Posterior Sternooclavicular Joint Injuries in Skeletally Immature Patients

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abstract

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The management of sternoclavicular injuries in skeletally immature patients has not been well described. The purpose of this study was to describe the authors’ experience treating this rare and potentially life-threatening injury. All skeletally immature patients who underwent treatment for a medial clavicular physeal fracture or sternoclavicular dislocation between 2003 and 2011 were identified using ICD-9 diagnostic codes. Sternooclavicular injuries with posterior displacement were isolated from this cohort for a thorough chart review. Patients were contacted to complete brief phone surveys and shoulder-specific outcome instruments. A total of 12 boys (mean age, 14.8±2.74 years), followed for an average of 10.3 months (range, 0-54 months), were identified. The incidence of significant associated symptoms was 8.3% (1 of 12). Eight patients were initially treated with closed reduction, 2 (25%) successfully and 6 (75%) requiring subsequent open reduction. Four of the 12 patients underwent an immediate open reduction. Braided composite sutures were used to treat all injuries that underwent open reduction (10 of 12). Complete data were obtained from 6 patients, all of whose injuries had been treated with open reduction. All 6 had returned to their full activity level, and all self-reported perfect Quick Disabilities of the Arm, Shoulder and Hand (QuickDASH) and Simple Shoulder Test scores (0 and 12, respectively). Among skeletally immature patients, medial clavicular physeal fractures and sternoclavicular dislocations can be effectively managed with closed or open reduction. When closed reduction is unsuccessful or is contraindicated, open reduction with braided composite sutures is associated with excellent results.

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Sternoclavicular dislocation is a rare injury in all age groups, accounting for less than 5% of all shoulder girdle injuries. Although the sternoclavicular joint is a saddle-type joint with little surface area of articulation, the joint’s ligamentous components make it inherently stable. Studies have shown that the posterior capsule is the joint’s strongest ligamentous stabilizer. This explains why posterior sternoclavicular dislocations are thought to be particularly rare, reportedly accounting for 5% to 27% of dislocations at this joint.

When discussing sternoclavicular joint dislocations in adolescents and children, it is important to understand the unique anatomy of the skeletally immature patient. The medial clavicular physis is the last in the body to begin ossification and to fuse, at approximately 18 to 20 years of age and 22 to 25 years of age, respectively. Therefore, sternoclavicular injury in the skeletally immature patient may consist of true dislocation at the joint or of medial clavicular physeal fracture with displacement, the latter of which has been termed pseudodislocation. These injuries can occur with significant force applied to the medial clavicle or secondary to an indirect force to the posterior shoulder, as frequently encountered in athletics. Contact sports such as football or wrestling, during which athletes are prone to falls or tackles onto the shoulder, are most often cited as venues for this injury, particularly in the skeletally immature population. Mediastinal structures that are at risk in posterior sternoclavicular joint dislocation include major neurovascular structures, as well as the trachea and esophagus. The right sternoclavicular joint is directly anterior to the innominate artery (brachiocephalic trunk), and the left sternoclavicular joint is directly anterior to the left common carotid artery, as well as the left subclavian artery and vein. Serious complications, including hemorrhage and death, have been reported to occur in up to 25% of posterior sternoclavicular joint dislocations.

The purpose of the current case series was to review the authors’ experience treating posterior sternoclavicular dislocations and/or medial clavicular physeal fractures within the skeletally immature patient population. Of those patients with isolated traumatic sternoclavicular injury with posterior displacement, the authors sought to retrospectively analyze patient demographics, incidence of injury complications, and treatment modalities used. Specifically, they were interested in the frequency of closed vs open reduction, as well as the timing, methods, and outcomes of both techniques. Finally, due to the unique anatomy at the sternoclavicular joint in this skeletally immature patient population, the authors sought to compare the initial diagnosis and the intraoperative diagnosis, if applicable, as well as the imaging modalities used for each patient.

**Materials and Methods**

After institutional review board approval was obtained, a query of ICD-9 diagnostic codes was used to identify all skeletally immature patients who underwent treatment for a medial clavicular physeal fracture or sternoclavicular dislocation at the authors’ institution between 2003 and 2011. The initial query identified 16 patients with an isolated, traumatic sternoclavicular dislocation and/or epiphyseal separation, including 12 patients whose injury resulted in posterior displacement and 4 in anterior displacement.

