Segmental clavicle fracture and acromio-clavicular joint disruption: an unusual case report

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Abstract

Clavicle fractures are common, accounting for 2.6% of all adult fractures. We describe a most unusual segmental fracture pattern of the clavicle with concurrent disruption of acromioclavicular (AC) joint. We were unable to find any publications or reports describing this fracture pattern. During surgery for a medial one-third shaft of clavicle fracture and AC joint dislocation, the medial clavicle was exposed, leading to the discovery (on table) of a previously unidentified additional undisplaced fracture of the medial clavicle cleaving the bone into three distinct fragments. An anatomical plate was successfully applied, fixing both fractures. The AC joint was then reduced with a hook plate. At 8 months, after removal of the hook plate, the patient has an excellent outcome with an Oxford Shoulder Score of 45/48 and a full range of movement without instability of the AC joint. We describe the operative management of this rare fracture pattern. This also highlights that segmental fractures of the clavicle are easily missed. It was successfully treated with a medial anatomic plate and lateral hook plate. We were unable to find any publications or reports describing the fracture pattern in this case.

Keywords

Acromioclavicular joint dislocation, clavicle fracture, segmental fracture

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Introduction

Clavicle fractures are common, accounting for 2.6% of all fractures in adults and 10% to 15% in children.¹ They are commonest in young males often resulting from sporting injury or road traffic collisions. The most common mechanism of injury is a direct force to the clavicle or a fall onto the outstretched arm.^{2,3}

We describe a most unusual segmental fracture pattern of the clavicle with concurrent disruption of acromioclavicular (AC) joint not previously known by ourselves. It was successfully treated with a medial anatomic plate and lateral hook plate. Rare case reports have been published of AC joint dislocations with ipsilateral mid-shaft clavicle fractures, including a series of four cases with a range of management and good outcomes.^{4–7} We found one case report of a segmental clavicle fracture with sternoclavicular joint disruption.⁸ We were unable to find any publications or reports describing the fracture pattern in this case.

Case report

A 40-year-old male sustained an isolated injury to his left shoulder after a fall from a motorcycle during a track race, landing on his left side. Of note, he also suffers from Poland syndrome, which, among other things, leaves him with agenesis of the left chest breast tissue, including pectoralis major muscle. On examination, there was significant bruising over the left shoulder and tenderness over the entire clavicle, including the AC joint, with a palpable AC joint deformity. Radiographs (see Figure 1) showed an

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Figure 1. Initial shoulder x-ray showing ACJ disruption with associated clavicle fracture. (note the medial fracture is not seen).

Figure 2. Illustration demonstrating the pattern of a segmental clavicle fracture with and ACJ dislocation.

unusual pattern composing of a mid-shaft fracture of the clavicle with disruption of the AC joint.

After discussion with the patient, written consent was obtained for surgical treatment of the injury, which was undertaken within 5 days.

The patient was given a general anaesthetic and surgery was performed in a supine position, slightly sitting up. A direct exposure of the clavicle was undertaken in its medial half where the displaced, off-ended fracture ends were palpable between the medial one-third and the mid one-third. The shaft fracture was reduced; at this point, an additional undisplaced hairline fracture of the medial end of the clavicle was discovered, potentially cleaving the bone into three distinct fragments as depicted in Figure 2. The original intention had been to treat this injury with a standard contoured clavicular plate and additional reconstruction of the coracoclavicular ligaments. However, under anaesthesia, it was

Figure 3. Post fixation x-ray showing hook plate and medial clavicle plate.

evident that the distance between the clavicle fractures and the AC joint disruption and the medialization of the fracture parts meant that these areas could be addressed independently. An anatomical clavicle plate was applied across the two clavicular fracture lines providing stability. The AC joint was then exposed laterally. Here, there was disruption to the coracoclavicular ligaments and of the capsule of the AC joint with involution making the joint irreducible. The capsule was therefore retrieved from the joint and a six-hole hook plate was applied to provide and maintain reduction. Figure 3 shows the post operative radiograph demonstrating the final fixation achieved.

Postoperatively, the arm was supported in a polysling, with the patient instructed to perform regular hand and elbow exercises, as well as gentle pendular exercises of the shoulder for a period of 6 weeks.

When seen at 6 weeks, the patient was doing well but was starting to develop some stiffness of the shoulder. At 10 weeks, the patient was experiencing no particular shoulder symptoms and, overall, he was already happy with the outcome. However, stiffness remained, with 80° of elevation, 10° of external rotation and glenohumeral abduction of 60°. Therefore, at the time of planned removal of the hook plate at 4 months, manipulation under anesthesia was undertaken, achieving 160° of elevation, glenohumeral abduction of 90° and external rotation to 60°.

