

Case Report

A Rare Case of a Distal Clavicle Fracture Type IV-Like Acromioclavicular Joint Injury in A Child: Case Report and Literature Review

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Abstract

The clavicle ranks among the most frequently fractured bones in the immature skeleton, accounting for approximately 15% of all fractures in children. Distal fractures only represent 10-20% of all clavicle fractures. In our study, we describe a very rare case of a 13-year-old girl who sustained an injury to the left AC joint as a result of a fracture of the lateral part of the clavicle and a complete rupture of the coracoclavicular ligaments with a posterior and superior displacement of the medial clavicle (type IV AC joint dislocation-like) and entrapment of the bone through the trapezius muscle. We decided for surgical treatment because of a marked displacement of the medial clavicle and the age of the patient, with a great outcome. Literature review only presented four other case-reports in children with the same injury (three of them treated surgically). Giving the rarity of this lesion, there is a lack of understanding and no consensus about the better treatment.

Keywords: Acromioclavicular Fracture Separation; Distal Clavicle Fracture; Immature Skeleton; Pediatric Trauma

Introduction

The clavicle ranks among the most frequently fractured bones in the immature skeleton, accounting for approximately 15% of all fractures in children [1-3]. Fractures of the clavicle are categorized according to anatomic location: medial third, middle third, and distal third, the bulk of which involves the middle third, while distal fractures only represent 10-20% [4,5]. The distal clavicle is often injured following a direct blow to the AC joint, and 85% result from injuries during sports or recreational activities [1,4,5]. Injuries to the lateral part of the clavicle in a child with an immature skeleton are more likely to be physeal fractures than true acromioclavicular separations [3]. When a fracture of the distal clavicle occurs in the child with open physis and the metaphyseal fragment is small or an epiphyseal-metaphyseal separation occurs, the injury appears like an AC dislocation and has been labelled a pseudodislocation [1,6].

A true AC disruption rarely occurs in children [3,5,6]. In fact, the combination of a physeal fracture with a ligamentous injury seems to violate the basic principle that a bone will fracture before a ligament rupture in a child [3]. The AC disruption associated with a posteriorly displaced distal metaphyseal clavicular fracture is even rarer and there are very few reports in the international literature that deal with this unique injury in children [1,4-6]. The purpose of this report is to describe the case of a 13-year-old girl who sustained an injury to the left AC joint as a result of a fracture of the lateral part of the clavicle and a complete rupture of the coracoclavicular ligaments with a posterior and superior displacement of the medial clavicle (type IV AC joint dislocation-like). This category requires special attention because of it is a rare injury and as it needs reduction and not mere observation as in the majority of distal clavicular fractures.

Case Report

A thirteen-year-old girl injured her left shoulder after suffer a fell from a motorcycle. She was taken to an emergency depart-

ment with severe pain and limited range of motion in the affected shoulder. After radiographs, she was informed of the diagnostic of clavicle fracture and was referenced to another orthopedic service. After fourteen days of trauma, the patient was admitted in our service with a sling immobilization, tenderness to palpation at the distal extremity of the left clavicle, the normal contour of the AC joint was lost, and had a bony prominence on her posterior shoulder, but was neurovascularly intact and had no skin lesions (Figure 1).



Figure 1: Marked bony prominence on her posterior shoulder.

New series of radiographs were done, which showed a transverse fracture of the lateral third of the clavicle with postero-superior displacement of the distal end of the medial fragment, associated with a dislocation of the AC joint (Figure 2).



Figure 2: X-ray showing type IV AC joint dislocation-like.

Because of the marked deformity, an operative repair was chosen and done with patient under general anesthetic and bra-

chialis plexus blockage, in a beach-chair position. A longitudinal incision was made over the AC joint. The distal end of the medial fragment was observed with significant posterior displacement into the trapezius muscle. It was also a complete rupture of the coracoclavicular ligaments (Figure 3).



Figure 3: Significant posterior displacement of clavicle.

The reduction of the medial fragment was done with difficulty due to the muscle interposition, and the time between the lesion and surgery. Once good reduction was achieved, two K wires (1.5mm) were inserted percutaneously from the lateral end of the acromion to the clavicle (Figure 4).



Figure 4: Post-operative X-ray.

The patient was discharged after forty-eight hours with a sling immobilization. Within six weeks, the K wires and the sling were removed, after radiologic confirmation of complete healing of the fracture. At that time, she was referenced to continue the treatment with physiotherapy for shoulder rehabilitation. After three months of surgery, the patient returned with no symptoms and shoulder range of motion not only preserved, but symmetric to the uninjured side, with a small upper deformity at the AC joint (Figures 5 A, B, C & D).



Figure 5 (A-D): Post-operative clinical examination.

The latest radiographs revealed the restoration of the articular congruence (Figure 6A & B).



Figure 6(A-B): Final X-ray.

The parents of our patient were informed that data concerning the case would be submitted for publication, and they consented.