Data were retrospectively collected from all patients affected by a posterior dislocation or posterior epiphyseal separation. The following variables were obtained: sex, age at initial injury, mechanism of injury, concomitant injuries, initial imaging modality, initial diagnosis,
length of time between injury and intervention, intervention type, intraoperative diagnosis, postoperative complications, and duration of follow-up.

All eligible patients were mailed a packet that included information about the study, an option to opt out of the study, and the following shoulder-specific outcome instruments: (1) the Quick Disabilities of the Arm, Shoulder and Hand (QuickDASH)\(^1\), and (2) the Simple Shoulder Test (SST).\(^1\) The QuickDASH is a self-reported instrument of 11 questions related to shoulder function, with answers scored on a scale of 1 to 5. Higher scores are indicative of greater shoulder disability. The SST is also a self-reported questionnaire consisting of 12 yes/no questions. Lower scores are indicative of greater shoulder disability.

Attempts were made by a single investigator (M.T.) to contact all 12 patients by telephone because none refused participation. Following verbal consent, the patients were asked to answer the following questions: (1) Have you returned to your preinjury activity level? (2) Have you reinjured your clavicle, and, if yes, did you seek medical treatment for the injury? (3) Have you undergone any additional surgeries since your last visit?

### RESULTS

A total of 12 boys (mean age, 14.8±2.74 years) were included in the study. The injury was most commonly associated with participation in athletics (91.67%; 11 of 12). Table 1 presents the demographics, injury complications, initial imaging modalities, and diagnoses of all patients in the cohort.

### Table 1

<table>
<thead>
<tr>
<th>Patient No./Sex/ Age, y</th>
<th>Injury Side</th>
<th>MOI</th>
<th>Injury-related Comp</th>
<th>Initial Diagnosis</th>
<th>Time to Intervention, d</th>
<th>Closed Reduction</th>
<th>Operative Fixation</th>
<th>Intraop Diagnosis</th>
<th>Treatment-related Comp</th>
<th>Follow-up, wk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/M/14.8 R Football</td>
<td>None</td>
<td>1</td>
<td>Posterior dislocation</td>
<td>1</td>
<td>Not attempted</td>
<td>FiberWire(^b)</td>
<td>Physeal fracture</td>
<td>None</td>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td>2/M/17.3 L Wrestling</td>
<td>Innominate vein compression</td>
<td>1</td>
<td>Posterior dislocation</td>
<td>1</td>
<td>Not attempted</td>
<td>FiberWire(^b)</td>
<td>Physeal fracture</td>
<td>None</td>
<td>27.4</td>
<td></td>
</tr>
<tr>
<td>3/M/17.2 L Football</td>
<td>None</td>
<td>10</td>
<td>Physeal fracture</td>
<td>10</td>
<td>Not attempted</td>
<td>FiberWire(^b)</td>
<td>Physeal fracture</td>
<td>None</td>
<td>9.0</td>
<td></td>
</tr>
<tr>
<td>4/M/7.2 L Football</td>
<td>Tracheal deflection</td>
<td>5</td>
<td>Posterior dislocation</td>
<td>5</td>
<td>Not attempted</td>
<td>FiberWire(^b)</td>
<td>Physeal fracture</td>
<td>None</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>5/M/14.3 R Wrestling</td>
<td>Jugular vein and superior vena cava compression</td>
<td>7</td>
<td>Posterior dislocation</td>
<td>7</td>
<td>Unsuccessful</td>
<td>FiberWire(^b)</td>
<td>Physeal fracture</td>
<td>None</td>
<td>36.7</td>
<td></td>
</tr>
<tr>
<td>6/M/13.8 L Football</td>
<td>Vein compression</td>
<td>1</td>
<td>Physeal fracture</td>
<td>1</td>
<td>Unsuccessful</td>
<td>FiberWire(^b)</td>
<td>Physeal fracture</td>
<td>None</td>
<td>45.0</td>
<td></td>
</tr>
<tr>
<td>7/M/16.6 L Football</td>
<td>Jugular vein intramural thrombus</td>
<td>1</td>
<td>Posterior dislocation</td>
<td>1</td>
<td>Unsuccessful</td>
<td>FiberWire(^b)</td>
<td>Posterior dislocation</td>
<td>Surgical-site pain at 124 wk</td>
<td>147.7</td>
<td></td>
</tr>
<tr>
<td>8/M/16.6 L Wrestling</td>
<td>None</td>
<td>4</td>
<td>Physeal fracture</td>
<td>4</td>
<td>Unsuccessful</td>
<td>FiberWire(^b)</td>
<td>Posterior dislocation</td>
<td>None</td>
<td>24.4</td>
<td></td>
</tr>
<tr>
<td>9/M/14.8 R MVC</td>
<td>None</td>
<td>1</td>
<td>Physeal fracture</td>
<td>1</td>
<td>Unsuccessful</td>
<td>FiberWire(^b)</td>
<td>Physeal fracture</td>
<td>None</td>
<td>324.1</td>
<td></td>
</tr>
<tr>
<td>10/M/15.4 L Basketball</td>
<td>Mild airway compression</td>
<td>3</td>
<td>Physeal fracture</td>
<td>3</td>
<td>Unsuccessful</td>
<td>FiberWire(^b)</td>
<td>Posterior dislocation</td>
<td>None</td>
<td>4.9</td>
<td></td>
</tr>
<tr>
<td>11/M/16.4 R Football</td>
<td>None</td>
<td>1</td>
<td>Posterior dislocation</td>
<td>1</td>
<td>Successful</td>
<td>N/A</td>
<td>N/A</td>
<td>None</td>
<td>2.6</td>
<td></td>
</tr>
<tr>
<td>12/M/13.6 R Snowboarding</td>
<td>None</td>
<td>&lt;1*</td>
<td>Posterior dislocation</td>
<td>&lt;1*</td>
<td>Successful</td>
<td>N/A</td>
<td>N/A</td>
<td>None</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: comp, complications; intraop, intraoperative; L, left; M, male; MOI, mechanism of injury; MVC, motor vehicle accident; N/A, not applicable; R, right.

