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FUNCTIONAL OUTCOME OF TYPE III AND IV RADIAL HEAD FRACTURES TREATED BY RADIAL HEAD PROSTHESIS

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ABSTRACT

INTRODUCTION: Fractures affecting the radial head and neck constitute approximately 1.7-5.4% of all fractures and represent about 33% of all elbow fractures. Fractures of the Mason Type III and IV are complex and management is controversial. The aim of this study was to determine the functional outcomes of radial head replacement in Mason III and IV radial head fractures in adults

MATERIALS AND METHODS: This retrospective study measured the outcomes of patients who had radial head replacement after a Mason III or IV fracture. This retrospective study included 30 patients of type III and IV radial head and neck fractures according to Mason's classification. This retrospective study included 30 patients of type III and IV radial head and neck fractures according to Mason's classification. Data was collected from hospital records and interviews and examinations were conducted with participants by appointment. Prior to developing the Data Sheets, a review of the literature was done to identify possible important demographic factors. The Mayo elbow performance index was found to be most useful in assessing functional outcomes.

RESULTS: Among the total of 30 cases, 19 (63.3%) cases were below the age of 40, while 11 (26.7%) cases were over 40. The average age was 35.8 years. The female population outnumbered the male population. There was significant improvement in flexion, extension, pronation, and supination at the second and sixth post-op weeks. 20 cases (66.7%) had MEPI score (Mayo Elbow Performance Index) >90 which indicates excellent result, 8 cases (26.6%) had MEPI score 75-89 which is good result and 2 cases (6.7%) had MEPI score 60-74 which indicates fair result.

CONCLUSION: It is concluded that that radial head prosthesis provides good functional results in Modified Mason's type III and IV radial head fractures, with a decreased complication rate and earlier mobilization.

KEYWORDS: Radial head fracture, radial head arthroplasty, radial head replacement, Mayo elbow performance index.

INTRODUCTION:

About 1.7–5.4 percent of all fractures are radial head and neck fractures, which account for about 33 percent of all elbow fractures [1]. These fractures usually happen when people fall and land on their extended arms [2]. With a major contribution to flexion, extension, pronation, and supination motions, the radial head is an essential component of elbow joint movement [3]. In terms of structure, it helps maintain stability over the forearm's length and offers crucial support against the lateral load on the elbow [4]. The exact categorization of radial head fractures usually determines how to treat them. It is generally acknowledged that the modified Mason classification is the recognized standard for classifying radial head articular fractures. Fractures of Mason type I feature non-displaced or slightly (<2 mm) displaced radial head fractures. Marginal sector fractures with some displacement (>2 mm) are classified as type II fractures. Complete and comminuted

radial head fractures are included in type III fractures. Elbow dislocation is linked to radial head fractures in type IV fractures [5].

There is strong evidence that undisplaced Mason type I fractures may be treated conservatively [6]. Many facilities treat displaced Mason type II fractures with ORIF to minimize the joint surface, and studies have shown positive results for these patients [7]. ORIF, resection, and radial head replacement are the three surgical therapy strategies for Mason III and IV fractures. Restoring stability is essential for treating unstable elbow dislocations and forearm injuries [8].

Radial head excision used to be a common treatment for radial head fractures that could not be repaired. These days, however, it is discouraged because the radius might move proximally, reducing elbow joint stability and causing distal radio-ulnar joint problems. [10] For fractures of Mason-Johnston type 3, ORIF is usually the initial therapy of choice. In order to maintain the blood flow to every fracture fragment, ORIF is often carried out in situ. However, because of the comminution and limited workspace, ORIF in situ might be difficult or perhaps impossible. [11,12]. Although arthroplasty is considered a salvage operation in instances that cannot be rebuilt, it may be provided in situations that are very comminuted. [13] Improvements in biomaterials and surgical procedures have led to good outcomes in radial head replacement studies, according to recent reviews of the literature [14,15] on elbow arthroplasties.

The aim of this study was to determine the functional outcomes of radial head replacement in Mason III and IV radial head fractures in adults.

