

Abstract

Background: This level 4 clinical case report involves a 24-year-old (76 inches and 214 lbs) male Minor League right handed pitcher. His medical history includes grade I right rotator cuff muscle strains, and sternoclavicular ligament sprain. The athlete comes into the athletic training room often reporting soreness and tightness in his R rotator cuff muscles, along with some supporting scapular muscular tightness. Initial evaluation reveals an abnormality of the athlete's chest wall on the right side. Also, his right shoulder sits higher than the left side, at rest. Following observations, it is noted the athlete has an absence of the right pectoralis major muscle but reports no pain. following palpations, the athletic trainer determines the athlete's pectoralis minor and subclavian muscle are present, only the pectoralis major is missing. Further palpation of the shoulder and back reveals myofascial trigger points in the rhomboids, levator scapulae, infraspinatus, descending trapezium, subscapularis, and teres minor. Full active range of motion and strength bilaterally with shoulder flexion, extension, adduction, abduction, internal rotation, and external rotation. Empty can test (-), clunk test (-), Hawkins-Kennedy's test (-). Following the evaluation, the athlete noted he was born without his pectoralis major muscle on his right side. **Differential Diagnosis:** muscular atrophy, pectoralis major avulsion, a rare birth defect causing the absent pectoralis major. **Treatment:** A biomechanical analysis was performed to determine what muscles were compensating for the lacking pectoralis major muscle during the pitching motion. A plan was established to strengthen the compensating muscles and relieve his trigger points. The pectoralis major is most active during the arm cocking phase and the arm acceleration phase of the throwing motion. During the arm cocking phase, the pectoralis major, anterior deltoid, and subscapularis contract concentrically to horizontally adduct the shoulder. It was determined that the subscapularis and latissimus dorsi were compensating during the arm acceleration phase creating a muscle length and trigger point phenomenon. Due to the absent pectoralis major, the subscapularis and latissimus dorsi must produce more force to perform the same action. Treatment began with deep tissue massage of the compensating muscles followed by therapeutic cupping if necessary, to release tension in the muscle fibers. Static stretching, along with a pin and stretch, or active release technique, can be used to stretch the fibers. To strengthen the compensating muscles, the athlete can perform a weekly shoulder program. The focus was to strengthen the rotator cuff muscles and supporting scapular muscles. A progressive resistance exercise program was initiated for the RTC. **Uniqueness:** Poland Syndrome is a rare birth defect that typically affects one side of the body. The effects consisting of; the absence of the pectoralis muscle on one side, and occasionally webbing of the fingers or toes are associated. It is more common in men than women, and more common on the right side than the left. According to the National Human Genome Institute, Poland Syndrome ranges from one to seven thousand, to one and one hundred thousand people affected. For a pitcher to have this syndrome and make it to the minor league level is even more rare and impressive. **Conclusions:** This case highlights the stages of pitcher's motion and the muscles activated during each stage. This case further highlights the rarity of Poland Syndrome in the sports world and what it is. This case also demonstrates how to treat and strengthen the muscles used by baseball pitchers.

Anatomy

Understanding the anatomy of the shoulder is essential in understanding the biomechanics of pitching and how Poland Syndrome effects the shoulder joint. The rotator cuff is a group of muscles consisting of the supraspinatus muscle, the infraspinatus muscle, teres minor muscle, and the subscapularis muscle. The rotator cuff's main responsibility is to keep the humeral head secure in the glenohumeral joint. It also provides stability during motion and allows for proper movement of the shoulder. The other muscles that assist in providing motion of the shoulder are the pectoralis major, the three aspects of the deltoid, coracobrachialis, triceps brachii (long head), biceps brachii, and teres major. These muscles are attached to the bones that make up the shoulder joint which are the humerus, scapula, and clavicle. The muscles and bones create the glenohumeral joint that is surrounded by ligaments and a labrum to provide extra support and create deepen the joint

Introduction

The shoulder is a complex joint that explores the most degrees of freedom out of all the other joints in the body. There are many structures surrounding the joint that influence the motion and position of the bones that make up the joint. Overhead athletes, specifically a baseball pitcher, experience many different motions and forces on the shoulder as they attempt to deliver the ball to the batter. These forces on the shoulder can lead to a variety of chronic or acute injuries that can sideline them for an extended period of time. In some cases, pitchers can be born with deficits or abnormalities that may affect their biomechanics. A pitcher that has been pitching for many years has learned how to adjust to the deficit or abnormality they were born with in order to continue to successfully pitch. Poland syndrome, the absence of the pectoralis major muscle typically on one side, is the deficit that is to be discussed in this review of literature. Furthermore, the pitching motion will be dissected into six phases and the muscles active during each phase will be discussed. Lastly, the effects of an absent pectoralis major and how it can alter a pitchers' biomechanics will be examined.

