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## CASE STUDY

### CASE OF MINIMALLY DISPLACED ACROMION FRACTURE TREATED CONSERVATIVELY WITH SHOULDER SPICA

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#### ABSTRACT

Scapular fractures generally result after high energy trauma. Approximately 8 – 9 % of scapular fractures involve the acromial spine. Historically scapular fractures have been treated non operatively due to limited knowledge about the surgical procedures and fixation devices. Thus majority of acromial spine fracture have been under treated and the complications have been accepted. We have reported a 49 year old male patient with minimally displaced acromion spine fracture, without reduction of the subacromial space. This fracture can be classified as type 1 fracture as per Kuhns Classification for which conservative treatment is recommended. We have treated this patient with a shoulder spica cast after closed reduction of the acromial spine fracture under image intensifier guidance. Serial X rays were done every week to check for displacement. Cast was continued for 4 weeks and shoulder mobilization was started thereafter. After 3 months, patient has good functional range of movement and strength at shoulder joint (UCLA Scale 33/35). There was no evidence of displacement of fracture after 3 months. The guidelines in literature for the treatment of undisplaced and minimally displaced fractures are controversial and there are no factors to predict the delayed displacement of such fractures. Thus we conclude that every acromion spine fracture should be protected to prevent further displacement, to provide a good functional outcome and to avoid the requirement of delayed surgical procedure.

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## INTRODUCTION

The scapula is an integral part of the connection between the upper extremity and the axial skeleton. Scapular fractures are generally the result of a high-energy trauma with a high incidence of significant associated (local as well as remote) injuries (Armstrong and Vanderspuy, 1984). Historically, scapular fractures have been treated by closed means. One of the earliest descriptions of treating scapular fractures was published in 1805 in Desault's treatise on fractures. Since then, it has been traditionally observed that over 90% of scapular fractures are undisplaced or minimally displaced and they do well with conservative treatment (Harmon and Baker, 1975). Approximately 8% to 9% of all scapular fractures involve the acromion (McGahan *et al.*, 1996). Most acromion fractures are successfully treated simply by immobilization with a sling or Velpeau dressing until the pain has subsided, which is usually within 3 weeks. Some authors have advocated the use of a spica cast with the shoulder in abduction (Nakae and Endo, 1996).

The knowledge about surgical treatment of acromion spine fractures has been limited. Also there has been lack of knowledge about optimum fixation devices for such fractures, hence majority of acromion spine fractures have been under treated and complications due to mal-alignment and inadequate functional outcomes have been accepted in the past.

### Case Report

A 49-year-old right hand dominant male presented to our emergency services with a history of Road Traffic Accident in the form of slip and fall from a two wheeler. He sustained injury to the right shoulder after the fall. He complained of pain in the posterior aspect of the right shoulder. Physical examination of the right shoulder revealed no gross deformity. On palpation, the patient reported pain over the scapular spine, approximately 4-6 cm medial to the lateral border of the acromion. The passive range of motion was painful and active forward elevation, abduction and external rotation were limited due to pain. The patient exhibited pain and hence signs for impingement, instability and acromioclavicular arthrosis were

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not elicited. The functional assessment scored 10 points on the University of California at Los Angeles (UCLA) Shoulder Rating scale and 7 points on the Visual Analog Scale (VAS).

On radiological examination, there was a fracture at the lateral aspect of spine of the right scapula with minimal displacement. (Figure 1) This fracture can be classified as a type 1 fracture as per Kuhns classification (undisplaced or minimally displaced acromion spine fracture, no reduction in subacromial space) (Kuhn *et al.*, 1994) (Figure 2)



Figure 1. Initial Radiograph Showing Minimally Displaced Fracture of Acromion Spine