MATERIALS AND METHODS:

This retrospective study measured the outcomes of patients who had radial head replacement after a Mason III or IV fracture. This retrospective study included 30 patients of type III and IV radial head and neck fractures according to Mason's classification. A descriptive study is used when information is required in a particular field and describes the variables in order to answer the research question, with no intention of establishing a cause-effect relationship. Whilst collecting the data, emphasis in this case was placed on structured observation and questionnaires.

Inclusion & exclusion criteria: Patients with radial head replacements in Mason Type III and IV radial head fractures were included in the study, provided that consent was given. Participants with missing and incomplete records, as well as patients with missing radiographic imaging, were excluded from the study. Furthermore, patients who could not be contacted for an interview and to complete a questionnaire were also excluded from the study.

Data collection: Data was collected from hospital records and interviews and examinations were conducted with participants by appointment. Prior to developing the Data Sheets, a review of the literature was done to identify possible important demographic factors. The Mayo Elbow Score was found to be most useful in assessing functional outcomes

Surgical Technique: Patient was posted for radial head replacement with radial head prosthesis. Prophylactic antibiotics were given intravenously pre operatively 30 minutes before skin incision to cover the common bacteria associated with postoperative surgical infections.

Under general or regional anaesthesia, the patient was positioned in the supine position. A sandbag was placed under the ipsilateral shoulder to assist in positioning of the elbow across the chest. The operative arm was placed over a padded bolster with a sterile tourniquet in place. After routine preparation and draping, Kocher approach was marked. Skin incision was placed. A full-thickness fascio-cutaneous flap was elevated. This exposure provided access to the radial head, capitellum, and lateral collateral ligament. The medial flap if needed was elevated to expose the coronoid and medial collateral ligament. The fascial interval between the anconeus and extensor carpi ulnaris was identified and developed. Excision of the fragments of the radial head was facilitated with the use of an image intensifier and a pituitary rongeur. Generous joint irrigation was performed to remove all loose intraarticular debris. Varus, Valgus and axial stress tests were done to check LCL, MCL and interosseous ligament, to confirm need for radial head replacement.

A modular radial head implant system was used. Measurement was taken after excision of radial head. Appropriate size press fit modular radial head prosthesis was inserted. After radial head replacement the elbow was placed through an arc of extension while carefully evaluating for elbow stability in pronation and supination. Closed suction drain was used for 24 hours. Haemostasis was achieved and wound was closed in layers. If the elbow was stable it was splinted in full extension with anterior plaster slabs, avoiding pressure over the olecranon and wound. If there was some residual instability it was splinted in 900 flexion and supination.

Postoperatively patients were given antibiotics and anti-inflammatory medicines for 3 days post op. A collar and cuff were worn during the day between exercises. A static progressive extension splint was used at night. Patient assessments were done of the basis of range of motion (ROM) at 2- and 6-weeks post op, stability and functionality was assessed according to the Mayo Elbow Performance Index (MEPI) at the final follow up. Complications were assessed on inspection and examination of the elbow and forearm as well as focussed questions regarding any neurology.

RESULTS:

Among the total of 30 cases, 19 (63.3%) cases were below the age of 40, while 11 (26.7%) cases were over 40. The average age was 35.8 years. The female population outnumbered the male population. In the majority of instances, almost 18 (60%) were attributed to falls, while the remaining cases were caused by road traffic accidents (RTAs). Out of the total number of cases, 21 instances (70%) exhibited right-side dominance, whereas 9 cases (30%) exhibited left-side dominance as shown in Table 1

Table 1: patient details

Age (years)	N	%
<40	19	63.3
>40	11	26.7
Gender		
Male	20	66.7
Female	10	33.3
Mode of injury		
Fall	19	63.3
RTA	11	26.7
Dominant side		
Right	21	70
Left	9	30

In our case study group, out of 30 cases, 25 cases (83.3%) were under Modified Mason's classification type Ill and 5 cases (16.7%) were under Modified Mason's classification type IV. Out of 30 cases, 24 cases (80%) were not associated with any ligamentous injury, 3 cases of LUCL and 3 cases of MCL injury was noted as shown in Table 2

