CASE REPORT

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Ultrasonography in Sternoclavicular Joint Posterior Dislocation in an Adolescent - A Case Report

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Sternoclavicular joint posterior dislocations are considered a very uncommon, and type of injury where if esophagus or airway injury occurs behind the clavicle, it poses a high risk to the patient. In addition, if epiphyseal fracture occurs as a result of the sternoclavicular joint posterior dislocation, surgical treatment is often required. However, in the absence of a complete ossification of the clavicle, it is difficult to differentiate between a simple dislocation and epiphyseal fracture-dislocation solely based on simple radiographs or computed tomography scans. In this case report, the authors present a case in which a sternoclavicular joint posterior dislocation was diagnosed in a 14-year-old male athlete. The case report discusses how the posterior dislocation without epiphyseal fracture was diagnosed using an ultrasound and subsequently treated with successful outcomes using manual reduction. The case report presents our findings along with discussion that includes a literature review of relevant research.
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Key Words: Sternoclavicular joint; Dislocations; Ultrasonography

Compared to acromioclavicular joint dislocations, sternoclavicular joint dislocation is considered quite rare, and only occurs in about 3% of all shoulder injuries.[1)] Although sternoclavicular joint dislocation can be classified either as an anterior dislocation or posterior dislocation, 90% of cases reported are anterior dislocations.[2)] Usually dislocation of sternoclavicular joint was confirmed by radiography or computed tomography (CT) scan. It is typically treated using a closed reduction or open reduction and a radiogrphy or image intensifier (C-arm) can be used to confirm stability after reduction. However, in adolescents where a complete ossification of medial epiphysis in clavicle has yet to occur, diagnosis that can distinguish between a simple dislocation and medial epiphyseal fracture is often difficult by only using a simple x-ray or a CT scan. Moreover, unlike simple dislocations, medial epiphyseal fractures typically require an open reduction approach or internal fixation. Thus, the authors of the present case report summarize the findings based on the case of a sternoclavicular joint posterior dislocation in which the diagnosis of a simple dislocation was made using an ultrasound, followed by a treatment which employed a closed reduction method that resulted in a successful treatment outcomes of the 14-year-old male athlete.

Case Report

A 14-year-old male patient came to the hospital suffering from extreme pain after hitting his shoulder on the ground during a wrestling match. Although there were no external wound, no bruise, no swelling on left shoulder reported during the emergency room examination. A deformity of the left sternoclavicular joint area was not clearly observed during initial physical exam. Extreme pain in the left upper arm during movement and motion of left shoulder. Sensitivity and circulation of the left upper arm were observed as normal. There was no definite abnormality on simple radiography of both clavicle (Fig. 1A, B). We checked special radiography (Hobb's view), the left clavicle was

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observed to have posterior dislocation and inferior translation (Fig. 1C). Although the left sternoclavicular joint posterior dislocation was identified during a 3-dimensional CT scan, neither fracture of medial clavicle end nor any injury of aortic arch or esophagus or airway pressure behind the sternoclavicular joint were observed (Fig. 2). Because the medial end of clavicle was ongoing ossification process, we didn't exclude epiphyseal fracture. In the ultrasound examination, left clavicle was posterior dislocated, but there was no tiny bony fragment in both side of sternoclavicular joint (Fig. 3), we excluded epiphyseal fracture.

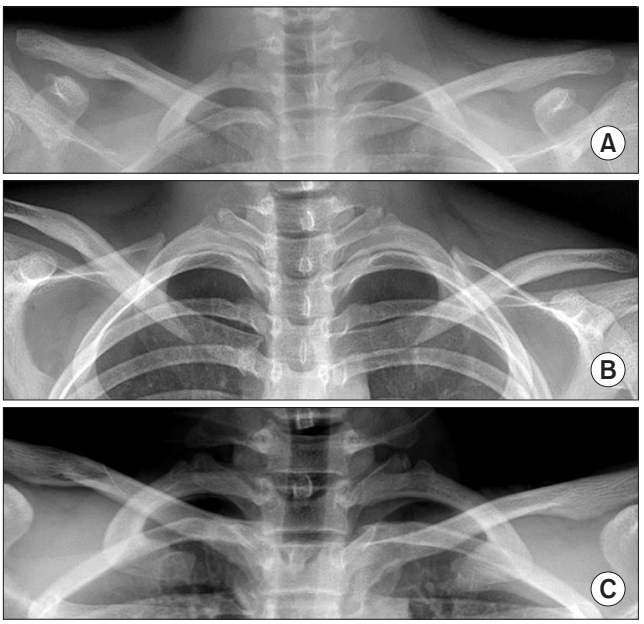

Fig. 1. The radiographic changes can beabsent in clavicle antero-posteior view (A), lordotic view (B), and left clavicle was inferior migration in Hobb's view (C).

