




Available online at
 ScienceDirect
www.sciencedirect.com

Elsevier Masson France

www.em-consulte.com/en


Orthopaedics
& Traumatology
Surgery & Research

CLINICAL REPORT

Proximal clavicle physeal fracture-separation mimicking an anterior sterno-clavicular dislocation

M.J. El Mekkaoui*, N. Sekkach, A. Bazeli, J.M. Faustin

Department of Orthopaedic and Trauma Surgery, Delafontaine Hospital, 93205 Saint-Denis cedex, France

Accepted: 26 August 2010

KEYWORDS

Fracture-separation;
Physeal;
Clavicle;
Sternoclavicular joint

Summary Proximal physeal fracture-separation of the clavicle is a very rare injury occurring in the adolescent and in the young adult which involves a contact loss with fracture between the clavicle and its cartilaginous ossification center similar in appearance to a sternoclavicular dislocation. The authors report an unusual case of a proximal physeal fracture-separation of the clavicle with avulsion of sternoclavicular periosteal and ligamentous structures without vasculonervous injury in a 16-year-old young person. A CT scan examination is essential. Surgical management consisted in costoclavicular ligament and periosteum reattachment associated with reduction of the fracture-separation and pin fixation. This repair demonstrated a successful outcome at 8-month follow-up.

© 2011 Elsevier Masson SAS. All rights reserved.

Introduction

Proximal physeal fracture-separation of the clavicle is an unrecognized entity due to the appearance then late fusion of the epiphyseal nucleus between the age of 22 and 25 [1].

This very rare lesion which usually occurs in the adolescent and the young adult, involves a loss of contact (with or without fracture) between the clavicle and its epiphyseal nucleus, thus similar in appearance to a sternoclavicular dislocation.

Sternoclavicular dislocations (including physeal fractures-separations) account for 3% of all surgical disorders of the shoulder [2].

In children, differential diagnosis between sternoclavicular dislocation and physeal separation is often difficult to perform.

Surgical management has not been clearly established yet and numerous means of fixation are suggested by the authors. Physeal fracture-separation associated with posterior displacement of the clavicle as well as symptomatic anterior instability should be surgically managed.

Case report

Clinical data

A 16-year old right-handed student, playing competitive football, sustained a high-energy trauma to his right shoulder after a fall during a motorcycle accident in June 1999. At presentation, the patient complained of pain localized in

* Corresponding author.
E-mail address: jalal.mekkaoui@hotmail.com
(M.J. El Mekkaoui).



Figure 3 Clinical examination at 8 months demonstrating satisfactory functional recovery and painless mobilization.

it enables mobilization of the cleidoscapular block on the trunk, block on which takes place the glenohumeral mobility [3,4].

Epidemiologically, our patient corresponds to the age, gender, origin of injury (road accident) criteria of dislocations and physeal fractures-separations of the proximal end of the clavicle [5]. However, due to the late ossification of the internal end of the clavicle and its proximity to the joint, it is often difficult to differentiate a true sternoclavicular dislocation from a physeal separation [6]. It should be



Figure 4 CT scan at 3 months after pin removal.

systematically suspected after indirect high-energy shoulder traumatism in the adolescent and young adult [7].

Standard radiographs do not provide proper evaluation and additional CT scan should be performed [8]. CT scan helps assess the relationship between clavicular extremity and major vessels located just posterior to it to establish the exact position of the fragment and plan reduction as well as osteosynthesis [9–12].

Surgical management of proximal physeal fractures-separations of the clavicle is not systematically performed [13]. In case of true physeal separation, the periosteal sleeve is often intact with stable reduction. Once reduction has been achieved, a conservative treatment is carried out. Conservative reduction is easily performed by combining retropulsion of the shoulder while pression is applied on the anterior aspect of the internal end of the clavicle [10,14].

In our case, there was an avulsion of the periosteal and costoclavicular structures, these elements being essential in providing a stable sternoclavicular joint in case of fracture-separation of the physeal nucleus. We believe stabilization was very useful since there was a great amount of displacement of the proximal clavicular fragment. The periosteum and costoclavicular ligament were reinserted by means of a “U” shaped transosseus suture. In order to protect this suture, a temporary sternoclavicular joint fixation was performed by inserting a pin from the clavicle to the sternal manubrium, the clavicular end of the pin being curved to prevent any migration. Many authors proscribe the use of this type of device (pin). However, according to our experience, the pin [15] curvature and its appropriate removal should prevent any complication.

