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Case Report
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Posterior Sterno Clavicular Joint Dislocation: A Case Report of a Surgical Stabilization Technique with PDS™ Cord

Castellani GC, Cerbasi S, Massetti D, Maresca A, Fantasia R, Sangiovanni P and Pascarella R*

Departemnt of Orthopedic and Traumatology, Ospedali Riuniti, Ancona, Italy

Abstract

Dislocation of sternoclavicular joint is an uncommon injury of shoulder girdle. It generally follows a high energy collision or a sport-related trauma. There is no unanimity on what the most adequate treatment management should be for such lesions in medical literature. Conservative treatment seems to be the choice of action in case of anterior sternoclavicular dislocations. Surgical procedure is to be reserved for posterior dislocations, due to possible complications which could arise given anatomical position. We here by present a case report on a posterior sternoclavicular dislocation following a sports trauma in a 15-year old boy surgically treated with a stabilizing technique using PDS™ Cord. The functional recovery after a 12-month follow up is extremely promising.

Introduction

Sterno Clavicular (SC) joint dislocation is an uncommon injury of shoulder girdle and it represents 2-3% of all upper limb lesions [1-3]. Anterior dislocations are more common than posterior dislocations with a 9 to 1 ratio [4]. In a review of 1600 SC joint dislocations, only one subject was diagnosed with a posterior dislocation [5]. In 30% of cases, immediate complications following posterior dislocations occur such as dyspnoea, dysphagia or vascular and neurological damage, with a 3-4% mortality rate [6]. Such a lesion is potentially lethal due to proximity of mediastinal structures (aortic arch, subclavian and carotid artery, esophagus, trachea, lungs and brachial plexus).

Two main mechanisms resulting in posterior sternoclavicular dislocation have been described. On the one hand, injury can be caused by high energy traumas with a postero-lateral compressive force to the shoulder. Second mechanism implies a force vector directed anteromedial to the clavicle, thus causing posterior dislocation of clavicle [7]. Sternoclavicular joint is a diarthrosis saddle type synovial joint. The joint is formed by two bone extremities covered with cartilage, a cavity limited by synovial membrane, a joint capsule and ligaments. Joint cavity is composed of two portions separated by a round articular disc (meniscus) connected to sternoclavicular anterior and posterior ligaments and to the joint capsule. Both bones present alternated concave and convex areas which fit together forming a saddle type joint which allows movements along anteroposterior and vertical planes, besides a certain degree of rotation around the major axis of clavicle. As less than 50% of the medial end of clavicle articulates with manubrium of sternum, it is not a stable joint. Its stability is therefore derived from intrinsic and extrinsic ligaments [8]. It has been demonstrated that the posterior capsule of the joint is more resistant than the anterior one, thus anterior sternoclavicular dislocations are 9 times more frequent than posterior ones [9].

Case Presentation

A 15-year old boy was referred to our attention in February 2016 following a sporting accident which took place during a rugby match. Patient presented functional limitation of left shoulder, swelling and pain in sternoclavicular region with reduced mobility. Clinical history of the patient was unremarkable and neurovascular examination of upper limb appeared normal. There were no associated skeletal injuries. A standard chest x-ray and x-ray of shoulder were performed and showed anomalies in the symmetry of the clavicles (Figure 1). Sternoclavicular joints, bones and soft tissue as well as mediastinal structures such as heart, major blood vessels, esophagus and trachea were more easily viewed on CT Angiography. Scans confirmed a full posterior dislocation of proximal part of left clavicle from manubrium of sternum (Figure 2a) which was causing a

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Correspondence:
Simone Cerbasi, Departemnt of Orthopedic and Traumatology, Ospedali Riuniti, Ancona, Italy,
E-mail: simone.cerbasi@libero.it

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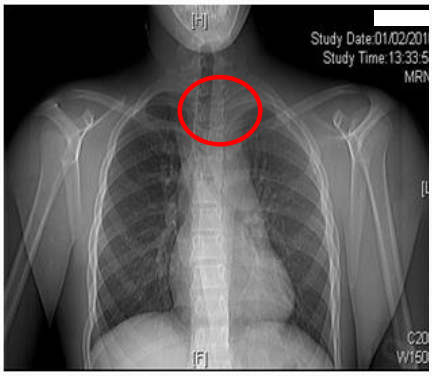

Figure 1: Radiography shows sternoclavicular dislocation to the left side.

