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## Use of Dura retractor and disc holder for radial head excision in cases of isolated radial head fractures through Mini-open technique

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### Abstract

**Introduction:** Radial head fractures are quite common with incidence 1.5-4% of all adult fractures. One of the treatment options for these fractures is Radial head excision. To overcome the complications associated with the open lateral approach, we suggested Mini-open approach which gives good functional outcomes.

**Aim and Objectives:** The aim is to evaluate the functional outcomes of radial head excision done using mini open technique done in a case of isolated radial head fracture using Dura retractor and disc holder.

**Material and Methods:** We did an observational study comprising 30 previously operated patients between age 18- 60 years with Mason type II/III radial head fractures at Seth GSMC and KEM Hospital, Mumbai. The patients were assessed during their one time OPD Visit after a period of 6 months-2 years after the surgery to check the functional outcomes of radial head excision using Mini open technique.

**Results:** Out of 30 patients, 25 patients (83.3 %) had an excellent functional outcome as per MEPS score at an average of 8.90 months follow-up post-operatively.

**Conclusion:** Our study shows that short-term results of radial head excision are good to excellent as per the MEPS score.

**Keywords:** Dura retractor, disc holder, isolated radial head, Mini-open technique

### Introduction

The radial head fractures are the most common fractures of the elbow. The incidence of these fractures is around 2.5-2.9 per 10,000 people per year <sup>[1]</sup>. These fractures occur more commonly in women as compared to men and most frequently fall in the age group 20-60 years <sup>[1]</sup>. Undisplaced and minimally displaced radial head fractures occur as isolated injuries typically. On the other hand, more displaced and comminuted fractures are associated with damage to the collateral ligaments. Fractures of the capitellum, coronoid, or proximal ulna can also be associated with them. In high-energy trauma, elbow and /or forearm dislocations can also occur. Disruption of the interosseous membrane and distal radial ulnar joint ligaments may lead to axial instability of the forearm, which is called the Essex Lopresti lesion <sup>[2, 3]</sup>. Minimally displaced radial head fractures have a good functional outcome with non-operative treatment. The radial head has an important role to play in the biomechanics of the elbow joint. The articulation that occurs between the elliptical radial head and the capitellum has a stabilizing effect on the axial and valgus loading of the forearm and elbow which prevents dislocation and excessive valgus displacement <sup>[4]</sup>. Consequently, the radial head excision leads to altered elbow biomechanics. Management of comminuted radial head fractures is still a controversy. For these fractures, either fixation or replacement should be done when there is an associated elbow dislocation or longitudinal forearm instability. On the other hand, the best treatment option for an isolated radial head fracture is unclear. Open reduction and internal fixation for patients who have a complex fracture pattern has led to a high number of complications <sup>[5]</sup>. For cases where the anatomical reconstruction is not possible, radial head excision is widely used. The goal is to prevent complications in cases of Isolated, comminuted, displaced <sup>[6]</sup> radial head fractures which are irreconstructible and regain elbow motion after the

radial head excision is performed with the help of physiotherapy thereby preventing stiffness of joint and other complications related to immobilization<sup>[7]</sup>. Hence, with better operative techniques, excision of radial head in these fracture patterns is carried out enabling the patient to smoothly resume his work without hampering his day to-day life.

### Materials and Methods

We did an observational study comprising 30 previously operated patients between age 18- 60 years with Mason type II/III radial head fractures at Seth GSMC and KEM Hospital, Mumbai. The patients were assessed during their one time OPD Visit after a period of 6 months-2 years after the surgery to check the functional outcomes of radial head excision using Mini open technique.

### Inclusion criteria

1. Age > 18 years
2. Clinical and radiographic evidence of isolated radial head fracture.
3. Radial head fractures presenting within 3 weeks of injury.
4. Patients who are medically fit for operative management.

### Exclusion criteria

1. Age < 18 Years and > 70 years
2. Patients with other ipsilateral upper limb fractures that may affect the final functional outcome of the surgery.
3. Vascular Injury
4. Neurological deficit
5. Ipsilateral elbow dislocation
6. Pathological fracture
7. Compound or Open fractures of radial head.
8. Chronic degenerative joint disease like Osteoarthritis/Rheumatoid arthritis involving elbow joint.
9. Distal radio-ulnar joint instability
10. Uncontrolled diabetes
11. Previous surgery involving the distal humerus, proximal radius and proximal ulna which will affect the final functional outcome of the surgery.
12. Patients not compliant to physiotherapy or followup.
13. Evidence of an active infection/Sepsis

### Mayo Elbow Performance Score<sup>[8]</sup>

**Part 1:** Pain (VAS) The patient is asked how severe the pain is and in how frequent the pain appears. Forty five points are for patients who do not have pain (1), 30 points are given to patients who have mild pain (2), moderate pain results in 15 points, patients with severe pain get 0 points (3).

**Part 2:** Arc of motion. Patient starts with the elbow completely stretched. The patient tries to bend his arm. Twenty points are given when the arm reaches more than 100° flexion (1), when the angle is between 100° and 50° the therapist gives 15 points (2). When the maximum is no more than 50° 5 points are given (3).

**Part 3:** Stability. When the elbow is considered stable, 10 points are noted (1). A mildly unstable elbow results in 5 points (2). An unstable elbow does not receive points (3). Concerning stability, the involved elbow is evaluated for valgus, varus and posterolateral rotatory instability.

**Part 4:** Activities of Daily living. Based on 5 Activities of

daily living that are each given 5 points an image is sketched how well the patient can participate in daily life. The activities are combing your hair (A), performing personal hygiene (B), eating (C) and putting on the shirt (D) and shoes (E).