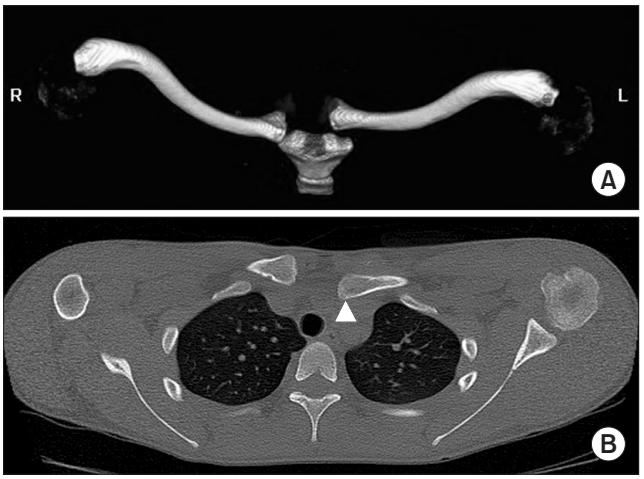

Fig. 2. Computed tomography scan of the sternoclavicular joints. Three-dimensional rotatory reformats (A) and axial bone algorithm (B) shows posterior dislocation of the left medial clavicle (arrowhead).

After this confirmation, manual reduction was attempted in the ER, but based on the decrease of the oxygen saturation of the arterial blood in the right finger down to 80%, we ceased manual reduction. Soon thereafter, a closed reduction was carried out in the operating room after intubation. General anesthesia was carried out by placing a sandbag between the patient scapulae, while traction was applied to the abducted arm in line with the clavicle. The traction was gradually increased while the arm is brought to extension. A sterile towel clap was applied around the medial end of the clavicle and pulled anteriorly. The reduction was confirmed with ultrasound examination and image intensifier. After the closed reduction, a comparison of both sternoclavicular joints were conducted using an ultrasound (Fig. 3) and image intensifier (C-arm). The ultrasound results indicated the following intervals of left sternoclavicular joints: right side, 9.2

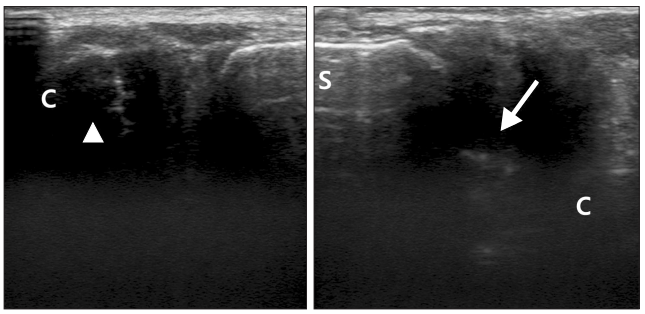

Fig. 3. Ultrasound scan of the sternoclavicular joints. Long axis sonographic image of the medial clavicles demonstrates posterior dislocation of the left medial clavicle (arrow), compared with the normally located right medial clavicle (arrowhead). S: sternum, C: clavicle.

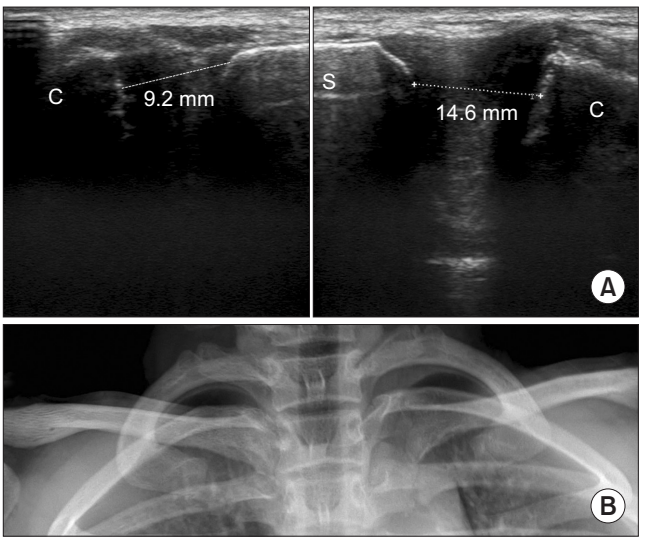

Fig. 4. (A) Long axis sonographic image of the medial clavicles demonstrates normally located left medial clavicle. The Sternoclavicular joint gap was 9.2 mm in right, 14.6 mm in left. (B) The radiographic image shows same level of both clavicle in Hobb's view. S: sternum, C: clavicle.

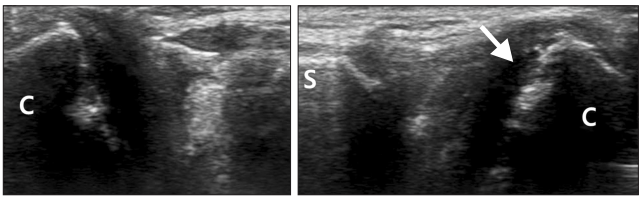

Fig. 5. Ultrasound scan of the sternoclavicular joints after postoperative 8 weeks. Long axis sonographic image of the medial clavicles demonstrates the normally located left medial clavicle (arrow). S: sternum, C: clavicle.

mm, left side 14.6 mm. It represented injury of sternoclavicular ligaments. Despite the 5 mm elongation of the left side, no other instability or abnormality of epiphysis were observed in shoulder physical examination (Fig. 4). After confirming stability by using a radiography and C-arm, figure-8-bandage was used. After 6 weeks of stabilization, physical activity was resumed, and no further instability was observed in the ultrasound after 8 weeks of treatment (Fig. 5). And 6 months post reduction, no further complications have been observed during post operative follow-ups.

