

Recurrent Low-Energy Intrathoracic Dislocation of the Scapula

T. Ty Fowler, MD, Benjamin C. Taylor, MD, and Richard A. Fankhauser, MD

Abstract

Dislocation of the scapula is a rare disorder. The nomenclature in the literature can be confusing as a result of nonspecific terms such as *locked scapula* and *dislocated scapula* when referring to both intra- and extra-thoracic dislocations. After a thorough review of the literature we further define and classify scapular dislocations to better understand prognosis and patient education. We report a case of a low-energy intrathoracic dislocation of the scapula due to anomalous anatomy. Similar to another reported case in the literature, we have been able to document recurrence of intrathoracic scapular dislocation only in association with persistent chest wall defects following rib resection.

There have been multiple reports of scapulothoracic injuries in the literature. The mechanism and severity of injury, rate of occurrence, associated injuries, and functional outcome can vary considerably.¹⁻¹¹ Scapulothoracic injuries can be broken down into 3 categories: scapulothoracic dissociation, intrathoracic dislocation of the scapula, and extrathoracic dislocation of the scapula.

Scapulothoracic dissociation is mentioned briefly, despite its inclusion within scapulothoracic injuries, because it is a very different entity clinically than scapular dislocations. Scapulothoracic dissociations are often associated with severe neurologic, and/or substantial vascular injury to the shoulder girdle, as well as life-threatening injury to other bodily systems and therefore must be recognized as a completely unique condition due to emergent diagnosis and treatment.^{1-3,10,11}

With respect to scapular dislocations, the nomenclature in the literature can be confusing as a result of nonspecific terms such as *locked scapula* and *dislocated scapula* when referring to both intrathoracic and extrathoracic dislocations.⁵⁻⁸ *Locked scapula* is a mechanical descriptive term that can be applied broadly to injuries of the scapula resulting in a lack of mo-

tion at the scapulothoracic articulation. This term does not provide insight into the pathoanatomy of the dislocation. A dislocated scapula, is defined as a disruption of the normal anatomic relationship between the scapula and the bony thorax. Dislocations of the scapula can be separated into extrathoracic and intrathoracic. An extrathoracic dislocation is defined as a disruption of the scapulothoracic articulation while maintaining the scapula outside the thoracic cavity. Intrathoracic dislocations are characterized by a portion of the scapula becoming lodged between ribs and within the thoracic cavity. This rare disorder has been associated with trauma and anomalous anatomy.^{4-6,8,10} This report presents a case of recurrent intrathoracic dislocation of the scapula associated with rib resection due to suspected metastatic bone disease.

The patient provided informed consent for written and electronic publication of this case report. Approval was also received from our Institutional Review Board.

Case Report

A genetically predisposed 54-year-old woman underwent right breast mastectomy due to primary breast carcinoma in 1980 and left breast mastectomy in 1994 for a new primary malignancy. After a minor injury in 1995 followed by unremitting chest-wall pain, concern arose for possible metastatic bone disease because of suspicious rib radiographs. The patient subsequently underwent diagnostic resection of the right 3rd and 4th ribs. Histologic analysis of the submitted tissue detected no evidence of malignancy and the patient recovered uneventfully.

Five years following rib resection, while gardening, the patient placed her right upper extremity into a position of extreme forward flexion. She immediately experienced a severe, sharp, nonradiating pain in the posterior right shoulder area. Despite evaluation by multiple physicians, but no orthopedists, a definitive diagnosis was not established. Her evaluation included frontal and sagittal radiographs of the chest as well as magnetic resonance imaging (MRI) of the shoulder. These studies were interpreted as normal.

Five weeks after injury, the patient underwent computed tomography (CT) scan of the chest for a suspected lung nodule seen on routine chest radiograph. The CT scan identified an intrathoracic dislocation of the inferior angle of the scapula

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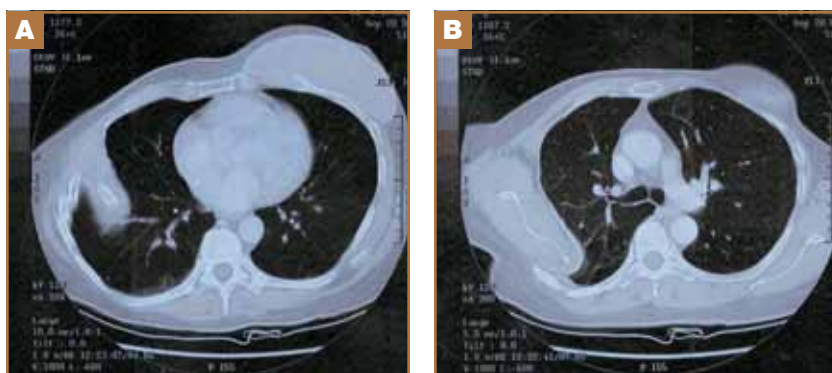


Figure 1. Axial CT scan of the chest shows the inferior angle of the right scapula in an intrathoracic location (A). A more proximal cut shows the scapular body in an intrathoracic location (B).

through her previous rib resection (Figure 1A, 1B). The patient was referred for orthopedic evaluation.

