

Thoracic Outlet Syndrome

YOSEF PRESBURGER

Department of Kinesiology and Sports Medicine; Rice University; Houston, TX

Category: Undergraduate

Advisor / Mentor: Papadakis, Zacharias (zacharias.papadakis@rice.edu)

ABSTRACT

CLINICAL PRESENTATION & EXAM: Thoracic Outlet Syndrome (TOS), a term first coined by Peet in 1956, is a controversial condition that is difficult to diagnose. Commonly characterized by neck and shoulder pain, TOS occurs due to complex mechanisms involving muscular dysfunction and neurovascular compression. Extremely rare in children, TOS affects young women more than men. Patients with a history of trauma around the thoracic outlet area, as well as people who engage in repetitive muscular activity such as competitive baseball pitchers and swimmers, are at an increased risk of TOS. Cases of TOS are classified as vascular (arterial or venous) or neurogenic. In cases of vascular TOS, symptoms can include ischemia in the digits, claudication in the arm, discoloration, pain, and swelling or muscle atrophy. However, about 90-95% of total TOS cases are of the neurogenic type. Patients with this condition may experience numbness, paresthesia, grip weakness, and radiating pain down the arm or to the ear, face, and occiput. **ANATOMY & PATHOLOGY:** The thoracic outlet is a passageway from the lower neck to the armpit through which veins, arteries, and nerves pass. In TOS, abnormal compression of this area between the clavicle and the first rib results in irritation of the nerves and blood vessels. Most often, muscular dysfunction and imbalance in the cervicospinal region creates intermittent nerve compression and/or tension on the brachial plexus, resulting in pain and discomfort. TOS can be the result of congenital abnormalities, trauma or injury to the thoracic region, functional acquired causes, and other unidentified sources. **DIAGNOSTIC TESTING & CONSIDERATIONS:** Due to the diversity of possible symptoms and the variability displayed in patients, TOS presents a diagnostic dilemma to the physician. Diagnosis is based on proper history, physical examination, direct observation and provocation tests, such as Adson's, Roos', and Elvy's maneuvers. These tests consist of manipulating the limbs to add stress onto the thoracic outlet region, thereby eliciting TOS symptoms in less than one minute and assisting in making a diagnosis. Different imaging techniques, such as X-rays and MRIs of the neck and shoulder areas, may be used to reveal a structural abnormality or to locate the site of vascular compression. Nerve conduction tests and an EMG can also be used to detect nerve damage. An arteriography or venography may be performed to inspect vascular functioning. **TREATMENT & RETURN TO ACTIVITY:** Preventative measures can be taken to correct or eliminate risk factors in regards to the workplace or home ergonomics. If diagnosed early, a conservative approach to treatment consisting of physical therapy can be effective. Exercises that focus on improving posture, increasing range of motion, and stretch muscles around the thoracic outlet can alleviate the symptoms. Non-surgical treatment may also include anesthetic agents, steroids, and botulinum toxin type A (BTX-A) injections. If conservative treatment is ineffective (2-12 months), surgery may be recommended. Typically, the first rib is surgically removed to create more space in the thoracic outlet and alleviate compression on the vessels and nerves. Depending on the severity of the syndrome and the surgeon's approach to either total or partial removal of the rib and adjacent muscles, outcomes are usually good but a minority of patients may experience a recurrence of symptoms.