**Exercise induced critical ischaemia of the upper limb secondary to a cervical rib**

R G Casey, S Richards, M O’Donohoe

The case is reported of a 32 year old woman with acute on chronic upper limb ischaemia due to thrombus from a cervical rib that had compressed the right subclavian artery of her dominant hand after use of a rowing machine. If not detected early, this condition can be debilitating especially in the young. A multidisciplinary approach is advisable to ensure a satisfactory outcome.

**CASE REPORT**

A 32 year old woman attended the emergency department complaining of a three day history of forearm pain in her dominant right hand, which prevented her from sleeping. She had recently taken up an exercise programme, using a rowing machine, after pregnancy. Musculoskeletal pain was diagnosed, and a short course of non-steroidal anti-inflammatory drugs and physiotherapy were prescribed. She was a smoker (10 cigarettes a day) and was taking the oral contraceptive pill. She returned to the emergency department on three occasions over a six week period. At the time of admission she complained of the same pain and numbness, which had worsened over the preceding four days. She had also had rest pain for the preceding 72 hours. The brachial artery pulse was barely palpable but the radial pulse was absent. A radial artery Doppler ultrasound signal was weakly audible. An intravenous heparin infusion was started.

X Ray fluoroscopy revealed a cervical rib on the right side and a smaller left cervical rib. Colour duplex ultrasound scanning now showed no arterial flow distal to the axillary artery. Angiography showed occlusion distal to the subclavian artery. Recombinant tissue plasminogen activator (r-TPA) was given for 24 hours, which was successful in restoring flow in the axillary and brachial artery to the elbow, but the patient continued to have severe pain in the forearm.

She proceeded to have a brachial embolectomy, which showed that the brachial artery was full of thrombus that extended to the palm. The ulnar artery appeared normal. A radial artery embolectomy and vein patch graft was then performed. Completion angiography confirmed collateral arterial flow to the fingers but not to the palmar arches. Radial and ulnar Doppler signals were present.

Three days later the Doppler signals were not audible. This may have been partly due to inadequate anticoagulation and to thrombus in the palmar arches. On further exploration it was found that the radial and ulnar arteries were occluded and there was intimal damage to the radial artery. Distal and proximal thrombectomy, on table r-TPA infusion, and radial artery vein patch grafting were repeated in a final attempt to improve the blood flow to her dominant hand. Doppler ultrasound showed a good radial artery signal and a weak ulnar artery signal.

One month later, at excision of the right cervical rib, it was apparent that the subclavian artery had been lifted to a very high and kinked position. There was no evidence of aneurysm formation.

The patient was discharged two weeks after admission with slight cyanosis of the pulps of her fingers and minimal paraesthesia in the radial two and a half fingers.

She returned three months later for magnetic resonance angiography of the right arm, which showed that the radial and ulnar arteries were occluded. The intersosseous artery was patent and provided collaterals to the palmar arch. The brachial artery was occluded above the elbow. She then underwent sympathectomy with good symptomatic relief and was able to carry out normal housework despite some arm claudication. Six months later she is asymptomatic and taking a calcium channel blocking drug (nifedipine) and is due to have prophylactic excision of a left cervical rib.

**DISCUSSION**

Thoracic outlet syndrome or thoracic outlet compression syndrome is due to compression of the subclavian vessels or brachial plexus in the region of the thoracic outlet. Congenital causes include cervical ribs and anomalous first ribs or fibromuscular bands. Acquired causes are blunt trauma, clavicular deformities, scalene musculotendinous hypertrophy, and subclavian artery aneurysms.

Thoracic outlet syndrome is the cause in less than 5% of patients with upper extremity ischaemia. Of these, a cervical rib is the most common cause, especially in fit young people. About 70% of cases of thoracic outlet syndrome are associated with neurological symptoms, and, when vascular injury occurs, venous problems—for example, axillary vein thrombosis—are more common than arterial.

Although thoracic outlet syndrome is very rare, it is important to bear it in mind. It is becoming more common in athletes, especially swimmers, who perform repetitive overhead movements and those who perform hyperabduction movements. There is also evidence in athletes that there is axillary artery compression by the head of the humerus during abduction.

These arterial injuries, especially in athletes, affect young and otherwise healthy and active people. If not diagnosed early, they can be severely debilitating, have significant morbidity, and may ultimately lead to amputation. One must have high clinical suspicion when confronted with a patient complaining of unilateral upper limb sensory and/or motor symptoms, especially after exercise that involves hyperabduction. Unfortunately, in this case, the patient had not received a proper initial physical assessment with a follow up plan, and returned with an acute on chronic ischaemic limb which was resistant to attempts at thrombectomy. In patients with acute arm pain, initial assessment should include examination of peripheral pulses and brachial artery blood pressure in both arms. Revascularisation of an ischaemic limb in a young patient may result in a compartment syndrome and thus may require prophylactic fasciotomy to avoid secondary muscle damage, ischaemic contractures, and further functional disability. Successful management of these patients involves a multidisciplinary approach. Close liaison with radiology,
vascular, physiotherapy, and rehabilitation services is essential to ensure a satisfactory functional outcome. At follow up, most patients are asymptomatic with a patent arterial system or at least significantly improved.

Take home message

- Repetitive movement in young athletes can lead to upper limb neurovascular injury
- Acute/chronic upper limb ischaemia (or deep venous thrombosis) should prompt evaluation for a cervical rib
- The initial emergency assessment and treatment of thoracic outlet syndrome is the same as for acute upper limb ischaemia from any cause
- Vascular complications associated with cervical ribs can be limb threatening

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