

Diagnosis and Treatment of Posterior Sternoclavicular Dislocations in Athletes

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Abstract

Posterior dislocations of the sternoclavicular joint are uncommon but one of the few potentially life threatening shoulder injuries which can occur at a sporting event. We report a case of a football player that sustained a posterior sternoclavicular joint (PSCJ) dislocation during a game, and review the diagnosis and treatment for such injuries. Often, initial plain radiographs can appear normal, requiring a high index of suspicion for identification. Computed tomography (CT) of the SC joint can assist in identification and treatment planning, identifying PSCJ dislocation, and in directing treatment options. Closed reduction is favored. The first line of treatment, if possible should be a closed reduction, over open reduction with internal fixation. Typically, patients are kept in a position of shoulder retraction and shoulder protection for 4 - 6 weeks, with gradual initiation of physician directed physical therapy at 12 weeks. The purpose of this case report is to help practitioners recognize and diagnose this emergent injury with potentially severe and life threatening consequences.

Keywords: Sternoclavicular Dislocations; Sternoclavicular Joint; Chest Injuries; Athletes; Chest Pain

Case Report

Our patient is a 22-year-old male, division one collegiate American football running back, who was tackled and landed forcefully on his lateral left shoulder. He experienced immediate pain and limited range of motion and was immediately evaluated by the medical staff on the sideline. He complained of shoulder pain, as well as anterior superior chest discomfort, and on initial sideline evaluation there was mild swelling and tenderness to palpation at the mid-clavicle as well the proximal (or medial) clavicle. The exam also demonstrated limited shoulder range of motion and strength due to pain, no clear glenohumeral instability, and normal neurovascular exam. At that time field x-rays were available and an x-ray of the clavicle and shoulder appeared negative for fracture of the clavicle.

During the evaluation, approximately 10 – 15 minutes after the initial injury, the athlete developed mild shortness of breath and light-headedness. Based on the mechanism of injury and the differential diagnosis, including posterior sternoclavicular joint dislocation and pneumothorax, the athlete was immediately transported to the emergency department for further evaluation.

AP radiographs of the shoulder and clavicle (Figure 1) were completed in the emergency room and was read as negative for fracture or dislocation of the shoulder and clavicle. PA/Lateral of the chest ruled out pneumothorax. The athletes’ vital signs remained normal, however his symptoms persisted. An urgent computed tomography (CT) scan was ordered and showed posterior SC joint dislocation (Figure 2).

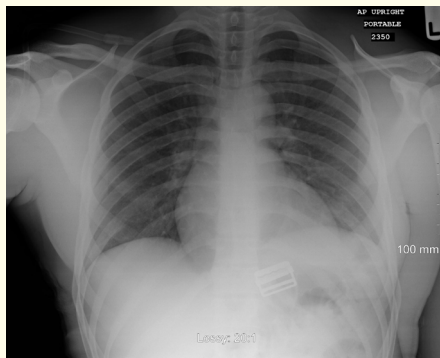


Figure 1: Plain film of SC joint in ED.

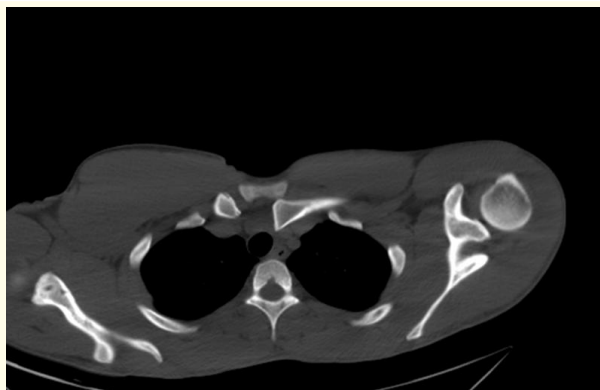


Figure 2: CT scan SC joint revealing left posterior sternoclavicular joint dislocation.

The athlete was admitted to the hospital for planned closed vs. open reduction with both orthopaedic surgery and vascular surgery present. Under general anesthesia, the athlete was placed supine with the dislocated shoulder near the edge of the table. A three-inch thick sandbag was placed between the shoulders. Lateral traction was applied to the left arm. The medial clavicle was firmly grasped and reduced from its posteriorly displaced position. Postoperative CT revealed anatomic reduction of the SC joint (Figure 3). The athlete was placed in a sling for three weeks in an attempt to maintain scapular retraction and support persistent anatomic reduction of the SC joint. Gentle range of motion physical therapy was delayed for 8 weeks, followed by gradual progressive physical therapy. The athlete was able to return to weight lifting at 10 weeks, sports specific drills at 12 weeks, and full return to play at 14 weeks.