Table 2: Mason's classification and associated injury

Masons classification	N	%
Type III	25	83.3
Type IV	5	16.7
Associated injury		
LUCL	3	10
MCL	3	10
NONE	24	80

There was significant improvement in flexion, extension, pronation, and supination at the second and sixth post-op weeks as shown in Table 3

Table 3: Post-operative flexion, extension, pronation, and supination at the second and sixth post-op weeks

Parameter	2^{nd} week	6^{th} week	p value
Flexion			
ROM (degrees)	77.12±19.72	117.46±16.86	0.004*
Extension			
ROM (degrees)	24±9.82	9.86±10.48	0.02*
Pronation			
ROM (degrees)	21±4.12	64.65±6.86	0.03*
Supination			
ROM (degrees)	34±6.45	69.76±6.86	0.001*

*Significance

20 cases (66.7%) had MEPI score (Mayo Elbow Performance Index) >90 which indicates excellent result, 8 cases (26.6%) had MEPI score 75-89 which is good result and 2 cases (6.7%) had MEPI score 60-74 which indicates fair result as shown in Table 4

TABLE 4: Mayo Elbow Performance Index (MEPI)-wise distribution

MEPI	n	%
<60 (Poor)	0	0
60-74 (Fair)	2	6.7
75-89 (Good)	8	26.6
>90 (Excellent)	20	66.7

Complications: 28 cases (93.4%) out of 10 cases had no complications, 1 case (3.3%) had infection and 1 case (3.3%) elbow stiffness.

DISCUSSION:

Patients with radial head fractures in our study had an average age of 35.8 years. According to Madhukar et al. [16], their median age of injury was 34.9 years. The mean age for radial head fractures was 48 years old, according to Kaas L et al. [17]. The number of females in our research exceeded that of males. In their 2010 research, Kaas L et al. [17] found a male:female ratio of 2:3. However, of the 30 patients in the study by Kulkarni et al. [18], 60% were men and 40% were women.

The majority of radial head fractures (18, 60%) were caused by falls, with RTAs accounting for the remaining instances. According to Kadam et al. [19], falls upon an outstretched hand caused the most fractures, RTA injuries were next, and assault caused the fewest injuries. Thirty percent of fractures in our research were on the left side, and seventy percent were on the right. This is in good agreement with the results of Kulkarni et al. [18], who found that 46.67% of fractures were on the left and 53.33% on the right. In their investigation, Madhukar et al. [16] also found that the right side was more prevalent.

Comminuted Mason type III and IV fractures often occur in conjunction with medial and lateral ligament and interosseus membrane disruptions, as well as other elbow injuries such capitellum and coronoid fractures [20]. In our research, 16.7% were categorized as Type IV and 83.3% as modified Mason type III. Of these individuals, 11.42% had damage to the medial collateral ligament (MCL), 10% to the lateral ulnar collateral ligament (LUCL), and 78.58% had no ligamentous damage.

66.7% of the 30 instances in our research had an MEPI score higher than 90, which indicates outstanding results. Furthermore, 6.7% scored between 60 and 74, suggesting acceptable results, while 26.6% scored between 75 and 89, indicating excellent outcomes. Comparatively, Kulkarni et al. [18] reported on 30 instances in which 26.66% had excellent results (MEPI 75-89), 3.33% had acceptable results (MEPI 60-74), 66.67% had fantastic results (MEPI > 90), and another 3.33% had bad results. However, in their analysis of 18 patients, Kadam et al. [19] found that 72% of them had exceptional results, 17% had acceptable results, and 11% had fair results. Additionally, in 80% of instances, there were no problems, although 10% had an infection and 10% had stiff elbows.

CONCLUSION:

It is concluded that that radial head prosthesis provides good functional results in Modified Mason's type III and IV radial head fractures, with a decreased complication rate and earlier mobilization.

