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Functional outcome of radial head replacement in isolated radial head fractures

Rahul Kadam, Chinmoy Sharma*, Santosh Pandhare, Abhay Chhallani, Abhishek Gupta, Ritesh Sawant

Department of Orthopaedics, MGM Medical College and Hospital, Kamothe, Navi Mumbai, India

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***Correspondence:**
Dr. Abhishek Gupta,
E-mail: hygro.chinz@gmail.com

ABSTRACT

Background: Proximal radial fractures are common type of fracture around the elbow joint. These commonly occur after an episode of fall on the outstretched arm. These fractures can occur in isolation or with other associated injuries. Among these comminuted radial head fractures are commonly associated with secondary injuries and instability of the elbow joint. Management of the radial head in such cases is very important in restoring stability of the elbow joint and starting early mobilization. This study will assess functional outcome of radial head replacement in isolated radial head fractures using Mayo elbow performance score.
Methods: Over a period of 24 months a total of 18 patients (male 12 and female 6) with isolated radial head fractures were included in the study. All of these patients had MASON type III fractures or above. Radial head replacement arthroplasty was done for irreparable radial head fractures and early mobilization was started. Functional outcome was calculated postoperatively with help of the Mayo elbow score on follow-up at 1, 3 and 6 month interval.
Results: On the basis of Mayo elbow performance scores, 13 patients had excellent results; 3 had good results; and 2 had fair results. Mean Mayo elbow score was 88.33 (SD 11.11) after 6 month follow up. None of the patients had elbow instability after radial head replacement.
Conclusions: Treatment of irreparable radial head fractures with radial head prosthesis along with soft-tissue reconstruction shows satisfactory results. Early mobilization of the elbow after operation is the key for restoration of elbow range of motion and function.

Keywords: Radial head fracture, Radial head replacement, Mayo elbow performance scores

INTRODUCTION

The incidence of radial head fractures constitutes about 2% to 5% of all adult fractures.[1] Radial head fractures constitutes for one third of all elbow injuries.[2] Injury to collateral ligaments of the elbow results in gross instability to the elbow joint in cases of radial head fracture.[3,4] The primary stabilizer of the elbow joint in these cases is the radial head.[5] Radial head is very important in maintaining stability of the elbow joint and starting early mobilization. Injuries of the radial head are treated according to their type for example Mason I injuries are mainly treated by conservative methods; Mason II injuries can be treated conservatively but if displaced should be managed with open reduction and internal fixation.[6-8] Mason type III and above fractures include comminuted fractures of radial head that are considered unreconstructible.[9] Surgical options are radial head excision with or without radial head replacement. Few studies have shown altered stability and kinematics of the elbow joint after radial head excision alone without replacement of radial head. After radial head replacement the stability and kinematics are almost similar to those of anatomical radial head. Radial head replacement offers

better results than radial head excision alone.[10] This study will analyze the functional outcome after treatment of isolated radial head type III with metallic radial head prostheses with help of the Mayo elbow score.

METHODS

We retrospectively reviewed 18 elbows with post-traumatic radial head fractures. These patients had received surgical treatment between January 2015 and December 2016 at our hospital. All 18 patients underwent radial head replacement and soft tissue reconstruction. The indications for radial head replacement included comminuted and irreparable radial head fracture with or without instability of elbow. Information on gender, age, injury mechanism and side, and radial head fracture classification with associated injuries was recorded for these patients. 16 patients had Mason type III fractures of the radial head and 2 had type IV fractures.

Inclusion criteria were patients with age of 18 years to 65 years of both sexes and isolated radial head fracture (Mason type III fractures or above).

Exclusion criteria were patients with Mason type I or type II fractures, other bony injury along with radial head fracture, age less than 18 years or more than 65 years and patients with severe comorbidity affecting recovery (e.g. uncontrolled DM).

Surgical procedure

The placement of radial head prosthesis was determined intraoperatively on the basis of elbow instability. Indications included a comminuted fracture of the radial head with or without media and lateral collateral ligament injury. All the implants were placed through a lateral Kocher approach, with a skin incision over the lateral elbow. We began a lateral elbow incision superior to the lateral epicondyle and extended it distally approximately 6 cm across the joint in the interval between the extensor carpi ulnaris and the anconeus. Metallic stainless steel radial head prosthesis was used for Radial head replacement. The radial head size was determined intraoperatively. All pieces of radial head were collected and radial head was reconstructed. Size of prosthesis was determined by measuring the reconstructed fractured radial head. The radial head was fixed after adequate canal preparation of radius using PMMA cement.

