



## Surgical management of a complex shoulder fracture including acromion and scapular spine

Youssef Mallat, Karim Turki, Achraf Abdennadher, Rabie Ayari, Khalil Amri, Lotfi Nouisri.

Department of Orthopaedic Surgery and Traumatology, Military Hospital of Instruction of Tunis, Tunisia

Corresponding author : Youssef MALLAT

Department of Orthopaedic Surgery and Traumatology, Military Hospital of Instruction of Tunis, Tunisia.

E-mail address: dr.youssef.mallat@gmail.com

### Resume

**Introduction :** Les fractures de l'acromion et de l'épine scapulaire sont rares. L'objectif de ce cas clinique était d'aider au diagnostic et au traitement de ces fractures.

**Présentation du cas :** Une fracture comminutive de l'acromion et de l'épine scapulaire a été diagnostiquée chez un militaire de 36 ans. Le patient a eu une réduction ostéosynthèse par deux plaques conçues pour les fractures de la clavicule et la reconstruction acétabulaire.

**Discussion :** Incorrectement traitées, les fractures de l'acromion peuvent entraîner une douleur, une raideur, un conflit sous-acromial et des lésions de la coiffe des rotateurs. L'ostéosynthèse par plaques permet une fixation rigide afin de neutraliser les forces musculaires et assurer une bonne consolidation osseuse.

**Conclusion :** Il n'existe pas de plaque spécifique pour l'acromion en raison de la forte variation interindividuelle de sa forme. Notre expérience positive avec l'utilisation de la plaque claviculaire et de la plaque incurvée peut aider à obtenir de bons résultats fonctionnels.

### Abstract

**Introduction :** Acromion and scapular spine fractures are rare. There are no common accepted treatment schemes and fixation methods. The study objective was to present a case, which may contribute to the diagnosis and treatment of these fractures.

**Presentation of case :** A complex fracture of the acromial process and scapula spine was diagnosed in 36-year-old soldier. The patient underwent surgical treatment with open reduction and use of two locking plates designed for clavicle fracture and pelvic reconstruction.

**Discussion:** Improperly treated, acromion fractures may lead to pain, stiffness, sub acromial impingement and rotator cuff injury. Open reduction and internal fixation were chosen in order to establish rigid fixation to neutralise deltoid muscle forces and to provide proper bone healing.

**Conclusion :** No specific plates are available for the acromion because of high interindividual variation in the shape of the acromion. Our positive experience with using anterior clavicle plate and curved reconstruction plate may help to achieve good functional outcome.

## I- Introduction

Scapula fractures are uncommon and represent 1 % of all fractures<sup>[1]</sup>. If only 8 to 10% of these fractures involve the acromion, scapular spine involvement is even rarer<sup>[1]</sup>. The literature regarding surgical management of these fractures and its functional outcome is limited. We aim to present a case of an association of fracture of acromion and scapula spine operated using two locking compressive plates. This report is in accordance with the criteria established by SCARE<sup>[2]</sup>.

## II- Presentation of case

A 36-year-old patient suffered from direct right shoulder and forearm trauma by a heavy object. Patient was a soldier, smoker, non-drug user with no comorbidities. He had ecchymosis, crepitation and deformity on his shoulder. He had no neurovascular deficit. Standards radiographs of the shoulder were performed (Figure 1) and completed by a computerized tomography scan with three-dimensional reconstruction (Figure 2). The examination revealed a scapula spine fracture and an acromion communitive fracture.



Figure 1. Initial Radiograph of the shoulder

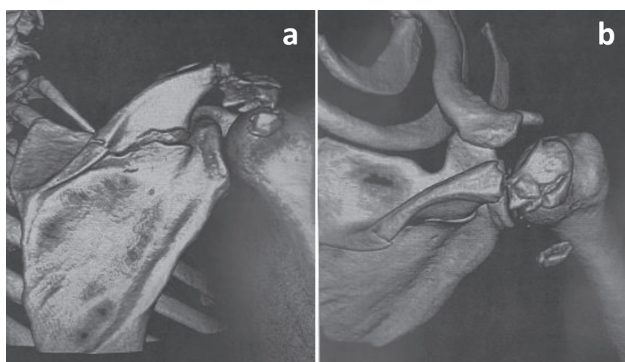


Figure 2. 3D reconstruction of the preoperative CT scan. a) Posterior view; b) upper view

Acromion fracture was classified as Type 1 according to Ogawa<sup>[3]</sup>, and spine fracture as type 3.

Surgery was performed two weeks after the injury because of cutaneous lesions. Therefore, we had to wait for adequate healing to reduce the risk of wound issues.

The patient was placed in a prone position. The entire shoulder was prepared and draped. The incision was made off the posterior border of the acromion and extended to the entire spine. The incision was taken down to the posterior acromion border between the fascia of the deltoid and trapezius muscles. Rotator cuff was intact. The deltoid and infraspinatus were reflected to expose the fracture (Figure 3).