Purpose

The purpose of this case report was to educate people on the rarity of Poland Syndrome, and to introduce a 24-year-old Minor League pitcher that lives with this syndrome. Also, to breakdown the pitching motion and explain how the significance of Poland Syndrome can effect the pitching biomechanics.

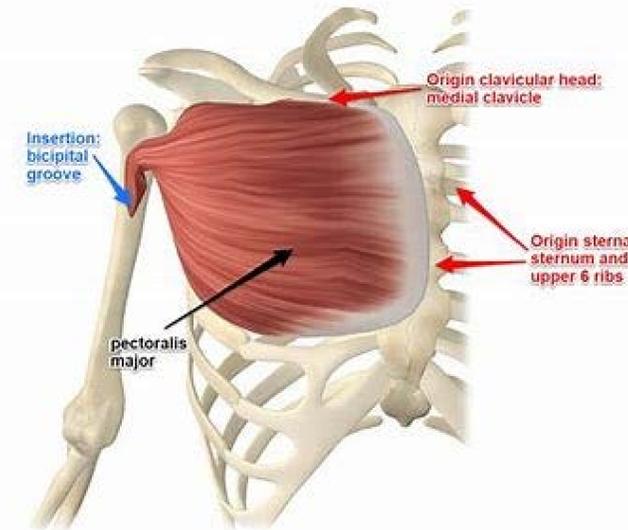
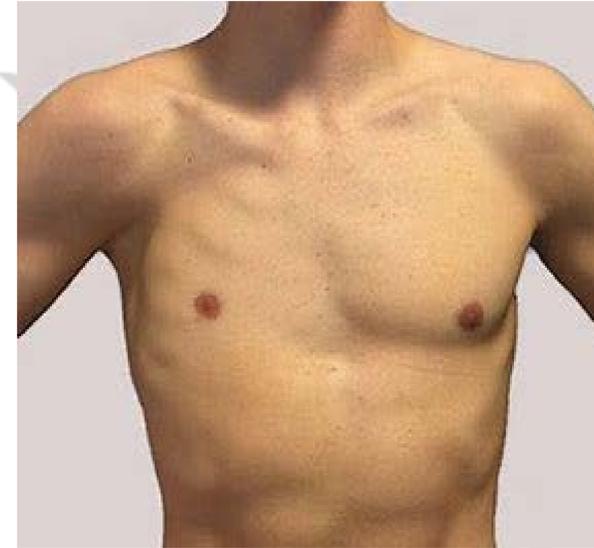
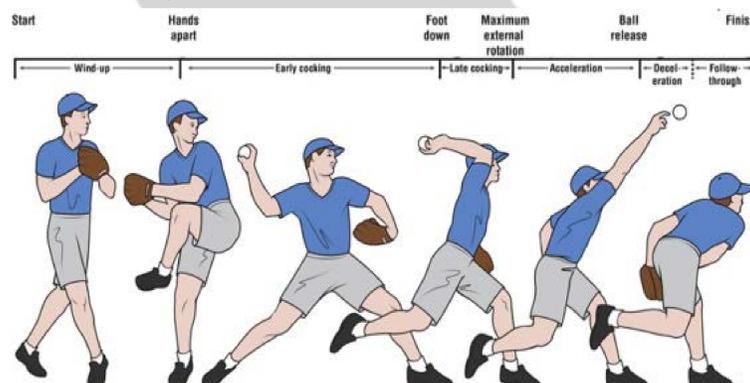
Case Report

Patient: The athlete is a 24-year-old (76 inches and 214 lbs.) male Minor League right handed pitcher. His medical history includes grade I right rotator cuff muscle strains, and sternoclavicular ligament sprain. The following information will explain the mechanism of injury, clinical assessments, radiographic findings, diagnosis, treatments and return to play to provide additional information to this athlete's unique injury.

