IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 21, Issue 5 Ser.3 (May. 2022), PP 41-49
www.iosrjournals.org

To Assess the Functional Outcome of Primary Prosthetic Replacement in Radial Head Fractures

[1.] Dr. Shariq Hussain Malik *(PG Scholar Orthopaedics, Govt. Medical College Srinagar)*
[2.] Dr. Arshad Bashir *(Associate professor Orthopaedics, Govt. Medical College Srinagar)*
Coresponding author: Dr. Arshad Bashir

Abstract
Introduction: Radial head arthroplasty is commonly used to treat acute unreconstructible radial head fractures. Radial head fractures are the most common elbow fractures. Radial head fractures are together with the radial neck fractures, relatively common injuries can be seen in all age groups, usually occur in adults (between 20-60 years of age). Radial head fractures usually occur as a result of indirect trauma, with most resulting from a fall on an abducted arm with minimal or moderate flexion of the elbow joint. In order to maintain stability of the injured elbow, goals of treatment of radial head fractures become more and more towards restoring function and stability of the elbow.
Aim and Objective: To assess the functional outcomes of primary prosthetic replacement in radial head fractures.
Material and Methods: The prospective study was conducted in the Postgraduate Department of Orthopaedics, Govt. Medical College Srinagar from January 2020 to December 2020. In this study 44 patients were enrolled. The enrolled patients were selected from emergency department and OPD with type-III and Type-IV radial head fractures according to Morrey modified Mason's classification.
Results: In this study 52.27 % of patients are in age group of 20-30 years. This study includes 70.45 % male patients and 29.55 % female patients. Out of 44 patients, Left side was involved in 43.18 %, while 56.82 % of patients had Right sided injury. Majority of patients (77.27 %) had history of road accidents. In our study, 79.55 % of patients presented with type III fracture while the rest 20.45 % with Mason type IV fracture. At the follow-up of 6 month, 72.73% patients showed excellent outcomes, 20.45 % showed good results while the rest 6.82 % showed poor functional outcomes.
Conclusion: Radial head arthroplasty can be used successfully with most of excellent results for treatment of Comminuted radial head fracture (The Modified Mason classification type III and IV radial head fractures).
Key words: *Elbow, fracture, management, radial head trauma.*

Date of Submission: 05-05-2022 Date of Acceptance: 19-05-2022

I. Introduction

Fractures of the radial head first were described in 1905 and were generally treated by immobilization [1]. Radial head and neck fractures are estimated to account for 1.7% to 5.4% of all fractures seen today [2]. They represent one third of all fractures involving the elbow [3, 4]. A radial head fracture usually results from a fall on an outstretched arm with the forearm pronated and the elbow partially flexed. The radial head is fractured because it absorbs the indirect force of the fall and impacts on the capitellum. The radial head, however, can fracture via direct impact or as one component of higher-energy trauma.

Fractures of the radial head have been classified by Mason 4 with a subsequent modification by Johnston [5]. As originally described, Mason type I fractures are fissures or marginal sector fractures without displacement. Type II fractures are marginal fractures with displacement that consists of a portion of the articular surface being impacted or angulated. Type III fractures are comminuted injuries affecting the entire radial head. The later addition to this classification was the Mason-Johnston type IV injury, which takes into account a radial head fracture in the presence of an ipsilateral ulno humeral dislocation.

Depending on the fracture pattern and associated soft-tissue injury several types of treatment exist for fractured radial heads. Regardless of the fracture type the goals of treatment for radial head fractures are to restore elbow stability, preserve elbow motion, and maintain the relative length of the radius. In the majority of fractures that are undisplaced these aims are accomplished with a few days of immobilization followed by prompt resumption of elbow motion. When large bony fragments block motion or are displaced markedly most surgeons will attempt open reduction and internal fixation because technology today allows for low-profile stable fixation, which permits early elbow rehabilitation.

When faced with the more complicated comminuted fracture pattern, one enters a gray area in which clinical decision making depends on factors unique to each patient. The approach in these cases consists of either conservative management, open reduction and internal fixation (ORIF), excision of the radial head, or radial head Arthroplasty [6].

Treating complex radial head fractures with ORIF can yield good results in the hands of experienced surgeons who are well versed in this procedure [7]. This can require a longer surgical time relative to other procedures, however, because fixation can be demanding technically and may require future removal of hardware. Historically excision of the radial head was the surgical solution for complex radial head fractures. It has become less popular as concerns about delayed sequelae emerged. These include wrist pain, valgus instability of the elbow, loss of strength, and ulno humeral arthritis. At the same time the instrumentation for internal fixation and arthroplasty has improved.

