Fracture Dislocation of the Radial Head: Radial head excision or replacement?

N Yasin, V Singh

Citation

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Abstract

A case of 28-year-old man with closed fracture dislocation of the radial head following a fall from height is reported. He was treated with radial head excision. The radial head is an important stabilizer of the elbow, thus the rationale of radial head excision in management of radial head fractures should be scrutinized. There is much debate regarding the optimal treatment for these fractures.

INTRODUCTION

Fractures of the radial head are relatively common injuries and are found in nearly 20% of all elbow trauma[1]. The radial head is an important stabilizer of the elbow, and that radial head excision alone is contraindicated in certain situations in which extensive damage to the primary stabilizers of the elbow has occurred. Excision of the radial head may lead to loss of strength, valgus instability, and proximal migration of the radius leading to wrist pain.

Studies of static loading across the elbow have suggested that as much as 60% of the force is transmitted across the radio-capitellar articulation[1]. Radial head is also a secondary stabilizer to valgus stress, with the primary restraint being the medial collateral ligament. Thus, pathological valgus instability can results from radial head resections in cases where there is concomitant injury to the medial collateral ligament. In this situation, effort should be made to preserve or replace the radial head. Similarly, the stabilizing role of the radial head become predominant when there is a concomitant injury to the interosseous membrane or distal radio-ulna joint (DRUJ), and resection in this situation may result in proximal migration of the radius.

In isolated lesions involving the radial head, treatment can focus on the head itself, and if the radial head is not salvageable, excision is a reasonable option. If other injuries are present, radial head reconstruction or replacement is indicated.

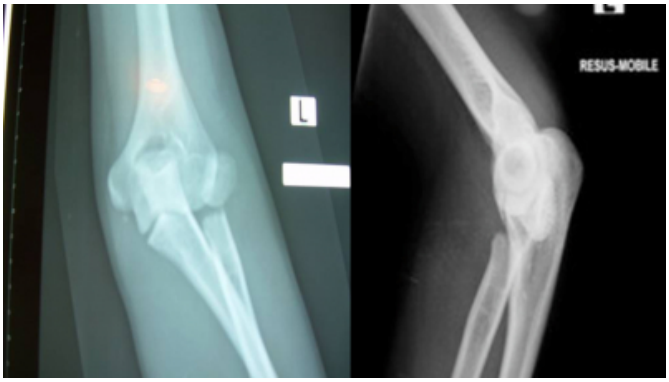
CASE REPORT

A 28-year-old man sustained a closed fracture dislocation of the left radial head following a fall from height. He was complaining of painful and swollen left elbow. On clinical examination, the left elbow was swollen, tender over lateral side of the elbow. There was no tenderness at the medial side of the elbow or at the wrist. His was able to flex the elbow from 10 to 80 degrees; pronation and supination were also very limited. There was no sign of wrist drop or other neurovascular injury.

Radiographs of the left elbow showed a displaced fracture of the radial head. The fracture was classified as type III according to Mason classification system for radial head fracture (figure 1).

Figure 1

Figure 1: Anterior-posterior view of the left elbow.



He was then treated by radial head excision using the standard lateral surgical approach. Intra-operative findings showed a displaced radial head fracture which was detach of all soft tissue attachment. Examination of elbow stability

under general anaesthesia showed that the collateral ligaments were intact. He was then discharged home with an above elbow backslab.

On follow up two weeks after the operation, he was started on physiotherapy with adequate analgesia. His latest attendance to the clinic showed good recovery and he had full range of motion of the left elbow with minimal pain. There was no evidence of medial collateral ligament laxity on valgus stress to the elbow and he also has no wrist pain.

DISCUSSION

Radial head fracture classically has been classified according to the radiographic appearance. These classifications failed to take into account associated ligamentous injuries to the elbow. These early classification were fond by Carstam, Bakalim and Mason. Johnston added a fourth category to Mason's classification in that he identified fractures associated with elbow dislocation. At the present time, the commonly used classification for radial head fractures is the Modified Mason Classification.

The Modified Mason Classification[1] can be used as a guide to decide on the most appropriate treatment for each type of fracture. This classification also used for radial neck fracture.

In Type I, there is marginal fracture which is undisplaced or with minimal displacement. Intra-articular displacement is less than 2mm. In this group, non-operative treatment with arm sling and early mobilization as tolerated with or without aspiration of joint for pain relief gives a good outcome. Even if the fracture is associated with elbow dislocation, the treatment is the same as above.

In type II, there is marginal fracture with displacement more than 2mm. If there is mechanical block in elbow range of motion, then open reduction with internal fixation is recommended. Without mechanical block, type II can be treated as for type I. With associated elbow dislocation or interosseous ligamental tear (Essex-Lopresti), open reduction and internal fixation using screw or plate is recommended.

