CASE REPORT

Case Report

Floating-clavicle from the 17th Century

The Oldest Case?

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Abstract

Background Dislocation of both ends of the clavicle is a rare traumatic lesion and the mechanism of the lesion is usually related to major trauma. The first case was described in 1831.

Case Description We present the oldest referenced case of this alteration. The skeleton studied belonged to an old woman buried inside the Sant Pere de Madrona Church in Berga (Barcelona/Spain) and its dating indicated it corresponded to the end of the 17th century. There was a

pseudarthrosis between the clavicle and coracoid ligament; when the bones were reconstructed by pseudarthrosis both ends of the clavicle appeared dislocated.

Literature Review Bipolar dislocation of both ends of the clavicle, or “floating-clavicle”, is a rare injury. Since 1831 when this type of injury was first reported, approximately 40 cases have been published. No archaeological case has been published.

Clinical Relevance Despite experiencing bipolar dislocation of both ends of the clavicle, or floating-clavicle, it is possible to have acceptable function of the arm as suggested by the anthropologic parameters analyzed here. The head of the humerus of the affected shoulder shows no abnormalities and the contralateral glenoid cavity shows severe osteochondritis of the anteroinferior side.

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Introduction

Bipolar dislocation of both ends of the clavicle, or floating-clavicle, is a rare injury. It was first described by Porral in 1831 [24]. Almost a century later, Beckman [4] reported 15 cases and carefully reviewed the prior cases. One hundred fifty years later in 1982, a new case was published [15]. Although road-traffic and sports injuries have

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increased the frequency of this injury, most reports have been based on single cases [1, 2, 5, 7, 8, 11, 12, 17, 27]. Only five studies presented multiple cases (four cases published by Rockwood [25] in 1984, six cases by Sanders et al. [26] in 1990, two cases by Le Huec et al. [18] in 1998, three cases by Dieme et al. [10] in 2007, and two cases by Schemitsch et al. in 2011 [28]).

Before the study by Porral [24], there were no references of this kind of lesion. There are no archaeological cases of this lesion described in paleopathologic literature, perhaps owing to the complexity of producing simultaneous dislocation of both acromioclavicular and sternoclavicular joints and the difficulty of finding evidence of dislocation in skeletal remains. We present a case in which the most probable diagnosis is a floating-clavicle injury. The skeleton of this individual was recovered from inside the Romanesque Church of Sant Pere de Madrona, near Berga, Spain. In the same place, anthropologists recovered skeletal remains from a total of 63 individuals. Historical and parish registers indicate they were buried at the end of 17th century [13, 14].

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The analyzed skeleton (Fig. 1) is that of an approximately 60-year-old woman (SPM'07 UE 78) buried beneath the

Fig. 1 The altered position of the articulation of the right shoulder is seen in this in situ photograph of our subject. The clavicle is seen by its lower face showing the area of the new joint.

church [20]. There was a new joint of the right coracoid process (Fig. 2) that articulated with the posterior side of the clavicle (Fig. 3); the dimensions of the pseudarthrosis were 3.2 cm in length $\times$ 2.6 cm in width $\times$ 1.1 cm in height. There were osteophytes and narrowing of the diaphysis from the anteroinferior side of the middle third of the right clavicle (Fig. 4). Eburnation was produced in the area of the new joint at the inferior side of the clavicle and the uppermost side of the coracoid process (Fig. 5) where apposition of the cortical bone shows a smooth and shiny aspect. After assembling the clavicle and scapula on the basis of the new coracoclavicular joint (pseudarthrosis), macroscopic or radiographic evaluation showed the external end of the clavicle was located in front of the acromion. The ends of the right clavicle (sternal and acromial) were smaller and had more rounded morphologic changes than

Fig. 2 There was a pseudarthrosis between the right coracoid that articulated with the clavicle.

Fig. 3 Reconstruction of the shoulder articulation shows the pseudarthrosis between the coracoid process and the clavicle. The clavicular and acromial ends do not touch.

