

Scapular Fracture Complicating Suprascapular Neuropathy: The Role of Computed Tomography with 3D Reconstruction

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We report the case of a 43-year-old man who sustained a head injury with left frontal hematoma after being hit by a falling steel plate. He had persistent left shoulder pain but plain film could not clearly demonstrate the suspected scapular fracture, which was finally confirmed by 3-dimensional (3D) reconstructed computed tomography (CT). With the presence of fractures at the base of the coracoid process and the neck of the glenoid process of the scapula, suspected suprascapular neuropathy was confirmed by nerve conduction studies and electromyography. Despite atrophied muscle bulk of the supraspinatus, the patient showed good functional results after nonsurgical treatment. We suggest the use of CT with 3D reconstruction in patients with persistent shoulder pain, marked weakness and suspected scapular fracture not clearly demonstrated on plain film for better evaluation of the extent and complication of the fracture. [*J Chin Med Assoc* 2009;72(6):340–342]

Key Words: computed tomography, fracture, neuropathy, scapula

Introduction

Scapular fractures are infrequent and usually caused by major blunt trauma. They constitute about 5% of all shoulder girdle injuries and 1% of all fractures.¹ Fractures of the scapular body or spine make up 50% of scapular fractures. More than 90% of scapular fractures are undisplaced or only moderately displaced and are usually treated conservatively.² Other associated injuries overshadowing the scapula on plain films, inappropriately performed computed tomography (CT) or an unusual mechanism of injury often lead to delayed diagnosis of scapular fracture.^{1,2}

Cases of trauma-related suprascapular neuropathy are often caused by scapular fractures, proximal humeral fractures, shoulder dislocations, penetrating trauma, rotator cuff injuries, and displaced clavicular fractures.^{3,4} However, due to its infrequent occurrence, suprascapular neuropathy may be overlooked as the cause of shoulder pain or dysfunction.

Case Report

A 43-year-old man, a building worker, sustained a head injury with left frontal hematoma after being hit by a falling steel plate on December 21, 2006. He underwent surgery to remove the hematoma that same day and regained consciousness, cognition and limb muscle power after the operation. On January 4, 2007, he was transferred to our rehabilitation ward for an intensive rehabilitation program. However, persistent left shoulder pain was noted, with difficulty in left shoulder elevation.

Physical examination found a contusion wound with prominence at the left shoulder, while painful limitation of active range of motion (ROM) (0–90°) and painless full passive ROM (170°) were present on elevation. Painful weakness was demonstrated on abduction and external rotation. Plain film of the left shoulder revealed widening of the left acromioclavicular joint and suspected fracture of the left scapula (Figure 1). CT with



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3D reconstruction clearly demonstrated the fracture, with mild displacement at the base of the coracoid process and the neck of the glenoid process of the scapula, which raised the suspicion of injuries to the suprascapular nerve and vessels (Figure 2). Fracture of the acromial process without displacement and a small fracture with mild angulation at the distal end of the clavicle were also visualized.

Nerve conduction studies revealed prolonged left suprascapular nerve latency (right, 2.0 ms; left, 4.6 ms) with reduction in amplitude of compound motor action potentials (right, 10.7 mV; left, 2.0 mV). Electromyography showed active denervation change in the supraspinatus and infraspinatus muscles. Ultrasonography

demonstrated a full-thickness rotator cuff tear at the supraspinatus tendon. The patient was treated conservatively for pain control and strengthening of the scapular stabilizer and rotator cuff muscles. The patient was discharged on January 19, 2007, and returned for follow-up on March 30, 2007. On physical examination, gross atrophy of the supraspinatus muscle (Figure 3) showed improved active ROM on elevation. Compared to the previous nerve conduction studies, repeated studies revealed improved left suprascapular nerve latency (right, 2.2 ms; left, 2.2 ms).

