Case Report

Plate fixation of acromion fracture using a mesh plate

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ABSTRACT

In several cases of treatment of acromion fractures of the scapula, plate fixation provides more rigidity to the fractured area. However, no specific plates are available for the acromion because of high interindividual variation in the shape of the acromion. We report two cases of acromion fractures operated using a mesh plate (Depuy Synthes, West Chester, PA, USA), which acts as a versatile, low-profile implant, being cut according to the specific fracture pattern and anatomical fitting. Our positive experiences with using a mesh plate may help to establish it as the operative procedure of choice in cases of acromion fracture.

Introduction

Acromion fractures of the scapula are rare. Scapular fractures constitute 1% of all fractures, of which only 8%–10% involve the acromion [1,2]. The types of internal fixation to treat acromial fractures commonly recommended in the literature include the use of Kirschner-wires (K-wires) with tension band wiring, cannulated screws with or without additional tension wiring as well as plate fixation [2,3]. In addition, plate fixation provides more rigidity to the fracture area [3].

There is high interindividual variability in the shape of the acromion. Therefore, there are no specific plates available to treat acromion fractures [2]. Variable Angle Locking Compression Plate (LCP) Mesh Plate 2.4/2.7 (Depuy Synthes, West Chester, PA, USA) acts as a versatile, low-profile implant, being cut according to the specific fracture pattern and anatomical fitting. We herein report two cases of acromion fracture operated using a mesh plate and the resulting positive results.

Case report

Case 1

A 75-year-old man was injured in a car-to-bicycle traffic accident while riding a bicycle and was transferred to the emergency department. He was alert and complained of pain and impaired range of motion in his left shoulder and right femur. Plain radiographs indicated left acromion fracture, left distal clavicle fracture (Neer classification type 2B [4]) (Fig. 1A) and right femur fracture. He underwent an operation of the femur by intramedullary nail four days after injury. Surgical treatment for the left acromion and ipsilateral distal clavicle fractures was performed 10 days after the injury. Under general anesthesia, a longitudinal 15 cm skin incision...
was made along the scapular spine to make the acromion and distal clavicle visible. The acromion fracture was temporarily fixed using K-wire. A mesh plate was cut and bent to match the shape of the acromion and fixed using four φ2.7 mm cortex screws for compressing bones, and then locked in place using φ2.4 mm and φ2.7 mm locking screws (Fig. 1C, D). Subsequently, we treated the distal clavicle fractures by a procedure involving both a synthetic conoid ligament reconstruction using Zip Tight (Zimmer Biomet, Warsaw, USA) and fracture site fixation using φ1.0 mm softwire (cerclage wiring). The patient started rehabilitation shortly after surgery. At nine months after surgery, we confirmed that bone union had occurred, and the range of motion of the shoulder joint became possible up to 170° for flexion and 30° for extension.

Case 2

A 27-year-old man was injured in a car-to-car traffic accident and visited our outpatient department. He complained of pain and impaired range of motion in his right shoulder and right elbow. A plain radiograph and computed tomography revealed right acromion fracture (Fig. 2A) and ipsilateral olecranon fracture. Surgical treatment was performed eight days after the injury. Under the interscalene block, a 15 cm longitudinal skin incision was made along the scapular spine. After exposing the acromion and the scapular spine, the fracture was temporarily fixed using K-wire. Mesh plate was cut and bent to match the shape of the acromion and fixed using four φ2.7 mm cortex screws for compressing bones and then locked in place using φ2.4 mm and φ2.7 mm locking screws (Fig. 2B, C). During screw insertion into the acromion, we took care to avoid contralateral cortical perforation.

The patient started active shoulder exercises one week after surgery. The patient returned to work again and had no complaints of pain at three months after surgery. At six months after surgery, bone union was confirmed. The shoulder range of motion at six months postoperatively was 180° for flexion and 30° for extension. There was no limitation of elbow flexion or extension.

