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Chest Pain Revealing Neurogenic Thoracic Outlet Syndrome With Bilateral Cervical Ribs and Cervical Spondylosis

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Abstract

Thoracic outlet syndrome is rarely considered in the emergency assessment of chest pain, although its pain can reach the anterior chest. A 47-year-old woman with no medical history presented to the emergency department with chest and neck pain of one month's duration, numbness and tingling of both upper limbs, and cold hands. Three 18-lead electrocardiograms and serum troponin were normal. Computed tomography of the cervicodorsal spine showed bilateral cervical ribs, larger on the right, with degenerative disc disease at C4-C5 and C5-C6. Nerve conduction studies showed reduced sensory nerve action potential of the medial antebrachial cutaneous nerve, which favored a lesion of the lower brachial plexus over a cervical radiculopathy. A selective nonsteroidal anti-inflammatory drug, analgesics, and physiotherapy relieved the symptoms within 15 days. Once an acute coronary syndrome is excluded, chest pain with upper-limb paresthesia warrants examination of the thoracic outlet. When cervical ribs and cervical spondylosis coexist, imaging cannot identify which lesion explains the symptoms. The sensory potential of the medial antebrachial cutaneous nerve helps separate a lower plexus lesion from radiculopathy, and cold hands call for arterial assessment.

Categories: Neurology, Emergency Medicine, Anatomy
Keywords: brachial plexopathy, cervical angina, cervical rib, cervical spondylosis, chest pain, nerve conduction study, thoracic outlet syndrome

Introduction

Cervical ribs are found in 2.0% of adults on cervical spine computed tomography (CT). They are bilateral in 40.3% of those affected and twice as frequent in women. Up to 10% of affected individuals develop thoracic outlet syndrome or brachial plexopathy [1]. Thoracic outlet syndrome is usually neurogenic and much less often vascular, and the pain of its neurogenic form can reach the anterior chest and simulate angina [2]. In the neurogenic form, the lower trunk of the brachial plexus (C8-T1) is compressed or stretched by the cervical rib or its fibrous band, which causes neck and shoulder pain with paresthesia and, later, weakness in the ulnar territory of the hand [2]. Symptomatic cervical ribs can also compress the subclavian artery and lead to thrombosis or aneurysms [3]. Disease of the cervical spine can produce chest pain that imitates angina as well, a presentation known as cervical angina [4]. The diagnosis of neurogenic thoracic outlet syndrome is difficult because no single test confirms it; it rests largely on clinical findings and the exclusion of other conditions. Its symptoms overlap with those of cervical radiculopathy and peripheral entrapment neuropathies [5]. A cervical rib and two-level cervical spondylosis coexisted in a 47-year-old woman who presented to the emergency department with chest pain, and nerve conduction studies helped determine which lesion explained her symptoms.

Case Presentation

A 47-year-old woman with no medical or surgical history presented to the emergency department with chest pain and neck pain that had begun one month earlier. The pain spread to the shoulders and was accompanied by numbness and tingling in both upper limbs; she also complained of cold hands.

On admission, she was conscious, her Glasgow Coma Scale score was 15, and her pupils were equal and reactive. Blood pressure was 130/90 mmHg, heart rate 76 beats per minute, and oxygen saturation 97% on room air. She was breathing normally, and there was no sign of peripheral hypoperfusion. Radial and ulnar pulses were present and symmetrical bilaterally, hand temperature and color were symmetrical, capillary refill time was less than 2 seconds, and there was no sign of ischemia such as pallor, cyanosis, digital ulceration, or trophic changes. A standard 18-lead electrocardiogram (ECG) was performed three times and was normal on each occasion. Serum troponin was below 0.01 ng/mL (reference value, < 0.01 ng/mL). An acute coronary syndrome was therefore ruled out.

Provocative maneuvers for thoracic outlet compression were positive, pointing to a thoracic outlet syndrome. CT of the cervicodorsal spine showed bilateral supernumerary cervical ribs, more developed on the right (Figure *1*), loss of the normal curvature of the cervical and upper thoracic spine, and multilevel

cervical spondylosis with degenerative disc disease at C4-C5 and C5-C6.