Postoperative care

After the operation a high above elbow slab at 90 degrees of flexion was applied for all patients. Flexion and extension exercises were started within pain limits and within a safe range of motion keeping in mind the associated osseous and soft tissue injuries. Forearm pronation and supination exercises were done actively while keeping the elbow in 90° of flexion. After 6 weeks postoperatively active and passive stretching and strengthening exercises were started.

Outcome measures

All patients were followed up clinically for a mean of 6 months (range from 4 to 12 months). The clinical evaluation was performed using the Mayo elbow performance score (MEPS).[11] The assessment included a record of the patient's pain level, range of movement at the elbow, elbow stability, and functional level. Each patient's affected range of movement was compared with the contralateral elbow. The MEPS results were classified as excellent (> 90), good (75–89), fair (60–74), or poor (< 60).

Statistical analysis

The results were tabulated and analyzed. The statistical analysis was conducted using Microsoft excel 2010.

Table 1: Mayo elbow score.

Function	Point score
Pain (45 points)	
None	45
Mild	30
Moderate	15
Severe	0
Motion (20 points)	
Arc 100 degrees	20
Arc 50 to 100 degrees	15
Arc 2 degrees	5
Stability (10 points)	
Stable	10
Moderate instability	5
Gross instability	0
Daily function (25 points)	
Combing hair	5
Feeding oneself	5
Hygiene	5
Putting on shirt	5
Putting on shoes	5

*Stable = no apparent varus-valgus laxity clinically, moderate instability = less than 10 degrees of varus-valgus laxity, and gross instability = 10 degrees or more of varus-valgus laxity.

RESULTS

A total of 18 patients were included in the study. Mode of injury in 8 of them was a fall on an outstretched hand. 6 of them sustained a radial head fractures following a road traffic accident; 4 after history of assault. Radial head replacement was done in all 18 patients as a primary procedure. 12 males and 6 females were included in the study as given in Table 2.

Table 2: Percentage distribution and mean age of patients in study.

	Numbers	Percentage	Mean age
Male	12	66.66%	39.58
Female	6	33.33%	34.00
Total	18	100%	37.72

The Mayo's scoring was recorded on each follow up visit. The following Figure 1 shows the pie chart of Mayo's score on their final follow up.

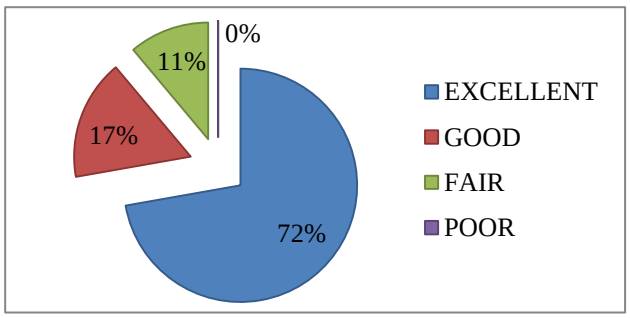

Figure 1: Mayo's score on final follow up.

Functional outcome as measured by MEPS. This shows excellent result in 13 (72%) of the patients good results for 3 (17%) and fair result in 2 (11%). None of the patients had a poor result as per MEPS scoring. None of the patients had any signs of infection or implant loosening. There were also no signs of elbow instability.

Figure 2: (a) Preoperative X-ray–AP; (b) Preoperative X-ray –LAT; (c) Postoperative X-ray –AP; (d) Postoperative X-ray – LAT.

DISCUSSION

Radial head fractures are almost 1/3rd of all fractures near elbow. Bilateral radial head fractures are rarely seen. Mechanism of injury of radial head fracture is by fall on an outstretched hand, when the force is transmitted along the axis of forearm resulting in compression of the radial head against the capitulum. Increased carrying angle in females may be a reason for higher incidence of this fracture in women. The excision of radial head was suggested classically but recently there has been increased interest in fixation or replacement of radial head in cases of radial head fracture fractures.

Ring et al suggested that ORIF for Mason type III fractures having more than three articular fragments were more likely to result in unsatisfactory outcomes compared to fractures with only 2 or 3 simple fragments.[12]

Moro et al advised to use metallic radial head prosthesis if a stable internal fixation of the comminuted radial head was not possible.[13]

Chen et al compared ORIF with radial head replacement for comminuted unstable radial head fractures. Two years follow-up showed patients with radial head replacement had significantly better ROM and lesser complications.[14]

However radial head prosthesis has problems like loosening and wears, which is not seen in the short-term follow-up. The main problem with radial head replacement is that only short or midterm results are known.

CONCLUSION

Radial head replacement for irreparable radial head fractures shows excellent to good outcome in our study. A good operative technique, choice of implant and early post-operative mobilization is important for the final functional outcome. However, larger study with longer duration of follow-up is needed to establish usefulness of radial head replacement in isolated radial head fractures.

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