Yet even as a late salvage radial head excision can provide reasonable functional improvements [8, 9]. Meanwhile radial head arthroplasty provides a suitable alternative in these difficult cases. Arthroplasty produces consistent results with a shorter learning curve than ORIF and prevents the late complications associated with radial head excision. Radial head arthroplasty has had a significant transformation since its modest beginnings when Speed [10] published the first series of ferrule caps for the radius head.

In 1951 Carr and Howard [11] then reported on metallic caps used for acute radial head fractures. Two years later Cherry [12] introduced an acrylic prosthesis for radial head fractures. Later the silicone arthroplasty was introduced by Swanson et al [13]. Silicone implants remained in vogue for several years, however, late complications soon became apparent. These included fractures of these silastic implants and the development of a silicone-based synovitis in the elbow [14, 15].

These complications and biomechanical studies showing the inability of silicone implants to support the radius functionally encouraged many companies to produce the metallic radial head replacements that are popular today.

II. Materials And Methods

The prospective study was conducted in the Postgraduate Department of Orthopaedics, Govt. Medical College Srinagar from January 2020 to December 2020. In this study 44 patients were enrolled. The enrolled patients were selected from emergency department and OPD with type-III and Type-IV radial head fractures according to Morrey modified Mason's classification. All the patients fulfills inclusion criteria.

INCLUSION CRITERIA

1. Morrey modified Mason's type-III and Type-IV.
2. Closed fractures.
3. Age of the patient: 20 years or more
4. Patients who can attend OPD for at-least 1 year.
5. Both Sexes.

EXCLUSION CRITERIA

1. Morrey modified Mason's type-I and Type-II**.**
2. Open fractures.
3. Age less than 20years.
4. Pathological Fractures.Associated Neurovascular Injury.
5. Presence of any infection.
6. Patients with dysplastic elbow-joints.
7. Patient who cannot come for follow up for at-least 1 year.

IMPLANTS USED

III. Method

Anesthesia: Regional block, spinal or general anesthesia.

Positioning Of Patient: Supine position
Under general or regional anesthesia, the patient was positioned in the supine position. After routine preparation and draping, Kocher approach was made to expose the radial head.

Draping

Skin marked

The fractured radial head was excised with great care taken not to leave any fragment in the elbow joint. Copious joint irrigation was performed to remove all loose intra articular debris. Valgus and axial stress tests were performed using an image intensifier to evaluate the competency of the MCL and interosseous ligament.

Interval Between ECU & Anconeus

Radial Head exposed

A modular radial head implant system was used. This device had multiple head diameters and heights and different stem sizes, which allowed for a close approximation to normal anatomy. Each head could be mated to any of the stems using a Morse taper resulting in multiple potential combinations of sizes. The different head heights accommodated for the extension of fractures into the proximal neck and also accounted for observed variability in head height. The parts of the broken head were reassembled on the table to ensure that the whole head had been resected to choose the size of the prosthetic head. A minimal amount of radial neck was resected at a right angle to the medullary canal of the radial neck to ensure a smooth surface for load transfer to the implant. The appropriate diameter and height of radial head implant were selected for trial implantation. The medullary canal of the radial neck was gently rasped using the hand reamers. Rasp was used to smooth the neck cut, ensuring that it was at 90° to the neck and the trial head was inserted onto the trial stem. The diameter, height, and congruency of the prosthesis were assessed visually with the aid of an image intensifier. The head had to reach the limit between the trochlear notch and the radial notch of the ulna. The trial components were removed and the definitive implants were inserted with cementing. After radial head replacement, the annular ligament was repaired. The fascial interval between the anconeus and extensor carpi ulnaris was closed. Wound was closed and tourniquet deflated. Associated procedures included MCL repair in three cases. Postoperative X-ray was taken.