Total Score: < 60 – poor; 60-74 – fair; 75-89, good; 90-100 – excellent.

### Technique

1. In supine position with the arm kept on side board, patient's parts are prepared under aseptic precautions.
2. With the elbow in flexion and forearm in pronation (so that needles fall anteriorly), the radial head is palpated (Fig 1) and two 18 number needles are taken and inserted onto the superior and inferior aspect of radial head over the lateral surface under C-arm guidance (Fig 2).
3. Skin marker is used to draw a straight line between the entry points of two needles.
4. A stab incision is taken on this line and extended minimally in the proximal and distal direction. Superficial and deep dissection are done and annular ligament is exposed (Fig 3).
5. With the help of two dura retractors,
  - The annular ligament is retracted (Fig 4)
  - Soft tissue adhesions to the radial head fragments are released.
6. Disc holder is used to remove the radial head fragments. For confirming the complete removal of radial head-
  - The radial head is reconstructed on the table with the removed radial head fragments (Fig 5).
  - Complete removal of radial head is also confirmed by C-arm.
  - Pronation and supination movements are performed on table to ensure no restriction after the removal of fractured radial head.
7. Thorough wash is given and the wound is closed in layers followed by a sterile dressing.

### Results

On the basis of Pain assessment by VAS score, the average VAS score was 2.00. On the basis of range of motion at elbow joint (flexion extension arc), the patients had an average range of motion of 118.53 degrees at an average of 8.90 months follow up post operatively. None of the patients showed any wound complications. The functional outcome of radial head excision with the mini incision approach as measured by MEPS score was excellent in 25 out of 30 patients (83.3 percent).



**Fig 1:** Radial head is palpated along the lateral border of elbow with the elbow flexed and pronated



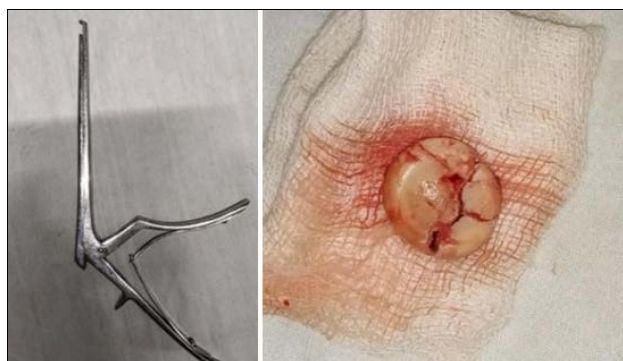
**Fig 2:** Two 18G needles are inserted onto the superior and inferior aspect of the radial head using Carm guidance.



**Fig 3:** A stab incision is made along the line joining the insertion points of two needles and the incision is extended minimally proximally and distally. Superficially and deep dissection is carried out.



**Fig 4:** Annular ligament is identified and retracted with the help of dura retractor.



**Fig 5:** Radial head fragments are removed with the help of Disc holder and reconstructed on the table to ensure complete removal.

**Table 1:** Distribution of Study Subjects according to the Age (Years) (N = 30)

Age (years)	Mini Incision (n=30) n (%)
≤ 30	13 (43.3)
31-40	9 (30.0)
41-50	8 (26.7)
>50	
Mean (SD)	32.97 (8.18)

**Table 2:** Distribution of Study Subjects according to the Gender (N = 30)

Gender	Mini Incision (n=30) n (%)
Female	9 (30.0)
Male	21 (70.0)

**Table 3:** MEPS Score

MEPS Score	Mini Incision (n=30) n (%)
Excellent	25 (83.3)
Fair	1 (3.3)
Good	4 (13.3)

**Table 4:** Time to follow up

Followup (Range: 6months-2 years)	Mini Incision (n=30) n (%)
6-9	19 (63.3)
9-12	10 (33.3)
>12	1 (3.3)
Mean (SD)	8.90 (2.13)

**Discussion**

The study was conducted with 30 patients with isolated radial head fractures out of which 9 were females and 21 were males.

After an average of 8.90 months of follow up, the mean range of motion was 118.73 degrees with an average VAS score of 2.00. 25 out of 30 patients had an excellent outcome as per MEPS score. The aim of operative management following an isolated radial head fracture is to allow early mobilization of the elbow and to meet the long term demands of the patient, whilst producing minimal complications and the need for secondary intervention. The Mini open technique, as the name suggests, utilizes a smaller incision (less than a cm) and makes use of two instruments-Dura retractor and Disc forceps for radial head excision that pose lesser trauma to the soft tissues. The mini open technique leaves a smaller scar over the lateral surface of the elbow thus reducing the risk of infection and post-operative hospital stay and improving functional outcomes. The Mini open technique for radial head excision is more acceptable to patients as it leaves a smaller scar and plaster immobilization is not required post operatively for more than a week, which would help in faster recovery rates in the patients and lesser chances of elbow stiffness. In a study done by Masayoshi ikeda [9] in 2006 on patients operated through the conventional open lateral approach for isolated radial head fractures, 81.4 % showed excellent results on MEPS score. In another study done by Ayush Kumar Singh [10] in 2019 on patients operated through the conventional open lateral approach for isolated radial head fractures, 46.6 % showed excellent and 53.3 5 showed good results on MEPS score. With the mini open technique, 83.3 % showed excellent outcomes on MEPS score.

**Conclusion**

Use of Dura retractor and Disc holder for radial head excision in patients of isolated radial head fractures via Mini Open approach may represent a good option in terms of maintaining

soft tissue integrity, faster recovery, good cosmesis, early rehabilitation, shorter hospital stay and excellent functional outcomes.

However, the drawback of this study is the sample size that is small making it difficult to prove clinical results statistically. Study should be conducted in larger group and a longer follow-up of the patients is required.

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