Discussion

The clavicle begins to form in the fifth week of gestation by intramembranous ossification. It consists of two physes: lateral and medial. The medial epiphysis does not ossify until 18 years of age. Closure of this physis may not be complete until 22-25 years of age. Approximately 80% of longitudinal growth of the clavicle is from the medial epiphysis [7]. Given that the center of ossification of the distal epiphysis of the clavicle appears after the age of 18 years, it has great potential for remodeling, thus significant shoulder deformities may develop in children [4]. In the skeletally immature patient, distal clavicular injuries may mimic AC disloca-

tions in adults [5,6,8]. As fusion of the distal epiphysis is not complete until the mid-twenties, fractures of the lateral end in children usually result in a physal separation of the distal clavicle, rather than a true Acromioclavicular (AC) separation. Additionally, a thick periosteum forms a protective sleeve around the distal clavicle and the acromion and serves as a point of attachment for the Coracoclavicular (CC) ligaments. Prior to epiphyseal closure, because the coracoclavicular ligaments are biomechanically stronger than the physal-metaphyseal region, when fractures occur, lateral portion of the clavicle is displaced superiorly from its periosteal tube rather than by detachment of the CC ligaments, giving the radiographic impression of a dislocation of the AC joint. Though, physal fracture occurs, however, the conoid and trapezoid ligaments usually remain intact, therefore, those fractures may mimic AC separation. Furthermore, the acromioclavicular joint is additionally stabilized by the trapezius and deltoid muscles. Because of this, this injury is more appropriately designated as “Pseudodislocation” [1,3,6,8]. Falstie-Jensen and Mikkelsen and Rockwood have pointed out that the injury is analogous to a banana peeling phenomena [5,6]. As a result of all these factors, a true acromioclavicular joint dislocation is extremely rare in patients who are younger than thirteen years of age [3,5,6].

Dameron and Rockwood developed a classification system with six distinct types of acromioclavicular injuries in adults: type-I and type-II injuries are practically sprains of the acromioclavicular joint, whereas types III and IV represent a complete disruption. A Type IV lesion consists of a posterior dislocation of the clavicle that is grossly displaced superiorly toward the base of the neck. In type V, clavicle is markedly elevated and coracoclavicular distance is more than double normal (i.e. >25 mm); Type VI lesions comprise an inferior dislocation of the distal clavicle to a subacromial or subcoracoid position [9]. This classification appears to be inconvenient for children’s AC injuries because of the difficulty in distinguishing types III-V, besides it does not include the fracture pattern of distal clavicle. Thus, Nenopoulos et al purposed a new classification system:

group I - greenstick fractures; group IIa - transverse fractures without displacement; group IIb - displaced transverse fractures; group IIIa - oblique fractures without displacement; group IIIb - displaced oblique fractures; group IV - comminuted fractures; and group V - acromioclavicular dislocation [5]. The excellent remodeling capacity in immature bone allows most distal clavicular injuries to be treated nonoperatively. It is widely accepted that nondisplaced or minimally displaced fractures, as the mentioned pseudodislocation of the acromioclavicular can be managed conservatively with sling immobilization and early rehabilitation with range-of-motion exercises, with good results [1,2,4,10].

Giving the rarity of the true AC disruption associated with a posteriorly displaced distal metaphyseal clavicular fracture in chil-

dren, like the presented case, there is a lack of understanding and no consensus in the literature. In our case, because of a gross displacement of the medial clavicle and the age of the patient we opted for surgical treatment, with a great final outcome, despite a residual deformity. There is minimal literature that provides examples and treatments for Type IV AC joint dislocation-like injury. The first case reported in the literature was described by Barber [11]. The 15-year-old male underwent open reduction with a primary ligamentous repair of the coracoclavicular and acromioclavicular ligaments and reconstruction of the periosteal-muscular envelope [1] treated an 11-year-old male surgically, with open reduction and percutaneous fixation. Eight weeks after surgery, patient had regained his full shoulder function and returned to full activity. Itokazu [12] reported a case of 11-year-old boy that required surgical intervention, because medial clavicle fragment was impacted into the muscle fiber. The fourth case was presented by Richards [13] involving a 13-year-old male that had his injury successfully reduced by closed means, with patient under general anesthetic. He states that the healing after closed reduction was excellent because of the intact AC joint and clavicle periosteal tube.

According other authors, displaced clavicle fractures in adolescents are more frequently treated with surgery, because of high rates of nonunion and functional deficits compared with the uninjured side, besides avoiding shoulder deformity, pain and for esthetic reasons [2,5,10,14]. [5] in his study with 75 children with distal clavicular injury from 3 to 16 years had only two patients with a true AC dislocation (group V of this author classification), one managed surgically and the other conservatively. [8] reported on 14 metaphyseal-epiphyseal separations of the distal clavicle mimicking AC dislocation. Of the patients, nine were treated by closed methods or had no treatment, and none of his patients had significant complains or functional limitations in follow-up ranging from one to 10 years [15] reported twenty-five AC separations in children treated surgically, all with good results. They noted that in all patients less than 13 years of age there was a lateral clavicular fracture rather than a true AC dislocation.

Conclusion

The type IV AC joint dislocation-like injury (fracture of the lateral part of the clavicle and a complete rupture of the coracoclavicular ligaments with a posterior displacement of the medial clavicle) is a very rare lesion in children. Therefore, there is not enough evidence to support its treatment. Our case was treated operatively with an excellent result. We believe that due to significant clinical deformity and entrapment of the bone through the trapezius muscle, the reduction of the fracture is recommended.

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