Mechanism of Injury: There is no known mechanism of injury for the athlete. He was born without his pectoralis major. Overuse of the shoulder due to repetitive throwing is the main suspect for causing the injury of an elevated first rib and sternoclavicular joint sprain with trigger points.

Clinical Examination: Following observations, it is noted the athlete has an absence of the right pectoralis major muscle but reports no pain. following palpations, the athletic trainer determines the athlete's pectoralis minor and subclavian muscle are present, only the pectoralis major is missing. Further palpation of the shoulder and back reveals myofascial trigger points in the rhomboids, levator scapulae, infraspinatus, descending trapezium, subscapularis, and teres minor. Range of motion is within normal besides forward flexion and abduction. Both directions lacking ten degrees. Strength bilaterally of the shoulder flexion, extension, adduction, abduction, internal rotation, and external rotation are within normal limits. Horizontal adduction is rated a 4/5. Empty can test (-), clunk test (-), Hawkins-Kennedy's test (-). Following the evaluation, the athlete noted he was born without his pectoralis major muscle on his right side. It was determined during evaluation the athlete has SICK scapula on the ride side. This finding was a starting point for the rehabilitation process and allowed for a better explanation for cause of injury

Radiographic Findings: The team physician within the athletic training room performed an MRI after rehabilitation progress. The MRI was used to clear up any questions to the athletes injury and allow for a final decision on return to play.



Discussion and Summary

Poland Syndrome is a rare birth defect that typically affects one side of the body. The effects consisting of; the absence of the pectoralis muscle on one side, and occasionally webbing of the fingers or toes are associated. It is more common in men than women, and more common on the right side than the left. According to the National Human Genome Institute, Poland Syndrome ranges from one to seven thousand, to one and one hundred thousand people affected. For a pitcher to have this syndrome and make it to the minor league level is even more rare and impressive. It was learned through the case and rehabilitation process that the pectoralis major is not needed to play an overhead throwing sport but will create problems with the synergistic muscles.

This injury process was accurately assessed and handle correctly by the athletic trainer. The rehabilitation process began with treating pain and assessing range of motion deficits. Strength and functional movement was focused on next after the pain and range of motion was back to normal. A proper return to play progression was followed as well as a full throwing progression without pain. The athlete successfully returned to full game activity after 4 months of rehabilitation. The athlete's first outing as a pitcher was successful with no pain or reoccurring symptoms.

Rehabilitation and Results

A biomechanical analysis was performed to determine what muscles were compensating for the lacking pectoralis major muscle during the pitching motion. A plan was established to strengthen the compensating muscles of the shoulder and the SICK scapulae, and relieve his trigger points. The pectoralis major is most active during the arm cocking phase and the arm acceleration phase of the throwing motion. During the arm cocking phase, the pectoralis major, anterior deltoid, and subscapularis contract concentrically to horizontally adduct the shoulder. It was determined that the subscapularis and latissimus dorsi were compensating during the arm acceleration phase creating a muscle length and trigger point phenomenon. Due to the absent pectoralis major, the subscapularis and latissimus dorsi must produce more force to perform the same action. Treatment began with deep tissue massage of the levator scapulae, trapezius, rhomboids, supraspinatus, infraspinatus, scalene's, subclavian, pectoralis minor, and anterior deltoid, to release tension in the muscle fibers. Static stretching, along with a pin and stretch, or active release technique, can be used to stretch the fibers. To strengthen the compensating muscles, the athlete can perform a weekly shoulder program. The focus was to strengthen the rotator cuff muscles and supporting scapular muscles. A progressive resistance exercise program was initiated for the RTC. To fix the SICK scapulae a focus on getting the lower trapezius muscle to be more active during scapular motion was the key. Having the athlete active the lower trapezius during scaption and horizontal adduction motions while in the quadruped position was the main exercise. Progressing those exercises to perturbed, resisted, and weighted was a way to strengthen the compensating muscles. The rehabilitation process was a slow but successful process that took about 4 months to complete. A full throwing progression took place before the athlete was able to pitch in a simulated game again.

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