Fig. 4 The right clavicle shows eburnation and osteophytes at the anteroinferior side of the middle third of the clavicle.

Fig. 5 The new joint is between the clavicle and coracoid process where eburnation in the coracoids can be observed.

Fig. 6A–B (A) Frontal and (B) lateral images of the pseudarthrosis between the right coracoid and clavicle are shown.

the left clavicle. These patterns in the acromial end were presumed attributable to a chronic acromioclavicular disruption. Radiographic analysis from the dry bone shows loose cancellous bone and the appearance of sclerotic bone (Figs. 6A–B).

In addition, the individual had an os acromiale in the left scapula (Fig. 7) and severe degenerative disease in the cervical spine, specifically in the posterior joints of C4 and C5, affecting only the right side (Fig. 8).

Fig. 7 The left scapula had an unfused os acromiale.

Fig. 8 The C4 and C5 vertebrae show severe degenerative alteration in the right facet joints. The C5 vertebra is partially destroyed by the action of fungi.

Discussion

The features observed in the right clavicle and scapula are compatible with a bipolar dislocation of the clavicle. The clavicle normally has little inherent stability owing to the lack of congruence of its joint surfaces and stability is provided by the joint capsules, muscle attachments, and intrinsic ligaments [21]. The lesion we describe was produced long before the woman's death, since it formed a neoarticulation between the lower margin of the clavicle and the upper margin of the coracoid process, forming a synchondrosis. The acromion ossification centers appear between the 15th and 16th years and fusion usually is complete by the 25th year [23]. The incidence of os acromiale ranges from 1.4% to 8% [19] and is bilateral in as much as 62% of cases [16]. Overuse reportedly retards or prevents fusion of this apophysis [6]. Because our subject was older than 60 years, the presence of a contralateral

acromiale (MSA/MTA type) [22] bone suggests to us the injury occurred during the period of growth, the patient compensated for the injury with use of the left arm, and overuse of the left arm did not permit fusion to the rest of the acromion. Furthermore, unilateral osteoarthritis of the right facet of the cervical vertebrae might be attributable to a postural change or an antalgic posture secondary to the clavicular dislocation.

Although in a few cases the floating clavicles were atraumatic [3], dislocation of both ends of the clavicle is usually a result of major trauma acting through an indirect mechanism like a violent blow on the lateral face of the shoulder or heavy compression (squeezing) with some kind of torsion of the trunk [9, 15]. The mechanism of the lesion presumably is based on an initial anterior subluxation of the sternoclavicular joint followed by subsequent posterior subluxation of the acromioclavicular joint [8]. The conoid and trapezoid ligaments may be preserved [8]. This lesion is more easily produced if it is associated with congenital joint laxity, although in some cases the dislocation is attributable to minor trauma [4, 7, 12, 17].

Although the function of the right upper limb for our subject would be speculative, according to Rockwood [25], who studied four patients who had clavicle dislocation, all patients functioned well after nonsurgical treatment.