At the time of initial orthopedic evaluation, the patient’s pain had improved greatly and she had no neurologic nor respiratory symptoms. Physical examination revealed a surgical scar from the previous rib resection and an obvious deformity in the right scapular region. The superior, medial, and lateral borders of the scapula could be palpated but the inferior angle of the scapula was not palpable. It appeared to be located in an intrathoracic position between the bordering posterior ribs of the palpable thoracic wall defect. Glenohumeral motion was not restricted except for minimal decrease in internal rotation. There were no neurovascular deficits in the right upper limb and chest auscultation revealed normal breath sounds in both lung fields.

After the diagnosis was established, reduction was recommended. The patient was consciously sedated in the operative suite and placed in left lateral decubitus position. Closed reduc-

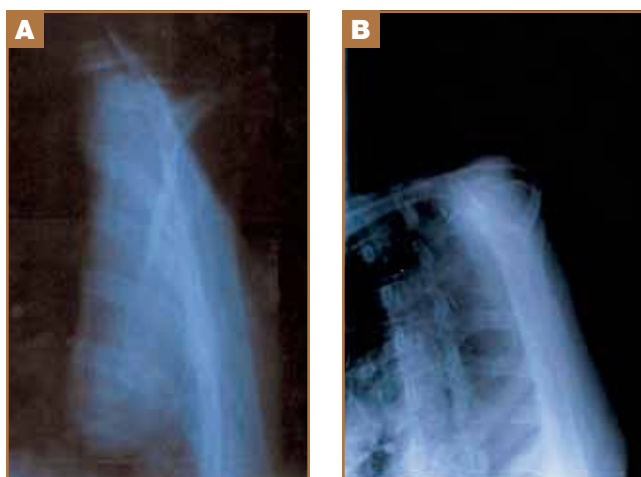


Figure 2. Pre-reduction scapular “Y” radiograph demonstrating the inferior angle of the scapula in an intrathoracic location (A). Post-reduction radiograph demonstrating successful reduction of the scapula to an extrathoracic position (B).

tion was achieved by hyper-abduction of the right arm and manipulation of the medial border of the scapula in a superior, lateral and posterior direction. Following reduction, neurovascular status was unchanged, the upper arm was neutrally positioned, and the scapular deformity was no longer apparent. The right upper limb was then placed in a sling for 3 weeks, followed by passive range of motion of the shoulder via physical therapy. Pre- and post-reduction scapular “Y” radiographs are shown in Figures 2A and 2B.

The patient had 3 subsequent episodes of intrathoracic dislocation after similar low-energy injury mechanisms over the next 6 years. Successful emergency department

reduction was achieved each time after conscious sedation and the previously described scapular manipulation. Since her most recent dislocation in August of 2006, the patient has limited her activities to lifting a maximum of 2.27 kg. with the right upper limb and avoids forward flexion of the right shoulder beyond 90°.

Discussion

There have been 6 reported cases of scapular dislocation (4 intrathoracic and 2 extrathoracic dislocations) in the English literature. Hollinshead and James⁷ described an extrathoracic dislocation of the scapula associated with a previously undiagnosed osteochondroma on the anterior surface of the scapula following a traumatic blunt force to the posterior aspect of the involved chest wall. The dislocation reduced spontaneously after administration of a paralytic agent. Three weeks after successful reduction of the scapulothoracic articulation, the benign cartilaginous tumor was excised and the symptoms resolved.

Ainscow⁹ reported the second case of extrathoracic dislocation of the scapula. This was a low-energy mechanism in which the patient was a passenger in a car and suddenly twisted her body as the car was about to strike a dog. The patient had restricted range of motion of her upper extremity and began developing paresthesias throughout her hand. After radiographic diagnosis, the patient underwent conscious sedation, which led to spontaneous reduction of the extrathoracic scapular dislocation. There have been no reports of redislocation. Ainscow⁹ concluded that muscular spasm may be a large component of the pathogenesis of extrathoracic scapular dislocations. This appears to be feasible, as both reported cases reduced spontaneously with conscious sedation and muscle relaxation. Extrathoracic dislocations appear to be stable after reduction with no recurrences reported in the literature.^{7,9}

In contrast, intrathoracic scapular dislocations have a more involved pathogenesis, more complicated reduction requirements, and variability in recurrent events. By further dividing intrathoracic dislocations into traumatic (high-energy) and nontraumatic (low-energy) mechanisms, these variables become more predictable.

