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Neural Tension in a Female Varsity Volleyball Player

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NEURAL TENSION IS an often-overlooked problem in overhead athletes. Butler[1] and others have extensively investigated the causes, assessment, and treatment for neural-tension syndromes. When tension is developed along a nerve, the pressure within the nerve increases as the nerve's cross-sectional area decreases.[1] The rise in intraneural pressure reduces local blood flow and subsequently can affect nerve conduction and axonal transport.[1] If there is damage anywhere along the nerve tract there will be changes in tension along the whole nerve chain.[1] Even minor changes in the flow of the axoplasm at one site will affect the entire neurone.[1] Specific nerve roots can be assessed and treated for restrictions. In the upper limb, the median, ulnar, and radial nerves each have a corresponding test and treatment position. The upper limb tension tests, specifically the ULTT1 described by Butler,[1] can be divided into the following components: shoulder-girdle depression, shoulder abduction to 110°, forearm supination and wrist and finger extension, external rotation of the shoulder, and elbow extension. Cervical side flexion away from the test side can be added to complete the ULTT1 and provide maximal tension along the median nerve tract (see Figures 1–3). This test can be considered positive if it reproduces the patient's symptoms,

Figure 1 Upper limb tension test 1. Starting position for therapist stabilizing the shoulder girdle and bringing client's hand and fingers into extension.

Figure 2 Upper limb tension test 1 from a superior view. Note that the therapist can use thigh and knee closest to client to bring shoulder into abducted position.

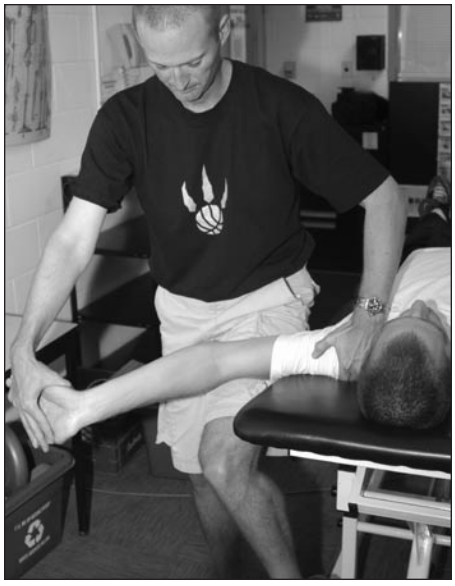

Figure 3 Upper limb tension test 1, completed position. Bringing the shoulder into 110° of abduction and elbow extension while maintaining shoulder-girdle stabilization and wrist/hand position. Can also add cervical-spine side flexion away from test side.

if the test responses can be altered by movement of distal body parts, or if there are differences in the test from the left side to the right side and from what is known to be normal.

A confounding issue with the positioning for neural testing is that a large number of "normal" patients, when tested, will exhibit many similar signs and symptoms with the ULTT, including a deep stretch or ache in the cubital fossa or a definite tingling sensation in the thumb and first three fingers.

This is a brief description of a very complex issue and is not intended to be a comprehensive narrative for neural-tension issues. For further information on the subject, refer to Butler's[1] text.

Signs and Symptoms

Many patients present with a variety of descriptions of their pain or main complaint. These descriptors include *vague, deep, burning, heaviness, aching,* and *searing*[1] and *sharp, shooting,* and *stinging* pain.[2] Pain might refer along a broad area or over a specific nerve root or dermatome. Pain or symptoms might present in clumps or lines of pain.[1] Associated weakness in the affected myotome might be present. Paresthesia and anesthesia might exist with or without pain.[1] Symptoms might be worse at night or the end of the day related to lower blood pressure while sustaining certain postures (e.g., shoulder protraction).

Case History

A 19-year-old female varsity volleyball player presented to the therapy clinic complaining of a sore right elbow and an inability to extend the elbow fully. She had played tennis for 10 years before playing volleyball. In volleyball, she played in the power position (on the left side of the court for a right-handed player). Her initial injury had occurred one and a half to two years earlier. Her medical history included previous rotator-cuff problems, a right thumb dislocation, and a fracture of the right scapula. This player reported cracking and popping in the elbow with movement and complained of a pinching sensation in the medial elbow area. Aggravating factors included pushing against resistance and full end-of-range elbow extension. The athlete had undergone therapy for the elbow for the preceding year with limited results. She had attempted to play in a provincial beach-volleyball tournament 8–10 weeks earlier but had reaggravated the elbow injury when she hit a ball awkwardly in an overhead position. The coach and player were in hopes that the player would be able to take part in practice sessions and undergo therapy during her first year with the team.