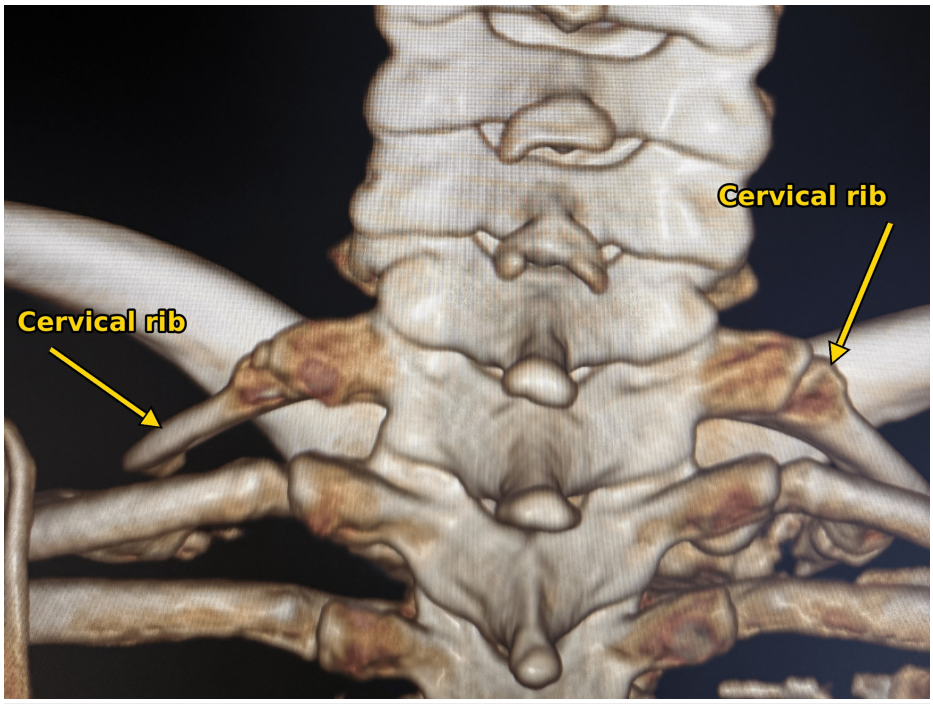


FIGURE 1: Bilateral cervical ribs on posterior three-dimensional CT reconstruction

CT of the cervicodorsal spine showed bilateral supernumerary cervical ribs, more developed on the right. The arrows indicate the bilateral cervical ribs arising from the seventh cervical vertebra. Loss of the normal curvature of the cervical and upper thoracic spine, and multilevel cervical spondylosis with degenerative disc disease at C4-C5 and C5-C6 were also noted.

Electromyography with nerve conduction studies showed a reduced amplitude of the sensory nerve action potential of the medial antebrachial cutaneous nerve. The diagnosis of neurogenic thoracic outlet syndrome rested on the clinical picture and this electrophysiological finding. No vascular imaging was performed, so concomitant vascular involvement was not assessed.

Treatment was conservative. It combined a selective nonsteroidal anti-inflammatory drug, analgesics, and physiotherapy aimed at relaxing the cervical and shoulder girdle muscles. Neck pain, chest pain, and paresthesia improved within 15 days (Table *1*).

Time	Event
One month before admission	Onset of chest pain and neck pain
Admission	Three normal 18-lead ECGs, troponin < 0.01 ng/mL, normal peripheral vascular examination, CT of the cervicodorsal spine showing bilateral cervical ribs and C4-C5 and C5-C6 disc disease
Workup	Positive provocative maneuvers, electromyography showing a reduced medial antebrachial cutaneous sensory potential
Days 0 to 15	Selective nonsteroidal anti-inflammatory drug, analgesics, and physiotherapy
Day 15	Improvement of pain and paresthesia

TABLE 1: Timeline of the case

Discussion

No single test confirms thoracic outlet syndrome, and the reporting standards of the Society for Vascular Surgery define its neurogenic form by three of four criteria, namely, local signs at the thoracic outlet, distal signs of nerve compression, the absence of another condition explaining the symptoms, and a positive response to a scalene muscle injection [5]. No scalene injection was administered in this patient, so the diagnosis rests on the first three criteria. The spondylosis put the third in doubt, and electromyography helped address it.

The pain of neurogenic thoracic outlet syndrome can radiate to the anterior chest and simulate angina [2], and disorders of the cervical spine produce chest pain of the same kind, which remains an underrecognized cause of noncardiac chest pain [4]. Either lesion could therefore explain the chest pain in this patient, and the first task was to exclude an acute coronary syndrome, which the repeated normal ECGs and normal troponin did. The second was to decide which lesion explained the arm symptoms.

The medial antebrachial cutaneous nerve arises from the medial cord and carries C8 and T1 fibers, well below the roots exposed to disc disease at C4-C5 and C5-C6. A root lesion lies proximal to the dorsal root ganglion and leaves sensory nerve action potentials intact, so a reduced sensory potential places the lesion in the plexus. In 32 patients with surgically verified true neurogenic thoracic outlet syndrome, the medial antebrachial cutaneous amplitude was the most sensitive of the sensory studies, low for age in 84% and low by side-to-side comparison in 95% [6]. The finding in this patient therefore points to the lower trunk of the brachial plexus, at the level of the cervical rib, and away from the spondylosis. Electrophysiology does not, however, exclude a contribution of the spondylosis to the neck pain, and both lesions may contribute to the symptoms.

The cold hands raise a separate question. In a surgical series of 23 cervical rib resections, symptomatic ribs were large and fused to the first rib in 74% of cases, and 7 patients presented with subclavian artery thrombosis, 3 of them with an aneurysm [3]. Neurological symptoms dominated in this patient and improved without surgery, but arterial compression was not excluded by imaging, and an arterial duplex study with dynamic maneuvers belongs in the workup of any patient with a cervical rib and cold hands. The absence of vascular imaging is a limitation of this report: concomitant arterial or venous involvement cannot be excluded and remains unresolved.

Conservative treatment is the usual first step in neurogenic thoracic outlet syndrome, and in this patient, it relieved the pain and paresthesia within 15 days. A reduced sensory amplitude reflects axonal loss in the lower trunk, so the improvement of the symptoms does not by itself show that the nerve has recovered, and clinical and electrophysiological follow-up remains necessary.

Conclusions

Thoracic outlet syndrome belongs in the differential diagnosis of chest pain with upper-limb paresthesia once an acute coronary syndrome has been excluded. When a cervical rib and cervical spondylosis coexist, imaging alone cannot assign the symptoms, and reduced sensory potential of the medial antebrachial cutaneous nerve supports a lesion of the lower brachial plexus, because root lesions spare sensory potentials. In this patient, however, a contribution of the spondylosis and concomitant vascular involvement could not be excluded. Cold hands in a patient with a cervical rib call for arterial duplex ultrasound with dynamic maneuvers.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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Disclosures

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