Radial Head resected

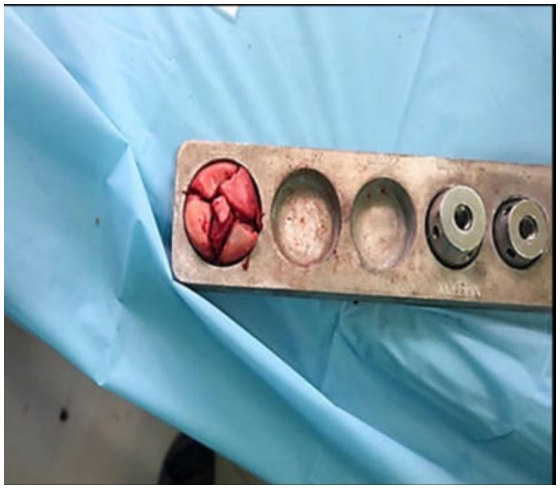
Rasping the medullary canal

Final picture of the prosthesis

Repairing the annular ligament

Inserting the prosthesis

Wound closed in layers



Measuring the size of prosthetic head

Prosthesis assembled before insertion

Final fluoroscopic picture: Lateral view

Final fluoroscopic picture: AP view

POST-OPERATIVE

- Physiotherapy

Patients with stable elbow were started with active flexion and extension exercises throughout a full arc of motion 3 days after surgery. A collar and cuff was worn between exercise period. A static progressive extension splints were used at night. A resting splint was maintained elbow at 90°degrees. Active forearm rotation with elbow at 90° flexion to avoid stressing medial and lateral ligament injury or repair. A progressive extension splint was used at night once ligaments healing and elbow stability improves by 6 weeks after surgery.

- Post-Operative Management

The operative limb was continuously elevated for 2 days, IV antibiotics was given for 5 days and then shifted to oral antibiotics. Anti-Inflammatory and analgesic drugs were given. Post-operative dressing was done on 2nd and 8th day. Stitches were removed on 12th day.

- Follow Up49

The patients were followed up in outpatient department fort-nightly for a period of 1 month postoperatively. Physiotherapy was continued.

At follow-up:

- Patients were examined clinically for a range of movements and then radiologically at the end of 6 weeks, 12 weeks, 6 months, and 1 year.
- Pain if any.
- Assessment of local wound.
- Swelling of joint.
- Power and tone of muscle.
- Tenderness at fracture site.
- Presence of any obvious inflammation.
- Movement of the limb- Active and passive.

SCORING SYSTEM

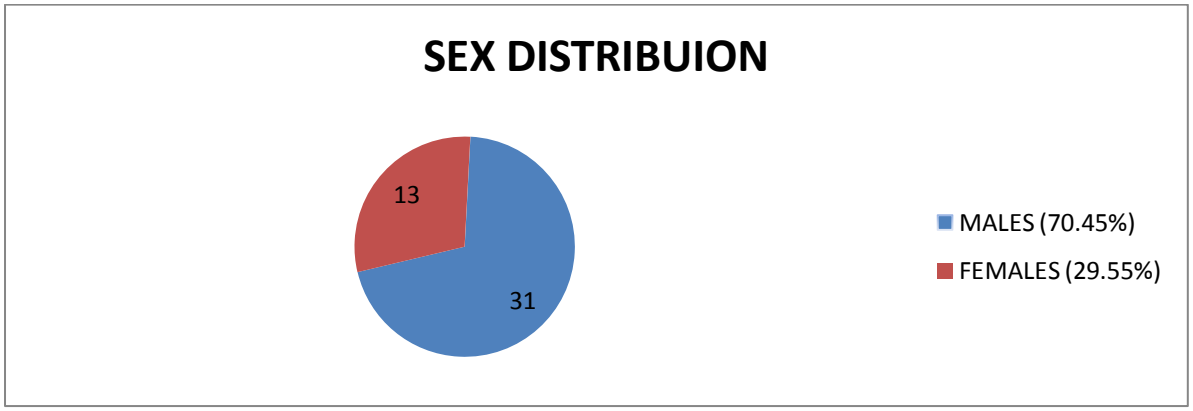
All cases were evaluated for:

- Range of Motion using manual Goniometer.
- Grip strength was evaluated by using hydraulic hand jammer dynamometer.
- Stability of the elbow joint was evaluated on the basis of clinical examination and radiograph.
- Elbow functional performance was assessed by Mayo Elbow performance (MEPI) [16, 17].
- The disability of Arm, Shoulder and Hand were assessed by DASH questionnaire [18].
- Residual pain was assessed by Visual Analogue scale (VAS) [19].