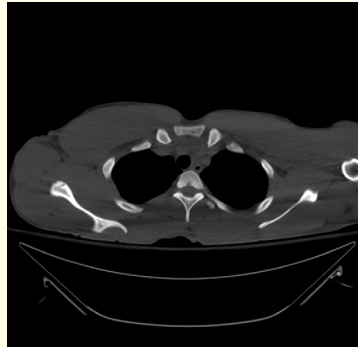


Figure 3: CT Scan of the SC joint post-reduction, reflecting a successful reduction and anatomic alignment.



Figure 4: Serendipity view of a right-sided sternoclavicular joint dislocation in a different patient. Note the posteriorly dislocated right medial clavicle appearing inferior to the normal side and also appearing smaller than the contralateral non-dislocated medial clavicle. An anterior dislocation would appear superior to the contralateral side and the medial clavicle would appear larger.



Figure 5: 3D CT reconstruction of the patient's left PSCJ dislocation.

Discussion

Sternoclavicular joint (SCJ) dislocations are highly uncommon, found to be less than 1% of all dislocations. Posterior sternoclavicular joint (PSCJ) dislocations are less frequent than anterior dislocations, with an incidence rate of less than 5% [8]. In children and young

adults, a displaced physal fracture of the medial clavicular epiphysis (a pseudodislocation) may be more common than a true SCJ dislocation give the late fusion of the epiphyseal plate at 23-25 yrs of age in most [15]. True SCJ dislocation was first reported by Sir Astley Cooper in 1824 [13]. In 2006, Carmichael et al calculated 130 cases of this unique injury reported in the literature [2]. Since then, about 26 more cases have been reported [8]. The majority of cases reported in the literature, including the one described here, can be attributed to contact sport injuries [10]. Often, an anterior force is directed at the posterolateral shoulder, forcing the lateral clavicle anterior, and levering the medial clavicle posteriorly [14]. Other cases have been attributed to motor vehicle accidents, minor trauma such as falls, and other injuries of direct force to the anteromedial clavicle in an anterior-to-posterior mechanism or indirect posteromedial force to the lateral shoulder.

The association of severe mediastinal injury with PSCJ dislocation is perhaps the most concerning aspect of managing these injuries; with a 30% incidence of injury to vital structures in the thorax, associated with a 12.5% mortality rate [7]. Due to their proximity to the SCJ, injury to the neurovascular structures, the trachea, and the esophagus are potential concerns in any patient with PSCJ injury. Although rare, immediate diagnosis and treatment is essential for the successful care of patients with PSCJ dislocation.

The improved development and use of safety equipment has decreased the number of injuries over time, however football remains a high-energy impact sport that leads to multiple injuries. Commonly, a low index of suspicion exists for PSCJ dislocations because they are rare. Concomitantly, difficulty of diagnosis with standard radiography can lead to missed or untimely diagnosis with serious implications. Practitioners should keep PSCJ dislocations on their differential diagnosis and pursue the diagnosis vigorously with history, physical exam, plain radiography and often with CT imaging.

Anatomy and Pathophysiology

Deep to the sternoclavicular joint is the superior mediastinum where the aorta, jugular vein, and superior vena cava are located. The trachea, esophagus, and the recurrent laryngeal nerve are also in close proximity [4]. Injuries to these vital structures have been reported in PSCJ dislocations. A variety of delayed vascular complications have occurred, including embolic cerebral infarction and proximal upper extremity venous thrombosis originating from brachiocephalic artery injuries [3,9].

Presentation

History usually includes but is not limited to high impact trauma. Physical exam is typically significant for localized swelling and tenderness in the region of the SCJ, which may range from mild to severe [5]. Additionally, increased pain with shoulder motion, a palpable sulcus over the sternoclavicular joint, and a variety of symptoms resulting from compression of the anatomical structures posterior to the SC joint may be present [5,6,10]. Careful attention to vital signs is warranted; particularly evaluating the injured athlete for hypoxia, tachypnea, hypotension and tachycardia as manifestations of trauma to the great vessels or upper airway. A complete physical exam may also reveal dyspnea, dysphagia, paresthesias, vascular compromise, evidence of venous thrombosis, or CNS dysfunction as a result of great vessel compromise [3,5,6].

Radiological Evaluation

Standard posteroanterior, lateral, and oblique views of the SCJ are difficult to interpret in the setting of acute SC joint dislocations. One of the most informative additional views, the serendipity view, is a plain radiograph done with a 40-degree cephalic-tilt to visualize both medial clavicles [11]. This view will show the posteriorly dislocated clavicle inferior to the normal side, whereas an anterior dislocation would appear superior. In this view, the dislocated medial clavicle also appears larger (anterior dislocation) or smaller (posterior dislocation) than the contralateral non-displaced medial clavicle [5].