*Injury treated on same date of initial diagnosis.

\(^\text{b}\)Arthrex Inc, Naples, Florida.
At initial presentation, radiographs and computed tomography (CT) were the most commonly used imaging modalities (10 of 12). Radiography was used in conjunction with magnetic resonance imaging (MRI) in 1 patient. In 1 patient, a CT scan was the only imaging modality used to establish the diagnosis of a sternoclavicular dislocation. Seven patients were initially diagnosed with a sternoclavicular dislocation. The remaining 5 patients were initially diagnosed with a medial clavicular physeal fracture.

The incidence of significant symptoms associated with the initial injury was 8.3% because 1 of the 12 patients presented with chest pain and left internal jugular vein intramural thrombus by CT arteriography (Figure 3), resolution of which was verified with repeat CT arteriography following closed reduction. Five other patients presented with tracheal or vascular abnormalities. Four of 12 patients underwent immediate open reduction due to concerns over impingement of mediastinal structures (n=2), delay in treatment of 10 days (n=1), or surgeon preference (n=1). The remaining 8 patients were initially treated with closed reduction, with 2 (25%) having success and 6 (75%) requiring subsequent open reduction. Three (50%) of 6 failed closed reductions were attempted more than 48 hours after injury. When closed reduction was attempted less than 48 hours after injury, the success rate was improved (2 of 5 [40%] success less than 48 hours after injury compared with 0 of 3 successful more than 48 hours after injury).

With the exception of 1 closed reduction performed in the Emergency Department under ketamine sedation, all were performed in the operating room with the patient in a supine position on the operating table and a towel bump between the scapulae. Closed techniques varied based on surgeon preference and included the following: (1) abduction and external rotation of the shoulder with the scapula on the affected side hyperextended; (2) gentle longitudinal traction on the upper extremity and use of a posteriorly directed force over the distal clavicle; (3) shoulder adduction and extension with traction pulled in the direction of the clavicle; (4) shoulder traction and upward pressure on the clavicle with fingers; and (5) gentle pressure on the shoulders to retract the scapulae. With failure of any of these techniques, percutaneous use of a towel clamp was employed in 4 of 8 closed reduction attempts. After sterile preparation of the field, the clamp was used to grasp the clavicle midshaft and pull anteriorly, taking care not to probe deeply due to risk of damage to mediastinal structures.

One of the 2 successful closed reductions was that performed in the Emergency Department under ketamine sedation. The second successful closed reduction was performed in the operating room under general anesthesia with gentle pressure on the shoulders to retract the scapulae. A palpable clunk was appreciated over the sternoclavicular joint, and there was resolution of the stepoff to palpation that had been felt at the sternoclavicular joint prior to reduction. Both radial pulse and extremity perfusion were verified. The median, radial, and ulnar nerves were also verified intact to motor and sensory testing.

