Knee Surg Sports Traumatol Arthrosc
(2004) 12 : 453–456

SHOULDER

DOI 10.1007/s00167-004-0504-x

Michael Wettstein
Olivier Borens
Raffaele Garofalo
Cyril Kombot
François Chevalley
Elyazid Mouhsine

Anterior subluxation after reduction of a posterior traumatic sterno-clavicular dislocation: a case report and a review of the literature

Received: 8 November 2003
Accepted: 27 January 2004
Published online: 3 June 2004

M. Wettstein · O. Borens · R. Garofalo
C. Kombot · F. Chevalley · E. Mouhsine (✉)
Service d'Orthopédie et de Traumatologie
de l'Appareil Locomoteur,
Centre Hospitalier Universitaire Vaudois,
1011 Lausanne, Switzerland
Tel.: +41-21-3142791,
Fax: +41-21-3142800,
e-mail: elyazid.mouhsine@hospvd.ch

Abstract Sternoclavicular dislocations represent a rare injury. Based on our clinical experience with a patient showing an anterior subluxation after reduction of a posterior traumatic dislocation, we review the literature. The emergent reduction of the dislocation is mandatory, always keeping in mind the potentially devastating neurovascular complications. If the treatment of a residual anterior instability remains controversial, a residual posterior instability should be treated by a surgical procedure. The optimal treatment depends mainly on each surgeon's choice and practice.

Keywords Shoulder · Sternoclavicular · Dislocation · Instability

Introduction

Sternoclavicular dislocations are rare. According to the literature, they represent 3% of all injuries of the shoulder girdle [1] or only 10 out of 1,600 trauma cases [2]. Since CT-scan imaging has become more available, the diagnosis is made earlier and not only post-mortem as often before [3]. The treatment of sternoclavicular lesions remains controversial, and the surgical treatment is associated with many risks.

Case report

A 22-year-old tennis player fell from a scooter onto his right anterolateral shoulder, and was admitted at an outside University hospital with severe pain. After a diagnosis of a posterior sternoclavicular joint dislocation had been established, he was transferred to our level 1 trauma center.

Although the CT-scan showed compression of the right brachiocephalic vein and trunk by the clavicle, the patient showed no signs of any neuro-vascular impairment (Fig. 1).

The dislocation was reduced under general anesthesia by traction in abduction of the right arm and direct percutaneous grasping of the clavicle with a towel clip. The X-ray control confirmed the reduction. The upper extremity was immobilized in a mitella for a few days.

A week later, the patient presented with an anterior subluxation of the sternoclavicular joint as seen on the CT-scan (Fig. 2) but with no residual symptoms. Therefore, and according to the literature [4,5,6], we decided on no further treatment.

At 6 weeks after the accident, spontaneous reduction was achieved and the patient had almost no residual pain, with normal motion of his right shoulder and no limitations in sports.

Review of the literature

Anatomy

The sternoclavicular joint is the junction of the shoulder girdle to the axial skeleton. A frequent variation is an accessory joint to the first rib. The joint between the clavicle and the sternum is incongruent, with only 50% of the clavicular surface being in contact with the sternum. This incongruence is compensated for by a disk. This type of joint design allows a wide range of motion in several directions [3].

Fig. 1 CT-scan showing posterior dislocation of the right medial clavicle compressing the right brachiocephalic vein and trunk

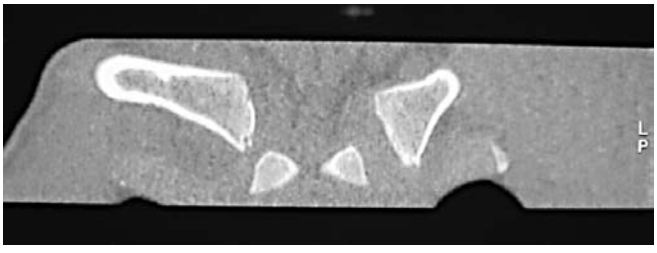

Fig. 2 CT-scan of the induced anterior subluxation of the right sternoclavicular joint

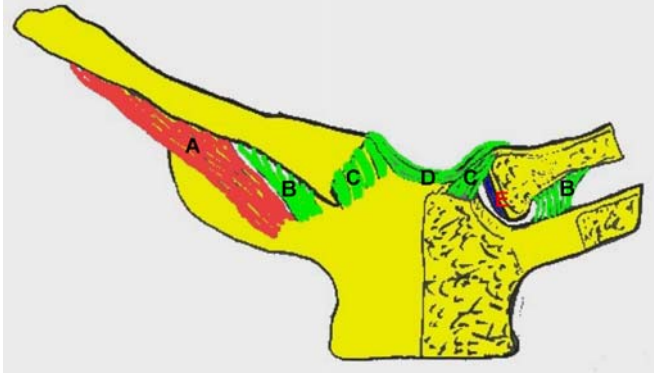

Fig. 3 Schematic representation of sternoclavicular environment. *A* Subclavius muscle, *B* costoclavicular ligament, *C* sternoclavicular ligament, *D* interclavicular ligament, *E* interarticular disk

