Axillary nerve entrapment in the quadrilateral space

Case report

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The quadrilateral space syndrome is a recently established entity with seemingly consistent pathological and radiographic features. An example of this syndrome is reported. In this patient, entrapment of the axillary nerve by fibrous bands in the quadrilateral space caused shoulder pain with paresthesias in the upper extremity. Subclavian angiography provided the diagnosis by demonstrating that the posterior humeral circumflex artery, which was normal when the arm was in a neutral position, was occluded when the arm was abducted and externally rotated. Axillary neurolysis through a posterior approach resulted in relief of symptoms.

KEY WORDS □∇ axillary nerve □∇ nerve entrapment □∇ quadrilateral space syndrome

Isolated neuropathy of the axillary nerve is an unusual syndrome. It has been described following laparotomy, and was attributed to suspending the forearm from the anesthesia screen to gain better abdominal exposure. Another instance was caused by compression from a figure-of-eight harness used to support a below-elbow prosthesis in an active amputee. Other cases have been attributed to sleeping in the prone position with the arms raised above the head. A more common precipitating event is intramuscular injection high in the posterior aspect of the shoulder resulting in injury to the axillary nerve. All of these cases had a precipitating traumatic event; however, Cahill reported a spontaneous form of axillary neuropathy resulting from entrapment of the nerve in the quadrilateral space. The quadrilateral or quadrangular space is the anatomical compartment bounded by the teres major and minor muscles, the long head of the triceps, and the neck of the humerus. Through these confines run the posterior humeral circumflex artery and the axillary nerve. Cahill appropriately named the disease the "quadrilateral space syndrome." This report describes a case fulfilling Cahill's criteria of the syndrome in which operative decompression resulted in a favorable outcome. The case is presented to bring this unusual entity to the attention of the neurosurgical community as a possible cause of shoulder and arm pain when the list of more common diagnoses has been exhausted.

Case Report

This 28-year-old woman was referred to the Ochsner Clinic with a chief complaint of right upper-arm pain. The pain was engendered by use of the arm and was described as radiating from the right shoulder along the lower border of the right deltoid muscle, occasionally spreading to the right lateral aspect of the neck. She complained of difficulty in raising her right arm above shoulder level. Continued use of her arm evoked a sensation of stiffness and a perception that the blood circulation to her arm had been occluded. She denied any prior history of trauma or illness involving the arm, neck, or shoulder.

Examination. Physical examination demonstrated excellent motor strength in all muscles of the right upper extremity including the deltoid. Sensation was intact. Adson's maneuver demonstrated no compromise of the radial pulse, but continued abduction of the arm reproduced her symptoms exactly. Further probing revealed exquisite tenderness lateral to the scapula. The diagnoses of cervical radiculopathy and thoracic outlet syndrome had been entertained by her referring physicians, prompting a cervical myelogram as well as a digital venous angiogram of the right upper extremity. The myelogram showed a very minimal asymmetry of the nerve roots at C5–6, but the digital venous angiogram, obtained with the arm in a neutral position and abducted, was reported as normal. Careful
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review of the digital venous angiogram, however, showed poor visualization of the posterior humeral circumflex artery. The patient was admitted to the Ochsner Foundation Hospital where transfemoral subclavian angiography was performed. This study showed normal flow in the posterior humeral circumflex artery when the arm was in a neutral position (Fig. 1 left), but an abrupt cessation of flow in the artery occurred when the arm was abducted and externally rotated (Fig. 1 right). Angiography of the unaffected upper extremity was normal.

Operation. The patient underwent exploration of the axillary nerve in the quadrilateral space through a posterior approach, using an incision parallel and inferior to the spine of the scapula (Fig. 2). At surgery, several thin bands of connective tissue were found running through this compartment in various directions, entrapping both the nerve and artery. The attachments of these bands lay beyond the confines of the quadrilateral space and were not identified. They were divided along the entire length of the exposed artery and nerve. After lysis of these adhesions, abduction and external rotation of the arm was performed while the posterior humeral circumflex artery was palpated beyond the quadrilateral space. Arterial pulsation continued throughout the full range of this maneuver, indicating release of the entrapment.

Postoperative Course. The patient had an uneventful postoperative course, reporting significant relief of her pain on the 1st postoperative day. At follow-up examination 3 and 6 months after surgery, she continued to have a satisfactory result with no recurrence of her preoperative complaints.

Discussion

According to Cahill and Palmer, the quadrilateral space syndrome is caused by compression of the axillary nerve and the posterior humeral circumflex artery in the quadrilateral space. It affects active young people between the ages of 22 and 35 years. The syndrome consists of slow, intermittent onset of pain and paresthesias in the upper extremity unassociated with trauma. The pain is poorly localized to the anterior and lateral aspects of the shoulder with point tenderness present over the quadrilateral space posteriorly. Forced abduction and external rotation of the upper arm for 60 seconds will often reproduce the symptoms. Neurological examination and electromyographic studies are normal. Subclavian angiography of the involved extremity is normal with the arm in the neutral position,
but shows compromise of flow in the posterior humeral circumflex artery with as little as 60° abduction and some external rotation. Since angiography of the uninvolved extremity has not been abnormal in any case yet studied, this procedure is considered unnecessary and is not recommended.3,4

Operative decompression is performed through a posterior approach to the shoulder2 (Fig. 2). An incision is made parallel and inferior to the spine of the scapula. After the deltoid is detached from the spine of the scapula and reflected inferiorly, the infraspinatus and teres minor muscles are visualized. The teres minor muscle is dissected free, detached at its insertion, and rotated medially, thus opening the superior border of the quadrilateral space. The axillary nerve can then be readily identified by tracing the motor branch to the teres minor muscle proximally to its parent nerve. Palpation within the space will reveal randomly oriented fibrous bands. Sharp dissection of these bands will decompress the nerve. Adequate lysis of adhesions is confirmed by palpating the pulse of the posterior humeral circumflex artery while the humerus is abducted and externally rotated. Compromise of the pulsation in this artery indicates a need for further dissection. The teres minor muscle is not reattached during closure for fear of entrapping the nerve again.3,4

Cahill and Palmer4 reported operating on 18 cases of quadrilateral space syndrome with good results: eight patients had dramatic relief; eight were improved but continued to have nocturnal pain; and two showed no improvement. In all these patients the neurovascular bundle was tethered by fibrous bands. These bands have not been found on dissection of cadaver specimens; hence they are considered to be pathological.3 Our single case is in accord with Cahill's series, both radiographically and pathologically, thus lending support not only to the existence of this entity but also to the possible benefit of operative decompression. The quadrilateral space syndrome should be included in the differential diagnosis whenever cervical disc disease, thoracic outlet syndrome, or unilateral shoulder girdle disorders are considered.

References

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