REFERENCES

1.Beingessner DM, Dunning CE, Gordon KD, Johnson JA, King GJ: The effect of radial head excision and arthroplasty on elbow kinematics and stability. J Bone Joint Surg Am. 2004, 86:1730-9.

2..Beingessner DM, Dunning CE, Gordon KD, Johnson JA, King GJ: The effect of radial head excision and arthroplasty on elbow kinematics and stability. J Bone Joint Surg Am. 2004, 86:1730-9.

3.Popovic N, Gillet P, Rodriguez A, Lemaire R: Fracture of the radial head with associated elbow dislocation:results of treatment using a floating radial head prosthesis. J Orthop Trauma. 2000, 14:171-7.

4.Morrey BF, Tanaka S, An KN: Valgus stability of the elbow. A definition of primary and secondary constraints. Clin Orthop Relat Res. 1991, 187-95.

5.MA ML: Some observations on fractures of the head of the radius with a review of one hundred cases . Br J Surg. 1954, 42:123-32

6.Kumar , V, Wallace, WA. Radial head fractures update on classification and management. *Orthopaedics and Trauma*. 2012;26 (2), 124-131.

7.Kaas et al. The epidemiology of elbow fractures. *Journal of Shoulder and Elbow Surgery.* 2011,19(4):p5*20-3*

8.Yoon, A, Athwal G, Faber, K, King, GJW. Radial Head Fractures. *Journal of Hand Surgery*. 2012;37 (A), 2626-1337

9.Mebouinz FN, Kasse A, Habib SM. Results of radial head resection after Mason type 3 or 4 fracture of the elbow. Clin Shoulder Elb. 2020;230020(3):131–5.

10. Saeed W, Waseem M. Elbow fractures overview. Treasure Island: StatPearls; 2022.

11. Businger A, Ruedi TP, Sommer C. On-table reconstruction of comminuted fractures of the radial head. Injury. 2010;41(6):583–8.

12. Kiran Kumar GN, Sharma G, Farooque K, Sharma V, Jain V, Singh R, et al. On-table reconstruction and fixation of Mason type III radial head fractures. Chin J Traumatol. 2015; 18(5):288–92.

13. Meacher H, Hermena S, Isaac S. Open reduction and internal fixation versus radial head arthroplasty for Mason III radial head fractures: appraising the current literature evidence. Cureus. 2020;12(4):e7501

14.Giannicola G, Sacchetti FM, Antonietti G, Piccioli A, Postacchini R, Cinotti G. Radial head, radiocapitellar and total elbow arthro -plasties: a review of recent literature. Injury 00 20.2014 Feb 1;45(2):428-36.

15. Kaur MN, MacDermid JC, Grewal RR,Stratford PW, Woodhouse LJ. Functional outcomes post-radial head arthroplasty: a systematic review of literature. Shoulder & Elbow. 2014 Apr;6(2):108-18.

16.Dr. Madhukar, Dr. Vinoth KR and Dr. Vijay Narasimman Reddy. Prospective comparative study of short term functional outcomes of radial head excision arthroplasty and radial head replacement arthroplasty in radial head fracture. National Journal of Clinical Orthopaedics. 2019; 3(1): 147-153
17.Kaas, L · van Riet, RP · Vroemen, JP · et al. **The epidemiology of radial head fractures** *J Shoulder Elbow Surg*. 2010; **19**:520-523
18.Kulkarni V, Lambat N, Patil T, Joshi S, Jadhav S, Dattu V: A study on functional outcome of radial head arthroplasty in comminuted radial head fracture. Int J Orthop Sci. 2020, 6:690-5.
19.Kadam R, Sharma C, Pandhare S, Chhallani A, Gupta A, Sawant R: Functional outcome of radial head replacement in isolated radial head fractures. Int J Res Orthop. 2017, 3:362-5.
20.van Riet RP, Morrey BF, O'Driscoll SW, Van Glabbeek F: Associated injuries complicating radial head fractures: a demographic study. Clin Orthop Relat Res. 2005, 441:351-5.