Approach to the Multitrauma Patient With Sternoclavicular Joint Dislocation

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A 28-year-old woman presented for evaluation of bilateral clavicular and right forearm pain following a motor vehicle collision.

Case

A 28-year-old woman was brought to the ED by emergency medical services for evaluation of injuries sustained from a high-speed, rollover motor vehicle collision (MVC), during which she was partially ejected from the passenger front seat. The patient did not experience any loss of consciousness following the MVC. At presentation, she was oriented to place and time, and actively complained of bilateral clavicular pain (which she noted was worse on her right side) as well as right forearm pain.

The patient's vital signs upon arrival were: heart rate, 94 beats/min; respiratory rate, 24 breaths/min; blood pressure, 107/84 mm Hg; and temperature, 98°F. Oxygen saturation was 98% on room air. Examination revealed a contusion over the right breast, normal lung and heart sounds, and equal pulses bilaterally. The patient had an open deformity of the right forearm; otherwise, her motor and sensory faculties were intact.

The focused assessment with sonography for trauma examination was negative. In addition to the bilateral clavicular and right forearm pain, the patient also had tenderness bilaterally over the sternoclavicular joints (SCJ) and the right midclavicle, though there were no obvious deformities. Laboratory studies were within normal limits, with the exception of an elevated white blood cell count of 21 x 10^9/L.

Initial plain radiographs showed a normal chest X-ray (CXR) and right forearm fracture. A computed tomography (CT) scan further demonstrated multiple fractured ribs, a superior dislocation of the right clavicular head with respect to the sternum (**Figure**), and a nondisplaced fracture of the right clavicle.

Orthopedic services were contacted and, with cardiothoracic surgery services readily available, the patient underwent an open reduction and internal fixation of the unstable SCJ. After surgical intervention, the patient experienced motor and sensory

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dysfunction, and a magnetic resonance imaging (MRI) study of the upper right extremity was ordered, which revealed brachial plexus injury secondary to hematoma and soft-tissue contusion in the right supraclavicular region. The patient remained in the hospital until postoperative day 3, at which time she was discharged home.

Three weeks after discharge, the patient followed up with the orthopedist for further surgical intervention of the comminuted distal forearm fracture. At that time, she had no further neurological or motor deficits from the upper extremity hematoma. However, 4 months after the MVC, she presented to the ED for evaluation of continued right shoulder pain. During this visit, X-ray studies confirmed posttraumatic arthritis; otherwise, the workup was negative for any further sequela or injury.

Discussion

Sternoclavicular joint dislocation is a rare traumatic injury, accounting for less than 3% of shoulder girdle injuries.[1-4] Dislocations of the SCJ, which may be anterior or posterior, superior or inferior, are typically due to an MVC or athletic injury involving great force.[5]

Although an injury involving mediastinal compression such as a posterior SCJ dislocation can be fatal if not treated early, these dislocations are typically not detected in a multitrauma patient until the secondary survey.[6] A missed diagnosis of posterior SCJ dislocation carries a mortality rate of 3% to 4% due to the potential for retrosternal injuries.[4,6] Unfortunately, SCJ dislocations can be an easily overlooked injury in the multitrauma patient, as plain radiographs are difficult to interpret and physical examination findings other than tenderness may not always be present.[5-7]

Anatomy

The SCJ is comprised of the manubrium's clavicular notch, the medial end of the clavicle, and the cartilage of the first rib.[3] The capsular ligaments cover the anterior and posterior parts of the joint and offer stability along with the costoclavicular and interclavicular ligaments. Since the surrounding ligaments provide strong support to the joint, an incredible amount of force is needed for a dislocation to occur.

The clavicle is the first long bone in the body to ossify, and it does so in utero; however, the epiphysis of the medial clavicle is the last to ossify, and it does not fuse with the body of the clavicle until the early-to-mid-third decade of life. Since younger patients are therefore more prone to physeal fracture than joint dislocation, it is imperative to keep this as part of the differential in patients younger than age 25 years.[1,3,8-10]

Primary Survey

The emergency physician (EP) should approach the multitrauma patient in the usual fashion, ie, by first performing the primary survey. However, there may be some signs present in this early examination to indicate a posterior SCJ dislocation, including painful range of motion at the joint, inability to move the shoulder joint, hoarseness, dyspnea, dysphagia, neuro-

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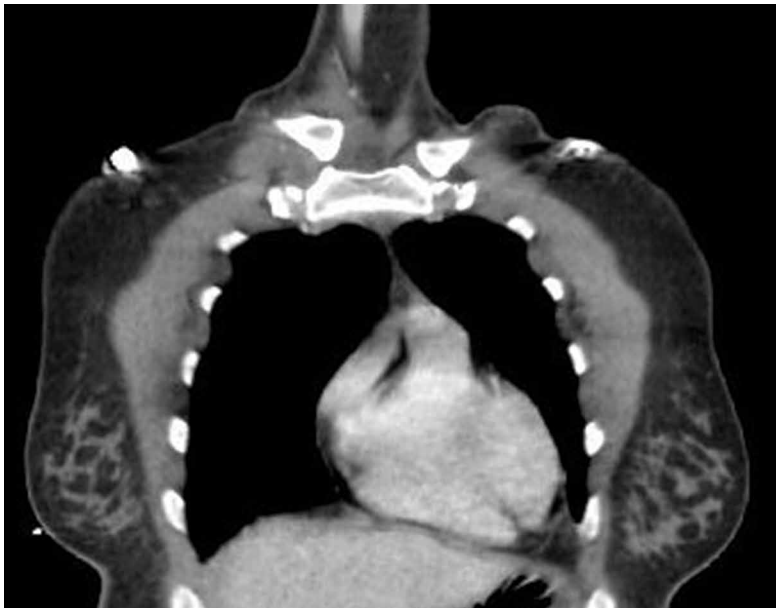

Figure. Coronal computed tomography image demonstrating the right superior sternoclavicular joint dislocation.

vascular compromise of the arm, or frank hemodynamic instability.[6-8] After the first survey is completed, if the EP has a high level of suspicion for SCJ dislocation, it is essential to perform a thorough secondary survey to confirm the diagnosis.