Examination

This player presented with the common thrower's, overhead hitter's posture: internally rotated shoulders and forward head posture. She also presented with her head held in a right-side-flexed position and held her right elbow in slight flexion. Her thoracic spine was mildly side flexed to the right, the left iliac crest was higher in standing, and her right scapula was held in a protracted position. The cervical spine was cleared for musculoskeletal involvement, but the thoracic spine could not be cleared because of limitations in rotation and side flexion to the right. Because of the previous history of rotator-cuff pathology, the shoulder was included as a part of the full assessment. The player had some limitation with active shoulder flexion and internal and external rotation in an abducted position. Weakness in manual isometric resistance testing at the shoulder included internal and external rotation and abduction (4 + /5). The elbow was limited actively and passively at the end of range for all movements.

The upper limb tension test revealed pain and limitation at the stage of the test with the start of elbow extension. The Hawkins impingement test was also positive in reproducing symptoms at the shoulder. All myotomes, dermatomes, and reflexes in the upper limb were within normal limits.

Accessory movement testing of the glenohumeral joint revealed the limitation of an inferior glide. The scapulohumeral articulation had reduced inferolateral glide. Posteroanterior glides of the thoracic spine revealed a general reduction of movement at levels T1–T7.

Tenderness on palpation was elicited over the medical epicondyle of the right elbow and in the ulnar groove of the humerus. Tinel's test at the elbow was negative. Valgus stress of the ulnar collateral ligament was normal at 0 and 30° of elbow flexion.

Impression

The musculoskeletal examination revealed that a number of the problems in the upper extremity were related to some of the postural dysfunctions. One differential consideration at the elbow was some sort of bony block within the humeroulnar joint. With this in mind, the player was referred to one of our sports-medicine physicians for evaluation and to rule out any bony abnormalities at the elbow. Plain radiographs of the elbow were ordered and were negative; NSAIDs and a reduction in activity were prescribed, because it was the start of training camp for the upcoming varsity season. Damage to the ulnar collateral ligament was also considered because of the location of the pain and the tenderness on palpation over the area.

Therapy

The physician referred the athlete back for therapy to address the motion deficits and pain. The therapy program was designed to address the problem from a global perspective, starting from the thoracic spine and working out to the elbow. Central posteroanterior mobilizations of T1–T7 were performed[3], and other techniques included scapular glides in all directions; supine Swiss-ball thoracic extensions, seated active right rotations of the thoracic spine against resistance, scapular strengthening, traction and inferior glides of the right glenohumeral joint at 90° of flexion and abduction, and a home program of exercises.

ULTT 1 mobilizations (gentle Grade 1 oscillations)[3] for 50 repetitions or roughly 20 s[1] were added, along with humeroulnar joint traction techniques. The athlete was prescribe home self-mobilization in the ULTT 1 position along with a number of the clinical exercises mentioned previously.

After the initial therapy session, which included ULTT 1 mobilizations, the athlete complained of an increase in "achiness" in the elbow, an indication that she had a more "irritable" disorder.[1] After four sessions of thoracic-spine mobilizations and Swiss-ball exercises, the thoracic spine's accessory movement was much improved. By the seventh treatment the ULTT test had improved to 75° of elbow extension in a wrist- and finger-extended position. Shoulder proprioception and strength exercises were gradually introduced.

The athlete returned to the physician after 3 weeks of therapy. At that time she presented with a significant reduction in pain, increase in ROM, and no tenderness on palpation. She was advised to return to activity *gradually*.

She began with more activity and speed-related overhead strengthening including pulleys moving from a forward-flexed position with the elbow extended into glenohumeral extension with the elbow extended, progressing to a more rapid hitting-related movement. This was progressed to high-speed tubing swings and overhead plyoball exercises. Volleyball-specific activities were gradually incorporated, such as easy passing, footwork, overhead volleying, overhead throwing, and, finally, hitting with progressively increasing intensity. She was cautioned to monitor for any signs of returned pain or symptoms and advised to maintain her home program throughout the season. Return of pain and symptoms did not occur.

Discussion

Neural tension problems are often overlooked but are surprisingly common. A thorough review of the anatomy and pathophysiology of neural structures and their ensuing injuries, as well as the secondary complications of normal musculoskeletal injuries, should be undertaken by all athletic therapists. Neural physiology is a complex yet integral component of normal human function. Butler's book[1] is an excellent review of neurobiomechanics, anatomy, pathophysiology, and clinical wisdom with regard to neural pathology. It includes a breakdown and explanation of each specific neural-tension test from the straight-leg raise to the upper limb tension test. Once therapists are familiar with the various signs and symptoms and the testing procedures for diagnosing neural-tension issues, they will find more and more patients presenting with these problems.

References

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