In type III, there is comminuted fracture of the radial head or completely displaced fracture of the radial neck. If there is no concomitant elbow dislocation or interosseous ligament disruption, early excision of the radial head is an option. But if there is associated interosseous ligament disruption, excision and insertion of radial head prosthesis is recommended.

The comminution is usually greater than expected from the preoperative radiographs, so approximately 70% would have a definitive fixation of the fracture as intended and the remainder would require radial head excision with or without radial replacement. The lack of soft tissue attachment to the radial head fragments intra-operatively would be against routine fixation because of concern about avascular necrosis and non-union.

In this patient radial head excision was chosen because he has no other associated soft tissue injury. However he may still develop complications associated with radial head excision such as loss of grip strength, wrist pain, valgus instability, heterotrophic ossification and post-traumatic arthritis of the trochlea-olecranon articulation. Another complication which has not been recognized previously as a complication of radial head resection is postero-lateral rotatory instability. This complication is difficult to diagnose due to the absence of the radial head after radial head excision. Hall and McKee[2] have identified a series of patients with postero-lateral rotatory instability following radial head resection. They believe that this instability is secondary to unrecognized lateral ulna collateral ligament deficiency pre-operatively and this instability may be a cause of unexplained elbow pain and instability following radial head excision.

The reported long term outcomes of the treatment of radial head and neck fractures with excision of the radial head excision have been mixed. Herbertson[4] and colleagues has shown that following a displaced radial head or neck fracture, excision of the radial head often leads to a good or fair result. They also found no differences in outcome between primary and delayed radial head excisions following a Mason type II or III fracture. The outcomes are associated with the type of fracture, with Mason type III fractures having the worst results, rather than with the timing of the radial head excision.

The other available option to avoid these complications especially in a young patient population is replacement of the radial head with prosthesis.

Prosthetic replacement has the advantages of giving more normal articular relationships, pain relief, intrinsic stability, and elimination of proximal migration of the radial shaft. The radial head prosthesis can also provide proper tension for collateral ligament repair performed for concomitant

lateral instability after elbow dislocation. Study by King[3] and colleagues have shown that the kinematics and laxity of stable elbows after radial head arthroplasty are similar to those of elbows with native radial head. However, radial head arthroplasty alone may be insufficient for the treatment of complex fractures that are associated with damage to the collateral ligaments as arthroplasty alone does not restore stability to elbows with ligament injuries. Thus concomitant repair of ligaments and muscular origins should be considered at the time of surgery.

In the early design, radial head was made of silicone. Studies by Carn[6] suggested that the silicone rubber prosthesis was too flexible and thus unable to transmit the normal physiological force from the proximal end of radius to the capitellum. Secondly, fracture from the silicone prosthesis cause particulate synovitis which lead to local pain and further implant loosening. Thus, the current standard is to use metallic implants which are mechanically more stable, more durable and do not produce inflammatory changes in the elbow.

During the radial head replacement, the head is usually resected at the metaphyseal flare. Annular ligament articulation is maintained by preserving as much of the radial neck as possible. The size of the radial head prosthesis must match the size of the native radial head, as a smaller implant may not have optimal stability and a larger one may impinge the elbow movement.

In general, results are better with radial head replacement and early motion is possible because of the improved stability. Early motion in this group enhanced the functional result and range of motion of the elbow. Ashwood[5] and colleagues have shown good results of treatment of Mason type III radial head fractures with monoblock titanium radial head prosthesis with soft tissue reconstruction. Again they are stressing on early mobilization of the elbow for the restoration of elbow range of motion and function.

In the elderly patient, low energy injury or lack of associated soft tissue disruption, resection of the radial head alone is an acceptable approach and in most instances is not associated with long term sequelae. This has been shown by Janssen and Vegter[1], where more than half of the patients had radiographic evidence of proximal migration of radius from 1 to 3mm after radial head excision, but only a few had any or mild wrist symptoms.

This case illustrates that excision of the radial head is an acceptable option and often leads to a good or fair result if used in the right situation. It also stressed the importance of assessing other associated soft tissue injuries with radial head fracture as it will affect the choice of treatment for individual patient and the long term outcome. Although Modified Mason classification does not include associated soft tissue injuries, it is still useful to guide the surgeon for the most appropriate treatment for each type of fracture.

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Author Information

Nor Faissal Yasin
Department of Orthopaedic Surgery, University Malaya Medical Centre

Vivek Ajit Singh
Department of Orthopaedic Surgery, University Malaya Medical Centre