique and local anesthetic, a 25-gauge spinal needle was advanced to the posterior, medial cortex of the proximal humeral metaphysis above the level of teres major, to determine depth. The needle tip was then redirected 1 cm further medial and anterior into the quadrilateral space. A small amount of contrast was injected to confirm filling of the space, and exclude intravascular placement. Subsequently, a mixture made by combining 1 cc of Depo-Medrol (40 mg) and 2 cc of Bupivacaine 0.5% was successfully injected.

Upon follow-up four weeks later, the patient's pain and paresthesias had nearly resolved. Despite still having restricted ROM compared to her contralateral side, her function had improved. Over the course of the following year, she would participate in regular physiotherapy. At her two-year follow-up, she had full resolution of her symptoms. An MRI done at this time demonstrates return of normal muscle signal without any residual muscle atrophy (Fig. 3). On physical examination, her ROM was 170° of forward shoulder flexion, 60° of external rotation, and was able to internally rotate her arm to the level of her thoracic 10th vertebrae. She had a negative horn blower's sign and 5/5 strength in her axillary nerve distribution.

Fig. 2. Left quadrilateral space injection, showing x-ray contrast and the needle tip in the quadrilateral space before injection of the corticosteroid-anesthetic mixture.

3. Discussion

The purpose of this case report is to present a unique case of QSS in a patient initially believed to have adhesive capsulitis following a low-energy trauma. Despite being perceived as a rare orthopaedic condition, it is important to appreciate the nonspecific signs and symptoms of QSS given its potential to lead to significant morbidity. In doing so, there may be fewer delays in diagnosis, and thus sooner appropriate care. As demonstrated with this case report, following diagnosis patients may find relief of symptoms with a corticosteroid injection into the quadrilateral space. Though previous reports have described successful ultrasound-guided blocks,^{6,7} we present a novel approach to performing a quadrilateral block using fluoroscopy.

Quadrilateral space syndrome is a rare disorder first described by Cahill and Palmer in 1983 as compression of the PHCa and the axillary nerve in the quadrilateral space. In his original paper, Cahill described four distinct features of QSS: diffuse pain around the

Fig. 1. Coronal (a) and axial STIR (b) sequences showing poorly-defined, feathery edema-like signal (arrows) in the deltoid and teres minor muscles consistent with subacute denervation injury from quadrilateral space syndrome.

Fig. 3. Coronal T2 FS (a) and axial PD FS (b) sequences demonstrate return of normal muscle signal, with no muscle atrophy.

shoulder, paresthesia in a non-dermatomal distribution; point tenderness over the quadrilateral space; and a positive angiogram finding when in a provocative positioning.³ While the etiology of QSS continues to be elusive, it is believed to be multifactorial. Furthermore, fibrous bands, trauma, osteochondroma, and muscular hypertrophy have all been described as causes of neural entrapment or vascular compression leading to QSS.^{4,5}

Under those circumstances, cases of QSS in the literature commonly involve younger patients, less than forty years of age. Unlike Cahill's original description of presenting symptoms, patients often present with vague complaints of pain without specifically localizing to the posterior shoulder, let alone directly overtop the quadrilateral space. Some patients may have their symptoms exacerbated with forward flexion or abduction and external rotation of the shoulder.¹ This case report presents an unusual case of a young female whose initial clinical presentation correlated most with a diagnosis of adhesive capsulitis following a low-energy trauma given her very limited ROM. In retrospect, her ill-defined paresthesias which followed no specific dermatomal pattern may have been the only symptom consistent with QSS. While the diagnosis of QSS is often a diagnosis of exclusion, physicians should be knowledgeable of the condition, despite its rarity, as patients can undergo unnecessary investigation. In fact, Hang et al. recently discussed a patient in their practice who underwent a labral repair, subacromial decompression, exploratory surgery, first rib resection, anterior/middle scalenectomy, neurolysis, and pectoralis minor release before the appropriate diagnosis of QSS was taken.⁴

Owing to the fact that most literature on QSS is limited to case series and case reports, there continues to be much variability in the treatment of QSS. Conservative management should be trialed before surgical options are entertained; this includes the use of nonsteroidal anti-inflammatories, activity modification focused at avoiding abduction and external rotation, and physical therapy.¹ Surgical decompression may be considered in those who fail conservative measure which results in good outcomes, whereby most patients have complete or near-complete resolution of symptoms post-surgical decompression and were able to return to their sporting activities.¹ Unfortunately, there is a lack of knowledge regarding the risk of perioperative complications following surgical decompression of the quadrilateral space.

More recently, there is emerging reports of patients with QSS successfully treated with ultrasound-guided corticosteroid injection.^{6,7} This modality has the added benefit of quicker symptom relief. Chang et al. have recently reported a case of QSS in a 42-year-

old male weight lifter who presented symptoms consistent of QSS of a few weeks duration. MRI results demonstrated moderate atrophy and fatty infiltration of the teres minor. This patient was treated successfully with ultrasound-guided corticosteroid injections.⁶ Furthermore, Feng et al. also reported a case of QSS in a 54-year-old female who presented with a six month history of progressive dull pain in her shoulder. QSS with axillary nerve entrapment was suspected following an MRI. The patient reported immediate partial pain relief after an ultrasound-guided axillary nerve block using 2mL 1% Xylocaine, and later on reported greater than 50% pain reduction after a two-week follow-up.⁷ As for the case reported in this paper, it is the first reported case of QSS treated successfully with fluoroscopic-guided corticosteroid injection that we believe has been reported to date. Fluoro-guided procedures have the advantage over ultrasound in that typically they are easier and faster to perform, allow for more confident maintenance of a sterile field, and conclusive extra-vascular needle tip placement. The disadvantages include radiation exposure (albeit it an extremely low dose), and potentially less access to the modality. In addition, unlike the aforementioned cases, we report patient outcomes at two-year follow-up. The patient presented here, regained full function and ROM of her extremity following her corticosteroid injection. Additionally, she had no return of similar symptoms in the two-years following her treatment.

4. Conclusion

Following this case, it is the author's opinion that added benefit may be obtained by incorporating QSS in the differential diagnosis of patients with atypical shoulder symptoms. In doing so, those patients with QSS may be diagnosed sooner with fewer unnecessary investigations. In addition, consideration for fluoroscopic-guided or ultrasound-guided quadrilateral space block should be considered for treatment, as this has the potential to be both diagnostic and therapeutic.

Declarations

Ethics approval and consent to participate

Ethics approval was waived by the University of Calgary given the nature of the research project.

Consent for publication

The patient provided informed consent for their de-identified personal and clinical details along with any images to be published in this case report.

Availability of data and material

Not applicable.

Conflicts of interest

The authors declare that they have no competing interests.

Authors' contributions

JBM provided reference literature search, was mandated with manuscript preparation; ED contributed to the literature search and helped with drafting the discussion, and revised the final manuscript critically; BF acquired and interpreted the patients' MRI and revised the final manuscript critically; JL is the corresponding author, presented the case report idea, revised the manuscript critically for important intellectual content and provided the background information. All authors read and approved the final manuscript.

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List of abbreviations

QSS	Quadrilateral Space Syndrome
PHCa	Posterior Humeral Circumflex artery
ROM	Range of Motion
MRI	Magnetic Resonance Imaging
PD	Proton Density
FS	Fat Saturated
STIR	Short TI Inversion Recovery

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