IV. Results

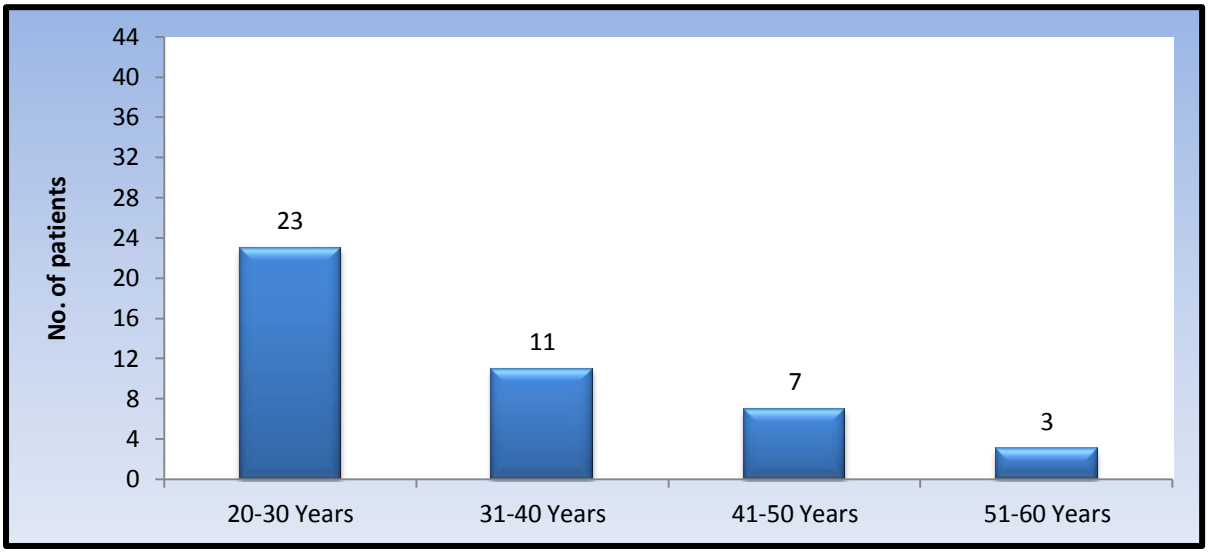
In this prospective study we enrolled 44 patients between age group of 20-60 years and the mean age was 32.59 years. In this study the obtained results are as under.

Distribution of patients on the basis of sex



In our study 70.45 % were male patients and 29.55 % patients female.

Distribution of patients on the basis of age group.



This study shows that maximum patients (52.77%) belongs to age group of 20-30 years.

Distribution of patients on the basis of side		
Side	No. of patients	Percentage
Right	25	56.82%
Left	19	43.18%
Total	44	100.00%

Right side is involved in 56.82% (25) of patients and left side is in 43.18% (19) patients.

Mode of injury		
Mode of injury	No. of patients	Percentage
Fall	10	56.82 %
Road accidents	34	77.27 %
Total	44	100.00 %

Majority of patients 34 (77.27 %) were of road accidents.

Fracture type		
Type	No. of patients	Percentage
Type-III	35	79.55 %
Type-IV	9	20.45 %

Majority of patients 35 (79.55 %) were with type-III fracture.

Results at the follow-up of 6 months		
	No. of patients	Percentage
Excellent	32	72.73 %
Good	9	20.45 %
Fair	0	0
Poor	3	6.82 %

At the follow-up of 6 months, among 44 patients 32 showed excellent outcomes, 9 patients good and 3 patients with poor outcomes.

V. Discussion

Radial head fractures are one of the commonest fractures around elbow (33%) and account for approximately 1.5% to 4% of all fractures [20, 21]. Initially, radial head resection was the treatment of choice for mason type 3 fractures. Maintaining the radial head by attempting reconstruction using open reduction and internal fixation has been associated with a high number of complications as well [22-25].

In recent times, radial head replacement has gained popularity for the treatment of isolated radial head fractures. As the radial head is an important secondary stabilizer of the elbow [26], replacement surgery is advised for patients with unreconstructible radial head fractures and concomitant ligamentous injuries, which call for its secondary stabilizing function. Through the use of a metal spacer to restore elbow articulation, RHR provides immediate stability with encouraging outcomes. Given the prevalence of injuries and age at surgery in

the young and active population, longterm results and longevity of prosthesis become a critical issue after implantation.

The purpose of this study was to analyze the functional results of patients who have undergone radial head arthroplasty for mason type 2 and 3 radial head fractures in Indian population.

