E-ISSN: 2708-1508
P-ISSN: 2708-1494
IJCRS 2024; 6(1): 04-06
www.casereportsofsurgery.com
Received: 13-11-2023
Accepted: 14-12-2023

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Remote spinal accessory nerve palsy as a cause for scapular dyskinesia in an adolescent baseball pitcher

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DOI: https://doi.org/10.22271/27081494.2024.v6.i1a.89

Abstract
We report a case of anterior shoulder pain and atypical scapula dyskinesia in an adolescent baseball pitcher due to a chronic mild spinal accessory nerve palsy. The spinal accessory nerve innervates the trapezius muscle, which is responsible for scapular retraction during overhead throwing. Impaired trapezius function leads to anterior shoulder pain by a disruption of the kinetic chain at the level of the scapula. His pain was refractory to injections targeting the biceps tendon, arthroscopy, and focused scapular rehabilitation. This case highlights a less common case of scapular dyskinesia and anterior shoulder pain due to neurogenic causes in an overhead-throwing athlete.

Keywords: Tendon, arthroscopy, focused

Introduction
Baseball pitchers who participate in repetitive overhead throwing have a higher risk of injury to the shoulder [1]. Typically, a pattern of neuromuscular dysfunction about the scapula occurs with shoulder injuries termed scapular dyskinesia [2]. Less common causes of scapular dyskinesis are peripheral nerve injuries. The purpose of this case report is to describe a pitcher with a remote spinal accessory nerve palsy who presented with a painful anterior throwing shoulder refractory to arthroscopy and conservative measures.

Case Summary
A 17-year-old, right-hand dominant male baseball pitcher presented to Orthopedic Surgery with anterior shoulder pain during the acceleration/deceleration phase of his pitching motion. He had a longstanding history of shoulder pain, which he attributed to pitching over 100 innings the previous season. His pain improved with rest. He was able to play in the outfield without issue. Non-steroidal anti-inflammatory drugs (NSAIDs) were also effective in reducing his pain. On examination, he was found to have a glenohumeral internal rotation deficit.
MR-Arthrogram of the right shoulder was reported as suspicious for a small focal posterior superior labral tear that did not extend into the biceps anchor. There was no bursitis, tendinopathy of the rotator cuff muscles, or biceps tenosynovitis.
He underwent a diagnostic arthroscopy and debridement of the posterior superior labrum. He was found to have a healthy glenohumeral joint with no signs of arthritis and a stable superior labrum and biceps anchor. The superior glenoid rim did not exhibit chondromalacia, and the superior labrum showed no detachment. The frayed posterior labrum was trimmed. It did not require repair.
Post-operatively, he continued having anterior shoulder pain and was sent for an ultrasound-guided right bicipital tendon sheath steroid injection, which improved his pain for three weeks. He was referred to Physiatry for a repeat injection after his shoulder pain returned with post-operative physiotherapy exercises.
On exam, there was evidence of scapular dyskinesia on the right and significant upper trapezius myofascial pain (Figure 1). His middle and lower trapezius muscles had reduced muscle bulk. He had a loss of 10 degrees of internal rotation on the right. Trigger point release of the upper trapezius, latissimus dorsi, and pectoralis muscles was performed. Passive shoulder internal rotation normalized post-procedure. Focused strengthening of the middle and lower trapezius and serratus anterior muscles was recommended, as was stretching of the pectoralis muscles and latissimus dorsi muscles.

Fig 1a: Lateral scapular winging seen at initiation of shoulder abduction. Black lines indicate medial and lateral scapular borders.

Fig 1b: Lateral scapular winging and elevation are seen at maximal shoulder abduction.

In follow-up, trigger point injections were repeated. He also had a repeat cortisone injection to the biceps' tendon and sub acromial sub deltoid bursa. Each time he had only temporary relief from pain and a transient improvement in shoulder position.

In follow-up with Physiatry, he volunteered that he had had an asymmetric scapula since he was a toddler. His delivery at birth was complicated by shoulder dystocia. The patient shared a picture of himself at 3 years old, where his right shoulder has laterally deviated, implying a chronic injury (Figure 2).

Fig 2: Right lateral scapular winging seen at 3 years old

A nerve conduction study (NCS) and electromyography (EMG) study showed evidence of chronic neurogenic changes to the middle and lower trapezius muscles in keeping with the mild lateral winging seen clinically, implying a remote spinal accessory nerve injury that had partially recovered. (Table 1).