Discussion

Scapular fractures are relatively uncommon injuries. Causes of scapular fractures are generally direct trauma and often associated with shoulder and thoracic injuries. CT has been found to greatly improve diagnostic accuracy if plain radiographs fail to delineate the extent of the injury.^{5,6} Tadros et al compared axial CT, and 2D and 3D reconstruction CT in the detection of fractures at 6 anatomic regions of the scapula, finding CT with 3D reconstruction to be the most useful imaging modality for detecting and defining the extent of scapular fracture.⁵

The suprascapular nerve is a motor nerve that arises from the upper trunk of the brachial plexus and passes across the posterior cervical triangle to reach the scapular notch. The suprascapular nerve passes through the notch and beneath the transverse scapular ligament, and compression of the nerve usually occurs at the suprascapular notch and the spinoglenoid notch. Traction injuries, however, most commonly occur at the suprascapular notch, where the nerve is tethered by the transverse scapular ligament.^{3,7} Scapular fractures



Figure 1. Plain film of the left shoulder reveals suspicious fracture of the left scapula.

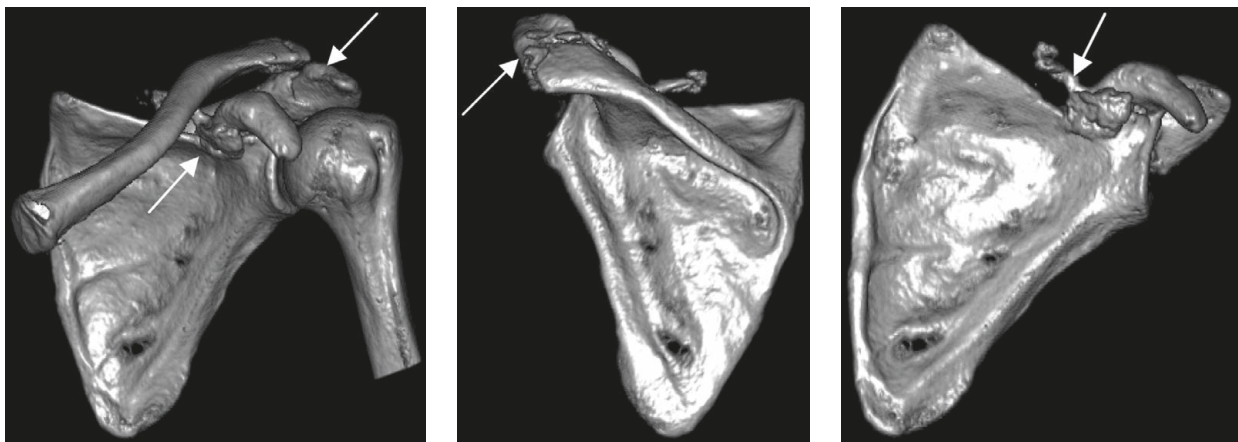


Figure 2. Computed tomography with 3-dimensional reconstruction of the left scapula. Note the extent and location of the scapular fracture (arrows).