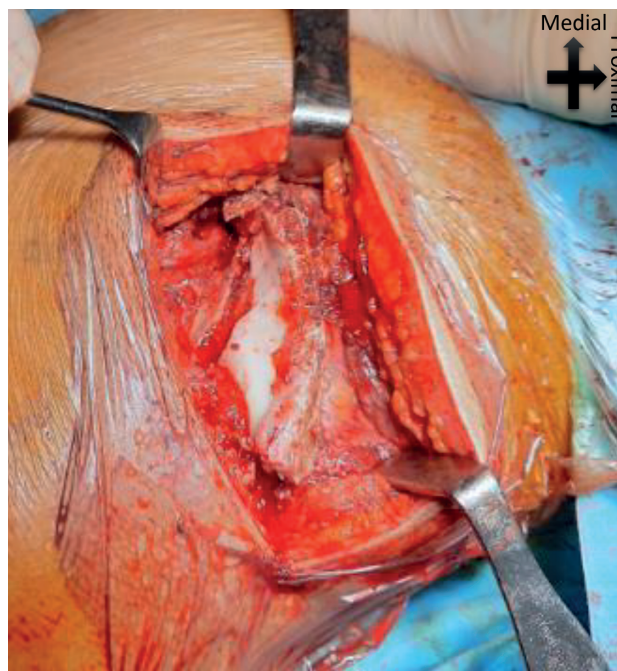


Figure 3. Fracture exposed after reflection of the deltoid and the infraspinatus

The fragments were distracted in order to clean out soft callus and hematoma while the fracture edges were cleared of periosteum.

The fracture of the spine was fixed first with a 3.5mm curved plate designed for pelvic reconstruction (Figure 4). Then, the acromion was fixed with an anterior clavicle plate with lateral extension (Figure 5). Locking screws were applied for both plates.

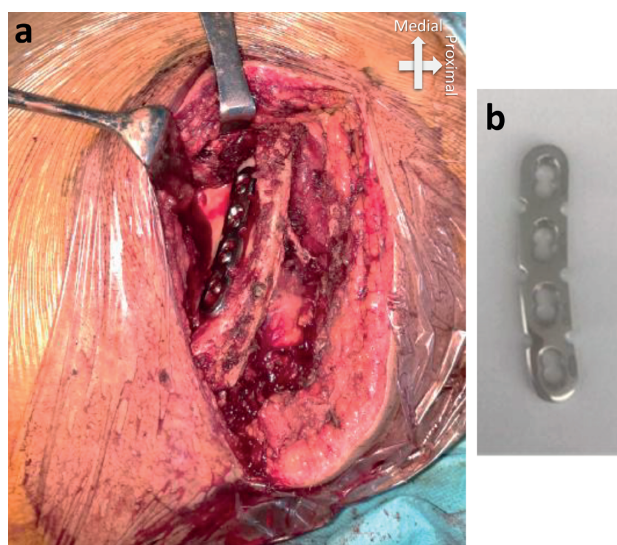
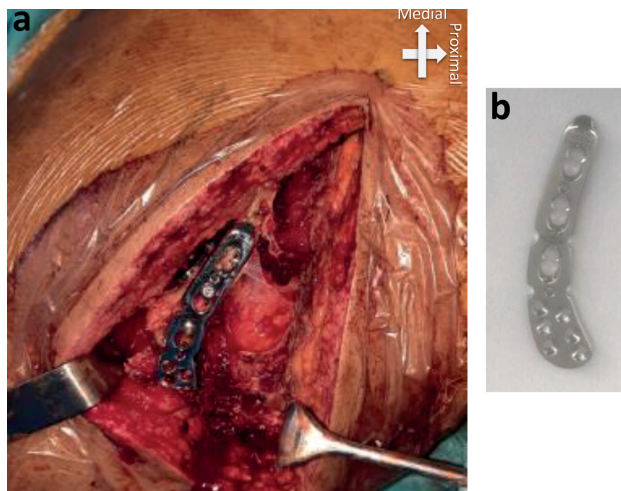


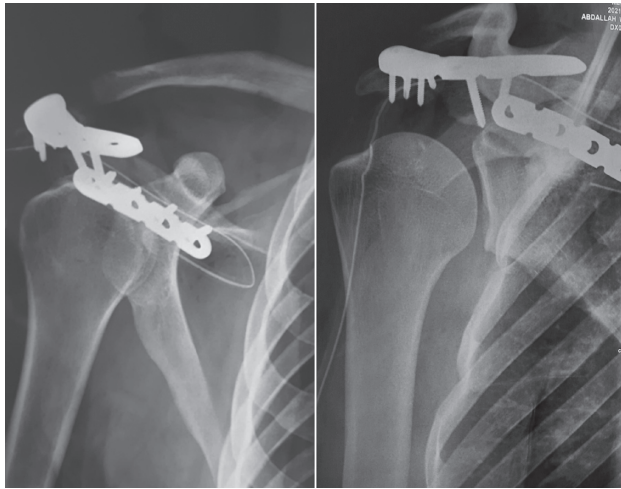
Figure 4. Reduction and fixation of the spine fracture (a) using a 3.5mm curved plate with locking screws (b).





