The *Heart* of the Matter

Cardiology Associates, P.C.

Wednesday, December 22

View Our Locations

Visit our website

A Message from Cardiology Associates, P.C.

Dear Colleagues,

Our December, 2010 Referring Physician newsletter focuses on the diagnosis and treatment of Thoracic Outlet Syndrome (TOS). This condition encompasses three related syndromes that cause pain and discomfort in the arm, shoulder and neck. TOS occurs when the blood vessels or nerves in the thoracic outlet become compressed. This condition is often overlooked or misdiagnosed, especially when presented to the emergency department. Dr. Stephen Stanziale discusses the common signs of TOS and suggests appropriate treatment options.

About the Author

Dr. Stephen Stanziale sees patients in our Annapolis and Kent Island, MD locations. He is board-certified in general surgery and vascular surgery. Dr. Stanziale has a special interest in peripheral vascular disease, and thoracic aortic aneurysm disease. He is a member of the American Medical Association, the Society of Clinical Vascular Surgery, and the Peripheral Vascular Surgery Society. Additionally, Dr. Stanziale belongs to the International Society of Endovascular Specialists, and the Society of Vascular Surgeons.

"Pins and Needles:" Diagnosing TOS

Presentation of Case

• A 38- year- old, athletic woman, with no significant past medical history, presents with intermittent edema of her left arm and numbness of her left hand and fingers.
• The edema has become more persistent and painful, especially with rigorous exercise or work involving her arm. When she raises her arm above her head she notes coldness in her fingers and numbness in her hand.
• Her contralateral arm and hand are not symptomatic, but upon further questioning, they have similar coldness and numbness with exercise.
• On examination, she is a thin, muscular woman with an athletic body habitus.
• Her left hand has pitting edema. She has a bounding radial pulse, which disappears with an Adson's maneuver. This involves the patient turning her head away from the affected side and taking a deep breath with her shoulder abducted and her elbow flexed at 90 degrees. Her symptoms of numbness and coldness are aggravated with Adson's maneuver.

A chest radiograph was within normal limits. Venous duplex ruled out a deep venous thrombosis. Her arterial pulse volume recordings are dampened with provocative maneuvers.

An arteriogram was performed with provocative maneuvers (Figures 1A, 1B and 1C) as well as a venogram (Figure 2). A diagnosis of venous and arterial Thoracic Outlet Syndrome was established.

FIGURE 1(A) *- A thoracic aortogram was performed with the patient's arm flat at her side. Notice the uninhibited flow in the subclavian artery at the level of the first rib on the left.*

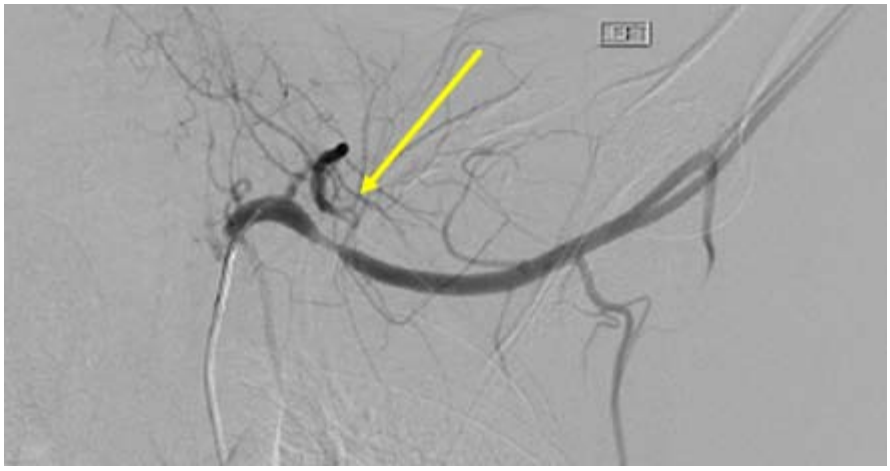

FIGURE 1(B) *- A catheter-directed angiogram was performed with the patient's arm abducted and elevated. Contrast is injected in the proximal subclavian artery. Flow is impaired at the thoracic outlet.*

FIGURE 1(C) *- The patient's arm is hyperabducted in the arteriogram, confirming the diagnosis of arterial Thoracic Outlet Syndrome.*

