

Management of floating shoulder: minimum 3 years' experience

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Background

Between February 2000 and April 2009, 23 patients with floating shoulders, that is, double disruption of the superior shoulder suspensory complex underwent internal fixation of both the clavicular and scapular fractures.

Patients and methods

The mean age of the patients was 40 (18–57) years. All patients had associated injuries. We evaluated the clinical results using the Rowe score in 20 available patients after a minimum follow-up of 20 months.

Results

All fractures united, and the average time to union was 12 weeks for clavicular and 10 for scapular fractures. The mean functional result according to the Rowe score was 86.

Conclusion

Surgical treatment for double disruption of the superior shoulder suspensory complex, which is inherently an unstable and rare injury, is a good option, allowing early rehabilitation and improving the functional outcome.

Keywords:

floating shoulder, fracture of the clavicle, fracture of the scapula

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Introduction

Ipsilateral fractures of the clavicle and scapular neck, or floating shoulder injuries, are rare. They result from high-energy trauma and have a high incidence of associated injuries, likely contributing to their underdiagnosis and undertreatment. We evaluated the clinical results using the Rowe score. Understanding the pathologic anatomy and appropriate treatment is important to minimize the sometimes significant morbidity from this injury [1–5]. The superior shoulder suspensory complex (SSSC) is a bony and soft tissue ring comprising the glenoid process, the coracoid process, the coracoclavicular ligaments, the distal clavicle, the acromioclavicular joint, and the acromion. Its integrity is essential to the normal relationship between the upper extremity and the trunk. Floating shoulder creates an unstable situation that may be slow to heal and may have a poor functional outcome [6]. The purpose of this study was to evaluate the outcome of operative treatment in 20 patients with an SSSC injury.

Patients and methods

Twenty-three adult patients presented with floating shoulders at Assiut and South Valley University Hospitals from March 2007 to October 2009. Eighteen were injured in road traffic accidents and five suffered falls from a height. The mean age of the patients was 40 (18–62) years. The male : female ratio was 4 : 1, and

the right : left ratio was 2 : 3. There was a wide variety of associated injuries in all patients: fractures of the ribs were the most common (17), followed by injuries to the pneumothorax (11), spine (eight), extremities (six), and head (two). After the initial assessment, according to ATLS principles, specific radiographic evaluation of the injured shoulder was performed as soon as the patient was in a stable condition. This evaluation requires a minimum of two radiographs of the shoulder area that are perpendicular to each other [7]. Three-dimensional computed tomography reconstruction images may be more beneficial for assessment. Patients underwent operative management at a mean of 10 (5–21) days after injury. In 11 patients who required ventilation for the management of a hemopneumothorax, surgery was delayed for 21 and 24 days. This study approved by the Ethical committee of Assiut University, Cairo, Egypt.

Surgery was performed with the patient in a 'beach chair' position. Osteosynthesis of the clavicle was undertaken using a 3.5-mm small dynamic compression plate (DCP) or reconstruction plate; the patient was then placed in the lateral position with the affected arm free and the fracture fixed with a reconstruction plate through a posterior approach between infraspinatus and teres minor. Patients

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started an active exercise program for 4 weeks after the operation. They were followed up regularly and the mean follow-up was 20 (21–36) months. Evaluation was undertaken using the Rowe scoring system, which includes 50 points for stability, 20 for movement, and 30 for function of the glenohumeral joint. At follow-up the patients were interviewed using a questionnaire to evaluate pain as per the visual analogue scale score [8] as well as about their daily and recreational activities; the patients also underwent follow-up radiography.

Results

The mean follow-up period for 20 patients was 20 months. All fractures united; the mean time to union was 12 weeks for clavicular fractures and 10 for scapular fractures. Rowe's scoring system was used in follow-up evaluation, which revealed 16 patients with an excellent functional result, three with good results, and one with a fair result. The mean score was 86; three patients had pain during daily activities (mean visual analogue scale score 1.7; range 0–6.5). Fourteen returned to their previous occupation, and five were already retired at the time of injury. One patient could not resume recreational activities because of the injury.

The remaining three patients were not available for follow-up because they had either died or were noncooperative.

Discussion

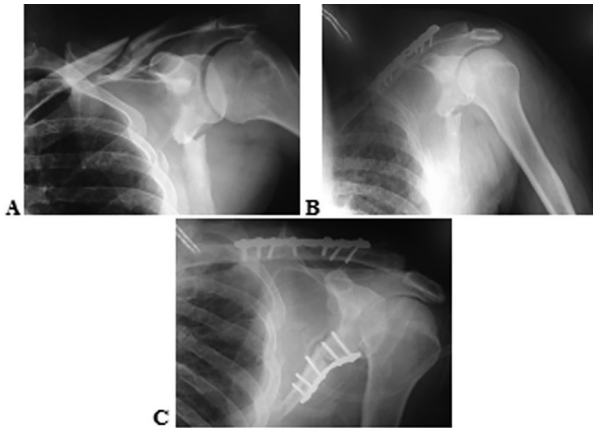
The term floating shoulder was used in 1992 by Herscovici *et al.* [9] to describe their series of ipsilateral fractures of the clavicle and scapular neck. The upper extremity is suspended primarily from the axial skeleton by a bony and ligamentous ring, the SSSC.

