Int J Clin Exp Med 2017;10(2):3817-3822
www.ijcem.com /ISSN:1940-5901/IJCEM0036367

Case Report

Acromioclavicular joint dislocation associated with fracture of the ipsilateral acromial base: a case report and review of the literature

Chengxue Wang, Baochang Qi, Lei Tan, Haipeng Zhang, Yulong Huang, Dong Zhu, Tiecheng Yu

Department of Orthopedics, First Norman Bethune Hospital of Jilin University, Changchun 130021, China

Received July 21, 2016; Accepted October 31, 2016; Epub February 15, 2017; Published February 28, 2017

Abstract: Acromial fracture associated with ipsilateral acromioclavicular (AC) joint dislocation is rare in adults and has not been reported previously. A 42-year-old woman presented to the emergency department and was diagnosed with a type III acromial fracture on initial radiographic assessment. Open reduction internal fixation was selected and performed immediately based on the diagnosis. However, the postoperative X-rays revealed AC joint dislocation (type III) that was not apparent on the initial assessment. The pattern of injury involved disruption of the AC and coracoclavicular ligament complex. The decision to re-operate was made based on these findings, and the dislocation was reduced and fixed. Acromial base fractures may make it difficult to accurately diagnose concomitant dislocations. The findings underline the importance of careful evaluation of X-rays and suggest the use of additional imaging in cases of doubt. We also review the literature and important aspects in the management of such cases.

Keywords: Acromioclavicular joint, coracoclavicular joint, dislocation, fracture, acromial base

Introduction

Acromial fractures are rare injuries that usually result from a direct blow to the acromion or from violent upward displacement of the humeral head and account for 8% of all scapular fractures [1]. An acromial fracture can also occur following minor trauma as a complication of reverse total shoulder arthroplasty [2, 3], arthroscopic sub-acromial decompression [4] or in the presence of rotator cuff tear arthropathy [5]. Although acromioclavicular (AC) joint dislocation is a common injury, the combination of AC joint dislocation with an acromial fracture is very rare and almost always a result of very high-energy trauma. To our knowledge, [6-11] no cases of acromial fracture associated with ipsilateral AC joint dislocation in an adult have been reported previously. This report describes an unusual case to highlight the importance of recognizing these injuries in an emergency setting during the initial assessment. Identification of such injuries is necessary to prevent the need for a second surgery and achieve an optimal functional outcome (**Table 1**).

Case report

A 42-year-old woman presented to the emergency department of our hospital 12 h after a fall from a tractor (4 m high), which caused her to lose consciousness (**Table 2**). On gaining consciousness, she noticed swelling and pain around her left shoulder and was unable to move the left shoulder. She had no history of previous injury to the left shoulder, and no history to suggest a metabolic bone disorder. Clinical examination showed her vital signs were normal, and evaluation of the head, neck chest, abdomen, and spine was normal. Local examination revealed swelling with localized tenderness over the spine of the left scapula. Considerable functional limitation with a painful passive restricted range of motion in the left shoulder was noted. She was unable to internally and externally rotate and elevate the left shoulder due to pain. The neurovascular examination was normal. Radiography revealed a displaced linear fracture at the base of the acromion, extending into the spine of the scapula with mild widening along the coracoclavicular distance (**Figure 1**).

Table 1. Mechanisms and management of acromial fractures and/or AC joint dislocations

	Cause of injury	Method of treatment
Acromial fractures	A direct blow to the acromion or a complication of arthropathy or reverse total shoulder arthroplasty [1-5, 22]	Internal fixation or nonoperative treatment [1-5, 22]
AC joint dislocation	A medial directed force to the lateral shoulder [6-21, 23, 24]	Internal fixation or nonoperative treatment [6-21, 23, 24]
Acromial fractures & ipsilateral AC joint dislocation	A medial and posterior directed force to the lateral shoulder in this case	Internal fixation in this case

Table 2. Basic information of the patient

Age (years)	Gender	Time to fix acromial fracture	Time to reduce AC dislocation	Time to remove internal fixator	Time of last follow-up
42	Female	3 days after injury	6 days after injury	1.5 years after operation	2 years after removal of the internal fixator