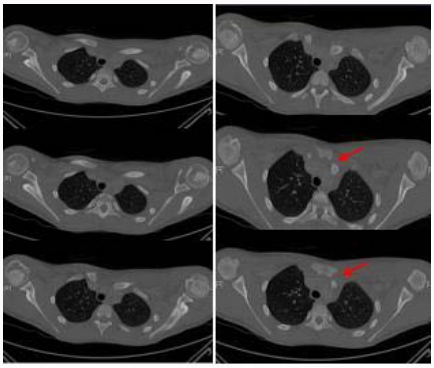

Figure 2a: Axial views of CT scan. Images show posterior dislocation of clavicle.

Figure 2b: Coronal views of CT scan. Compression on brachiocephalic vein.

compression on brachiocephalic vein (Figure 2b). As a reduction maneuver was deemed not possible and given possible complications, a multidisciplinary team (Orthopaedic surgeon and Cardio thoracic surgeon) decided to treat surgically the lesion with an open reduction and fixation. Patient was stable for following three days.

Surgical technique

Young athlete in supine position on operating table underwent general anesthesia. Cardiothoracic surgeon was present in or in case of damage to those vessels running posterior to SC joint occurred. An arcuate incision of approximately 10 cm was made from manubrium of sternum to proximal third of clavicle. Sternoclavicular joint dislocation was identified through careful dissection. Meniscus was repaired. Subsequently, through two 2.5 drill holes in medial end of clavicle and sternum, manual reduction of dislocation was performed and it was fixed using a figure-of-eight suture with PDS™ Cord (Ethicon Johnson & Johnson International) (Figure 3a). An additional suture anchor between clavicle and sternum was performed to have more stability (Figure 3b). Repair and reinforcement of capsule was then obtained. At the end of procedure joint was absolutely stable

Figure 3a: Intra-operative pictures.

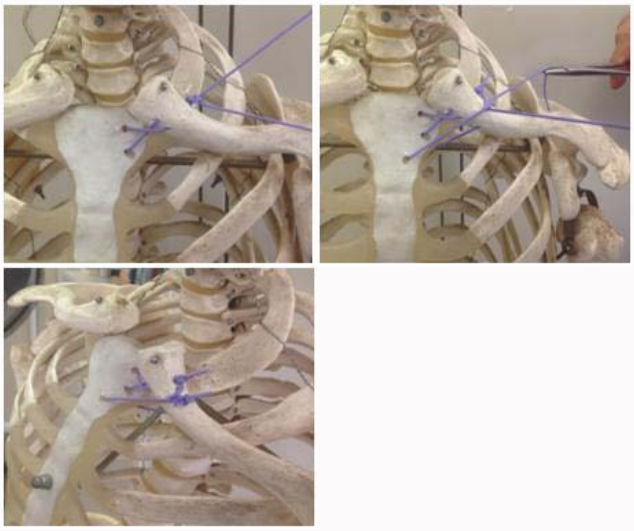

Figure 3b: Demonstration of technique using drill holes in clavicle and sternum with PDS™ Cord.

with no mobility.

Follow up

In early post-op period and for the following 4 weeks a Gilchrist shoulder brace was positioned. A careful passive joint mobilization was initiated with pendulum exercises and gradual functional recovery was observed together with an increased muscle tone and tropism thus obtaining a complete ROM in 10-12 weeks. Patient was clinically assessed during follow up at two weeks, one month, three months and one year. Pain, ability to work and satisfaction with treatment received were also evaluated, using an analog centesimal scale (VAS). DASH questionnaire [10] (disability of the arm, shoulder and hand), a validated tool for measurement of functional disabilities with a range of values between 0 and 100, latter being worst outcome, was used to perform clinical evaluation of patient. During last check up, patient did not report any pain or disability, he was satisfied about treatment that he had received and presented a full range of motion (Figure 4). Six months after trauma, the young athlete went back to playing rugby. As a secondary outcome, CT scans at three months and one year were performed, in order to evaluate the joint and recognize possible failures in result. No clinical aspects of a recurrent dislocation were seen and CT confirmed joint stability (Figure 5).