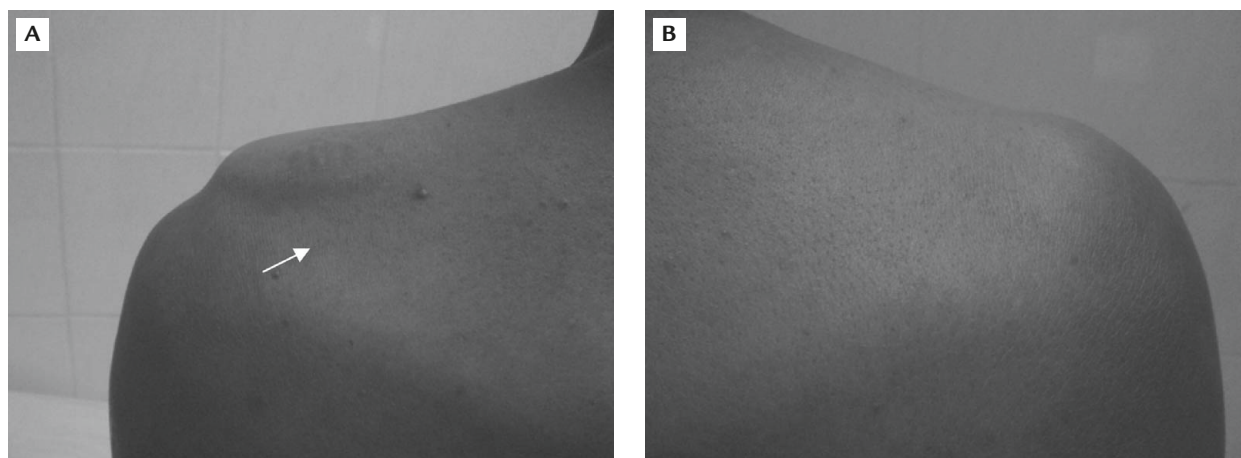


Figure 3. Comparison of the: (A) left and (B) right supraspinatus muscles. Note the gross atrophy of the left supraspinatus muscle (arrow).

are one of the most common causes of direct trauma to the suprascapular nerve.^{3,4,8} However, the clinical presentation of suprascapular neuropathy frequently mimics rotator cuff or cervical disc disease. With involvement at the level of the suprascapular notch, tenderness may be found in the area bound by the clavicle and the scapular spine. For long-standing neuropathy at this level, diffuse wasting of the supraspinatus and the infraspinatus may occur. If the diagnosis is uncertain, nerve conduction studies and electromyography often provide essential information.^{1,4} Positive studies can demonstrate delayed distal latency with decreased amplitude from Erb's point to the supraspinatus or infraspinatus, and denervation potentials and spontaneous activities can be found.

In this case, due to proximity of the fracture to the suprascapular notch, suprascapular neuropathy was highly suspected. With positive nerve conduction studies and electromyography, a diagnosis of suprascapular neuropathy was confirmed.

Treatment for most scapular fractures consists of immobilization with a sling and swath for comfort, and analgesics for pain control, and early mobilization and scapula-stabilizing exercises often lead to satisfying results.

As for treatment of suprascapular neuropathy without evidence of space-occupying lesions, such as tumors and cysts, most cases are treated nonsurgically and resolve completely, but restoration of atrophied muscles may be incomplete.^{3,4,8,9} Rehabilitation exercises should be focused on scapular positioning with strengthening of the trapezius, rhomboids, serratus and rotator cuff muscles.³

In conclusion, scapular fractures and suprascapular neuropathy are both often delayed in diagnosis or missed altogether. For patients with persistent shoulder pain combined with marked muscle weakness after traumatic injury, CT with 3D reconstruction is a good modality to visualize the extent and localization of the fracture and the possibility of injury in other associated structures. Due to having similar symptoms as cervical disc and rotator cuff lesion, diagnosis of suprascapular neuropathy often relies on nerve conduction studies and electromyography.

References

1. Martin SD, Weiland AJ. Missed scapular fracture after trauma. A case report and a 23-year follow-up report. *Clin Orthop Relat Res* 1994;299:259–62.
2. Tadros AM, Lunsjo K, Czechowski J, Abu-Zidan FM. Causes of delayed diagnosis of scapular fractures. *Injury* 2008;39:314–8.
3. Romeo AA, Rotenberg DD, Bach BR Jr. Suprascapular neuropathy. *J Am Acad Orthop Surg* 1999;7:358–67.
4. Huang KC, Tu YK, Huang TJ, Hsu RW. Suprascapular neuropathy complicating a Neer type I distal clavicular fracture: a case report. *J Orthop Trauma* 2005;19:343–5.
5. Tadros AM, Lunsjo K, Czechowski J. Usefulness of different imaging modalities in the assessment of scapular fractures caused by blunt trauma. *Acta Radiol* 2007;48:71–5.
6. Goss TP. The scapula: coracoid, acromial, and avulsion fractures. *Am J Orthop* 1996;25:106–15.
7. Habermeyer P, Rapaport D, Wiedemann E, Wilhelm K. Incisura scapulae syndrome. *Handchir Mikrochir Plast Chir* 1990;22:120–4. [In German]
8. Gosk J, Urban M, Rutowski R. Entrapment of the suprascapular nerve: anatomy, etiology, diagnosis, treatment. *Ortop Traumatol Rehabil* 2007;9:68–74.
9. Fansa H, Schneider W. Suprascapular nerve entrapment. *Handchir Mikrochir Plast Chir* 2003;35:122–6. [In German]