The joint is stabilized by the articular capsule, which is reinforced anteriorly by a tiny sternoclavicular ligament and posteriorly by a much stronger sternoclavicular ligament (Fig. 3). This may explain why anterior dislocations,

Fig. 4 CT-scan at the medial end-level of both clavicles. *A* Right brachiocephalic vein, *B* brachiocephalic trunk, *C* trachea, *D* left common carotid artery, *E* left brachiocephalic vein, *F* left subclavian artery

due to indirect stresses, are more frequent than posterior ones [7] in a proportion of approximately 1:20 cases [8]. Cranially, the interclavicular ligament, which unites both clavicles, is a very thin structure. The costo-clavicular ligament stabilizes the joint in the caudo-cranial direction and in rotation, due to its configuration with an anterior and a posterior lamina. This ligament also acts as a fulcrum during a postero-lateral blow to the shoulder which results in a medial and backward displacement of the clavicle.

Directly posterior to the right sternoclavicular joint (Fig. 4) pass the right brachiocephalic vein and trunk, as well as the trachea, and directly posterior to the left sternoclavicular joint run the trachea, the left brachiocephalic vein, the left common carotid artery and the left subclavian artery. All these structures may be damaged during an injury to the sternoclavicular joint.

Compression of the brachiocephalic and subclavian veins can lead to swelling and cyanosis of the corresponding arm and can also lead to venous thrombosis [9].

Compression of the subclavian artery induces acute ischemia of the arm. Limited compression of the trachea leads to respiratory stridor, but can be fatal due to complete obstruction or disruption.

The lower brachial plexus (C5-Th1) lies behind the vessels over the first rib. Thoracic outlet syndrome and brachial plexus compression have been reported in a case of chronic posterior dislocation of the sternoclavicular joint [10]. For these reasons, a careful neurovascular examination of the upper extremities and the examination of the respiratory status are mandatory.

If any arterial injury is suspected, an arteriography should be performed as soon as possible to guide an open

reconstruction of the damaged vessel if necessary. Because of the risk of a lesion to one of the above mentioned structures, the reduction of a posterior dislocation should be considered a true emergency. However, because of the possible laceration of a great vessel, it is advisable to proceed to a reduction only if a vascular surgeon is rapidly available.

Classification

Different classifications can be used to describe a sternoclavicular dislocation. One is based on the anatomic position of the dislocation, and the other one on the etiology of the lesion [6]. A clinical classification was published by Allman [11] and seems to be a good tool for the treatment choice in addition to the direction of dislocation.

Stage 1 corresponds to a contusion or minor distortion with a stable joint and no radiological signs of lesions.

Stage 2 is a subluxation of the joint due to partial rupture of the sternoclavicular ligaments, whereas the costoclavicular ligament remains intact.

Stage 3 is a dislocation of the joint with a complete rupture of all ligaments and the articular disk.

Treatment

Minor sprains with subluxation are best treated functionally with a protective mitella and non steroidal anti-inflammatory drugs (NSAI) for a few days.

Anterior dislocations can be treated by closed reduction under general anesthesia. However, these lesions are often unstable and may redislocate [12]. In the case of a recurrent dislocation, no further treatment should be applied if the patient feels no pain or discomfort, which are rare in anterior dislocations [4]. In the case of symptoms, open reduction can be attempted. However, the fixation of the joint by screws is biomechanically unfavorable [6] and the use of Kirschner wires can lead to fatal migrations of the pins [13]. In these cases, the best therapy is probably the excision of the torn disk, suture and plastic reinforcement of the ligaments as shown in a large series [14].

After reduction or open repair, the shoulder should be held back with a figure-of-eight dressing for 6 weeks to allow ligament healing [6].

Posterior dislocations should first also be treated by means of closed reduction [6]. The reduction is done with the patient in a prone position under general anesthesia, with a sandbag between the shoulder blades. Progressive traction on the abducted arm is applied and, if this is not sufficient for reduction, the clavicle is grasped with a sterile towel clip to apply direct anterior traction [6]. Even if other techniques exist [6], this seems to be the best to us. In most cases such a reduction remains stable, and needs only an immobilization with a figure-of-eight dressing for 4–6 weeks.

If a dorsal subluxation persists, some authors [15] have recommended an open repair of the ligaments and fixation by Kirschner wires with the already stated complications. This technique should be definitely abandoned.

As a residual posterior dislocation is not tolerated [16], many techniques for repair have been published. Speed [5] used a fascial loop between the clavicle and the first rib. Allen [17] used a fascia lata flap to reconstruct the sternoclavicular ligaments. Burrows [18] used the tendon of the subclavius muscle passing through the proximal clavicle. All these techniques show reliable results, although in each case the series was only small.

