Editorial

Thoracic outlet syndromes (TOS)

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The knowledge and understanding of conditions leading to neurovascular compression at the thoracic outlet has come a long way since Sir Astley Cooper ligated a large subclavian aneurysm distal to a cervical rib in 1821[1]. In the 1970s and 80s, there was a sharp rise in the number of operations performed for TOS in the United States, usually for doubtful indications and, in a situation akin to carotid surgery, there was scepticism, a rise in the number of complications and a backlash from health insurers and neurologists.

We are now in an era of accurate diagnosis, mainly conservative management and safe surgery for carefully selected patients. Patients are subdivided into arterial (A-TOS), venous (V-TOS) and neurologcal (N-TOS) thoracic outlet syndromes. A fourth subdivision, that of post-traumatic N-TOS without clinical signs, is contentious and further research is needed. Although there is a theoretical basis for its existence, problem is that medico-legal considerations often obscure the truth.

Arterial thoracic outlet syndrome

A cervical rib or an abnormally angled first rib lifting the vessel upwards usually causes symptomatic compression of the subclavian artery. The upper fulcrum is the clavicle. Forearm ischaemia is precipitated by actions that narrow the costociavicular angle. This occurs on raising the ribs as in elevating the arm or protraction as in reading a newspaper. Repetitive trauma can lead to intimal damage, emboli or aneurysm. The diagnosis is established by reproducing the symptoms, usually by the Roos' or abduction external rotation test. "Although Roos' original description mentions repeated finger clenching for 3 minutes, most patients develop pain with the diminution of the radial pulse and infraclavicular bruit merely by assuming the position. The bruit disappears as the vessel occludes.

The appearance of symptoms (or not) may be correlated with progressive occlusion of the vessel. Duplex scanning being a dynamic test is superior to angiography and is currently used as a first line routine test. Patients can be shown what happens to the artery in different arm positions and thus be advised on how to avoid occlusion. Angiography is reserved for those with emboli or aneurysm as a tool for planning reconstruction. Furthermore, arterial compression on duplex is a useful surrogate marker for ulna nerve (C8/T1) N-TOS compression. Since the artery and lowest roots of the plexus are intimately related as they pass over the cervical/first rib if the artery is compressed, the nerve affection is most likely.

Management

Mild or moderate cases usually respond to postural advice and physiotherapy[4]. The anatomical predisposition predates the onset of symptoms which is usually in the mid thirties. If the trigger (such as working with a new computer) can be identified, the process leading to the emergence of symptoms can be reversed. If a prolonged directed course of physiotherapy is unsuccessful, or if there is arterial damage, transaxillary rib resection has a 90% success rate. Surgery is safe and durable, but not for the occasional operator. The most common complication is intercostobrachial anaesthesia and local aching, which resolves in about 3 months.

Currently video-assisted thoracoscopic sympathectomy is the treatment of choice for those with severe vasospasm. It is a minimal access day case operation that allows a precise T4-T2 sympathectomy with minimal risk of Horner's syndrome.

Venous thoracic outlet syndrome

Some amount of venous compression of the upper limb is present in majority with A-TOS because the vein lies near the costoclavicular fulcrum. Following surgery, patients with A-TOS often notice that their arm not swell having previously accepted some venous engorgement to be normal.

At the other extreme is effort-related thrombosis, or Paget-Schroetter syndrome. Seen in young athletes, this is caused by repetitive compression of the vein between the hypertrophied subclavius muscle the first costochondral joint. The vein has a constant valve at

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this point, and becomes encased in fibrous tissue. Presentation with a painful swollen arm can be dramatic but a history of previous mild episodes is common. Pulmonary emboli can affect 10% of patients.

Management

Primary angioplasty or stenting are universally unsuccessful because of the intrinsic venous abnormality and persistent extrinsic compression. Late presentation with troublesome venous hypertension may be helped by rib resection. Jugular vein swing down is a major, disfiguring and ineffective operation. The creation of a dialysis-type brachiocephalic fistula to increase flow is recommended. The fistula is disconnected at 6 months.

In summary the diagnosis and treatment of effort thrombosis[5] is based on

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- Typical history (relation to sport)
- Immediate heparin and aspirin
- Duplex to confirm (look at other side as well)
- Sedentary or older patients: warfarin for 3 months
- Fit sportsmen: offer thrombolysis decompression by rib resection and venolysis. If clot more than 2 weeks old, leave and reassess in 9-12 months.

Neurological thoracic outlet syndrome

Once again, there is a spectrum of severity, ranging from pain in the distribution of the ulna nerve and posture-related paraesthesia to intrinsic muscle-wasting resembling end stage carpal tunnel syndrome (CTS), N-TOS often coexist with secondary diagnoses such as cervical spondylosis, rotator cuff instability or CTS. Upper plexus N-TOS involves the C5/6 distribution. Unilateral headache, facial pain and toothache are common.

Diagnosis is clinical (Roos' test), radiological (cervical ribs or 'droopy' C7 transverse process associated with bands), duplex (surrogate marker with A-TOS) and Electromyography (EMG). EMG is useful to identify more easily treated causes of 'double crush' such as CTS, to act as a baseline and, in many cases, to confirm the diagnosis. Decreased sensory action potential in the medial or lateral antebrachial cutaneous nerves, abnormal f-waves and motor-unit loss are characteristic if taken in the clinical context.

Management

It is vital to convene a multidisciplinary team to manage these patients. Cross referral between spinal surgery, shoulder surgery, rheumatology, neurology, pain clinic, physiotherapy, psychology and an interested osteopath is not unusual. Failure of conservative measures and objective neurological complications are dealt by surgical decompression via the transaxillary or supraclavicular approach.

In summary, the diagnosis and treatment of N-TOS is based on a

- Characteristic history and examination (Roos' test, pulses, etc.)
- X-ray, duplex, EMG (MRI useful to 'clear' cervical cord)
- Identification and treatment of coexisting pathology
- Directed conservative treatment
- Live with symptoms or consider surgery.

Disputed thoracic outlet syndrome

These patients often present after road accidents, and litigation is rife. To avoid litigation, careful documentation and a motivated, well-informed patient is the key. Results of treatment are better once the case has been settled. Avoid surgery unless there are compelling objective tests in a well-balanced patient who gives a consistent history and examination findings. Traction injury to the plexus is often worse in the more vulnerable lower trunk; thus surgery should be delayed for approximately 2 years to allow the plexus maximal time to recover.

Surgical techniques

The results of supraclavicular and transaxillary approaches to surgery appear similar[6]. Familiarity with the approach and an adequate decompression are more important. The operation should be visual and not tactile. Correct instrumentation is vital. Laparascopic assistance is useful for lighting, precise surgery and teaching.

References

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