



SURGICAL MANAGEMENT OF MONTEGGIA FRACTURE DISLOCATION IN ADULTS

Orthopaedics

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ABSTRACT

Twenty cases of simple Monteggia fracture-dislocation in adults were treated by open reduction and internal fixation with minimum six holed AO 3.5mm dynamic compression plate of ulna with closed reduction of radial head. Radial head was excised in one case with late presentation. The follow up ranged from 5-15 months. Males were predominant with right elbow affection more than left. Majority of fracture-dislocations were due to road traffic accidents. The fracture-dislocation was more common in third and fourth decade of life with an average age of 35.9 years. Most of the cases were type-I fracture-dislocation according to Bado's classification. Upper limb was immobilized in 110-120 degrees of flexion of the elbow with forearm in supination to prevent radial head redislocation. Using Anderson et al scoring system, we had 13(65%) cases with excellent results, 6(30%) satisfactory results, 1 (5%) unsatisfactory results, with no cases of failure. The complication rate was minimal when closed reduction of radial head dislocation and open reduction and internal fixation of ulna with AO 3.5mm Dynamic compression plate, the complications being superficial infection and posterior interosseous nerve injury which recovered spontaneously.

KEYWORDS

INTRODUCTION

"Giovanni Battista Monteggia" of Milan in 1814 published his classical description of the fracture that is associated with his name. Monteggia fracture dislocations are rare injuries that comprise less than five percent of all forearm fractures. These fractures have a variety of complications that are unique to this lesion including error in diagnosis, redislocation of radial head and radioulnar synostosis. Watson-Jones stated in 1943 that "No fracture presents so many problems; no injury is best with greater difficulty; no treatment is characterised by more general failure". It is a treacherous condition to treat and can cause complications like joint stiffness and nerve injuries. This condition is widely recognized by orthopaedic surgeons largely because of notoriously poor results associated with treatment of these injuries in adults. In the past, closed reduction and plaster cast application was the treatment for Monteggia lesions and treatment of radial head dislocation has been controversial. Böhler stated that all Monteggia fractures could be treated nonoperatively. However, various studies conducted on Monteggia lesions showed that results were poor if conservative management is opted. With various complications like malunion or nonunion of ulna, recurrent radial head dislocation and posterior interosseous nerve palsy. So keeping this in consideration it has become important to intervene surgically. Careful diagnosis and prompt, adequate treatment recommended for this, potentially treacherous injury. The active mobilization after the surgery will restore the patient to normal function as early as possible. Active movements not only prevent the tissue from fracture disease but also greatly influence the quality and rapidity of fracture union. Goal of treatment of Monteggia fracture is anatomic reduction of radial head together with reduction and fixation of ulna. Open reduction and internal fixation of ulna with dynamic compression plate and screws not only prevents malunion or nonunion but achieves rapid union of fracture site. This dissertation is undertaken to verify the claims of various authors regarding surgical management of Monteggia fracture-dislocation in adults and to know the advantages and complications of surgical management.

CLASSIFICATION AND MECHANISM OF INJURY

Depending upon the forces acting Monteggia fracture dislocations can be classified as

1. Flexion injuries - seen in ten to fifteen percent of cases. Fractured ulna is angulated with convexity posteriorly and the head of the radius is displaced backwards.
2. Extension injuries: seen in eighty five to ninety percent of cases. The fractured ulna is angulated with its convexity anteriorly and

laterally and head of the radius is dislocated forwards and to lateral side.

3. Adduction injury: rare and is caused by an adduction strain at the elbow. The ulna is angulated laterally and the radial head is displaced laterally.

In 1967, Bado suggested the term Monteggia lesion, noting that Monteggia's original description was a fracture between the proximal third of ulna and the base of the olecranon associated with an anterior dislocation of radial head.

Bado classified Monteggia lesions into four distinct categories.

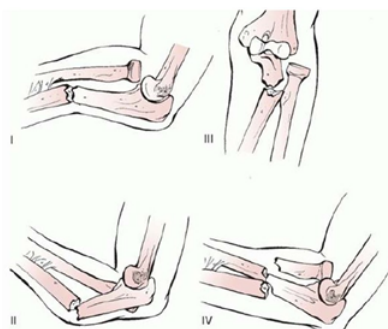


Fig.1 : Classification of Monteggia (Bado's) fracture

- Type-I - Fracture of the ulnar diaphysis at any level with anterior angulation at the fracture site and an associated anterior dislocation of the radial head
- Type-II - Fracture of the ulnar diaphysis with posterior angulation at the fracture site and a posterolateral dislocation of the radial head.
- Type-III - Fracture of the ulnar metaphysis with a lateral or anterolateral dislocation of the radial head.
- Type-IV - Fracture of the proximal third of both the radius and ulna at the same level with an anterior dislocation of the radial head
- Type-I lesion is the most common, Type-III and type-II lesions are next in the frequency and type-IV lesions are the rarest.

MECHANISM OF INJURY:

Several mechanisms of injury probably exist, including direct blow to

the ulnar aspect of the forearm and a fall with hyperpronation or hyperextension with strong supination force of biceps pulling the radial head anteriorly as the fracture of ulna is produced by the compression forces of the fall.