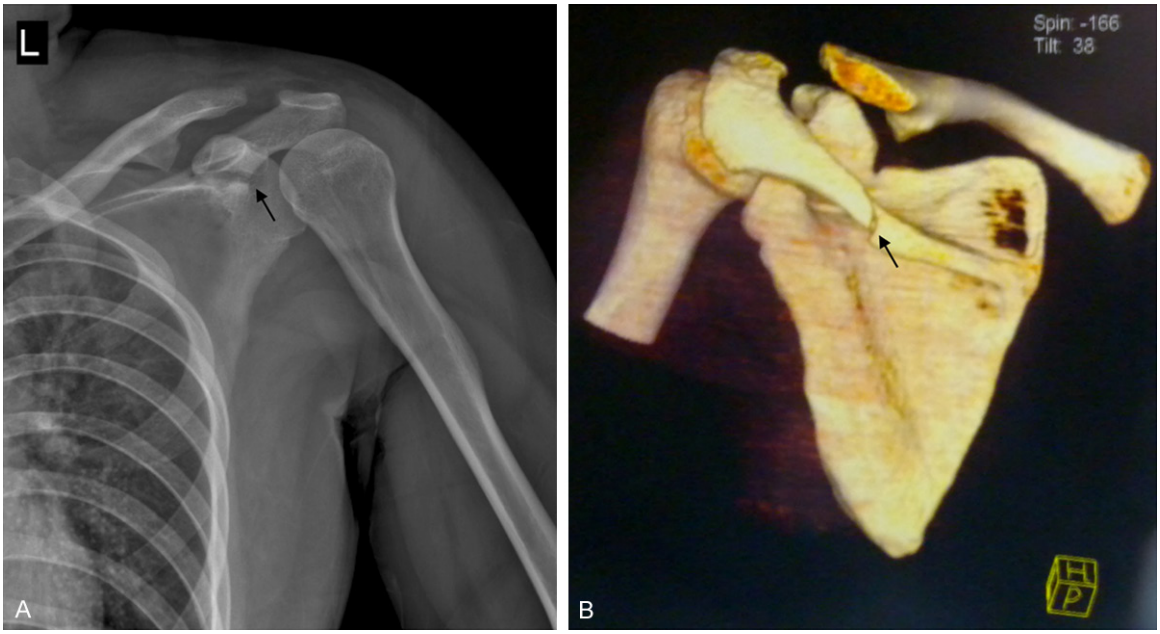

Figure 1. Radiographs taken immediately after injury demonstrate a displaced acromial base fracture as indicated by black arrows (A and B). Also noted was an increased coracoclavicular distance (A). Dislocation of the AC joint could not be observed on these radiographs (A and B).

Three days after the patient's admission to the hospital, open reduction internal fixation (ORIF) of the acromion fracture was performed in the spine of the scapula and the acromion with a pelvic neutralization plate and 3.5-mm cortical screws (**Figure 2**). The postoperative anteroposterior radiograph showed the existence of type III AC dislocation (**Figure 2**). In order to confirm this injury, a computed tomography (CT) scan was obtained, and the images were processed using the 3-dimensional reconstruction software (**Figure 1**). The preoperative and postoperative radiographs along with CT scans and reconstructions were carefully reviewed, and a decision to reoperate in order to stabilize the AC joint was made. The patient was counseled regarding the nature of the injury and the need for a second surgery. With consent from the patient, a second surgery to reduce the AC dislocation with a clavicular hook plate (**Figure 3**) was performed 3 days after the first operation. The patient was discharged on the 7th day with her arm in a sling, and the postoperative course was uneventful.

A structured rehabilitation program for injuries of this nature was followed. The regimen of active shoulder motion exercise was started