**Figure 5.** Open reduction and osteosynthesis of the acromion (a) using an anterior clavicle plate with lateral extension (b).

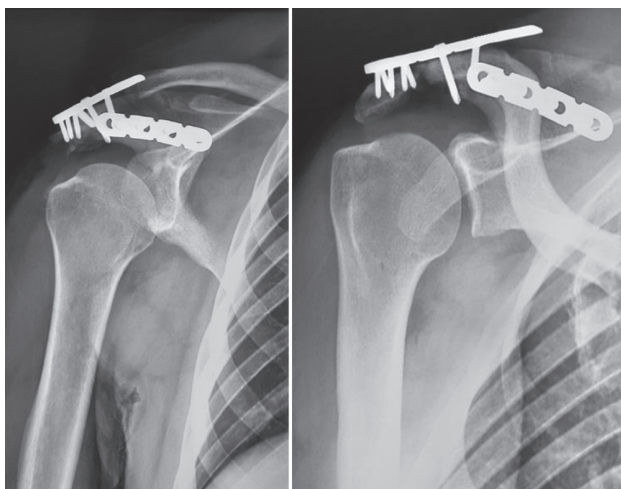
Immediate postoperative radiographs showed a successful reduction and an optimal placement of the implants (Figure 6). The wound was irrigated and closed over a suction drain. The arm was immobilized in a sling.



**Figure 6.** Immediate post-operative right shoulder x-rays.

He started passive shoulder exercise one week after surgery and active exercises 4 weeks after.

The patient returned to work 2 months after surgery. At three months follow up, shoulder motion was almost normal except 30 degrees of stiffness on abduction. Fracture union was completed (figure 7).



**Figure 7.** Radiographs at last follow-up

### III- Discussion

The acromion process is an origin and attachment site for multiple ligamentous and muscular structures of the shoulder<sup>[4]</sup>. It is a basic constituent of the superior shoulder suspensory complex (SSSC).

Fractures of the acromion process and scapula spine are rare: to our knowledge, this case report is the second to show these concomitant fractures, after the case cited by Nunes<sup>[5]</sup>.

There is no gold standard to treat these types of fractures, and the current recommendations are often based on a limited number of cases<sup>[6]</sup>.

Improperly treated, acromion fractures may lead to; pain, stiffness, subacromial impingement, rotator cuff injury and symptomatic non-union.

According to Hill, operative treatment is required in case of : symptomatic non-union, subacromial impingement, displacement more than 1 cm, open fractures and disruption of superior shoulder suspensory complex<sup>[4]</sup>.

In our case, we chose surgical treatment because the patient had superior shoulder suspensory complex injury and subacromial space reduction.

Our objectives regarding surgery were to reduce acromion displacement in order to restore subacromial space dimensions and to stabilise the acromioclavicular joint.

A review of operatively treated fractures revealed a variety of fixation techniques including K-wire fixation, tension band wiring, screw fixation and plate fixation<sup>[6]</sup>.

Plates provide more rigidity to the fracture area and allow reconstruction of multifragmental fracture. The use of K-wires is not recommended because it may cause early implant failure and stable reconstruction may not be achieved.

Open reduction and internal fixation were chosen in this case in order to establish rigid fixation to neutralise deltoid muscle forces and to provide proper bone healing.

Zhu<sup>[7]</sup> used perpendicular double-plate with a locking system and reported good outcomes.

Kurahashi<sup>7</sup> used a mesh plate for the treatment of acromion fracture.

For our patient, we used implants which could better fit scapular shapes and fractures.

Hill<sup>[4]</sup> applied plate to all acromion fractures in a study carried out with 13 patients. Irritation and infection can be seen after fixation with plate screw<sup>[8]</sup>. Zhu<sup>[7]</sup> reports temporary suprascapular nerve entrapment on patients with double-plate.

In our case, we did not encounter any intraoperative or postoperative complication after 3 months follow up.

### IV- Conclusion

Acromion and scapular spine fracture are rare. Surgical treatment is important to regain shoulder functions, as it enables early rehabilitation. Because of the high inter

individual variability in the shape of the acromion process; there are no specific plates available for the acromion. Our positive experience with using anterior clavicle plate and curved reconstruction plate may help to achieve good functional outcome.

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#### **VI- Disclosure of competing interest**

The authors report no conflict of interest related to this manuscript.

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