Discussion

Sternoclavicular dislocations are rare and they usually follow a high energy trauma. Due to their low frequency, there are no precise guidelines regarding either conservative or surgical treatment. Recent reviews have been published, which allow us to deduct possible management guidelines [11-13]. In anterior dislocations a closed reduction can be obtained in acute phase by applying traction

Figure 4a: Clinical outcome 12 months after surgical procedure.

Figure 4b: Functional outcome 12 months after surgical procedure.

to the arm and direct pressure over medial clavicle; shoulder is then stabilized with a figure-of-eight bandage for a 6-week period. Recurrent anterior dislocations are usually asymptomatic and require no treatment, however, in presence of pain and functional limitation, surgery is indicated. High disability rates have been reported in non-treated anterior dislocations (90% of patients presented recurrent dislocations and 28% of these referred to ongoing pain) [14]. For the invalidating outcomes of sternoclavicular joint instability, Rotini [15] and Abiddin [16] propose a stabilizing technique which implies use of bony anchors and suture cut off plates, with excellent results after a 2-year and 4-year follow up respectively. Others suggest a reparative arthroplasty (with resection of the medial 1.5 cm of the clavicle) [17,18] or other types of surgical reconstructions using soft tissues (such as subclavian tendon tenodesis, fascia lata graft or sternocleidomastoid muscle) [19-21], all associated with positive clinical results or a very low rate of dissatisfaction.

In acute posterior dislocations a closed reduction following sedation should be attempted. Rockwood described a reduction technique with use of a sterile towel clip percutaneously to dislodge the medial end of clavicle in its anterior position [22]. However, posterior dislocations should always be treated with stabilizing techniques in order to avoid compression on retrosternal structures which could be life threatening both in immediate or long term future [23-26]. Different techniques to stabilize sternoclavicular joint in acute phase have been described such as use of figure-of-eight technique [27-28], fixation with a locking plate and monocortical screws [29] or sternoclavicular joint repair with reconstruction of costoclavicular ligaments [30]. All methods had a long term positive outcome, apart from few cases of dissatisfaction. Although certain authors have previously recommended percutaneous Kirscher wire fixation after closed reduction, it is not recommended now a days due to possibility of wire migration, breakage and penetration into major vessels [31]. No long term studies with a large number of patients have been conducted, therefore there is no demostration of one surgical technique being better than other. Our technique proved to be safe and valid, with excellent functional results in long term period. It does not imply accessory manoeuvers and the low

Figure 5a: Radiograph 12 months after surgical reduction.

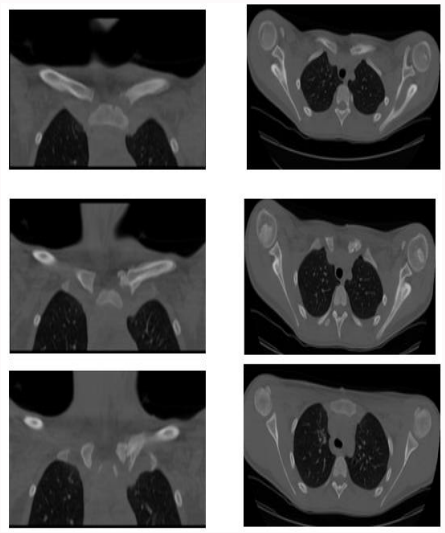

Figure 5b: CT scan showing correct position of sternoclavicular joint.

cost of materials used represents another advantage. Furthermore, we underline importance of CT axial images to evaluate joint during follow up. We suggest this technique as an alternative to those more articulate ones present in medical literature. However, due to lack of a large number of patients with a long follow up, only future research will help us decide which is the best approach in order to obtain best functional results or which is the best technique to be used as surgical management of a sternoclavicular dislocation.

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