



Surgery

OUTCOMES OF INTERNAL SYNTHESIS OF THE HUMERUS HEAD SPLIT FRACTURES IN YOUNG PATIENTS, A RANDOMISED STUDY

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ABSTRACT **PURPOSE:** Humerus head split fracture is rare and the importance of correct diagnosis of the type of the fracture is crucial in order to achieve good result.

METHOD: a retrospective study of humerus head split fracture operated during 2014-2015 in Tirana Albania, classified according to the severity of fracture and age.

RESULTS We have a series of 15 patients < 50 years, who underwent locking plate fixation. We noticed that in a mean of 34 months follow up, 12 of them had united. No osteonecrosis or nonunion was seen in simple fractures (5 patients). In complex fractures (10 patients), osteonecrosis was seen in 4 patients, nonunion in 2 patients, and glenohumeral arthritis in one patient. We concluded that complex fractures are associated with higher rates of nonunion, avascular necrosis and inferior shoulder function. We also considered the RSA in the failed cases

CONCLUSION : Although we prefer to consider internal fixation first, we suggest that RSA is to be considered in the first signs of failed, otherwise the postoperative fibrosis will lead to bad functional results.

KEYWORDS : Humerus head split fracture, internal synthesis, reverse shoulder prosthesis

INTRODUCTION

Humerus head-split fractures are rare and count less than 5% of all proximal humeral fractures (1,2,3). They occur when the large surface area of the humeral head cleaves as it impacts against the narrow "anvil" of the glenoid into two or more large fragments, generally associated with fractures of the tuberosities and/or surgical neck (4). According to some authors at least 20% of the articular surface is affected (5). Although head split fractures are usually grouped with articular impression fractures they have a different aetiology and require different treatment. Patients presenting with head split fractures generally can be divided in two groups. The first group can be defined by young, usually male patients with good bone quality and a potentially viable humeral head with a mechanism of injury representing a high energy direct trauma (bicycle-, motor-, car accident, epileptic seizure) (1). The other group represents the other population with female domination and the fracture type occurring after a low energy trauma, usually a fall from the standing high (6).

DIAGNOSING

It can be difficult to diagnose a head split fracture on initial radiographs. The "pelican sign" which represents the radiograph density corresponding with the cortex of the greater and lesser tuberosity fragment of the subcondral bone of the attached articular segment is helpful to identify them on conventional radiographs (6). Computed tomography especially using 3D reconstructive represents the method of choice to evaluate the basic fracture morphology and to evaluate the morphology and to evaluate the dimension of the head involvement.

The precise knowledge of the fracture morphology is necessary for the preoperative planning and to achieve the best individual treatment for each patient. We currently classify head split fractures into four different fracture patterns: type 1- anterior head split fracture with a large posterior articular head segment, type 2-posterior head split with a large anterior articular head segment, type 3- head split fracture including a free floating articular head segment and type 4-head split fracture with a severely comminuted articular surface.



Generally, there is a lack of information concerning the optimal treatment of head split fractures of the proximal humerus since they are being approached on case-by-case basis. Treatment should be focused on maximizing the patient's functional outcome and minimizing pain, considering their functional demands, the presence of comorbidities and the ability to undergo operative treatment. Historically, it is believed that the outcome of head-split fractures, regardless of management, is thought to be worse than non head split fractures because of a perceived higher energy of injury and disruption of the terminal blood supply of the articular fragments (7).



Non displaced and minimally displaced fractures may be treated conservatively, consisted of a sling immobilization for three weeks with passive motion of the shoulder, followed by active-assisted range of motion exercises progressing to resisted strengthening at 3 months.

In a subset of patients, elderly, low demand, or those with significant medical comorbidities, even more complex fracture patterns may be treated without surgery.

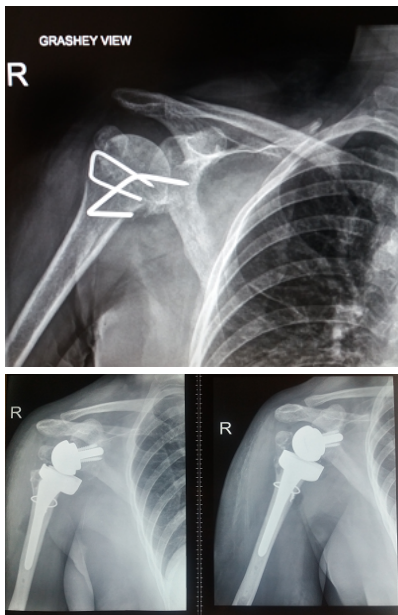
Historically, complex proximal humeral fractures, as head-split fractures, and impression fractures involving $\geq 40\%$ to 50% of the articular surface have been managed with shoulder hemiarthroplasty. Nowadays a growing number of studies are changing this ideology showing that in younger patients head-split fractures can be fixed with locking plate, with the aim of joint preservation.

MATERIAL AND METHOD

We are reporting 15 patients (9 men and 6 women) < 50 years, who underwent locking plate fixation for humeral head-splitting fractures in our hospital during 2014-2015. We noticed that in a mean of 34 months follow up (25 -47 months), 12 of them had united. No osteonecrosis or nonunion was seen in simple fractures (5 patients). In complex fractures (10 patients), osteonecrosis was seen in 4 patients, nonunion in 2 patients, and glenohumeral arthritis in one patient. The mean Constant score was 65.5 (56-76) and DASH score 22 (8-35), showed significantly outcomes in simple fractures. We concluded that complex fractures are associated with higher rates of nonunion, avascular necrosis and inferior shoulder function. Cheeser et al. described good results with internal fixation (one or two cancellous screws) in simple head split fractures in 3 of 8 young patients (19-41

years old) and opted for hemiarthroplasty in older patients (more than 55 years old) (1).

Indications for joint replacement for head split fractures represent the inability to achieve satisfactory reduction and stable fixation, especially in elderly patients with osteoporotic bone. The results of hemiarthroplasty depends on the situation of the tuberosities. Since the head split fractures are caused by high energy trauma and involve the articular surfaces the outcome of the hemiarthroplasty tend to be quite good. On the other hand, the fractures with compromised tuberosities may be candidates for a reverse prosthesis. Reverse total shoulder arthroplasty is reserved for patients with a deficient or irreparable rotator cuff, or highly comminuted tuberosities, glenohumeral arthritis and risk of tuberosity non-union(9). However there are no prospective studies referring the use of reverse arthroplasty in head-split fractures as a primary treatment. In our opinion implanting a reverse prosthesis in a failed operated fracture may force the surgeon to find compromises with the humeral cut (going down with the humeral cut because of the fibrous contractures- as shown in the picture).



CONCLUSION

Head split fractures are rare, difficult to treat and sometimes even difficult to diagnose. They are currently classified into four different fracture patterns using diagnostic methods like 3D-CT reconstruction which help to detect the fracture pattern and allows to optimize therapeutic decision making. Beside fracture morphology, the surgeon's experience, the patient age and demand are influencing the treatment strategy and the final outcome.

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