Discussions

We reported osteosynthesis using a mesh plate for acromion fractures and the resulting positive results. A mesh plate may be useful for plate fixation of acromion fractures, and early treatment with appropriate plate fixation can prevent long-term disability and facilitate an early return to work.

The mesh plate is useful for the plate fixation of the acromion fracture because this plate can be cut and bent to be available shape for each fracture type and interindividual variable shape of the acromion. There are two problems with general plate fixation. First, displacement and tilting of the fragment, which are caused by insufficient fixation and pulling of the deltoid muscle, compromise the function of the rotator cuff [5]. Second, the selection of long size screws increases the risk of screw penetration into the subacromial space during fixation due to the thinness of the acromion [6]. The features of mesh plates, such as short size screws (the shortest being
6 mm) and multiple screw holes results in stronger plate fixation and can remedy these problems.

In patients with polytrauma, diagnosis and treatment of acromion fractures can be delayed or overlooked [6]. We could establish an early diagnosis of acromion fracture and early surgical intervention in two cases. Our treatment of these two cases resulted in a good range of motion of the shoulder, and we did not encounter postoperative complications such as symptomatic nonunion. If an acromion fracture is improperly treated, pain, movement restriction, subacromial impingement, rotator cuff injury, and symptomatic nonunion can occur [6,7].

There are various fixation techniques for the open reduction and internal fixation of acromion fractures [1,2]. Among them, tension band wiring, interfragment screw fixation, and plate fixation are well known. Tension band wiring does not provide the most solid fixation, and there is a risk of implant irritation and migration [2,3,8]. Interfragment screw fixation offers greater stability and a higher rate of fracture union, but screw insertion can be difficult because of the thin bone layer of the acromion [3]. Compared with other techniques, plate fixation provides more rigidity to the fracture site [1,3]. Because of the high interindividual variability in the shape of the acromion, there are no specific plates available for the acromion [2]. Therefore, we recommend a mesh plate for the treatment of acromion fracture.

In conclusion, our positive experience with using a mesh plate may help to establish it as the operative procedure of choice in cases of acromion fracture.

Declaration of competing interest

The authors declare that there are no conflicts of interest.

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References

[1] J. Anavian, C.A. Wijdicks, L.K. Schroder, S. Vang, P.A. Cole, Surgery for scapula process fractures: good outcome in 26 patients, Acta Orthop. 80 (2009) 344–350.
[2] H. Belien, H. Biesmans, A. Steenwerckx, E. Bijnens, C. Diericks, Prebending of osteosynthesis plate using 3D printed models to treat symptomatic os acromiale and acromial fracture, J Exp Orthop 4 (2017) 34.
[3] F. Hess, R. Zettl, J. Welte, D. Smolen, C. Knoth, The traumatic acromion fracture: review of the literature, clinical examples and proposal of a treatment algorithm, Arch. Orthop. Trauma Surg. 139 (2019) 651–658.
[4] C.S. Neer II, Fracture of the distal clavicle with detachment of the coracoclavicular ligaments in adults, J. Trauma 3 (1963) 99–110.
[5] F.H. Hardegger, L.A. Simpson, B.G. Weber, The operative treatment of scapular fractures, J Bone Joint Surg Br 66 (1984) 725–731.
[6] O. Çiçekli, A. Akar, H.N. Topçu, Displaced acromion fracture: a rare injury, case report, Int. J. Surg. Case Rep. 39 (2017) 313–316.
[7] B.W. Hill, J. Anavian, A.R. Jacobson, P.A. Cole, Surgical management of isolated acromion fractures: technical tricks and clinical experience, J. Orthop. Trauma 28 (2014) e107–e113.
[8] J.D. Harris, M.J. Grieser, G.L. Jones, Systematic review of the surgical treatment for symptomatic os acromiale, Int J Shoulder Surg 5 (2011) 9–16.