The ring consists of the middle and distal clavicle, coracoclavicular and acromioclavicular ligaments, acromion, coracoid process, and glenoid. A double disruption of the SSSC ring results in an unstable construct and is the most accurate description of a floating shoulder [10]. When there is a fracture of both the clavicle and the neck of the scapula, the scapular fracture is unstable. Weight of the arm and the muscles acting on the humerus displaces the glenoid fragment distally and anteromedially [11,12]. Ada and Miller [13] reported a high incidence of rotator cuff dysfunction in patients with displaced clavicular and scapular fractures resulting in loss of the normal lever arm of the rotator cuff, and they recommended that the fractures be treated by open reduction. As with most scapular fractures, ipsilateral fractures of

the clavicle and scapular neck have a high incidence of associated injuries, which may result in underdiagnosis as attention is drawn to more life-threatening injuries [1,13]. These injuries require particular attention as caused by high-energy trauma, as in our study all patients have other associated injuries. The severity of the associated injuries may divert attention from the trauma to the shoulder, with the risk of inappropriate treatment. In our series the assessment of patients with floating shoulders includes evaluation of the injury and evaluation of the whole patient. An emergency physician and often a trauma surgeon, depending on the associated injuries, are usually the first to see these patients. Before 1970, most floating shoulder injuries were treated conservatively [14]. This trend was changed after Ganz and Noseberger [15] noted that scapular fractures associated with an ipsilateral clavicular fracture were displaced more often and more severely than scapular fractures that were not associated with an ipsilateral clavicular fracture. Since then, treatment recommendations for all ipsilateral fractures of the clavicle and scapula, even if minimally displaced, has focused on some form of internal fixation to reduce the risk of scapular fracture displacement. Goss also recommended stabilization of both sides and stated that conservative treatment causes drooping of the shoulder [6,16]. In the study of Goss [10] osteosynthesis of both sides achieved sound union in all patients and excellent functional results in 80%. We concluded that it is important to understand the pathoanatomy of floating shoulder, especially the important role played by the stabilizing ligaments. Stabilization of both fractures even if minimally displaced is recommended in double disruption of the SSSC to allow early rehabilitation, to obtain a good functional outcome.

Constant, *et al.* and Egol, *et al.* were recommended osteosynthesis of the clavicle to prevent malunion of the scapular neck fracture [12,17]. The results of the study of Oh and colleagues showed that two patients out of five who underwent clavicular fixation alone suffered failure of fixation, and in these cases the scapular fracture remained unreduced after clavicular fixation, as shown on an intraoperative radiograph. The failures of fixation were probably either due to inadequate fixation or due to overconcentration of the load on one side of the disruption. The plate fixation was considered stable at the operation, and therefore we assumed that the failure was caused by concentration of the load at the clavicular fracture site, which had failed to reduce and stabilize the second disruption adequately. For this reason stabilization was performed on both clavicular and scapular sides in patients with a displaced scapular fracture, which was not reduced after clavicular osteosynthesis [18] (Figs. 1 and 2).

Figure 1



Anteroposterior radiographs of a 36-year-old man. (a) Fractures of the clavicle and neck of the scapula. (b) After plate fixation of the clavicle. Despite anatomical reduction of the clavicle, the glenoid is incompletely reduced. (c) After plate fixation and anatomical reduction of the fracture of the neck of the scapula.

Conclusion

Ipsilateral fractures of the clavicle and scapular neck, or floating shoulder injuries, are rare. They result from high-energy trauma and have a high incidence of associated injuries, likely contributing to their underdiagnosis and undertreatment. Surgical treatment for double disruption of the SSSC, which is inherently an unstable rare injury is a good option, allowing early rehabilitation and improve the functional outcome.

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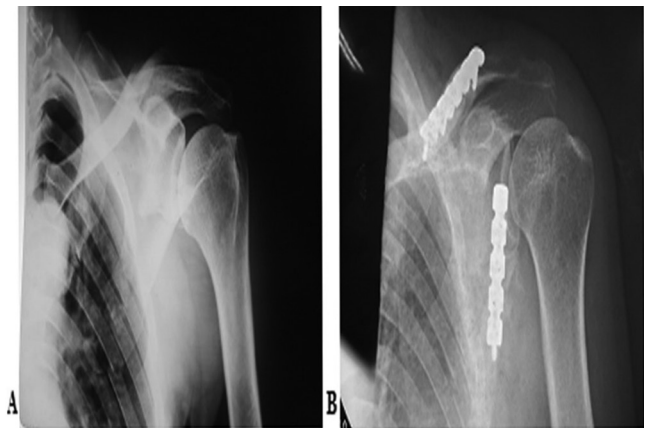
Conflicts of interest

There are no conflicts of interest.

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Figure 2



Anteroposterior radiographs of a 45-year-old man. (a) An ipsilateral fracture of the clavicle and of the neck of the scapula. (b) Two years after treatment of the clavicular and scapular fractures by plate fixation.

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