At 8 months after his initial surgery, the patient has had an excellent outcome with an Oxford Shoulder Score of 45/48 and with a full clinical range of movement without instability of the AC joint. He has no restrictions in his work or hobbies, even returning to motorcycle riding.

Discussion

Clavicle fractures are common, comprising 2.6% of all adult fractures.¹ The segmental clavicle fracture is an uncommon pattern, with one study showing 0.8% of

clavicle fractures to be segmental.⁹ We did not find any reports of segmental midshaft and medial clavicle fractures with associated AC joint disruption.

The patient describes landing directly onto his head and left shoulder with significant force. It is at this point that we hypothesize the disruption of the ACJ to have occurred because this is a well described mechanism.⁷ The second stage of the injury occurs with the force now in line with the long axis of the clavicle on the lateral dislocated end, with the patients' body rolled over the left shoulder increasing the force through the long axis of the clavicle, causing the medial segmental fractures of the clavicle to occur as the direction of force changes with the body rolling over the shoulder, creating the two separate fractures. We recognize this to be in contradiction with the proposed mechanism described by Celenza et al.⁶ Our rationale for this discrepancy is based upon the mechanism as described by the patient and the hypothesis that the highest force will have caused the most displacement. Therefore, the most medical undisplaced fracture occurred last in the sequence.

The management of segmental fractures has little guidance in the literature, with some reports of successful operative^{7,10,11} and non-operative management.^{6,8,12} In this report, we describe one possible method for the operative management of this rare fracture pattern, which has resulted in an excellent outcome for this patient. As previously highlighted in the literature^{1,7,9-12}, the present case also shows that segmental fractures of the clavicle are easily missed. Examination in retrospect can raise suspicion but medial symptoms in the presence of another fracture can make clinical diagnosis difficult. Imaging of the medial clavicle can be difficult and computed tomography may prove helpful in those cases where a medial fracture is suspected.¹³

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References

1. Postacchini F, Gumina S, De Santis P and Albo F. Epidemiology of clavicle fractures. *J Shoulder Elbow Surg* 2002; 11: 452–6.
2. Robinson CM. Fractures of the clavicle in the adult. *J Bone Joint Surg Br* 1998; 80: 476–84.
3. Stanley D, Trowbridge EA and Norris SH. The mechanism of clavicular fracture. A clinical and biomechanical analysis. *J Bone Joint Surg Br* 1988; 70: 461–4.
4. Daolagupu AD, Gogoi PJ and Mudiganty S. A rare case of segmental clavicle fracture in an adolescent. *Case Rep Orthop* 2013; 2013: 248159.
5. Psarakis SA, Savvidou OD, Voyaki SM, Beltsios M and Kouvaras JN. A rare injury of ipsilateral mid-third clavicle fracture with acromioclavicular joint dislocation. *Hand (NY)* 2011; 6: 228–32.
6. Celenza M, Bertini G, De Tullio V, Guagnini M and Sarda G. A case of a fracture of the clavicle associated with an acromio-clavicular luxation. *Minerva Med* 1990; 81 (Suppl 7–8): 127–9.
7. Wurtz LD, Lyons FA and Rockwood CA Jr. Fracture of the middle third of the clavicle and dislocation of the acromioclavicular joint. A report of four cases. *J Bone Joint Surg Am* 1992; 74: 133–7.
8. Pang KP, Yung SW, Lee TS and Pang CE. Bipolar clavicular injury. *Med J Malaysia* 2003; 58: 621–4.
9. Throckmorton T and Kuhn JE. Fractures of the medial end of the clavicle. *J Should Elbow Surg Am* 2007; 16: 49–54.
10. Heywood R and Clasper J. An unusual case of segmental clavicle fracture. *J Royal Army Med Corps* 2005; 151: 93–4.
11. Miller D, Smith KD and McClelland D. Bipolar segmental clavicle fracture. *Eur J Orthop Surg Traumatol* 2009; 19: 337–9.
12. Sethi K, Newman S and Bhattacharya R. An unusual case of bipolar segmental clavicle fracture. *Orthop Rev (Pavia)* 2012; 4: e26.
13. Khan K, Bradnock TJ, Scott C and Robinson CM. Current concepts review. Fractures of the clavicle. *J Bone Joint Surg Am* 2009; 91: 447–60.