Learning Point of the Article:
The triple disruption of the Superior Shoulder Suspensory Complex needs proper preoperative evaluation and appropriate surgical intervention gives good results and avoids long-term complications.

Abstract

Introduction: Superior shoulder suspensory complex (SSSC) plays a key role in maintaining stable upper extremity–axial skeleton connection. Injury to one component is a common occurrence while double disruption leading to floating shoulder is a rare occurrence. Disruption of more than one component of this complex leads to significant morbidity and interferes with adequate shoulder function and requires surgical intervention.

Case Report: This case report describes a rare triple disruption of SSSC in a 40-year female in dominant shoulder involving fracture of lateral end of clavicle, Type 1 coracoid fracture, and an acromion fracture. She underwent operative fixation of all the components and reported excellent functional outcome at the end of 1-year follow-up.

Conclusion: The triple disruption of the SSSC is an extremely rare injury comprising breakages of the ring at three distinct locations, which usually follow high-velocity injuries associated with other musculoskeletal and visceral injuries. Proper pre-operative evaluation and appropriate surgical intervention give good results and avoid long-term complications such as chronic pain, weakness, and subacromial impingement of shoulder.

Keywords: High-energy trauma, superior shoulder suspensory complex, triple disruption.

Introduction

The concept of superior shoulder suspensory complex (SSSC) was first described by Goss in 1993 as a bone and soft tissue ring secured to the trunk by superior and inferior bony struts [1]. The ring is composed of the glenoid fossa, the coracoid process, the coracoclavicular ligaments, the distal clavicle, the acromioclavicular (AC) joint, and the acromion process. The superior strut is the middle clavicle while the inferior strut is the lateral scapular body or spine [2]. Traumatic disruption of single component of SSSC is common occurrence with excellent clinical outcomes after operative or non-operative management depending on the location of injury. Double disruption of the complex leading to a floating shoulder is a rare occurrence which requires surgical intervention as displacement on either or on both disruption sites may cause problems in healing, such as delayed union, malunion, and nonunion, as well as adverse long-term functional difficulties [3]. Triple disruptions are extremely rare injuries in which three structures of the complex are broken, are more unstable than the double disruption of the SSSC, and require reduction and stabilization of at least two structures of the complex for optimal healing and shoulder function. This case report describes a rare triple disruption of SSSC in a 40-year female in dominant shoulder involving fracture of lateral end of clavicle, Type 1...
Case Report

A 40-year female was referred to our hospital outpatient department from a different hospital for further management. She had met with a road traffic accident 2 weeks back and sustained fracture of mandible, multiple ribs fracture (right 1–6 ribs), and fracture proximal humerus left along with shoulder girdle disruption of the right side. She was stabilized hemodynamically in a local hospital and underwent open reduction and fixation of proximal humerus with a locking plate along with mandible fracture fixation. She was then referred to our institute for further evaluation and management of shoulder girdle injury on the right side. Her physical examination revealed pain, tenderness, swelling, and restriction of movements of the right shoulder with healed abrasions. There was no documented neurovascular abnormality in the limb. Radiographs of the right shoulder, anteroposterior, and axillary views showed acromion fracture, Ogawa Type II fracture of coracoid process, and lateral end clavicle fracture with a doubtful disruption of AC joint. Fracture of the acromion and clavicle was reduced and fixed with tension band wiring and the acromioclavicular joint stabilized with end-to-end periosteal non-absorbable sutures (No.5 Ethibond). Subsequently, the coracoid process was exposed which revealed a comminuted fracture. A large fragment was identified and fixed to the glenoid base using a single 4 mm cancellous screw passed from the tip of coracoid process. The deltoid was reattached to the acromion meticulously and watertight closure of the wound was done. Postoperatively, bilateral shoulder rehabilitation was done in phased manner. The patient was immobilized in abduction brace for 6 weeks while allowing active hand and wrist movements. The patient was allowed passive and active assisted shoulder range of motion (ROM) exercise 6 weeks after surgery. Active shoulder movements were allowed from 9 weeks and core strengthening exercises were started from 12 weeks. At the end of 6 months, the patient had painless full ROM (Fig. 3) and the patient documented near total functional recovery after a follow-up of 1 year and recorded a constant shoulder score of 87 at last follow-up.(Fig. 4).

