First Rib Dissection, Scalenectomy, and Pectoralis Release in a Professional Baseball Player

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Abstract

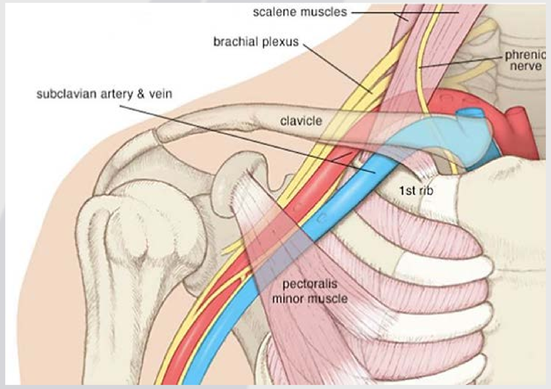
Background: Athlete is a 22 year-old male professional baseball pitcher. The athlete has an extensive past medical history of acromion bursitis in high school (approximately five years ago), an orbital fracture with surgical reconstruction, and surgical ulnar collateral ligament reconstruction of the right elbow During his UCLR intermittent throwing program, right intermittent shoulder pain and discomfort was experienced. Pain was described as pinching and sharp in the anterior and posterior aspects of the shoulder. Pain is exacerbated with throwing and horizontal abduction. No obvious asymmetry or atrophy of shoulder musculature noted at this time. Abduction with internal rotation, forward flexion with internal rotation, and supraspinatus stress testing elicited pain. Athlete followed treatments conservatively to focus on rotator cuff strengthening without success for 2 months. Symptoms persisted with increasing pain and reports of numbness and tingling down the right upper extremity. Positive Roo's and Adson's testing was discovered. Conservative treatment was prescribed for a diagnosis of thoracic outlet syndrome without success for 2.5 months. Athlete was referred for a vascular evaluation for thoracic outlet syndrome and admitted for a first rib dissection, scalenectomy and pec release for surgical treatment. **Differential Diagnosis:** Rotator cuff fatigue/tendonitis. Superior labral tear anterior to posterior. Shoulder Impingement Syndrome. Thoracic Outlet Syndrome. **Treatment:** MRI imaging discovered a type II acromion and supraspinatus and infraspinatus tendon intact. After unsuccessful conservative treatment and referral, a steroid injection into the right subacromial space was given to treat pain. Decreased ROM, specifically with shoulder external rotation was noted, accompanied with pain. Numbness and tingling symptoms were denied at this time. Recurrent pain continued to present with unsuccessful treatment. Further imaging was then warranted for cervical pathology as numbness and tingling symptoms began to be present. An intraforaminal disc spur was present. Continued conservative treatment with a focus on scalene and pectoralis minor lengthening was without success. A vascular evaluation confirmed thoracic outlet diagnosis with need for surgical treatment. Uniqueness: This athlete was rehabbing ulnar collateral ligament reconstruction when first reporting symptoms of shoulder pain. There is an interesting correlation to the athletes breathing patterns and postural rib angle. The athlete's symptoms have been vague and inconsistent. As the athlete represented no physical signs of hypertrophy in his musculature, he was found to have a predisposing anatomical body type for thoracic outlet syndrome, being tall and narrow framed specifically having a narrow rib angle. **Conclusions:** Thoracic outlet syndrome is comprised of multiple factors that can cause a multitude of vascular and neurological symptoms. It is important as athletic trainers to be aware of predisposing factors and notice athlete complaints related to the diagnosis of thoracic outlet syndrome prior to escalated and irreversible damage occurring. Deeper causes behind initial complaints need to be discovered and treated as there is no direct method to successfully treat thoracic outlet syndrome.

Introduction

Thoracic Outlet Syndrome (TOS) involves a variety of symptoms and complications regarding anatomical structures in the shoulder and neck. The diagnosis can be rooted from an anatomical or functional underlying cause. Due to its generalized terminology, TOS has been subcategorized into three different types of TOS. These categories are defined as neurological, venous, and arterial reliant upon symptoms presented and their problematic source. Evidence has suggested that overhead athletes and ectomorphic body types are more preeminent to developing TOS.

Purpose

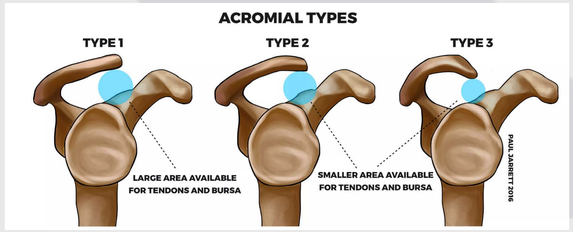
It is important to be aware of and familiar with the possible factors present in TOS and its anatomically involved area to augment proper treatment decisions and to prevent further injury and damages. As TOS is developed mainly through repetitive overuse, early detection can help to prevent progressive permanent damages.



Anatomical structures located within the thoracic outlet.

Anatomy

The thoracic outlet comprises of the region between the clavicle and the thoracic cage of the shoulder and neck. The anatomical borders of the thoracic outlet are located at the clavicle, costoclavicular ligament, subclavius, and anterior scalene anteriorly; the first rib inferiorly; and middle scalene posteriorly. Traveling through the thoracic outlet, crowded blood vessels, nerves, and muscles are found. There are three different potential spaces of this area that can cause the result of the pathology, the interscalene triangle, costoclavicular space, and subpectoralis minor space. The proximal aspect of the outlet involves the interscalene triangle and costoclavicular space. Both involve the greatest clinical relevance in the role of TOS on the neurovascular bundle. The interscalene triangle is bordered by the anterior scalene, middle scalene and clavicle. Enclosed in interscalene triangle are the ventral rami of the 3rd to 5th cervical nerve roots, the superior, middle, inferior trunks of the brachial plexus, and the subclavian artery. The costoclavicular space is bordered by the medial aspect of the clavicle, the first rib, and upper border of the scapula. The pectoralis minor space originates from the muscles base of the third to fifth ribs and attachment at the apex of the medial border and superior surface of the coracoid process (Boezaart, et al. 2010).