Table 1: Electromyography Results

Muscle Tested (Right)	Nerve, Root	Needle Electromyography
Serratus Anterior	Long thoracic nerve (C5,C6,C7)	Normal
Infraspinatus	Supras capular nerve (C5,C6)	Normal
Supraspinatus	Supras capular nerve (CS, C6)	Normal
Upper Trapezius	Spinal accessory nerve (CN XI)	Difficulty activating due to discomfort
Lower Trapezius	Spinal accessory nerve (CN XI)	t Amplitude t Firing Rate
Rhomboid Major	Dorsal scapular nerve (Cs)	Normal
Deltoid	Axillary nerve (CS)	Normal
Biceps	Musculocutaneous nerve (C5, C6) (CS, C6)	Normal
1^2 Dorsal Interosseous	Ulnar Nerve (CS, TI)	Normal

He has not been able to return to pitching successfully due to pain recurrence with throwing. No further surgical procedures are planned at this time.

Discussions

We describe a case of an adolescent baseball pitcher with a mild chronic spinal accessory nerve palsy that probably occurred as an infant and partially recovered. Resultant mild lateral scapular winging and dyskinesia limited his baseball pitching career.

Lateral scapular winging can result from a muscle imbalance between the trapezius, which exerts a medializing force on the scapula in retraction, and the serratus anterior pectoralis minor muscles, which are the major scapular protractors. When the trapezius is injured, the medial border of the scapula "lateralizes" along the posterior chest wall.

Other nerve palsies that can result in scapular winging include the dorsal scapular nerve and long thoracic nerve [4]. Paralysis of the major and minor rhomboid muscles occurs in a dorsal scapular nerve palsy. A dorsal scapular nerve palsy causes lateral rotation of the inferior angle of the scapula and lateral scapular winging. The serratus anterior muscle attaches to the medial aspect of the scapula and is innervated by the long thoracic nerve. In a long thoracic nerve palsy, the serratus anterior can no longer stabilize the scapula medially. Therefore, medial scapular winging occurs due to long thoracic nerve palsies. Although dorsal scapular nerve palsies can result in scapular winging, long thoracic and spinal accessory nerve palsies are more commonly implicated.

In baseball pitching, a stable scapula is critical to force dissipation along the kinetic chain [2]. An adequate balance between scapular protraction and retraction provides a stable base of support for the glenohumeral joint, maximizing glenoid concavity/compression kinematics and minimizing impingement [3]. Typical physical rehabilitation focuses on strengthening the muscle groups responsible for scapular retraction, such as the middle and lower trapezius and rhomboid muscles, as well as controlled protraction via the serratus anterior. With a spinal accessory palsy, a baseball pitcher would have a weakened ability to retract their scapula, and it would be expected that increased impingement would occur due to an overly protracted and elevated scapula during the late cocking and acceleration phases of the baseball pitching motion.

Spinal accessory nerve injuries are typically traumatic (e.g., a blow from a stick or compression from a heavy backpack) or iatrogenic following head and neck surgery [4]. They are not typically seen as the cause of injury in overhead-throwing athletes. Spinal accessory nerve palsies are also less common birth-related peripheral nerve injuries.

The natural history of a spinal accessory nerve injury depends on the mechanism of injury. Up to 1/3 of patients have a poor long-term outcome as defined by weakness and ongoing pain [5]. In our case, his injury was presumably at birth or as an infant, given his history, and one would infer he has made a partial recovery, given he had neurogenic changes in the right lower trapezius muscle, which would be the last to reinnervate. It can be assumed that he has made maximal recovery at this point.

Non-operative treatment of spinal accessory nerve injuries includes strengthening, electrical stimulation, and bracing. Nonoperative treatments are typically unsuccessful in active patients. Surgical procedures like the Erden Lange tendon transfer are typically reserved for more severe winging and dysfunction [4].

To our knowledge, this is the first case of a remote spinal accessory nerve palsy presenting in a high-level amateur adolescent baseball pitcher as lateral scapular winging. This case highlights the resultant high level of disability from an athletic perspective from mild lower trapezius weakness resulting in an inability to maintain scapular retraction in full arm abduction.

Conflict of Interest

Not available

Financial Support

Not available

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How to Cite This Article
Castonguay J, Hook J, Delgado I, Bains J, Chin P, Holtz KA. Remote spinal accessory nerve palsy as a cause for scapular dyskinesia in an adolescent baseball pitcher. Int J Case Rep Surg. 2024;6(1):XX-XX