Thoracic Outlet Syndrome

Thoracic Outlet Syndrome is an entrapment syndrome of the upper extremity involving the great vessels, as they leave the chest, and the nerves as they exit the neck to enter the upper limb. The clinical picture may be confusing because the complaints are often vague and the physical examination may be quite normal. The syndrome, however, may prevent effective use of the shoulder and arm in sports, activities of daily living, employment, and may be a source of continuing disability after injury to the neck and shoulder.

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Some mention of the regional anatomy and development is helpful in better understanding the Thoracic Outlet Syndrome. The thoracic cavity is relatively immobile while the shoulder is the most mobile joint in the body. Normal development of the shoulder girdle involves the descent of the scapula from a high position at birth to a lower position at maturity. At the thoracic outlet, a triangle is formed between the anterior and middle scalene muscles and the first rib. There may be anatomic variations involving the attachments of these muscles to the first rib. Also, in about 0.5% of the general population, cervical ribs are found which, with their attachment, may be the basis for a neurovascular compression. The interval between the first rib and the clavicle has been likened to a “nutcracker” and is a potential source of compression when, the shoulder is in abduction, the clavicle moves backward against the immobile first rib. To accommodate mobility of the arm, neurovascular structures may change direction by up to 180 degrees below the level of the caracoid process, in which the pectoralis minor muscle inserts acting as fulcrum.

The descent of the scapula on the chest cage does not occur until puberty and it descends to a lower level in females, and since the suspension of the scapula is entirely muscular, depending on the strength and tone of shoulder girdle muscles, it follows that the thoracic outlet syndrome affects females much more frequently than males. It also is more likely to affect those with droopy pos-
tures and/or large breasts and/or poor muscular tone. It occurs most commonly between the ages of 20-40 years. Drooping shoulders and poor muscular tone in the shoulder girdle may also signal a clinical depression. The thoracic outlet syndrome is seen more commonly in females with an emotional depression in many clinical studies.

Complaints most commonly relate to compression of the lower trunk of the brachial plexus with pain and/or numbness and tingling extending from the neck along the inner aspect of the arm and forearm to involve the small and ring fingers of the hand. There may be weakness involving the intrinsic muscles of the hand and complaints of weakness of grip or difficulty with fine manipulations. Symptoms are almost always related to position of the arm and shoulder; there may be no problems until the arms are elevated above horizontal. Symptoms may occur during sleep when the arm may fall into a position overhead. Generalized numbness and muscle fatigue with overhead activities are symptoms associated with arterial compression, while swelling and blue coloration of the arm would be caused by compression of the subclavian arterial vein.

Unilateral Raynaud’s phenomenon may be caused by thoracic outlet syndrome. Symptoms may occur in the context of injury to the neck or shoulder girdle or in the context of habitually carrying heavy loads on the affected side. Symptoms are almost always intermittent and related to position of the limb.

The specific diagnostic maneuvers, which are performed during physical examination, reproduce neurovascular compression. These included the Adson Maneuver where the patient inhales deeply, holds their breath, elevates the chin and turns toward the affected side. If this series of maneuvers reduces or obliterates the radial pulse, or reproduces the symptoms, it calls attention the anterior scalene muscle. In the Costoclavicular Maneuver, the shoulders are drawn downward and backward with the head in neutral position and the patient takes a deep breath. If this reproduces symptoms or obliterates the radial pulse, the costoclavicular space may be narrowed by an abnormal cervical rib or excessive amount of callous from fracture of the first rib or fracture of the clavicle. With the Wright’s Hyper-abduction Test, the upper extremity is placed above or behind the head with the elbow flexed. If symptoms are reproduced or the radial pulse obliterated, neurovascular entrapment by the pectoralis
minor or entrapment between the clavicle and first rib is suggested. Additional positive physical finding may included fullness above the clavicle, muscle wasting, atrophy, and weakness in the upper extremity. Abruit may be heard with the stethoscope placed over the supraclavicular fossa. There may be venous congestion in the arm. One would expect, however, to find normal reflexes, normal sensation and no focal motor weakness.

While the Adson, Costoclavicular and Wright maneuvers may or may not be positive, various laboratory studies are often needed to pin down the diagnosis. X-ray films should include views of the cervical spine looking for cervical ribs, and evidence of arthritis. Electrodiagnostic studies (EMG and nerve conduction) may suggest a thoracic outlet syndrome but are more useful in excluding cervical radiculopathy, ulnar neuropathy at the elbow (cubital tunnel syndrome) or median nerve compression at the wrist (carpal tunnel syndrome).

Evaluation of the arterial component in thoracic outlet syndrome is assisted by the Doppler studies but relies on the arteriogram for definitive diagnosis. The arteriogram is considered the “gold standard” and it is important for both arterial and venous flow be observed.

The differential diagnosis would include conditions of the cervical spine such as cervical spondylosis or disc herniation, supraclavicular fossa tumor from lung cancer, brachial neuritis, cubital tunnel syndrome, carpal tunnel syndrome, reflex sympathetic dystrophy, and primary conditions of the shoulder.

Treatment is usually conservative and relies heavily on exercises to correct postural abnormalities and to strengthen neck and shoulder girdle musculature, often under the direction of a physical therapist. Identification and treatment of underlying depression, if suspected, would be an integral part of the conservative treatment. A weight reduction program might be appropriate. In cases of severe thoracic outlet compression, exercises may increase symptoms and may not produce favorable results. Exercises should be performed for a period of two or three months before abandoning them.

With failure of conservative treatment, one may resort to surgical treatment, but this is generally withheld for the most refractory cases. There are several procedures described for treatment as there are several anatomic abnormalities. However, the common denominator for the successful surgical procedure involves removal of a portion of the first rib, often through a transaxillary exposure. Injury to the brachial plexus or vessels are complications of the surgery. Surgical treatment of thoracic outlet syndrome in my community falls into the purview of the thoracic or vascular surgeon. In other communities, depending upon his interest and experience, the Orthopedic Surgeon may be involved with the surgical treatment.

REFERENCES

Price Chenault, M.D.
Orthopedic Surgeon

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OMAC Thanks Dr. Chenault for the time & effort involved in writing this article.

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