Double clavicular fractures associated with scapular neck and coracoid process fractures

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ABSTRACT

We report a 38-year-old man with a combination of fractures in his left shoulder involving the middle and distal clavicle, the scapular neck, and the coracoid process, associated with scapulothoracic dissociation and an upper brachial plexus injury. The middle clavicular fracture was fixed with a plate, whereas the distal clavicular fracture was fixed with tension band wiring. Internal fixation for fractures of the scapular neck and coracoid process was not performed, as they were in an acceptable position after fixation of the clavicular fractures. At the 14-month follow-up, the range of motion of the left elbow, the wrist, and all fingers had recovered fully, whereas that of the left shoulder was limited to 35º abduction, 20º flexion, and 20º external rotation. The strength of the left shoulder abduction, flexion, and external rotation was M2. Elbow flexion, wrist extension, and finger extension strength had recovered to normal (M5). Sensation corresponding to the C5-6 dermatome had also improved to almost normal.

Key words: brachial plexus; clavicle; scapula; shoulder

INTRODUCTION

Simultaneous fractures of the mid-clavicle and scapular neck account for 0.1% of all patients with fractures.1 Such fractures are unstable and known as ‘floating shoulder’ and requires surgical treatment.1,2 There are only 3 reports of simultaneous fractures of the proximal epiphysis and mid-clavicle in children.3 Double (middle and distal) clavicular fractures are also rare. Only one case of a combination of the floating shoulder and double clavicular fractures has been reported.4 Fractures of the coracoid process account for 5% of all shoulder fractures.5 Concomitant fractures of the coracoid process and clavicle are even rarer;6 as is scapulothoracic dissociation of the shoulder girdle (displaced fracture of the clavicle and lateral scapular displacement) associated with brachial plexus and/or vascular injuries.7 We present a 38-year-old man with a combination of the floating shoulder, double (middle and distal) clavicular fractures, and fractures of the coracoid process and scapular neck, together
with scapulothoracic dissociation and brachial plexus injury. The mechanism and treatment of this injury are discussed.

CASE REPORT

In August 2010, a 38-year-old man presented with intense swelling and tenderness over the left shoulder and an open wound over the clavicle after falling off his motorcycle. The patient was unable to flex and abduct the shoulder, to flex the elbow, and to extend the wrist and the fingers. Radiography and computed tomography of the left shoulder showed double (middle and distal) clavicular fractures, fractures of the scapular neck and coracoid process, and fractures of the second and third ribs (Fig. 1). Anteroposterior chest radiographs revealed lateral displacement of the scapula, a distracted-fracture of the clavicle, and a left hemopneumothorax (Fig. 2). There was a 15-mm difference between the distances from the medial borders of the 2 scapulae to the thoracic spinous process. Neurologic examination revealed absence of shoulder flexion, abduction, external rotation, elbow flexion, wrist extension, and fingers extension (M0). The lateral shoulder, arm, forearm, and hand (corresponding to C5-6 dermatome) were insensate. Electromyography demonstrated an upper brachial plexus injury. The arteriogram displayed normal vasculature.

Two weeks later, surgical exploration revealed a 2-cm defect of the upper trunk of the brachial plexus (Fig. 3). The right sural nerve was grafted to fill the defect. The middle clavicular fracture was fixed with a 3.5-mm dynamic compression plate, whereas the distal clavicular fracture was fixed with tension band wiring (Fig. 4). Fluoroscopy showed that the scapular neck fracture and the coracoid process fracture were in an acceptable position without manual reduction of the scapula, so further internal fixation was not performed.

Exercise was started after 3 weeks of immobilisation with a sling and a bandage. At the 4-month follow-up, fractures of the clavicle, scapular neck, and coracoid process had healed. There remained a 6-mm difference between the distances from the medial borders of 2 scapulae to the spine, despite improvement on the distance of the left side.