Many fixation techniques are available. According to some authors, proper restoration of the anatomical structures is essential, and can be combined or not with the use of a fixation device [16]. Other techniques are available to ensure capsuloligamentous repair through ligamentoplasty by means of natural or synthetic tissue-engineered implants (Achilles, sub-clavious, fascia lata, long palmar tendons, Dacron band...). Among the most commonly used techniques, that of Jackson Burrows using the sub-clavious muscle tendon or those performing temporary joint fixation by means of internal fixation devices such as osteosutures, cerclage wirings or cannulated screws [3,17,18].

Conclusion

Dislocation and physeal fracture-separation of the proximal end of the clavicle is a very rare entity due to the multiple strong ligaments of the sternoclavicular joint. It mostly involves physeal separations due to the late fusion of the internal ossification nucleus of the clavicle (22- to 25-year-old).

CT scan must be performed. Anterior dislocations and physeal fracture-separations of the proximal end of the clavicle can be conservatively managed. However, in case of major displacement which could threaten the skin, surgery should be the treatment of choice.

Disclosure of interest

None.

References

- [1] Williams Jr GR, Shakil M, Klimkiewicz J, Lannotti JP. Anatomy of the scapulothoracic articulation. *Clin Orthop Relat Res* 1999;359:237–46.
- [2] Robinson CM. Fractures of the clavicle in the adult. *Epidemiology of clavicle fractures*. *J Bone Joint Surg Br* 1998;80:476–84.
- [3] Rockwood Jr CA. Disorders of the sternoclavicular joint. In: Rockwood Jr CA, Matsen FA, editors. *The shoulder*, 83. London: WB Saunders; 1998. p. 238–64.
- [4] Goldfarb CA, et al. Retrosternal displacement after physeal fracture of the medial clavicle in children treatment by open reduction and internal fixation. *J Bone Joint Surg Br* 2001;83:1168–72.
- [5] Postacchini F, et al. Epidemiology of clavicle fractures. *J Shoulder Elbow Surg* 2002;11:452–6.
- [6] Brinker MR, Simon RG. Pseudo-dislocation of the sternoclavicular joint. *J Orthop Trauma* 1999;13:222–5.
- [7] Waterman J, Emery R. The diagnosis and treatment of sternoclavicular joint. *Curr Orthop* 2002;16:368–73.
- [8] Stanley D, Trowbridge EA, Norris SH. The mechanism of clavicular fracture. A clinical and biomechanical analysis. *J Bone Joint Surg Br* 1988;70:461–4.
- [9] Levinsohn EM, et al. Computed tomography in the diagnosis of dislocations of the sternoclavicular joint. *Clin Orthop Relat Res* 1979;140:12–6.
- [10] Waters PM, et al. Short-term outcomes after surgical treatment of traumatic posterior sternoclavicular fracture-dislocations in children and adolescents. *J Pediatr Orthop* 2003;23:464–9.
- [11] Emms NW, et al. Subclavian vein obstruction caused by an unreduced type II Salter Harris injury of the medial clavicular physis. *J Shoulder Elbow Surg* 2002;11:271–3.
- [12] O'Connor PA, et al. Retrosternal dislocation of the clavicle associated with a traumatic pneumothorax. *Interactive Cardiovasc Thorac Surg* 2003;20:9–11.
- [13] Anderson K, Jensen P, Lauritzen J. Treatment of proximal clavicular fractures. *Acta Orthop Scand* 1987;57:71–4.
- [14] Reilly P, et al. Erosion and nonunion of the first rib after sternoclavicular reconstruction with Dacron. *J Shoulder Elbow Surg* 1990;8:76–8.
- [15] Falcone M, Guinand R, Bachour F, Chantelot C. Bifocal fracture of sternal end of clavicle-pseudodislocation of sternoclavicular joint. *J Chir Main* 2007;26:50–4.
- [16] Waterman J, Emery R. The diagnosis and treatment of sternoclavicular joint. *Curr Orthop* 2002;16:368–73.
- [17] Lehnert M, Maier B, Jakob H, Maier M, Laurer HL, Marzi I. Fracture and retrosternal dislocation of the medial clavicle in a 12-year-old child-case report, options for diagnosis, and treatment in children. *J Pediatr Surg* 2005;40:33–9.
- [18] Rockwood Jr CA, Groh GI, Wirth MA, Grassi FA. Resection arthroplasty of the sternoclavicular joint. *J Bone Joint Surg Am* 1997;79:387–93.