Among patients who underwent open reduction and internal fixation (ORIF), a cardiothoracic surgeon was notified about the case prior to surgery and was available. All surgical procedures were performed under general anesthesia. A transverse incision was used to expose the sternoclavicular joint, and the clavicle was reduced with pointed reduction clamps. Two holes were then drilled in the medial clavicular metaphysis, and the shaft of the clavicle was secured to the manubrium with braided composite sutures in a figure-8 configuration (Figure 4). Among the 10 injuries that underwent operative treatment, 4 were determined to be posterior sternoclavicular dislocations and 6 were determined to be medial clavicular physeal fractures based on intraoperative visualization. Three of the injuries initially diagnosed as posterior dislocations based on preoperative imaging were determined intraoperatively to be physeal fractures.
Two of the injuries initially diagnosed as physeal fractures were determined to be posterior dislocations (Table 1).

The postoperative protocol included a sling for comfort, weight-bearing restrictions for 6 weeks, and restriction from contact sports for 12 weeks. Postoperatively, no patient required additional intervention. Complications, noted in a single patient treated for dislocation, consisted of surgical-site pain at 124 weeks postoperatively. Physical examination revealed a minimally tender scar over the sternoclavicular joint with normal range of motion and radiographs unchanged compared with previous postreduction films. The patient was directed to return on an as-needed basis. When contacted for functional outcomes data at 147 weeks, the patient reported pain resolution and excellent shoulder function (Table 2).

### Long-term Functional Outcomes

Complete follow-up data were obtained from 6 patients, all of whom underwent open reduction (Table 2). Among this subset of patients, all had returned to full activity level and all self-reported perfect QuickDASH and SST scores (0 and 12, respectively). The other 6 patients were unable to be contacted due to the following reasons: left the country following treatment (n=1) or invalid/outdated contact information (n=5).

### Discussion

Although anterior dislocations are generally thought to be far more common than posterior dislocations at the sternoclavicular joint, studies are lacking to elucidate the relative ratio in skeletally immature individual patients. In the current authors’ initial cohort of 16 skeletally immature patients, posterior injuries were more prevalent, with an anterior:posterior incidence of 1:3. Until further studies help to confirm the relative ratio in this specific population, the ratio reported in this study should be interpreted as a representation of the relative incidence rates of these injuries at a pediatric tertiary referral center.

The rarity of sternoclavicular dislocations/pseudodislocations has made it difficult for clinicians to formulate an optimal treatment plan because there are currently no practice-based guidelines. Most authors recommend initial treatment with closed reduction but take important exception with some or all of the following, requiring operative treatment: (1) complicated retrosternal dislocation with injury to neurovascular structures, the trachea, or the esophagus; (2) patients without mediastinal injury who have a delayed presentation because adhesions make closed reduction difficult in these patients; and (3) closed reduction resulting in redislocation with chronic pain.12-15

Based on findings early in their previously published case series, Waters et al8 advocated for ORIF of the sternoclavicular joint and medial clavicle in all patients with known posterior sternoclavicular joint injuries. Specifically, this recommendation was based on findings of CT scans performed following attempted closed reductions, demonstrating loss of reduction and recurrent displacement in 3 of 3 patients. These authors8 advocated that previous studies asserting the stability of closed reduction did not include routine postreduction CT scans. Although closed reduction was generally not the definitive treatment in the current cohort of patients, its usefulness is evident by the successful closed reduction of posterior sternoclavicular dislocations in 2 patients, both of whom presented without serious complications and were treated within 48 hours.

Because the efficacy of closed reduction has been shown to diminish with time, authors have suggested attempted closed treatment if the patient presents within the initial 48 hours or even within the initial 10 days following injury.14,16,17 The precise time frame within which closed reduction remains successful remains unclear. In the current cohort, closed reduction was successful only 25% (2 of 8) of the time and only when treated within 48 hours of injury. More specifically, 2 of 5 patients treated with closed reduction within 48 hours needed no further treatment, whereas all 3 treated more than 48 hours after injury required subsequent open reduction.

