

# Scapulothoracic Dissociation

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## Abstract

Scapulothoracic Dissociation (STD) is a rare injury that can be recognized on Chest X-Ray (CXR). It has potentially devastating associated findings including complete brachial plexus avulsion and subclavian artery disruption. This paper presents a Scapulothoracic dissociation without significant associated neurovascular or orthopedic injury.

## Introduction

The scapula is a somewhat mobile structure which, although fixed to the thoracic cage both by muscular and skeletal attachments, can change position with regards to the underlying chest wall [1]. The Scapulothoracic position is maintained by both muscles (serratus, rhomboids etc) and the clavicle which itself attaches laterally to the scapula (acromioclavicular joint) and medially to the chest wall (sternoclavicular joint). Most injuries to the shoulder such as clavicle fractures or clavicular joint separations will not in and of themselves result in STD. True dissociation occurs when severe lateral displacement of the scapula disrupts both the muscular and skeletal connections between the scapula and the chest wall without tearing the overlying skin. However the more severe traumatic forces that cause separation between the scapula and the chest wall often yield associated injuries which disrupt the clavicle strut and the Scapulothoracic articulation causing the scapula to move laterally. Severe lateral traction can also cause brachial plexus injuries and vascular injuries. The most devastating injury is complete disruption of the brachial plexus which can result in a flail arm. If there is a complete brachial plexus avulsion, some authors recommend above elbow amputation of the limb [2,3].

## Case Report

A 42 year old male with a history of previously repaired Scapulothoracic dissociation presented to an Emergency Department after falling off an all-terrain vehicle on to his left shoulder. He complained of severe shoulder pain and a CXR at an outside hospital showed a scapular dislocation.

The patient was transferred to the Emergency Department of a University hospital where he continued to complain of pain in the shoulder. On exam, he had an obvious deformity in the neck (Figure 1), numbness in the fourth and fifth fingers of the left hand and weakness of grip strength. There was normal range of motion at the elbow and his radial and ulnar pulses were intact. Chest X-ray demonstrated dislocation of ipsilateral scapula (Figure 2). Computed Tomography (CT) scan of the shoulder revealed the glenohumeral joint to be intact.

Utilizing conscious sedation with parenteral fentanyl and midazolam, relocation was achieved by rotating the scapula medially. The patient reported improvement in his symptoms following relocation.

## Discussion

Scapulothoracic dissociation was originally described by Oreck [4] in a series of patients with severe injury and lateral displacement of the scapula visualized on CXR. The subsequent literature consists of small patient series and case reports. Scapulothoracic dissociation is classified as 1) musculoskeletal, 2) musculoskeletal with either vascular or neurologic compromise or 3) musculoskeletal injury with both vascular and neurologic compromise [5].

On clinical exam there is often significant muscular swelling as well as severe pain in an otherwise anesthetic extremity indicating nerve root avulsion. The actual site of avulsion may be either preganglionic or postganglionic. Postganglionic injuries will correspond to a specific neurologic compromise depending on the site(s) of injury within the brachial plexus. Preganglionic avulsion can lead to additional neurologic signs and symptoms such as a Horner's syndrome (suggesting preganglionic T1 avulsion) or paralysis of the serratus anterior, rhomboids, supraspinatus and/or diaphragm.

The radiologic findings of ST dissociation have been detailed by Kelbel [6]. He measured the distance from the medial border of the



Figure 1: Observation of deformity in the neck region.



Figure 2: Chest X-ray demonstrated dislocation of ipsilateral scapula.

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scapula to the thoracic spinous process on each side of the thorax. The ratio of this distances between the injured and non-injured sides was dubbed the “scapula-index”, and a ratio of 1.29 or greater correlated with Scapulothoracic dissociation. Other imaging modalities may also be useful. A CT scan may show a paraspinous hematoma or separation of the scapula away from the chest wall. A CT myelogram may show pseudomeningoceles which are diagnostic for nerve root avulsion. Other diagnostic tests such as EMG of the limb and posterior neck muscles may demonstrate denervation three weeks after injury due to Wallerian degeneration.

Management of Scapulothoracic dissociation depends on many factors. The injury is often the result of a high-speed collision and thus there is a significant risk of associated neurologic, intrathoracic and intraabdominal injuries which may require operative intervention.

With regard to the local injury, STD may result in localized hemorrhage within the chest wall and cause hypotension requiring surgery. Angiography performed to investigate poor or absent pulses may demonstrate arterial occlusion and/or disruption. In the pulseless limb, urgent vascular repair is indicated. However examination of the arms in STD patients does not always demonstrate frank ischemia because of the extensive collateral network around the shoulder [7,8] and therefore if STD is diagnosed angiography should be undertaken to assess the vascular anatomy. Injuries to the brachial plexus require also exploration [9] and surgical intervention may include microsurgical repair or nerve grafts, or tendon transfers. Finally, muscular and/or tendinous disruption may require direct repair. The overall goals of surgery are to restore vascular flow, repair neurologic injury and re-establish shoulder stabilization in order that ipsilateral arm function be maintained. Any concomitant skeletal injuries are then stabilized to protect the vascular and neurologic repairs.

Scapulothoracic dissociation is a relatively rare condition however it has been reported increasingly for two reasons. Increasing use of all-terrain vehicles and motorcycles have contributed to the increase in Scapulothoracic dissociations [10]. It is postulated that the mechanism involves attempting to hold on to the handlebars while being forcibly thrown [11,12]. In one series 60% of the patients with Scapulothoracic dissociation were motorcycle riders [13].

The other factor contributing to the increase in cases are the improvements in trauma care which allow more patients to survive devastating injuries.

In the case presented here, the scapula was relocated with improvement in the neurologic symptoms. This is probably because the previous injury had resulted in a dislocation with subsequent healing of the clavicle strut. The current injury caused neuropraxia of the brachial plexus without avulsion or vascular injury.

The numbness of the hand and weak grip strength in this patient suggests injury to the ulnar nerve within the brachial plexus [14].

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