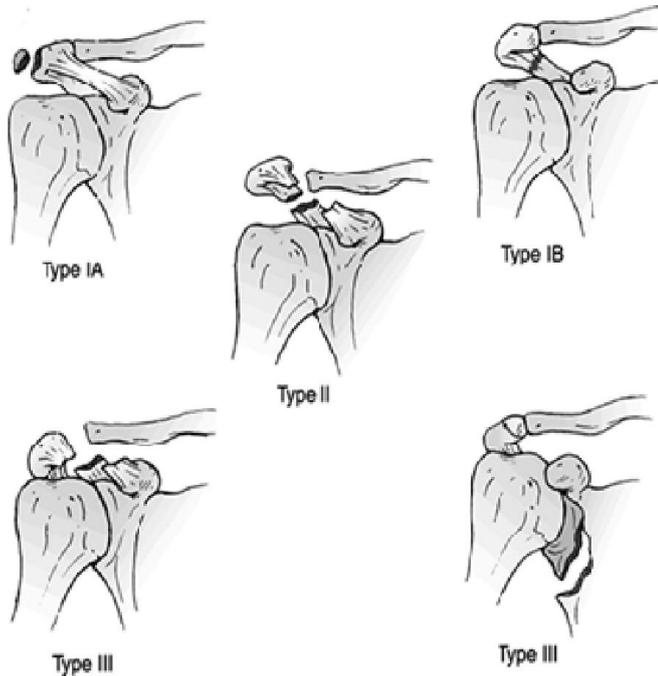


Figure 2. Kuhn's Classification of Acromion fractures

We treated the patient non-operatively as per the standard protocol of undisplaced / minimally displaced acromial spine fractures (Kuhn *et al.*, 1994; Doo-sup Kim *et al.*, 2010). We evaluated the patient under image intensifier guidance and achieved closed reduction of the fracture. A shoulder spica cast was given in this reduced position and was again checked under image intensifier. (Figure 3) Patient was discharged on

the next day and was followed up in out patients department every week. A weekly check X-ray was taken to look for any displacement at the fracture site. (Figure 4)



Figure 3. Shoulder spica cast in 45 degrees of abduction after reduction of the scapular spine under image intensifier



Figure 4. Check X ray at follow up two weeks post Spica



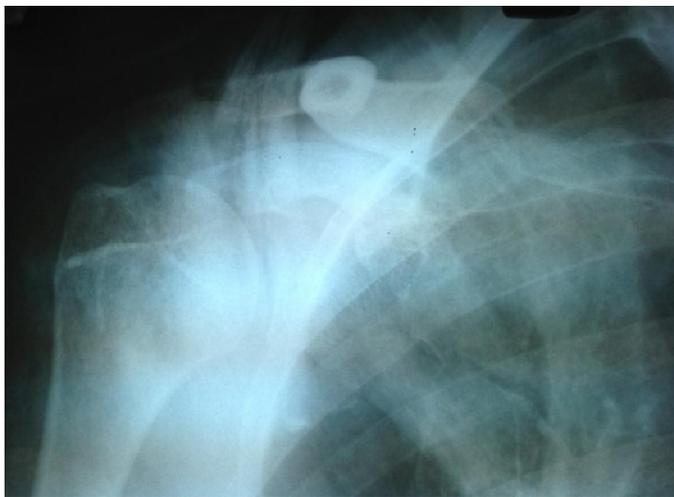
Figure 5(a). Range of active abduction at 8 weeks follow up

Spica cast was continued for 4 weeks and free active movements were started at 4 weeks after the removal of cast. Resistance movements were started after 6 weeks since spica application. After 2 months, the patient was painfree (UCLA – 33/35) and had recovered complete range of motion (abduction and internal rotation) of right shoulder joint (Figure 5a, 5b).



**Figure 5(b). Range of active internal rotation at 8 weeks follow up**

After 3 months, the patient did not have any pain and returned to his activities of daily living. The UCLA scale was 33 at 3 months of follow-up. At three months follow up, patient had recovered his complete strength at shoulder joint. The radiograph at 3 months follow up did not show any signs of displacement (Figure 6).



**Figure 6. 4 Weeks Post Shoulder Spica, Showing Consolidation**

## DISCUSSION

Acromion fractures are rare and caused by high energy trauma and, in general, accompany damage to surrounding organs and life-threatening injuries. It is difficult to detect acromion fractures from simple chest radiographs taken in the emergency room. (Harris and Harris, 1988) Therefore, often the diagnosis and management is delayed.