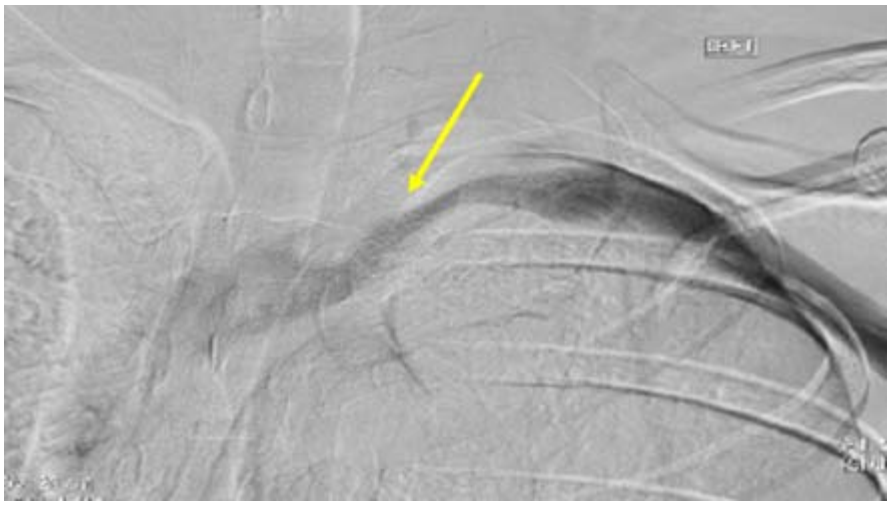

FIGURE 2 *- Venography was performed via the antecubital fossa demonstrating venous compression of the subclavian vein within the thoracic outlet.*

Discussion

Thoracic outlet syndrome (TOS) comprises the spectrum of symptoms caused by compression of the structures within the thoracic outlet. The thoracic outlet is a triangular 'space' defined by the anterior scalene and middle scalene muscles and the first rib (Figure 3). The 'space' contains the subclavian artery, subclavian vein and the brachial plexus.

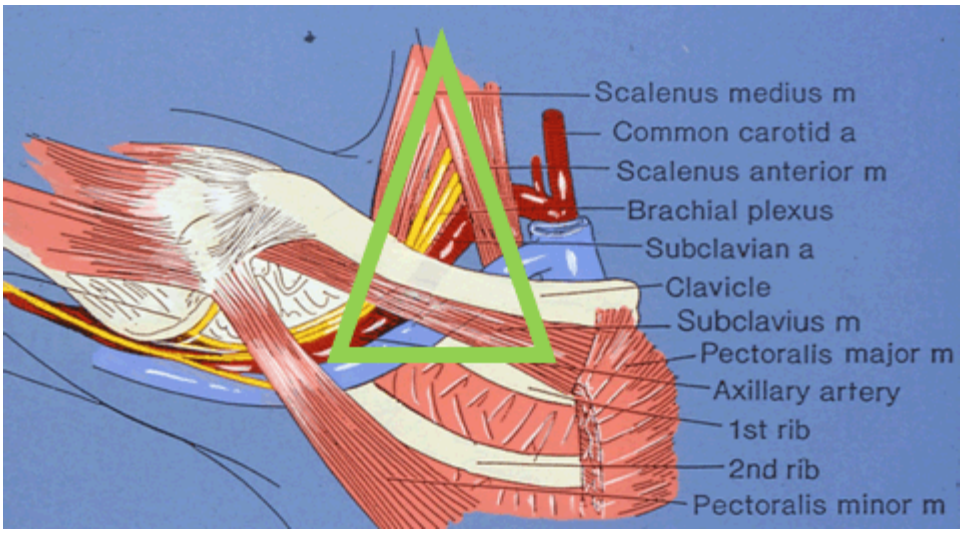

FIGURE 3 *- The thoracic outlet is a triangle defined by: anterior scalene muscle, middle scalene muscle, first rib.*

Neurogenic TOS is the most common form of TOS, accounting for 95% of cases, wherein the brachial plexus nerve roots are compressed causing dysasthesias, sensory loss, pain, and weakness and motor dysfunction of the muscles innervated by the corresponding compressed nerves. The 'lower' brachial plexus fibers may be affected, yielding pain and paresthesias in the distribution of the ulnar nerve, commonly manifesting in the hand. The 'upper' brachial plexus also may be compressed causing symptoms in the upper arm and forearm rather than in the hand.

Vasculogenic TOS is less common. Venous TOS accounts for approximately 3% of cases and manifests as edema, cyanosis and discomfort that is aggravated by activity/exercise of the corresponding arm and shoulder. Advanced cases result in thrombosis, known as Paget Schrotters Disease or Effort Thrombosis. Arterial TOS is less common, accounting for only 1-2% of cases. Patients present with stigmata of arterial hypoperfusion: pain, pallor, lack of an identifiable pulse (often positional) and extremity coolness. Symptoms of claudication or fatigue are exacerbated by arm and shoulder movements that accentuate the compression at the thoracic outlet.

Etiology

Predisposing factors for TOS include congenital osseous abnormalities such as cervical ribs (Figure 4), rudimentary first ribs, and fibro-muscular bands. Quite often, acquired extrinsic factors are implicated:

1) Trauma leads to inflammation and scarring after cervical whiplash or shoulder injury;

2) Repetitive stressful motions associated with occupation or recreational activities, such as in weightlifters and athletes, can create a similar injury pattern.