### Epiphyseal Fractures vs True Dislocations

The differentiation between true sternoclavicular joint dislocations and physeal injuries in the skeletally immature patient has been discussed throughout the literature, specifically whether the differentiation is possible in the closed setting and whether the differentiation affects

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**Table 2**

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>Verification of Reduction</th>
<th>Return to Full Activity</th>
<th>QuickDASH Score</th>
<th>SST Score</th>
<th>Revision Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Radiograph+CT+exam</td>
<td>Yes</td>
<td>0</td>
<td>12</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>Radiograph+exam</td>
<td>Yes</td>
<td>0</td>
<td>12</td>
<td>No</td>
</tr>
<tr>
<td>6</td>
<td>Radiograph+exam</td>
<td>Yes</td>
<td>0</td>
<td>12</td>
<td>No</td>
</tr>
<tr>
<td>7</td>
<td>Radiograph+CT+exam</td>
<td>Yes</td>
<td>0</td>
<td>12</td>
<td>No</td>
</tr>
<tr>
<td>8</td>
<td>Radiograph+CT+exam</td>
<td>Yes</td>
<td>0</td>
<td>12</td>
<td>No</td>
</tr>
<tr>
<td>9</td>
<td>CT+exam</td>
<td>Yes</td>
<td>0</td>
<td>12</td>
<td>No</td>
</tr>
</tbody>
</table>

*Abbreviations: CT, computed tomography; DASH, Disabilities of the Arm, Shoulder and Hand; exam, examination; SST, Simple Shoulder Test.*
treatment. Some authors have stated that it may be difficult or even impossible to distinguish between epiphyseal plate fractures and true posterior dislocations based on imaging alone.\textsuperscript{16,18-21} Even in cases in which 3-dimensional CT scans are used to evaluate the injury, the distinction may often be made by open reduction alone.\textsuperscript{6,18-21} Arguably, most retrosternal dislocations of the clavicle can be assumed to be Salter-Harris type I or II epiphyseal plate separations, not true dislocations.\textsuperscript{16,22}

Much of the literature suggests that the distinction between true sternoclavicular joint dislocation and physeal injuries affects treatment and thus should be made, if possible. Some authors have shown that closed reductions are only effective in true dislocations due to entrapment of the periosteum in cases of displaced epiphyseal fractures.\textsuperscript{18} Other authors have argued that physeal injuries are more likely to heal with time and without surgical intervention and should thus be treated conservatively, particularly if asymptomatic and late presenting.\textsuperscript{14} Others have recommended that immobilization following reduction of a true dislocation in an older patient be slightly longer (6 weeks) compared with that following reduction of a displaced epiphyseal fracture in a younger patient (4 weeks).\textsuperscript{23}

In the current cohort of patients, the differentiation of posterior sternoclavicular dislocations from epiphyseal separations was often not possible based on preoperative CT or MRI alone. Of the 10 patients who underwent surgical treatment, the initial diagnosis made by imaging was sternoclavicular dislocation in 5 and medial clavicular physeal fracture in 5. However, based on intraoperative findings, 5 patients were misdiagnosed. Three of the 5 patients initially diagnosed with a dislocation had a physeal fracture, whereas 2 of the 5 patients initially diagnosed with a physeal fracture had a dislocation. Thus, 6 of 10 patients actually had medial clavicular physeal fractures compared with 4 of 10 patients with sternoclavicular dislocations. As previously noted, periosteal interposition can block reduction in cases of physeal fracture, thus requiring operative treatment. Nonetheless, the authors found no significant difference between failure of closed reduction in patients with an intraoperative diagnosis of physeal fracture vs true dislocation.

**Surgical Techniques**

Various methods of operative fixation have been described, including those requiring the use of Kirschner pins/wires (not recommended due to previously described pin migration with fatal consequences),\textsuperscript{24} large cannulated screws,\textsuperscript{25} anterior plating,\textsuperscript{26} Balser plate stabilization,\textsuperscript{27} and suture anchor fixation of the sternoclavicular joint.\textsuperscript{28} Other techniques include resection of the medial aspect of the clavicle\textsuperscript{29} and various soft tissue methods such as suture repair of the costoclavicular and sternoclavicular ligaments,\textsuperscript{18} figure-8 semitendinosus reconstruction,\textsuperscript{30} costoclavicular tenodesis using the subclavius muscle,\textsuperscript{18} and sternoclavicular tenodesis using the sternal head of the sternocleidomastoid muscle.\textsuperscript{18}

All of the current study’s open reductions were stabilized with braided composite suture (FiberWire; Arthrex Inc, Naples, Florida) and were associated with excellent self-reported shoulder function. These findings are in agreement with those of a recent systematic review of sternoclavicular dislocations (both anterior and posterior). In that study, Glass et al\textsuperscript{26} concluded that, based on the results of 38 patients treated with these procedures, tenodesis, suture fixation, and ORIF (including those treated with Balser plate or anterior plate stabilization) have the largest proportions of excellent/good results without high-risk complications. In patients with posterior dislocation in particular, these authors reported that 7 (88%) of 8 patients had excellent/good results with suture fixation and no reported complications.