Secondary Survey

Anterior SCJ dislocations might be easier to detect clinically during the secondary survey, as the patient might have a deformity of the clavicle and swelling.[8] However, posterior and superior SCJ dislocations might be more subtle during examination, and may only exhibit tenderness and limited range of motion.

Imaging Studies

Computed Tomography. Since overlying structures often make it difficult to interpret simple radiographs, advanced imaging studies such as CT are often needed for diagnosis. A CT angiogram (CTA) may be considered if there is concern for vascular injury and compromise of the limb, as this modality is more accurate in evaluating vasculature such as the subclavian artery.[4,10]

Special Radiographic Views. If advanced imaging is not immediately available or if the patient is not in a suitable condition to leave the ED, an alternative is to obtain a serendipity view X-ray. Described in 2009 by Wirth and Rockwood,[11] the serendipity view is obtained with the patient in the supine position and the X-ray beam tilted to a 40-degree cephalic angle centered through the manubrium. This view permits comparison of both clavicles without overlying structures. The usefulness of serendipity view X-ray, however, is limited, as it does not allow for differentiation of sprains.

Other plain radiographic views, such as the Hobbs, Heinig, and Kattan views, have also been described to evaluate for SCJ dislocation, but these views are often not feasible or easily obtained in an emergency setting with an acutely injured patient.[6,9,12]

Magnetic Resonance Imaging. Though CT is typically the advanced initial imaging modality of choice for assessing the presence of an SCJ dislocation, additional studies using MRI are indicated for patients in whom there is a concern of physeal injury.[1]

Ultrasound. Point-of-care ultrasound has become an important tool in the EP's armamentarium, and can easily be employed to diagnose a posterior SCJ dislocation, as well as confirm the reduction. The method described by Bengtzen and Petering[13] involves placing a linear array probe in the long axis to the clavicle and scanning until the clavicle and sternum are identified by finding the hyperechoic areas. The hypoechoic area in between the clavicle and sternum is the SCJ space. An ultrasound of the unaffected side can be useful for comparison purposes.[6,13]

Management

Posterior SCJ dislocations are considered a true emergency because of the potential structures associated with this type of injury. Concomitant injuries requiring immediate intervention include mediastinal compression, pneumothorax, laceration of the superior vena cava, tracheal erosion,

esophageal injury, and brachial plexus compression and injury. Moreover, an unstable patient with an SCJ dislocation may have a lacerated thoracic vessel and need immediate thoracotomy.[6]

Anterior Reduction. Prior to any attempts at reduction, it is imperative to consult with orthopedic and cardiothoracic surgery services. However, if the patient's dislocation is causing limb or life compromise, then the EP should attempt closed reduction in the ED.[1,3] One reduction technique is to place the patient in the supine position with a towel rolled up between his or her shoulders. The EP then extends and abducts the affected arm using a traction-countertraction approach.

Another technique is to have an assistant either pushing posteriorly or pulling anteriorly on the medial clavicle, while the EP performs lateral traction. An audible "snap" sound might be heard with successful reduction. If the assistant is unable to grasp the medial clavicle, then a towel clip should be used percutaneously to grasp it. If the joint remains reduced, the limb is immobilized with a figure-of-8 bandage[1,8]

Further treatment options for complete SCJ dislocation include operative and nonoperative management.

Posterior Reduction. While anterior dislocations are often managed conservatively with closed reduction and nonoperative treatment, posterior dislocations can often be reduced using either an open or closed approach.[1-3,8,9,14] If a posterior SCJ dislocation is reduced using a closed approach, it is more likely to be stable after reduction when compared to anterior SCJ dislocation reduction.

An attempt of closed reduction of posterior SCJ dislocation is often recommended before open approach is attempted, if it occurred within 48 hours and there are no signs of mediastinal compression.[9] Some authors however, prefer immediate surgical approach and treatment of all complete dislocations due to better visualization of other structures such as the meniscus and potentially damaged fibrocartilage, which if untreated can result in decreased mobility and pain.[14,15]

Conclusion

Although rare, posterior SCJ dislocations can be fatal when they are not diagnosed early. The EP must keep the possibility of an SCJ dislocation in mind based on the mechanism of injury—usually direct force to the joint such as occurs in an MVC or a lateral compression of the shoulder. There are clues during the primary survey that might point in the direction of an SCJ dislocation.

Prior to any attempts at reduction, it is imperative to consult with orthopedic and cardiothoracic surgery services.

If the patient is hemodynamically unstable, immediate reduction is warranted and the possibility of a thoracotomy must be considered. Thirty percent of all posterior SCJ dislocations will have concomitant life-threatening injuries involving structures such as the esophagus, great vessels, and trachea.

Since sternoclavicular dislocation is often difficult to detect on CXR, the gold standard for diagnosis is CT or MRI. While the serendipity view X-ray can facilitate the evaluation of the SCJ, its value is limited. Other available plain radiographs are the Hobbs, Heinig, and Kattan views, but bedside ultrasound is often more useful and allows for faster evaluation and without ionizing radiation. Orthopedic services should be immediately consulted, and cardiothoracic surgery should readily available.

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