Traumatic intrathoracic dislocation of the scapula is a rare event that has been described in 3 case reports.⁴⁻⁶ Two of the reported cases were the result of high-energy, blunt force directed from posterior to anterior on the chest wall.^{5,6} Under such force, the superior aspect of the scapula is apparently displaced anterolaterally, while the inferior angle of the scapula is displaced medially and anteriorly, presumably with enough force to disrupt scapular soft-tissue attachments, fracture ribs, and allow the inferior angle of the scapula to become lodged in an intrathoracic position.^{5,6,10} The high energy imparted can also result in accompanying scapular fracture.⁵ Muniz⁴ reported a third case involving a different mechanism of injury, namely high-energy traction being applied to the involved upper extremity resulting in the inferior angle of the scapula being displaced laterally. Post-traction recoil resulted in the inferior angle lodging between 2 posterior ribs. Patients in these case reports all reported paresthesias of the involved upper limbs in the acute period with no motor deficits or vascular injuries and all had full recovery of sensation.

Successful closed reduction of traumatic dislocations varies based on the time frame of presentation. Both cases that presented acutely for treatment were reduced successfully with conscious sedation and manual manipulation of the scapula to an extrathoracic position.^{4,6} In the case report presented by Nettrour and colleagues⁵ the dislocation was irreducible with closed manipulation at presentation 6 weeks after injury. Open reduction was required to release posttraumatic fibrosis and affect removal of the scapula from the thoracic cavity. Despite the requirement for closed or open reduction, all patients with traumatic intrathoracic scapular dislocations recovered uneventfully with no documented recurrences.^{4,6}

To our knowledge, Ward and colleagues⁸ described the only case of nontraumatic, low-energy intrathoracic scapular dislocation, which was very similar to our case. Their patient also had penetration of the thoracic cavity by the inferior scapular angle through a surgically created chest-wall defect, also as a result of rib resection. That patient sustained dislocation when the arm was positioned in abduction, external rotation and extension, differing somewhat from the position of instability of our patient, perhaps reflecting differences in the position and magnitude of the chest-wall defects of the respective patients. Successful closed reduction was performed at initial presentation. This patient had recurrent dislocations that became self-reducible.

To our knowledge, there are 2 reported cases of intrathoracic dislocation of the scapula through surgically created thoracic-wall defects including ours. These reports suggest substantial prognostic implications for patients with thoracic wall defects; both of these case reports have demonstrated the propensity for recurrent intrathoracic dislocation without notable trauma in contrast to the intrathoracic scapular dislocation that results from high-energy mechanisms with no documented recurrent events.

Successful reduction maneuvers for intrathoracic scapular dislocations have been very similar.^{4-7,10} Reduction begins with hyperabduction of the involved shoulder, followed by

manipulation of the inferior angle of the scapula in a superior, medial-lateral and dorsal direction to achieve an extrathoracic position of the scapula. Despite a typically stable scapula following reduction, Rockwood and colleagues¹⁰ recommend securing the scapula to the chest wall with adhesive tape or a sling and swathe for comfort and soft-tissue healing for a period of no greater than 3 weeks. After 3 weeks of immobilization, unprotected, and progressive functional use of the involved upper extremity is encouraged.

Successful closed reduction of traumatic dislocations varies based on the time frame of presentation.

In the absence of chest-wall defects, the rare traumatic intrathoracic and extrathoracic scapular dislocations, once reduced and given time for soft-tissue and bony healing, have been documented to result in good return of function with no reports of recurrent dislocation.^{4-6,8,9}

Based on our reported case and literature review, we have been able to document recurrence of intrathoracic scapular dislocation only in association with persistent chest-wall defects following rib resection. Current recommendations for immobilization of the involved upper extremity appear to be ineffective in this specific patient population.

Conclusion

Scapular dislocations often have similar mechanisms of injury despite the different etiologies. Extrathoracic dislocations of the scapula often can be reduced with adequate muscle relaxation alone. Traumatic intrathoracic dislocations without pre-existing thoracic-wall defects usually require closed manipulative reduction and, depending on the chronicity of presentation, may require open reduction. Usually, reduction can be accomplished by hyperabduction of the arm with traction, while manipulating the scapula in a superior, medial-lateral and dorsal direction. Following reduction of a traumatic intrathoracic scapular dislocation, unassociated with thoracic wall defects, the shoulder should be protected with adhesive taping or sling and swathe immobilization for a period of 3 weeks, followed by progressive functional activity. A good functional result with no permanent neurological deficits can be expected. Based on our experience and literature review, it is not clear that post-reduction immobilization of intrathoracic dislocations associated with thoracic-wall defects is beneficial. These patients should be advised of a high likelihood of recurrent dislocations.

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Dr. Fowler is Orthopedic Trauma Director and Dr. Fankhauser is Orthopedic Surgeon, Residency Program Director, Mount Carmel Medical Center, Columbus, Ohio. Dr. Taylor is Orthopedic Surgeon, Grant Medical Center, Columbus, Ohio.

Address correspondence to: Ty Fowler, MD, 793 W State St, RM 3S43, Columbus, OH 43222, (tel, 248-767-8394; fax, 614-234-2772; e-mail, ty.fowler@me.com).

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This paper will be judged for the Resident Writer's Award.