**Treatment Outcomes**

The current literature addressing posterior sternoclavicular dislocations and medial clavicular physeal fractures primarily includes multiple case reports and case series. The 2 systematic reviews on the topic of sternoclavicular joint injuries both consider anterior and posterior injuries in aggregate, neither specifically addressing the treatment patterns in skeletally immature populations.\textsuperscript{26,31} The largest studies of sternoclavicular joint injuries in skeletally immature patients are those by Waters et al\textsuperscript{8} and Laffosse et al.\textsuperscript{18}

Waters et al\textsuperscript{8} performed a retrospective review of the treatment of 13 patients (age range, 13-17 years) with posterior sternoclavicular dislocations or medial clavicular physeal fractures. All were treated definitively with ORIF using a suture technique and followed clinically for a minimum of 6 months. The authors concluded that skeletally immature patients with posterior sternoclavicular injuries can expect excellent functional outcomes and minimal complications when diagnosis is timely and treatment is with operative fixation.

Laffosse et al\textsuperscript{18} retrospectively reviewed 30 patients (age range, 15-41 years) with posterior sternoclavicular dislocations or medial clavicular physeal fractures incurred during sports participation with a minimum 12-month follow-up. Fifteen of the 30 patients were 18 years or younger. One of these 15 patients was treated successfully with closed reduction alone, 6 were treated operatively following failure of closed reduction, and 8 were treated operatively without prior attempt at closed reduction. The authors concluded that closed reduction is only successful in dislocations, further stating that 4 of 4 failures of closed reduction in cases of epiphyseal separation were in cases in which the diagnosis was not accurately made by preoperative imaging. All 15 patients achieved excellent functional outcomes.

Due to the limited number of adolescent or pediatric patients with posterior
sternoclavicular injuries treated successfully with closed reduction and having long-term follow-up, it is not possible to provide a direct comparison of treatment with open vs closed reduction.

**Treatment Philosophy**

Based on a review of the literature and the current authors’ experience, advanced imaging should be obtained when a traumatic posterior sternoclavicular dislocation or physeal fracture is suspected. Imaging is needed to confirm the direction of displacement and evaluate the integrity of surrounding soft tissue structures. Closed reduction should be considered if attempted 48 hours or less after the initial injury. Due to the propensity for the joint to redisplace following reduction, imaging should be obtained following closed reduction. The authors have typically used 3-dimensional CT scans to confirm a stable reduction. However, increased cost and radiation exposure are concerns. Ultrasound has previously been described as a means to assess physeal fractures pre- and postreduction and may be a possible alternative. However, the current authors have no experience with this modality at their institution. For cases in which (1) the initial closed reduction is unsuccessful; (2) the patient presents for evaluation 48 hours or less after the initial injury; and/or (3) the patient presents with a major concomitant injury, the authors recommend ORIF with braided suture wire. The excellent functional outcomes reported in this study following braided suture wire fixation are consistent with outcomes reported in similar studies that have used a suture-type stabilization technique in skeletally immature patients. The current authors’ postoperative protocol includes a sling for comfort, weight-bearing restrictions for 6 weeks, and restriction from contact sports for 12 weeks. If a patient is asymptomatic after 12 weeks, then he or she is cleared for full activities and instructed to return as needed.

**CONCLUSION**

The unique anatomy of the skeletally immature sternoclavicular joint renders it susceptible to injury, both in the anterior and posterior directions. In contrast to the adult literature, the majority of sternoclavicular dislocations or physeal fractures identified in the authors’ query of skeletally immature patients were posterior in direction rather than anterior. Posteriorly directed injuries demand a high index of suspicion and the need for definitive diagnosis because presenting symptoms may be subtle and confusing in the pediatric patient, and these injuries bear life-threatening complications. Essential elements to diagnostic algorithms include advanced imaging studies for evaluation of mediastinal structures and early treatment for potential closed vs open reduction. Operative treatment can result in an excellent self-reported functional outcome. In the authors’ experience, distinguishing a true dislocation from a physeal injury cannot be definitively determined without an open operative procedure.

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