In our study 52.27 % patients were in the age group of 20-30 years. Male predominance was found in our study. Majority of patients had history of accidental fall. The results of the study were compared with the studies of Morrey et al [27, 28] 1985, Judet et al [29] 2005 and Choudhary BM et al [30] 2019. In our study, type III Mason fracture was found in 79.55 % of patients while 20.45 % had type IV Mason radial head fracture. The results were compared with the studies of Ikeda et al [31] 2003, Dotzis et al [32] 2006 and Businger et al [33] 2010.

At the end of this study, 72.73 % patients at the end of 6 month follow up showed excellent outcomes. 20.45 % showed good results while the rest 6.82 % showed poor functional outcomes. These results were comparable with few other studies conducted by Goldberg et al [34] 1986, Fuchs et al [35] 1999, Iftimie et al [36] 2011 and Yalcinkaya et al [37] 2013.

In our study, the DASH score showed an average of 21.9 (10.9 – 54). These results were comparable with orther studies (Grewal et al [38], Zunkiewicz et al [39]).

VI. Conclusion

Radial head arthroplasty can be used successfully with most of excellent results for treatment of Comminuted radial head fracture (The Modified Mason classification type III and IV radial head fractures).

References

[1]. Furry KL, Clinkscales CM. Comminuted fractures of the radial head: arthroplasty versus internal fixation. Clin Orth Rel Res 1998;353:40 –52.
[2]. Morrey BF. Radial head fracture. In: Morrey BF, ed. The elbow and its disorders. 3rd ed. Philadelphia: WB Saunders, 2000:341–364.
[3]. Harrington IJ, Tountas AA. Replacement of the radial head in the treatment of unstable elbow fractures. Injury 1981;12: 405–412.
[4]. Mason ML. Some observations on fracture of the head of the radius with a review of one hundred cases. Br J Surg 1954; 42:123–132.
[5]. Johnston GW. A follow up of one hundred cases of fracture of the head of the radius with a review of the literature. Ulster Med J 1962;31:51–56.
[6]. Herbertsson P, Josefsson PO, Hasserius R, Besjakov J, Nyqvist F, Karlsson MK. Fractures of the radial head and neck treated with radial head excision. J Bone Joint Surg 2004;86A:1925–1930.
[7]. Ikeda M, Sugiyama K, Kang C, Takagaki T, Oka Y. Comminuted fractures of the radial head. J Bone Joint Surg 2005;87A:76–84.
[8]. Broberg MA, Morrey BF. Results of delayed excision of the radial head after fracture. J Bone Joint Surg 1986;68A:669–674.
[9]. Goldberg I, Peylan J, Yosipovitch Z. Late results of excision of the radial head for an isolated closed fracture. J Bone Joint Surg 1986;68A:675–679.
[10]. Speed K. Ferrule caps for the head of the radius. Surg Gynecol Obstet 1941;73: 845– 850.
[11]. Carr CR, Howard JW. Metallic cap replacement of the radial head following fracture. West J Surg 1951; 59:539 –546.
[12]. Cherry JC. Use of acrylic prosthesis in the treatment of fracture of the head of the radius. J Bone Joint Surg 1953; 35B:70–71.
[13]. Swanson AB, Jaeger SH, La Rochelle D. Comminuted fractures of the radial head. The role of silicone-implant replacement arthroplasty. J Bone Joint Surg 1981;63A:1039–1049.
[14]. Vanderwilde RS, Morrey BF, Melberg MW, Vinh TN. Inflammatory arthritis after failure of silicone rubber replacement of the radial head. J Bone Joint Surg 1994;76B:78–81.
[15]. Morrey BF, Askew L, Chao EY. Silastic prosthetic replacement for the radial head. J Bone Joint Surg 1981; 63A:454–458.
[16]. Smith MV, Calfee RP, Baumgarten KM, Brophy RH, Wright RW. Upper extremity-specific measures of disability and outcomes in orthopaedic surgery. J Bone Joint Surg Am. 2012 Feb 1;94(3):277-85.
[17]. Broberg MA, Morrey BF. Results of delayed excision of the radial head after fracture. J Bone Joint Surg Am. 1986 Jun;68(5):669-74.
[18]. Hudak PL, Amadio PC, Bombardier C, Beaton D, Cole D, Davis A, et al. Development of an upper extremity outcome measure: The DASH (disabilities of the arm, shoulder, and head). Am J Ind Med. 1996;29(6):602-8.
[19]. Bourdel, N.; Alves, J.; Pickering, G.; Ramilo, I.; Roman, H.; Canis, M. (2014). "Systematic review of endometriosis pain assessment: how to choose a scale?". Human Reproduction Update. 21(1): 136 -152.
[20]. Herbertsson P, Josefsson PO, Hasserius R, Besjakov J, Nyqvist F, Karlsson MK. Fractures of the radial head and neck treated with radial head excision. J Bone Joint Surg Am. 2004;86:1925-30.
[21]. Herbertsson P, Josefsson PO, Hasserius R, Karlsson C, Besjakov J, Karlsson M. Uncomplicated Mason type-II and III fractures of the radial head and neck in adults. A long-term follow-up study. J Bone Joint Surg Am. 2004;86:569-74.
[22]. Goldberg I, Peylan J, Yosipovitch Z. Late results of excision of the radial head for an isolated closed fracture. J Bone Joint Surg Am. 1986;68:675-9.
[23]. Hotchkiss RN, Weiland AJ. Valgus stability of the elbow. J Orthop Res. 1987;5:372-7.
[24]. King GJ, Evans DC, Kellam JF. Open reduction and internal fixation of radial head fractures. J Orthop Trauma. 1991;5:21-8.
[25]. Shore BJ, Mozzon JB, MacDermid JC, Faber KJ, King GJ. Chronic posttraumatic elbow disorders treated with metallic radial head arthroplasty. J Bone Joint Surg Am. 2008;90:271-80.
[26]. King GJW, Morrey BF, An K-N. Stabilizers of the elbow. J Shoulder Elbow Surg 1993;2(3):165-174.
[27]. Morrey BF, An KN. Articular and ligamentous contribution to the stability of the elbow joint. J Sports Med. 1983;11:315-9.
[28]. Morrey BF, Askew LJ, Chao EY. A biomechanical study of normal functional elbow motion. J Bone Joint Surg Am. 1981;63(6):872–7.
[29]. Bain GI, Ashwood N, Baird R, Unni R. Management of Mason type-III radial head fractures with a titanium prosthesis, ligament repair, and early mobilization Surgical technique. J Bone Joint Surg Am. 2005; 87, 1(Pt 1):136-
[30]. *Choudhary BM et al. Int J Res Orthop. 2019 Jan;5(1):70-76.*