Figure 1  (a) Radiograph and (b) computed tomography of the left shoulder showing double (middle and distal) clavicular fractures, fractures of the scapular neck and coracoid process, and fractures of the second and third ribs.

Figure 2  Radiograph showing lateral displacement of the scapula, a distracted-fracture of the clavicle, and a left hemopneumothorax.
At the 14-month follow-up, the patient was pain-free, although shoulder function remained diminished, owing to the brachial plexus injury and severe soft-tissue damage. The range of motion of the left elbow, the wrist, and all fingers had recovered fully, whereas that of the left shoulder was limited to 35° abduction, 20° flexion, and 20° external rotation. Although the function of the musculocutaneous and radial nerve had returned, the function of the axillary and the suprascapular nerve had only improved slightly. The strength of the shoulder abduction, flexion, and external rotation was M2. Elbow flexion, wrist extension, and finger extension strength had recovered to normal (M5). Sensation corresponding to the C5-6 dermatome had also improved to almost normal.

DISCUSSION

The ‘floating shoulder’ is double disruptions of the superior shoulder suspensatory complex, which is a bone and soft-tissue ring supported by the superior and inferior bony struts that serve as a suspension for the upper extremity. The superior strut is the middle clavicle, whereas the inferior strut consists of the lateral scapular neck and body. The ring is composed of the distal clavicle, the acromioclavicular ligament, the acromion, the glenoid fossa, the coracoid process, and the coracoclavicular ligament. The shoulder becomes unstable when the complex is disrupted in at least 2 sites, with a severe displacement at either or both sites of the clavicle and/or the scapular neck. In our patient, the 2 struts and the 2 sites of the ring were disrupted and therefore the shoulder was extremely unstable.

Scapulothoracic dissociation of the shoulder girdle is a complete disruption of the scapulothoracic articulation, with lateral scapular displacement. There is a difference of over 10 mm between the distances from the medial borders of the 2 scapulae to the midline of the spine. It is often associated with musculoskeletal injuries such as displaced clavicular fracture, acromioclavicular joint dislocation, sternoclavicular joint dislocation, massive muscle damage, and soft tissue swelling. Most such patients also have brachial plexus and/or vascular injuries of the subclavian or axillary artery. Its outcome is usually poor, with a flail extremity in 52%, early amputation in 21%, and death in 10%. Because of the severity of the neurological injury, there is no report of a patient recovering enough function to make the arm a useful extremity.

A combination of the floating shoulder and double clavicular fractures results from high-energy trauma in the following sequence of events. The strong downward force directly impacting the distal clavicle causes fractures of the distal clavicle and scapular neck. The clavicle shaft is then pulled down and fractured by impacting on the rib. According to the location of the skin excoriation on the shoulder girdle in our patient, the force was directly transferred to the anterolateral aspect of the shoulder girdle, especially the distal clavicle, from above downward. Then, the distal clavicle was fractured, and the clavicular shaft was pulled down by the downward force. With the clavicle impacted on the first rib, the middle clavicle was fractured secondary to the further downward
force. This impact also fractured the coracoid process and scapular neck, and drove the scapular neck against the chest wall to fracture the second and the third ribs. Without protection from the clavicle, the underlying brachial plexus and subclavian artery were also damaged. Scapulothoracic dissociation is also a result of either a violent, direct, blunt force or a high traction force to the shoulder girdle. Rotational and lateral scapular displacement occurs when the upper extremity is caught on a fixed object while the body is moving at high speed. A single disruption of the superior shoulder suspensory complex can usually be managed conservatively. However, double disruptions of the superior shoulder suspensory complex are unstable, and operative treatment is considered necessary. The structure becomes more unstable when combining with fractures of the clavicle and scapular neck. To avoid further disruption of structure, open reduction and internal fixation of the clavicle alone is recommended, as scapular neck fractures are usually reduced indirectly. The scapula fracture should only be fixed if there is residual displacement of the scapula after fixation of the clavicle fracture.

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