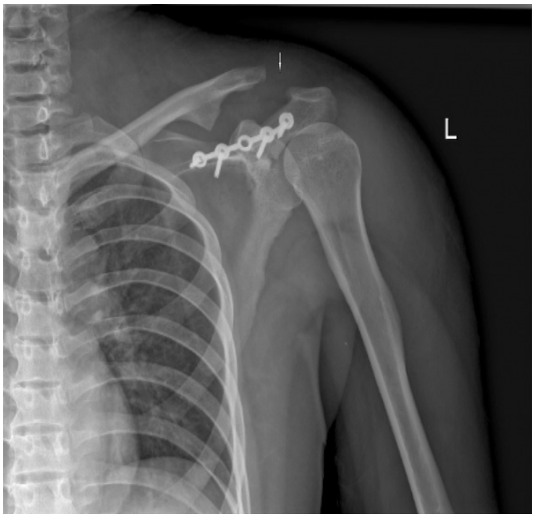

Figure 2. Anteroposterior (AP) radiograph taken on day 1 postoperation revealed a stable fixed acromial fracture. However, after stabilization, an AC dislocation was clearly visible with an increased coracoclavicular distance (indicated by white arrow).

after 3 weeks, and 2 months later the patient resumed nearly full activity without pain or discomfort. Radiographs taken 3 months postoperatively showed that the acromial fracture had healed and the AC joint remained congruent and well reduced. By the 6-month follow-up evaluation, the patient had returned to work. The internal fixator was removed 1.5 years after the operation. The patient was evaluated again 2 years after the operation in which the internal fixator was removed, and she showed normal shoulder function without pain (**Figure 4**). We obtained written informed consent for publication from the patient.

Discussion

AC joint separation is much more common than fractures of the acromion [6, 12-15]. AC dislocation usually results from a direct blow or fall on the shoulder [15, 16]. During the process, the AC ligaments are torn first, and the deltoid and trapezius muscle attachments rupture next. Disruption of the coracoclavicular (CC) ligaments completes the injury, resulting in dislocation of the AC joint (**Table 1**). It is very rare for the acromion to be broken along with this injury [16]. In the reported case, the injury may have been a result of direct impact and force dissipation secondary to a fall that caused a direct blow while the arm was in an adducted position, impacting the AC joint. The force vector would have led to the complete rupture of the AC capsule and CC ligaments as well as fracture of the acromial base. This injury involved double disruptions of the superior shoulder suspensory complex (SSSC). The SSSC, which was originally described by Goss in 1993, [17] is an extremely important structure at the superior aspect of the shoulder that maintains the stable relationship between the upper extremity and the axial skeleton. The SSSC is a ring of bone and soft tissues composed of the glenoid, coracoid, acromion, distal clavicle, and connecting ligaments. Isolated, single traumatic disruptions, such as acromion fracture, AC joint separation, or disruption of the CC ligaments, are common and do not significantly change the stability of the ring. However, double disruption of the SSSC leads to instability of the construct and usually requires operative treatment. Floating shoulder, which was introduced by Herscovici in 1992 [18] and defined as ipsilateral fractures of the clavicular shaft and the scapular neck, is a common injury. However, triple disruption of the SSSC is extremely rare and is encountered in high-energy trauma cases. Kim et al. reported a triple lesion involving the coracoid, acromial fracture, and AC joint separation in 2012, [19] and our case seems very similar to theirs. Overall, the number of reports discussing disruptions of the SSSC is increasing.

Acromial fractures even in isolation are relatively rare. Generally, within the larger category of scapular fractures, they account for only 1% of all fractures reported, and most occur as the result of high-speed trauma such as that experienced in motor vehicle accidents [20]. The classification of acromial fractures proposed by Kuhn et al. is helpful in determining the treatment [5, 21, 22]. Type I acromion fractures are nondisplaced and include type IA (avulsion) and type IB (complete fracture). Type II acromion fractures are displaced but do not reduce the subacromial space, whereas type III acromion fractures cause a reduction in the subacromial space [21]. From 3-dimensional CT examination and reconstruction, we found that the acromial fracture in this case, which had caused a reduction in the subacromial space (**Figure 1**), could be classified as a type III fracture. Thus, in accordance with the guidelines for such fractures, an operation to fix the acromial fracture