If degenerative changes are noted in the joint, several authors [15, 16, 19] have recommended the resection of the medial end of the clavicle. During removal of the articular part, attention should be paid not to damage the costo-clavicular ligament, or to repair it if already torn.

Arthrodesis of the sternoclavicular joint was reported in the treatment of habitual dislocation of the sternoclavicular joint [20]. This procedure should not be done anymore because a severe limitation of normal shoulder movements can occur.

One recent publication [1] outlined the long immobilization which is necessary after ligamentous repairs. The authors proposed a method of plaiting of the sternoclavicular joint allowing an early functional recovery.

No patient showed a recurrent dislocation, and the mean functional outcome was good to excellent with this technique. The only critical point of the treatment was the need for removal of the implant.

Conclusion

Sternoclavicular dislocations are rare and they remain a challenging problem. Most cases, both anterior and posterior dislocations, should first and immediately be treated by means of closed reduction and immobilization. The potentially disastrous complications of posterior dislocations should always be kept in mind during the investigations.

If a residual posterior instability or symptoms occur, a surgical procedure is necessary. Up to now, it is unclear whether a repair of the ligaments with ligamentoplasty or the use of a hook-plate will bring better results, as only small series of patients have been published. The advantage of ligamentoplasty is the need for only one operation, but it carries with it the disadvantage of a long-term immobilization. The use of a hook-plate seems an interesting alternative, but requires the removal of the plate and can damage the sternoclavicular joint, risking subsequent arthritis.

We think that a surgeon should use one single method which he feels most familiar with, so as to obtain the best results.

References

1. Franck WM, Müller O, Hennig F (2000) Die traumatische sternoklavikuläre Instabilität. Eine therapeutische Alternative. Unfallchirurg 103:834–838
2. McCulloch P, Henley BM, Linnau KF (2001) Radiographic clues for high energy trauma: three cases of sternoclavicular dislocation. AJR Am J Roentgenol 176:1534
3. Rajaratnam S, Kerins M, Apthorp L (2002) Posterior dislocation of the sternoclavicular joint: a case report and review of the clinical anatomy of the region. Clin Anat 15:108–111
4. Rockwood CA, Matsen FA (1998) Disorders of the sternoclavicular joint. In: Rockwood CA (ed) The Shoulder, 2nd edn. Saunders, Philadelphia, pp 555–609
5. Speed K (1942) A textbook of fractures and dislocations, 4th edn. Lea and Febiger, Philadelphia, pp 282–290
6. Wirth MA, Rockwood CA Jr (2001) Injuries to the sternoclavicular joint. In: Bucholz RW, Heckman JD (eds) Rockwood and Green's fractures in adults, 5th edn. Lippincott Williams and Wilkins, Philadelphia, pp 1253–1255
7. Marker LB, Klareskov B (1996) Posterior sternoclavicular dislocation: an American football injury. Br J Sports Med 30:71–72
8. Nettles JL, Linscheid R (1968) Sternoclavicular dislocations. J Trauma 8: 158–164
9. Ono K, Iragawa H, Kiyota K, Terada T, Suzuki S, Maekawa K (1998) Posterior dislocation of the sternoclavicular joint with obstruction of the innominate vein: a case report. J Trauma Injury Infect Crit Care 44:381–383
10. Rayan GM (1994) Compression brachial plexopathy caused by chronic posterior dislocation of the sternoclavicular joint. J Okla State Med Assoc 87:7–9
11. Allmann FI (1967) Fractures and ligamentous injuries of the clavicle and its articulation. J Bone Joint Surg Am 49:774–784
12. De Jong KP, Sukul DM (1990) Anterior sternoclavicular dislocation: a long-term follow-up study. J Orthop Trauma 4:420–423
13. Kumar P, Godbole R, Rees GM, Sarkar P (2002) Intrathoracic migration of a Kirschner wire. J R Soc Med 95: 198–199
14. Fery A, Sommelet J (1988) Dislocation of the sternoclavicular joint: a review of 49 cases. Int Orthop 12:187–195
15. Bateman JE (1978) The shoulder and neck, 2nd edn. Saunders, Philadelphia
16. Borrero E (1987) Traumatic posterior displacement of the left clavicular head causing extrinsic compression of the subclavian artery. Physician Sports Med 15:87–89
17. Allen AW (1928) Living suture grafts in the repair of fractures and dislocations. Arch Surg 16:1007–1020
18. Burrows HF (1951) Tenodesis of subclavius in the treatment of recurrent dislocation of the sternoclavicular joint. J Bone Joint Surg Br 33:240–243
19. Breitner S, Wirth CJ (1987) Resection of the acromial and sternal ends of the clavicle. Z Orthop 125:363–368
20. Rice EE (1932) Habitual dislocation of the sternoclavicular articulation: a case report. J Okla State Med Assoc 25:34–35