Discussion

This case report describes a successful outcome of surgical treatment of a triple disruption of SSSC which is a very rare injury. Meticulous pre-operative planning and intraoperative surgical decision-making are essential to ensure a successful outcome leading to optimum functional outcome and reduced morbidity associated with this complex injury. A triple disruption of SSSC is often mistakenly diagnosed as a double disruption and managed accordingly, leading to less than optimal functional outcomes in the shoulder joint. In ring structure concept, like the pelvis, it is more reasonable to think if the ring is broken in one area and the fragments displaced, then there must be a fracture or dislocation in another portion of the ring [4]. Byoung-Kook et al. reported a case, wherein the patient...
had a fracture of midshaft clavicle and coracoid process, but the presence of AC joint injury was initially overlooked and a diagnosis of double disruption was made. However, they noted the presence of AC joint postoperatively and performed a resurgery to stabilize the AC joint [5]. The need for fixation of the triple disruption of the SSSC depends on many factors. However, because a complete destruction of the structures within the ring concept at more than two locations causes instability, surgical intervention is usually necessary. Before 1970, most floating shoulder injuries were treated conservatively [6]. This trend was changed after Ganz and Noesberger 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 [7]. Since then, treatment recommendations for all ipsilateral fractures of the clavicle and scapula, even if minimally displaced, had focused on some form of internal fixation to reduce the risk of scapular fracture displacement. Multiple disruptions of the SSSC come in several possible combinations, with the most common combination being that of the AC joint dislocation, the fracture of the distal third of the clavicle, and a fracture of the acromion or of the coracoid process [8]. Along with the triple disruption, if a concomitant injury of the clavicular–AC joint–acromial strut exists, additional operative treatment may be required. Conversely, a concomitant injury of the coracoacromial ligament or the C-4 linkage may be conservatively treated, and it will usually lead to satisfactory outcomes given that the clavicular fracture is treated properly [3]. A review of literature has shown that very few case reports have been published regarding the management of triple disruption which was managed with different techniques [8, 9, 10]. Lecoq et al. described a triple disruption of the SSSC that involved the distal third of the clavicle, the acromion, and the coracoid process. They performed a surgical reduction and repair of the fractured coracoid process through screw fixation while the fractures of the clavicle and of the acromion were treated conservatively [9]. Jung et al. described a triple disruption of the SSSC comprising a displaced fracture of the distal clavicle, a fracture of the coracoid process, and a non-displaced fracture of the acromion. The coracoid process fracture was treated through reduction and fixation, and the clavicle and the acromion fractures were treated through screw fixation and two Kirschner wires [10]. Both authors obtained good functional outcomes for the treatments at the final follow-up using their respective surgical techniques. In our patient, surgical management of all three fractures was decided based on the fact that the patient sustained a proximal humerus fracture in the opposite arm as well, and therefore, adequate fixation of both limbs will allow for early rehabilitation and early use of both limbs for activities of daily living.

**Conclusion**

Triple disruption of the SSSC is an extremely rare injury caused by high-energy trauma and it is often associated with other injuries. This case report describes satisfactory functional outcome in this injury following surgical fixation of all components of the injury.

**Clinical Message**

The triple disruption of the SSSC is an extremely rare injury comprising breakages of the ring at three distinct locations, which usually follow a high-velocity injury associated with other musculoskeletal and visceral injuries. Proper preoperative evaluation and appropriate surgical intervention with systematic steps and minimal implantation give good results and avoid long-term complications such as chronic pain, weakness, and subacromial impingement of the shoulder.

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