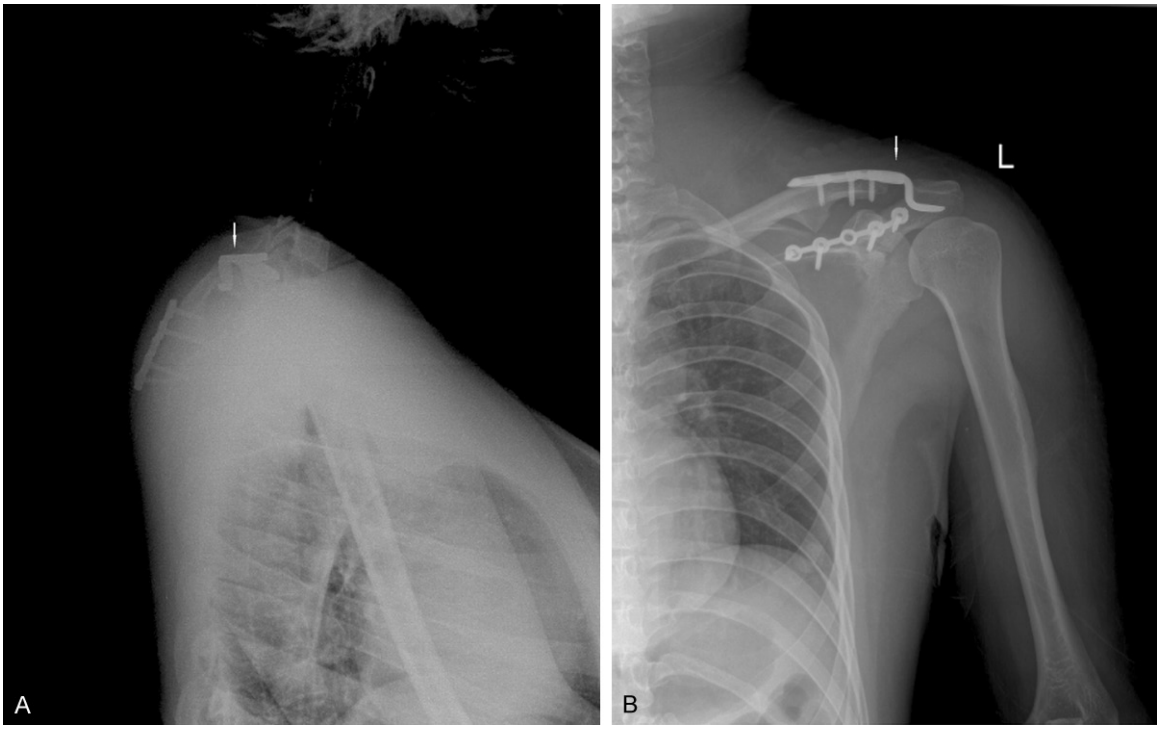

Figure 3. AP (A) and lateral (B) radiographs taken after the second surgery revealed a well-reduced AC joint. The dislocation of the AC joint was reduced as indicated by the white arrows.

