

# Subclavian Vein Compression and Thrombosis Presenting as Upper Extremity Pain

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**W**e report a case of upper extremity pain that eluded diagnosis. Only after ultrasonography was repeated with the patient in the sitting position was external compression of the subclavian vein and a subclavian vein thrombosis detected. The patient was diagnosed as having hypertrophied anterior scalene muscles that compressed the venous structures when he assumed the upright position. Performance of ultrasonography with the patient upright allowed confirmation of the clinical diagnosis and referral for treatment.

## Case Report

A 30-yr-old man sustained injury to his right neck and shoulder when a wooden beam fell and struck him. Radiographic analysis and magnetic resonance image of the involved areas were negative. The patient suffered the immediate onset of a throbbing, burning pain in his right shoulder, arm, and hand. At 1 wk, the pain persisted and was accompanied by hand swelling. Physical examination was reported as negative; specifically, there was no allodynia, temperature changes, or excessive sweating. Thoracic outlet maneuvers were also performed and found to be negative. The patient was treated with physical therapy, transcutaneous electrical nerve stimulation, and nonsteroidal antiinflammatory drugs, which provided minimum pain relief. He was evaluated by a neurosurgeon, who found no pathology and referred him to a pain specialist. The patient received trigger-point injections to the muscles of his right shoulder and neck. He reported temporary relief of shoulder pain.

At 2 mo, the patient's complaints were unchanged except for the development of intermittent hand cyanosis. Reflex sympathetic dystrophy was suspected, and stellate ganglion, axillary, and differential cervical epidural blocks were performed. The patient reported transient, mild relief from each of the blocks, but each time noted recurrence of the baseline pain within 24 h. Electromyography and nerve conduction velocity tests indicated results consistent with partial injury to the lower segment of the brachial plexus. The patient's complaints of pain and swelling persisted into

the third month. An aortic arch and subclavian arteriogram were performed and were negative. Computerized tomography of the chest and magnetic resonance imaging of the brachial plexus were unremarkable. The patient underwent a cervical computerized tomography myelogram, which was normal. He was referred to a second pain clinic.

The patient was a muscular man who presented to our clinic in no acute distress. Prominent superficial veins in both upper extremities were appreciated, more so on the right (Figure 1). The venous distention was partially relieved with the patient supine, but his complaint of throbbing pain (7 of 10 intensity) was unaffected by position. A complete physical examination revealed mild right hand swelling but was otherwise unremarkable. A Doppler ultrasound venous flow evaluation was performed and reported to be negative. The following week, the Doppler evaluation was repeated at another facility with the specific request that it be performed with the patient seated. In this position, the ultrasound probe was applied to the chest wall above and below the clavicles. The signals were measured and videotaped while maneuvers were made to augment and decrease venous flow, i.e., probe compression of the vessels being studied, deep inspiration by the patient, and rapid squeezing of the biceps to increase venous blood flow. Results were consistent with partial, bilateral subclavian vein compressions. This was thought to be caused by impingement by the anterior scalene muscles given the site of venous narrowing and the lack of phasic flow in those specific regions. A partially occluding thrombus was also detected in the right subclavian vein. A presumptive diagnosis of bilateral, anterior scalene muscle hypertrophy was made from the site of vein narrowing during the dynamic examination with the ultrasonogram. The patient was referred for thrombolytic treatment and possible anterior scalenotomy.

## Discussion

Deep vein thrombosis of the upper extremity occurs rarely (1,2). The pathology is classified into primary and secondary according to etiology. To be classified as primary or "effort induced," two criteria must be met: the vein must have been traumatized, and, additionally, there must be an underlying anatomic abnormality near or surrounding the vessel (3). The possible abnormalities include narrowed costoclavicular space, scarring of the perivenous soft tissue, and hypertrophy of the anterior scalene muscles (2-6). Effort-induced thrombosis (also termed the Paget-Schroetter

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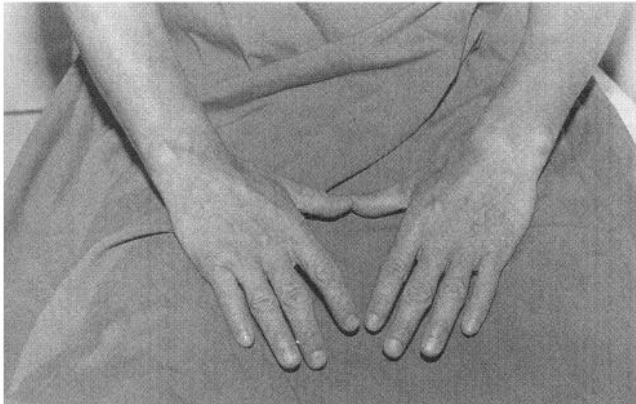


Figure 1. Note the dilated veins.

syndrome) tends to affect young men (3,4,7). Repetitive overhead motions made while painting ceilings or mounting storm windows can cause anterior scalene hypertrophy with resulting venous congestion. If the activities continue, prolonged compression and venous stasis lead to thrombus formation (3,4). The most common presenting symptom is upper extremity swelling (90%–95%) (1,8). Pain is also a presenting symptom (4,8), and complaints range from mild aching to disabling pain (1,8). Other symptoms include cyanosis and the appearance of prominent superficial veins of the arm and shoulder (3,4). Untreated thrombosis may lead to pulmonary embolism (12%) (2,4). Secondary thrombosis follows direct damage to the endothelium of the vessel, as following instrumentation (6).

Venography is the most accurate diagnostic tool (1,7,8). The procedure is invasive and can aggravate thrombosis or cause phlebitis. Noninvasive studies have no morbidity but are less sensitive; venous flow through collateral channels can be misperceived as flow within the primary vessel. The incidence of false-negative findings is 20%–33% (1,8). In this case, the sensitivity of ultrasonography was enhanced with the patient sitting. We hypothesize that this position itself

contributed to narrowing of the costoclavicular space. Contraction of the anterior scalene muscle when the neck is fixed elevates the first rib (9). With assumption of the sitting position, tension from hypertrophied anterior scalene muscles would narrow an already compromised space for the subclavian veins.

We report this case to demonstrate the magnitude of the work-up that was performed, the expense incurred, and the significant risk of iatrogenic injury that was borne by the patient. This was all sustained before a diagnosis, which can be inferred by a careful physical examination, was considered. We recommend that deep vein compression or thrombosis be entertained as a cause of persistent arm pain after trauma. Furthermore, the performance of Doppler ultrasonography with the patient in an upright or sitting position may prove useful in making a diagnosis.

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