According to Kuhn's Classification of acromion fractures, Type I, i.e. undisplaced or minimally displaced acromion fractures can be treated non-operatively. At times cases of minimally displaced fractures go unnoticed without close observation by clinician in the emergency room. Our patient's plain radiograph showed a minimally displaced fracture of the acromion. Under C-arm evaluation, a Shoulder Spica was given in a stable and reduced position.

Ringelberg reported that the average force generated by the middle third of the deltoid to hold the arm at 45° of shoulder abduction is more than 400 N. This force decreased by only 10% when shoulder abduction was decreased to 30°. Thus, the pulling force of the deltoid muscle from the acromion is significant even on nondisplaced acromion fractures. (Ringelberg, 1985) We can thus assume that almost 90% of forces exerted by deltoid can be neutralised in the range of 30° to 45° of abduction and thus this can prevent the delayed displacement of such fractures. Hence, we recommend giving a shoulder spica in this abduction range and neutralise the deltoid pull.

Doosup Kim *et al.* in his study of 18 patients with nondisplaced acromion fractures treated with delayed surgical intervention, reported that six patients (33.3%) who had no evidence of displacement at the time of injury and used crutches had displacement. Displacement occurred in 7 patients (38.8%) without displacement at initial examination and despite recommended conservative treatment. (Doo-sup Kim *et al.*, 2010)

Although early surgical treatment has good outcome in displaced fractures, it is imperative to stress that it may be an overtreatment in undisplaced fractures, when conservative management can lead to full functional recovery and complete range of motion. In cases of nondisplaced acromion fractures, it is important that patients and families are properly informed about advantages and disadvantages of non-operative management, early surgery and also about chances of displacement during the course of treatment, and requirement of delayed reconstruction if such a displacement takes place at a later date. Especially when patients are young and active, the possibility of displacement during conservative treatment is to be stressed, and early surgery is to be more carefully selected. With respect to the nondisplaced acromion fracture, there are few case reports where such delayed displacement of acromion spine fractures has been reported and thus delayed reconstruction of such fractures was inevitable (Butala *et al.*, 2014).

Several studies by Wilber and Evans (Wilber and Evans, 1977), Hardegger *et al.* (1984) and O'Donoghue (O'Donoghue, 1960) have advocated surgical management for displaced fractures, non-unions and neurovascular injuries. So surgical management for displaced fractures, especially those with reduction of subacromial space is proven and non controversial. However, the management protocol for undisplaced / minimally displaced / displaced fractures with intact subacromial space, and especially an isolated acromion fracture with no associated injuries is still controversial. In spite of so many classification methods, the watershed line for

the planning and decision making for surgical or conservative management of acromion spine fractures is still unclear. Also there is no classification or criteria which can predict whether an undisplaced fracture can displace at a later date and go into non union or pseudoarthrosis and lead to reduction in subacromial space and compromise the final functional outcome of patient.

Thus we have adopted a method to avoid displacement of acromial spine fracture by giving patient a spica cast in reduced position to reduce neutralize the force of deltoid muscle and hence reduce the chances of delayed displacement of fracture site. We observed the patient for any displacement by check radiographs at weekly follow ups for a period of 4 weeks. Since there was no displacement, we continued the spica for 4 weeks and started mobilizing the shoulder immediately after spica removal. At the end of 12 weeks, patient was painfree, he had full range of motion and no functional disability (UCLA 35/35).

### Conclusion

We hereby conclude that every acromion spine fracture should be protected, so as to prevent any further displacement and requirement of delayed surgical intervention. Shoulder Spica in a position where the fracture is reduced and stable is a good way of enforcing immobilization and neutralizing the pull of the deltoid on the non-displaced fragment. Till date the best method of treatment for such fractures has not been backed by any literature. Protection with a spica is a good way to treat such fractures till any concrete guidelines are recommended by large centric trials for such borderline acromion spine fractures.

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