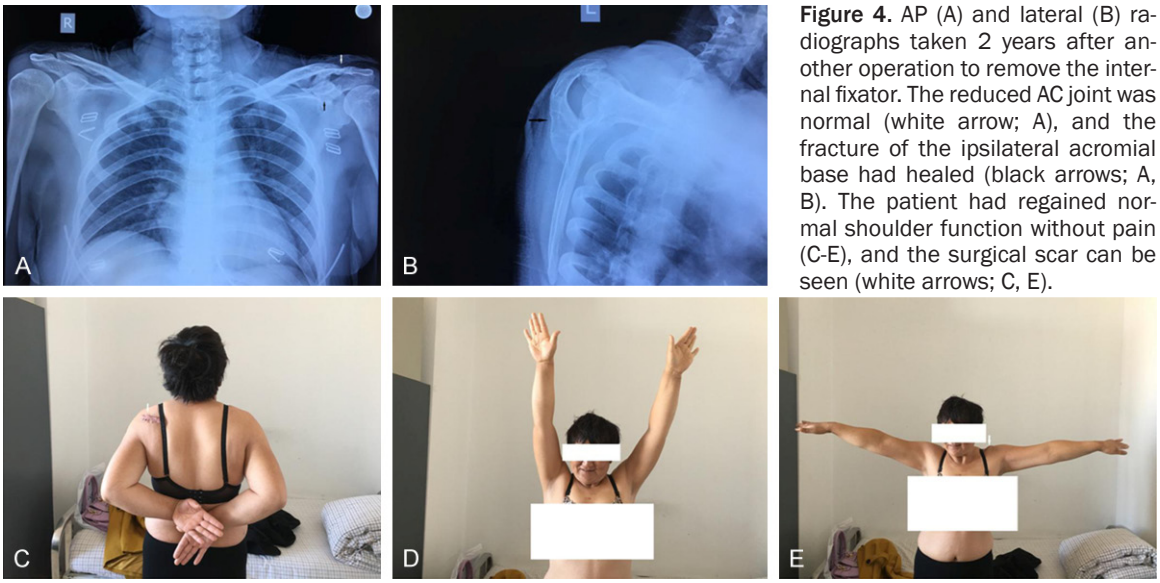

Figure 4. AP (A) and lateral (B) radiographs taken 2 years after another operation to remove the internal fixator. The reduced AC joint was normal (white arrow; A), and the fracture of the ipsilateral acromial base had healed (black arrows; A, B). The patient had regained normal shoulder function without pain (C-E), and the surgical scar can be seen (white arrows; C, E).

with a pelvic neutralization plate and 3.5-mm cortical screws was performed.

AC joint injuries are best classified according to the extent of damage inflicted by a given force. Injuries to the AC joint have been classified as type I (the AC capsule is sprained and CC ligaments remain intact); type II (the AC capsule is ruptured and CC ligaments are sprained but not torn); type III injuries (the AC capsule and CC ligaments are completely ruptured); type IV (the distal end of the clavicle is posteriorly dislocated, the AC capsule and CC ligaments are completely torn, and the deltoid and trapezius muscles are detached); type V (the distal clavicle is stripped of all its soft tissue attachments, the

AC capsule and CC ligaments are completely torn, and the deltoid and trapezius muscles are detached); and type VI (the distal clavicle is inferiorly dislocated, the AC capsule and CC ligaments are completely torn, and the deltoid and trapezius muscles are detached) [23]. The AC dislocation in this case was categorized as type III because the AC capsule and CC ligaments were completely ruptured. Patients with a type III injury have a distal clavicle that is unstable both horizontally and vertically with up to 100% translation relative to the acromion. It is suggested that a young age with high functional demands is a relative indication for operative treatment of acute type III AC dislocation, although no definitive evidence exists in the literature to support this as an absolute indication for surgery [24]. In the present case, we decided to proceed with the surgery after a team discussion and in accordance with the wishes of the patient regarding the functional outcome.

The simultaneous occurrence of AC joint dislocation and ipsilateral acromial base fracture is a rare occurrence, and hence, is reported in this case report. The fracture of the ipsilateral acromial base made it difficult to judge the degree of AC joint dislocation, and thus, the AC joint dislocation was missed on initial assessment and radiographic review. After fixation of the acromial fracture, postoperative radiographs clearly showed that the patient suffered from a simultaneous dislocation of the ipsilateral AC joint. This case highlights the importance of careful preoperative assessment and further investigation in case of doubt when an acromial fracture following high-energy trauma is seen in the emergency setting. Optimal management of these patients involves both fixation of the fracture and stabilization of the AC joint.

Conclusion

The force vector, which can cause fracture of the acromial base, might have led to the complete rupture of the AC capsule and CC ligaments as well. Therefore, when an acromial fracture following high-energy trauma is seen in the emergency setting, careful preoperative assessment and further investigation of the ipsilateral AC capsule and CC ligaments should be carried out.

Acknowledgements

This study was supported by grants from the National Natural Science Foundation of China (Grant No. 81172183 and 31470932) to Tiecheng Yu.

Disclosure of conflict of interest

None.

Address correspondence to: Dr. Tiecheng Yu, Department of Orthopedics, First Norman Bethune Hospital of Jilin University, NO. 71 Xinmin Avenue, Changchun 130021, China. Tel: +8643185098981; Fax: +8643185654528; E-mail: tiechengyu@163.com

References

[1] McGahan JP, Rab GT and Dublin A. Fractures of the scapula. J Trauma 1980; 20: 880-883.

[2] Mayne IP, Bell SN, Wright W, Coghlan JA. Acromial and scapular spine fractures after reverse total shoulder arthroplasty. Shoulder Elbow. 2016; 8: 90-100.