References

1. Arenas AJ, Pampliega T, Iglesias J. Surgical management of bipolar clavicular dislocation. *Acta Orthop Belg.* 1993;59:202–205.
2. Argintar E, Holzman M, Gunther S. Bipolar clavicular dislocation. *Orthopedics.* 2011;34:e316–319.
3. Attarian DE. Atraumatic floating clavicle and total claviclectomy. *J South Orthop Assoc.* 1999;8:293–296.
4. Beckman T. A case of simultaneous luxation of both ends of the clavicle. *Acta Chir Scandinavica.* 1924;56:156–163.
5. Benabdallah O. [Bipolar luxation of the clavicle: apropos of a case] [in French]. *Rev Chir Orthop Reparatrice Appar Mot.* 1991;77:263–266.
6. Capasso L, Kennedy KA, Wilczak CA. *Atlas of Occupational Markers of Human Remains.* Teramo, Italy: Edigrafital SPA; 1998.
7. Caranfil R. [Bipolar luxation of the clavicle: a case report] [in French]. *Acta Orthop Belg.* 1999;65:102–104.
8. Cook F, Horowitz M. Bipolar clavicular dislocation: report of a case. *J Bone Joint Surg Am.* 1987;69:145–147.
9. De Palma AF. *Surgery of the Shoulder.* Philadelphia, PA: WB Saunders; 1972.
10. Dieme C, Bouso A, Sane A, Sane JC, Niane M, Ndiaye A, Sy MH, Seye S. [Bipolar dislocation of the clavicle or floating clavicle: a report of 3 cases] [in French]. *Chir Main.* 2007;26:113–116.
11. Echo BS, Donati RB, Powell CE. Bipolar clavicular dislocation treated surgically: a case report. *J Bone Joint Surg Am.* 1988;70:1251–1253.
12. Eni-Olotu DO, Hobbs NJ. Floating clavicle: simultaneous dislocation of both end of the clavicle. *Injury.* 1997;28:319–320.
13. Fierro Macía J. [Archaeological research of the monument: the castle and the church] [in Catalan]. *L'Erol: revista cultural del Berguedà.* 2010;104:14–20.
14. Galí Farré D, Ventura Sellés A. [The site of Madrona through documents. Castle, parishioners and farmhouses] [in Catalan]. *L'Erol: revista cultural del Berguedà.* 2010;104:21–29.
15. Gearen PF, Petty W. Panclavicular dislocation: report of a case. *J Bone Joint Surg Am.* 1982;64:454–455.
16. Kohler A. *Roentgentology: The Borderlands of the Normal and Early Pathological in the Skiagram.*, Translated and edited by Arthur Turnbull. Ed 5. New York, NY: William Wood; 1928.
17. Jain AS. Traumatic floating clavicle: a case report. *J Bone Joint Surg Br.* 1984;66:560–561.
18. Le Huec JC, Mc Bride JT, Ligois F, Lesprit E, A. Le Rebeller. Bipolar lesion of the clavicle: report of two cases. *Eur J Orthop Surg Tr.* 1998;8:85–87.
19. Liberson F. Os acromiale: a contested anomaly. *J Bone Joint Surg Am.* 1937;19:683–689.
20. Liria J, Carrascal S, Laguillo O, Núñez A, Fadrique T, Malgosa A. [The burials from Sant Pere de Madrona church: anthropological study] [in Catalan]. *L'Erol: revista cultural del Berguedà.* 2010;104:30–32.
21. Ljunggren AE. Clavicular function. *Acta Orthop Scand.* 1979;50:261–268.
22. Mudge MK, Wood VE, Frykman GK. Rotator cuff tears associated with os acromiale. *J Bone Joint Surg Am.* 1984;66:427–429.
23. Neumann W. [About “Os acromiale”] [in German]. *Fortschr Geb Röntgenstr.* 1918;25:180–191.
24. Porral A. [Observation of a double dislocation of the right clavicle] [in French]. *J Uni Hebd Med Chir Prat.* 1831;2:78–82.
25. Rockwood CA. Fractures and dislocations of the shoulder: Part II. Subluxations and dislocations about the shoulder. In Rockwood CA, Green DP, eds. *Fractures in Adults.* Vol 1, Ed 2. Philadelphia, PA: JB Lippincott; 1984:722–985.
26. Sanders JO, Lyons FA, Rockwood CA Jr. Management of dislocations of both ends of the clavicle. *J Bone Joint Surg Am.* 1990;72:399–402.
27. Scapinelli R. Bipolar dislocation of the clavicle: 3D CT imaging and delayed surgical correction of a case. *Arch Orthop Trauma Surg.* 2004;124:421–424.
28. Schemitsch LA, Schemitsch EH, McKee MD. Bipolar clavicle injury: posterior dislocation of the acromioclavicular joint with anterior dislocation of the sternoclavicular joint. A report of two cases. *J Shoulder Elbow Surg.* 2011;20:e18–22.