CT scan has largely supplanted the plain radiograph as the preferred diagnostic modality for SC joint dislocations [5,6]. CT scan can provide more accurate evaluation of the joint and surrounding structures. Also, in cases of suspected vascular injury or mediastinal compression, angiography can be combined with CT scan to provide additional clarity of the exact location of the displaced clavicle [5].

Magnetic resonance imaging (MRI) scanning has also been described as a more accurate modality compared to plain radiographs, however availability, time and cost limit its use [5,6]. A recent study has suggested the use of ultrasound in the intraoperative setting to diagnose SC dislocation: 89% of the group interpreted the ultrasound image of a dislocated SC joint correctly, compared to only 13% being able to identify it correctly via x-ray [12].

Treatment

Treatment of posterior dislocation of the SC joint is based on the concept of returning the structures in question to their normal anatomic relationships. This can be accomplished by either the closed or the open approach. The universally preferred method is a closed reduction because compared to the anterior dislocations the posterior dislocation tends to be more stable after closed reduction.

Typically, both open and closed approaches should be attempted in the operating room with the use of either intravenous sedation or general anesthesia. Immediate treatment is indicated for a decompensating athlete with a high suspicion of PSCJ dislocation. Onsite reduction can be attempted by placing the athlete supine with a rolled-up towel or helmet between scapulae. First longitudinal traction and then extension force is applied to the abducted ipsilateral arm away from midline in attempt to rotate the clavicle anteriorly. The dislocated clavicle is then grasped at the medial end with the fingers and anterior force applied to reduce it. If the practitioner cannot maintain a grasp on the clavicle a sterile towel clip may be used in the same fashion. Immediate transfer to higher level of care for further radiological evaluation and definitive treatment is essential to assess structures below the SC joint. This is the same technique used in the operating room for the closed approach albeit with sedation/general anesthesia [1].

Closed reduction appears to be most successful when attempted within 48 hours of initial injury. In one meta-analysis, closed reduction performed within the first 48 hours was successful in 55.8% (43/77), while closed reduction > 48 hours after injury was successful only 30.8% (4/13) [14]. When closed, reduction is unsuccessful or unstable, open reduction with possible surgical repair of ligamentous structures is indicated. This should be performed with the assistance of a cardiothoracic surgeon due to the afore mentioned structures in close proximity.

A wide variety of techniques have been evaluated in the open treatment of PSCJ dislocations. The bulk of the surgical interventions fall into one of three major categories: 1) Suturing of the sternoclavicular ligaments and costoclavicular ligaments 2) Reconstruction of the anterior sternoclavicular ligament 3) Reconstruction of the costoclavicular ligament [15]. Additional techniques have employed cannulated screw fixation, anterior plating, suture anchor fixation, resection of the medial head of the clavicle, and K wire fixation among others [14]. Medial clavicular head resection has been largely abandoned due to less than positive outcomes, and K wire fixation has been found to lead to unacceptably high risk of intramediastinal migration of wires and soft tissue injury [14,15]. In the acute setting, suturing of the sternoclavicular and costoclavicular ligaments appears to be the dominant modality for stabilization of the SCJ when open reduction is required. At median follow-up of 26 months, full pain-free range of motion without recurrence was reported in 92% of patients following closed reduction of SCJ dislocations; and in 96% of patients who underwent open reduction and internal fixation [14].

Conclusion

The posterior dislocation of the SC joint, given its critical location in the midline lower neck/upper chest, presents significant opportunity for vascular, airway, esophageal, and neurologic injury. Thoracic outlet syndrome, vascular compromise, brachial plexus injury, and fatal tracheoesophageal fistula as well as persistent instability in the joint with subsequent musculoskeletal impairment have all been documented. Careful attention to the initial diagnosis, airway management, neurovascular findings, and emergent treatment including collaboration with various surgical subspecialties is critical in successfully avoiding long-term morbidity and mortality. It is important to keep a broad differential diagnosis in regards to injuries when it comes to contact sports. The diagnosis of sternoclavicular joint dislocation requires a high index of suspicion, in the setting of mechanism of injury i.e., direct or indirect forceful contact. Majority of the documented cases of injury to structures in close proximity to SC joint were detected late after initial trauma and medical personnel evaluation. A high index of suspicion is essential in PSCJ dislocation injury. Though rare, diagnostic difficulties and improper management of this injury can lead to poor outcome and life threatening sequelae.

Conflicts of interest

The authors report no conflicts of interest.

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