[3] Wahlquist TC, Hunt AF, Braman JP. Acromial base fractures after reverse total shoulder arthroplasty: report of five cases. J Shoulder Elbow Surg 2011; 20: 1178-83.

[4] Matthews LS, Burkhead WZ, Gordon S, Racanelli J and Ruland L. Acromial fracture: a complication of arthroscopic subacromial decompression. J Shoulder Elbow Surg 1994; 3: 256-261.

[5] Dennis DA, Ferlic DC and Clayton ML. Acromial stress fractures associated with cuff-tear arthropathy. A report of three cases. J Bone Joint Surg Am 1986; 68: 937-940.

[6] 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 (N Y) 2011; 6: 228-232.

[7] Kovilazhikathu Sugathan H and Dodenhoff RM. Management of type 3 acromioclavicular joint dislocation: comparison of long-term functional results of two operative methods. ISRN Surg 2012; 2012: 580504.

[8] Nemec U, Oberleitner G, Nemec SF, Gruber M, Weber M, Czerny C and Krestan CR. MRI versus radiography of acromioclavicular joint dislocation. AJR Am J Roentgenol 2011; 197: 968-973.

[9] 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: 133-137.

[10] Jiang C, Wang M and Rong G. Proximally based conjoined tendon transfer for coracoclavicular reconstruction in the treatment of acromioclavicular dislocation. Surgical technique. J Bone Joint Surg Am 2008; 90 Suppl 2 Pt 2: 299-308.
[11] Jiang C, Wang M and Rong G. Proximally based conjoined tendon transfer for coracoclavicular reconstruction in the treatment of acromioclavicular dislocation. J Bone Joint Surg Am 2007; 89: 2408-2412.
[12] Beris A, Lykissas M, Kostas-Agnantis I, Vekris M, Mitsionis G and Korompilias A. Management of acute acromioclavicular joint dislocation with a double-button fixation system. Injury 2013; 44: 288-292.
[13] Rask MR and Steinberg LH. Fracture of the acromion caused by muscle forces. A case report. J Bone Joint Surg Am 1978; 60: 1146-1147.
[14] Hall RJ and Calvert PT. Stress fracture of the acromion: an unusual mechanism and review of the literature. J Bone Joint Surg Br 1995; 77: 153-154.
[15] Li X, Ma R, Bedi A, Dines DM, Altchek DW and Dines JS. Management of acromioclavicular joint injuries. J Bone Joint Surg Am 2014; 96: 73-84.
[16] Bahk MS, Kuhn JE, Galatz LM, Connor PM and Williams GR Jr. Acromioclavicular and sternoclavicular injuries and clavicular, glenoid, and scapular fractures. J Bone Joint Surg Am 2009; 91: 2492-2510.
[17] Goss TP. Double disruptions of the superior shoulder suspensory complex. J Orthop Trauma 1993; 7: 99-106.
[18] Herscovici D Jr, Fiennes AG, Allgower M and Ruedi TP. The floating shoulder: ipsilateral clavicle and scapular neck fractures. J Bone Joint Surg Br 1992; 74: 362-364.
[19] Kim SH, Chung SW, Kim SH, Shin SH and Lee YH. Triple disruption of the superior shoulder suspensory complex. Int J Shoulder Surg 2012; 6: 67-70.
[20] Walch G, Mottier F, Wall B, Boileau P, Mole D and Favard L. Acromial insufficiency in reverse shoulder arthroplasties. J Shoulder Elbow Surg 2009; 18: 495-502.
[21] Kuhn JE, Blasier RB and Carpenter JE. Fractures of the acromion process: a proposed classification system. J Orthop Trauma 1994; 8: 6-13.
[22] Levy JC, Anderson C and Samson A. Classification of postoperative acromial fractures following reverse shoulder arthroplasty. J Bone Joint Surg Am 2013; 95: e104.
[23] Wu JH, Liao QD, Chen G, Zhong D, Li KH and Li RJ. [Clavicular hook plate in the treatment of dislocation of acromioclavicular joint and fracture of distal clavicle]. Zhong Nan Da Xue Xue Bao Yi Xue Ban 2006; 31: 595-598.
[24] Cook JB and Tokish JM. Surgical management of acromioclavicular dislocations. Clin Sports Med 2014; 33: 721-737.