The different anatomical acromial types found. Depicting different areas in the subacromial space and predisposing risk for impingements.

Case Report

Patient: This athlete is a 22 year old professional minor league baseball pitcher with a past medical and surgical history involving an orbital fracture and right ulnar collateral ligament reconstruction. The athlete is 6' 2" with a lean, ectomorphic structural build. **Mechanism of Injury:** Following UCLR the athlete was braced in a shoulder sling and limited shoulder and arm movement for over 2 weeks. With immobilization for an extended time, the athlete practiced a shoulder care rehab to strengthen and prepare and build the arm for the demands needed to pitch again. This consisted of repetitive RTC and scapular strengthening exercises. Hypertrophy and over activation of the upper trapezius, scalene musculature, and pectoralis minor began to lead to compression of anatomical structures traveling though the thoracic outlet. Imaging also discovered anatomical abnormalities of a type II acromion and enlarged first rib, which further disposed the athlete to compressive forces in this area. **Clinical Presentation:** The athlete began to experience intermittent right shoulder pain upon returning to a throwing program during his UCLR rehab. The athlete reports the pain had presented for 2-3 weeks before reporting to the athletic trainer's attention. Paresthesia was reported negative at the time of the initial evaluation. 2 months following attempted conservative rehabilitation, painful symptoms continued along with the addition of numbness and tingling down the right extremity. Cyanosis of the right hand also presented with overhead exercises. Hypertrophy and overactivity of the upper trapezius and scalene muscles observed with overhead motion. Narrow anatomical frame and specific narrow rib angle noted.

Rehabilitation and Results

Initial evaluations diagnosis involved right shoulder impingement. After two months of unsuccessful conservative treatment. The athlete was seen for a follow up with a physician for a subacromial space steroid injection to alleviate impingement pain. Continued monitored therapeutic exercises and manual therapy was prescribed. Pain relief was notably decreased for 2-3 weeks before reoccurring. Two more months of conservative treatment went unsuccessful. Research suggests that conservative treatment tends to be the most commonly prescribed when TOS is presented. This method intends to focus on decreasing musculature tightness and adhesion of the musculature composing the thoracic outlet borders. As the athlete's chief complaint was numbness and tingling, muscular compression of the brachial plexus was addressed. Due to the anatomical compression that occurs when lifting the arm overhead, overhead exercises were avoided. Rotator cuff strengthening to work underactive musculature (ie. lower trapezius, serratus, rhomboids, and rotator cuff musculature) and manual soft tissue to loosen and lengthen tight and overactive musculature (ie. scalenes, upper trapezius, subclavius) was implemented into an exercise prescription plan. With continued complaints of symptoms, the athlete was referred to a thoracic outlet specialist for vascular screening. Upon further TOS evaluation, a vascular compromise was determined. Surgical intervention of a first rib dissection, scalenectomy, and pectoralis release was implemented for treatment. This surgical intervention allowed for a release of structures causing compression in the thoracic outlet space. Post surgical treatment and therapy to prevent scar tissue formation. Postural reformation and breathing exercises were implemented to adjust postural abnormalities into a better optimal position for proper breathing and completion of therapeutic exercises.

Discussion and Summary

There are many variations of deeper paths to the diagnosis involved in the simple term of TOS. As the diagnostic name represents the location of the problem to be addressed, variations of subcategorized diagnosis are needed to determine a proper treatment method. As symptoms affect sensation and pain beyond the location of the thoracic outlet, there is overlap in representations involved in other pathological conditions. For example, signs and symptoms of TOS may commonly be mistaken for carpal tunnel syndrome, DeQuervian's tenosynovitis, or lateral epicondylitis. It is important to have prompt differential recognition and treatment of TOS to provide the greatest opportunity for optimal recovery. Unfortunately, the multitude of nonspecific symptoms and challenges in the diagnosis can delay treatment and increase the risk of complications (Jones et al., 2019). Keeping the diagnosis of TOS in mind especially when presented with overhead athletes can be critical in catching and treating an issue in a timely manner.

Among medical disciplines, there tends to be a lack of a global consensus on the exact matters in diagnosing TOS. It has been estimated that surgeons diagnose TOS 100 times more frequently than neurologists, and this may be due to the potential reimbursement of surgical procedures to treat the diagnosis (Hooper et al., 2010). So why consider the time to attempt conservative treatment if anatomical abnormalities may be present and can be fixed operationally? A surgical intervention is invasive and in tissue healing can commonly continue to cause symptoms due to increased scarring of ligamentous and muscle tissue (Levine & Rigby, 2018). It is important to monitor healing and tissue regeneration after surgical interventions. As scar tissue and fascia build up from healing and immobility, further compression to nerve roots to can contribute to causing the possible reoccurrence of symptoms. All aspects of the examination should be driven to determine the root problem eliciting the patient's symptoms. From this, a proper decision can determine best practice to treat the condition and deem whether surgical intervention is warranted or not.

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