FIGURE 4 *- Bilateral cervical ribs are indicated by the arrows.*

Examination

• Neurogenic signs: paresthesias, weakness, hypothenar wasting, 'claw hand'
• Venous signs: edema, cyanosis, distended venous collaterals
• Arterial signs: pallor, lack of an identifiable pulse, (+) Adson's test, ischemic ulceration

Diagnosis

• Largely a clinical diagnosis (especially Neurogenic TOS)
• Provocative clinical tests - Adson's and EAST tests demonstrate loss of pulse or reproduction of patient symptoms with arm manipulation
• Cervical and chest radiographs - to evaluate bony abnormalities
• MRI/CT - to detect soft tissue abnormalities
• Nerve conduction studies
• Duplex ultrasonography - to evaluate venous and arterial compromise
• Venogram Arteriogram

Therapy

Therapy is centered on relieving the mechanical compression on the structures within the thoracic outlet. This may be accomplished by Physical Therapy at a skilled institution. Identification and education of the factors that exacerbate compression of the thoracic outlet is essential. Patients must learn to modify work habits and exercise regimen that potentiate the injury. Aggressive physical therapy will strengthen the cervicoscapular muscles, relax stressed and hypertrophied musculature and correct postural abnormalities. Anti-inflammatory medication may alleviate symptoms.

If acute or severe symptoms exist, then operative decompression is the first line of therapy. In these cases, Physical Therapy will play an important role in the postoperative course.

Operative decompression is performed by one of two approaches:

• Transaxillary
• Supraclavicular

Both approaches are based on:

1) The removal of the offending portion, if not all, of the first rib (Figure 5),

2) Anterior scalenectomy, and

3) Adhesiolysis of the scar formed within the thoracic outlet.

FIGURE 5(A) *- Supraclavicular TOS decompression (First Rib - in vivo).*

FIGURE 5(B) *- Supraclavicular TOS decompression (First Rib - ex vivo).*

Operative decompression may require adjuvant interventions but always require postoperative Physical Therapy. If venous TOS progresses to deep venous thrombosis of the subclavian vein, then thrombectomy (most commonly percutaneous), is pursued. Advanced arterial TOS may require bypass, arteriolysis or aneurysmorrhaphy.

Results

The current standard surgical decompression of first rib resection and anterior scalenectomy has not been universally employed in the past and comparing outcomes is difficult.

For neurogenic TOS, initial success in most studies is greater than 90%. Success is defined as reduction in symptoms, return to work or other aggregates of subjective patient reports. Ten-to-fifteen-year success, in one of the largest studies was 71% (Sanders RJ: Results of the surgical treatment for thoracic outlet syndrome. Sem. Thorac. Cardiovasc. Surg. 8:221-228, 1996).

Success of surgical therapy for vasculogenic TOS is widely regarded as significantly better. However, there is a paucity of reproducible long-term data.

Conclusion

The patient underwent first rib resection, anterior scalenectomy and extensive arterial and venous adhesiolysis. Her symptoms on the operative side abated. She underwent bilateral physical therapy and her contralateral symptoms abated after several weeks.

Please Join Our Mailing List

We are offering you this monthly newsletter as a way to provide cardiovascular news and update you on developments within our field. For your convenience, we are distributing our newsletter via e-mail. Visit our site at (www.heartcapc.com) and click the Referring Physician Newsletter link at the upper left corner of our home page. You will receive an e-Newsletter every month featuring an article or a case report from one of our physicians and links to other sources featuring new trends in the field of cardiology. Our focus will be on real questions and issues that we encounter in our day-to-day medical practice. In fact, if there is a topic that is of particular interest to you (or a question that is related to any of our articles) please e-mail your inquiries to our Project Manager, Nazar Snihur at nsnihur@heartcapc.com. (Of course, we will not share your e-mail address outside of our offices.)

Our Locations

Annapolis Cardiology Office
2002 Medical Parkway, Suite 500
Annapolis, MD 21401
Phone: 410-573-6480
Fax: 410-573-9413

Annapolis Vascular Office
2002 Medical Parkway, Suite 520
Annapolis, MD 21401
Phone: 410-571-8430
Fax: 410-573-5981

Bowie Office
4175 N. Hanson Court
Suite 100
Bowie, MD 20716
Phone: 301-809-6880
Fax: 301-805-4233

Irving Street 4800N
106 Irving Street, NW
Suite 4800N
Washington, DC 20010
Phone: 202-726-5484
Fax: 202-726-4587

Kent Island Office
1630 Main Street
Suite 208
Chester, MD 21619
Phone: 410-643-3186
Fax: 410-643-4098

K Street Office
2131 K Street, NW
Suite 800
Washington, DC 20037
Phone: 202-822-9356
Fax: 202-331-0451

Olney Office
18109 Prince Philip Drive
Suite 225
Olney, MD 20832
Phone: 301-774-5810
Fax: 301-774-0188