[31]. Ikeda M, Yamashina Y, Kamimoto M et al (2003) Open reduction and internal fixation of comminuted fractures of the radial head using lowprofile miniplates. J Bone Joint Surg Br 85:1040–1044
[32]. Dotzis A, Cochu G, Mabit C et al (2006) Comminuted fractures of the radial head treated by the Judet floating radial head prosthesis. J Bone Joint Surg Br 88:760–764
[33]. Businger A, Ruedi TP, Sommer C (2010) On-table reconstruction of comminuted fractures of the radial head. Injury 41:583–588
[34]. Goldberg I, Peylan J, Yosipovitch Z. Late results of excision of the radial head for an isolated closed fracture. J Bone Joint Surg Am. 1986;68:675-9.
[35]. Fuchs S, Chylarecki C. Do functional deficits result from radial head resection? J Shoulder Elbow Surg. 1999;8:247-51.
[36]. Iftimie PP, Calmet Garcia J, de Loyola Garcia Forcada I, Gonzalez Pedrouzo JE, Giné Gomà J. Resection arthroplasty for radial head fractures: long-term follow-up. J Shoulder Elbow Surg. 2011;20:45–50.
[37]. Yalcinkaya M, Bagatur AE, Erdogan S, Zorer G. Resection arthroplasty for mason type iii radial head fractures yield good clinical but poor radiological results in the long-term. J Orthop. 2013;36(11):1358-64.
[38]. Grewal R, MacDermid JC, Faber KJ, Drosdowech DS, King GJ. Comminuted radial head fractures treated with a modular metallic radial head arthroplasty. Study of outcomes. J Bone Joint Surg Am. 2006;88(10):2192–200. doi: 10.2106/JBJS.E.00962.
[39]. Zunkiewicz MR, Clemente JS, Miller MC, Baratz ME, Wysocki RW, Cohen MS. Radial head replacement with a bipolar system: a minimum 2-year followup. J Shoulder Elbow Surg. 2012;21(1):98–104. doi: 10.1016/j.jse.2011.05.012.

Dr. Arshad Bashir, et. al. "To Assess the Functional Outcome of Primary Prosthetic Replacement in Radial Head Fractures." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 21(05), 2022, pp. 41-49.