Discussion

The bony structure of sternoclavicular joint is inherently unstable and the most incongruous joint in the body because the articular surface of clavicle is much larger than the articular surface on sternum. The sternoclavicular joint is supported by strong ligaments (anterior and posterior stenoclavicular ligaments which is thickenings of the anterior and posterior stenoclavicular ligaments, the inter clavicular ligament, costoclavicular ligaments, intra-articular disk), making it stable to allow forward thrust and movements of the upper limb. So the sternoclavicular dislocation is uncommon compared with acromioclavicular joint. The sternoclavicular joint posterior dislocation is extremely rare, under 0.1% of all joint dislocations.[1)]

The sternoclavicular joint posterior dislocation was first described by Rodigues at 1843 and 120 cases have been reported in last 75 years.[3)]

The sternoclavicular joint dislocations may occur with a direct blow over the medial clavicle or with a directed blow to the lateral shoulder. The sternoclavicular anterior dislocation results in posterolateral force to lateral shoulder. The sternoclavicular posterior dislocation results in anteromedial force to lateral shoulder.[4)] This mechanism results in the costoclavicular ligament on the 1st rib acts as a fulcrum around which the clavicle rotates.

Clinical signs in sternoclavicular joint dislocation may be subtle leading to a delay in diagnosis, and soft tissue swelling may make it difficult to distinguish between anterior and posterior dislocations. Conventional radiographs (such as the clavicle antero-posterior [AP] view, the clavicle lordotic view) may show asymmetry in the vertical level of the medial ends of the clavicles. Special radiographic views (such as the Rockwood view, the Hobb's view, the Heinig view) are more helpful for diagnosis. Rockwood (serendipity) view is an AP view with 40° cranial angulation, the Hobb's view is a 90° cephalocaudal view with the patient slumped over the x-ray cassette and the Heinig view is a view taken with the patient supine, the beam directed in a coronal plane tangential to the joint and parallel to the opposite clavicle and the cassette placed across the opposite shoulder and perpendicular to the central ray. However such specialized views are difficult to perform reliably and are not be widely practiced. As in our case, the radiographic changes can be absent in clavicle AP view and subtle in the Hobb's view (Fig. 1). CT scan is the most appropriate imaging method to confirm the diagnosis of sternovlacivular dislocation and evaluating the mediastinal structures. Ultrasound is more effective in distinguish epiphyseal fracture and simple dislocation. When epiphyseal fracture was occurred, undisplaced periosteal sleeve was showed in ultrasound.[5)]

The complications of sternoclavicular posterior dislocation were trachea compression, pneumothorax, vascular compression, esophagus compression and injury, brachial plexus compression. In our case, the cause of the oxygen saturation decrease during closed reduction at ER might be result in compression of trachea due to posterior migration of medial clavicle end.

The clavicle ossification is early but complete ossification is very late. The medial clavicular epiphysis does not ossify until around 12 to 20 years, and physeal fusion occurs at 22 to 27 years.

If the medial clavicular epiphysis is not ossified, CT and radiographs cannot distinguish between sternoclavicular dislocation and epiphyseal fracture or ligamentous injury.[6)] If epiphyseal fracture occurred, failure of attempted reduction is very high and often need a opeative treatment.[7)]

In previous case reports, Siddiqui and Turner illustrated the value of intra-operative ultrasound in identifying failure of attempted closed reduction of posterior sternoclavicular dislocation in a 20-year-old male.[8)] Deganello et al.[5)] ultrasound demonstrated that the clavicle had dislocated posteriorly through a tear in the undisplaced periosteal sleeve. This indicated that closed reduction was unlikely to be successful and confirmed the need for open reduction, stabilisation and periosteal repair. Laffosse at al.[9)] A closed reduction was attempted in ten cases of posterior dislocation. It was successful in only seven of ten dislocations, but two of seven had recurrence. But a closed reduction was failed in all four epiphyseal disruptions.

To our knowledge, the role of ultrasound in the pre- or post-operative assessment of sternoclavicular dislocation has not been previously described. Clinical examination, conventional radiography, CT may be ineffective in distinguishing between simple sternoclavicular dislocation and medial epiphyseal fracture of

clavicle in children and adolescents.

Therefore, based on this case, we think that the ultrasound is of particular value when trying to distinguish the difference between simple sternoclavicular dislocation and medial epiphyseal fracture of clavicle in children and adolescents.

Plain radiographs are not easy to use for confirmation of reduction and follow-up, and we can't take CT scans every clinical visit. Ultrasound is very simple and easy to confirm reduction, very useful for confirmation of reduction and follow-up evaluation.

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