MATERIALS AND METHODS

The present study consists of 20 cases of Monteggia fracture dislocation in adults treated by 3.5mm Dynamic compression plate and screws in the department of Orthopaedics, SVS Medical college hospitals during the study period (2014– 2017). There were eleven male patients and nine female patients who underwent surgery. Seven of the male patients had right side involvement and four had left side involvement. Five of the female patients had right side involvement and four had left side involvement.

Of the twenty cases, eleven patients met with road traffic accidents due to two wheeler accidents. Eight patients had fallen from a height on to the ground and one patient sustained injury while guarding against assault with a stick.

IMMEDIATE MANAGEMENT:

As soon as the patient was admitted to hospital, thorough clinical examination was done regarding general condition of the patient, any associated systemic disease and any associated injuries were recorded. All patients presented with elbow in about 30 degrees of flexion supported by the other hand. All of the cases were simple fracture-dislocations. Clinically tenderness, bony irregularity, crepitus and deformity of ulna were elicited. In fourteen patients, radial head was palpable anteriorly which was confirmed by rotatory movements. One of the patients who presented late to the hospital had minimal pain and restriction of movement. In four patients radial head was palpated posterolaterally and in two patients who had signs of fracture of proximal ulna and proximal radius, the head was palpated anteriorly.

RADIOGRAPHIC EXAMINATION:

Standard x-rays in anteroposterior and lateral views were taken for confirmation of diagnosis and also to know the type of fracture. Out of twenty patients, fourteen patients had fracture of ulnar diaphysis at upper third with anterior angulation at the fracture site and an associated anterior dislocation of the radial head. This was type 1 fracture dislocation, according to Bado's classification. Out of fourteen cases, two cases were comminuted fractures, six transverse and six cases were short oblique. Four had fracture of ulnar diaphysis with posterior angulation at the fracture site and posterolateral dislocation of radial head, which were type 3 fractures. Out of four cases three were transverse and one short oblique. Two patients had fracture of the proximal third of radius and ulna at the same level with anterior dislocation of radial head, which was type-4 fracture-dislocation. In this case the fracture type of ulna was short oblique. None had type-2 fracture-dislocation. The upper limb was immobilized in above elbow POP posterior slab. The affected limb was kept elevated. Pain and inflammation was managed by using oral analgesics like Diclofenac sodium 50mg with serratiopeptidase twice daily or Brufen 400mg twice daily. Routine examination of urine was done for presence of albumin and sugar. Examination of blood was done Hemoglobin percentage, Total and differential WBC counts, Fasting blood sugar, Blood urea, serum creatinine, Bleeding and Clotting time. HIV, HCV, Hbsag and ECG were done. In one of the patient who had head injury, patient was treated by neurosurgeon. She was diagnosed to have extradural hemorrhage for which she was operated. Another patient had contralateral fracture of the ulnar shaft at the junction of middle and lower third, was operated for the same. There was one female patient who sustained injury by falling on to the ground. Patient presented to hospital after 10 weeks of injury. Patient was not taken treatment anywhere prior to presenting to the hospital. Physician fitness was obtained in all cases. Patients were then prepared for surgery after pre- anaesthetic check up.

SURGICAL PROCEDURE:

- Anaesthesia: the operation was performed under general anaesthesia.
- Position and tourniquet: The affected limb was kept in elevated position for 2 to 3 minutes and exsanguination of the limb was done. Then, mid arm pneumatic tourniquet was applied and patient was put in lateral position with elbow in ninety degrees flexion supported with wooden block wrapped in sterile towel. Site of the surgery was thoroughly scrubbed, painted with iodine and spirit and draped.

- Technique: First, attempt was made to reduce the dislocation of the radial head by traction on the forearm and counter traction on the arm.

Followed by flexion of the elbow to 110 - 120°. Once the radial head dislocation was reduced, which was confirmed by palpation of radial head just below the lateral epicondyle. A vertical incision along the subcutaneous border of ulna extending distally for about 10 cms from the olecranon was made. Fascia was incised along the line of skin incision. An interval was developed between flexor carpi ulnaris and extensor carpi ulnaris and incision was made through the periosteum of the ulna to expose the fracture site. Sufficient periosteum was stripped sparingly from each fracture end using periosteal elevator. Fracture hematoma was cleared off and the fracture site was gently curetted with small curette. Accurate anatomical reduction was achieved and held with AO universal bone holding forceps. Next a narrow six holed 3.5mm Dynamic compression plate was placed over the fracture site and held securely to the two fragments with two small self-retaining forceps. Using hand drill/power drill fitted with 2.5mm drill bit, a hole was drilled in the nearest fragment of one end of the bone using neutral drill guide. Using a depth gauge, length of the screw was measured. Next the hole was tapped and 3.5mm cortical screw was fitted into the hole using hexagonal screwdriver to secure the plate to one fragment. Later a hole was drilled in the other fragment through the hole of the plate immediately next to the fracture using eccentric drill guide. After measuring the length of the screw using depth gauge and tapping, screw was fitted with hexagonal screwdriver. As the screw is screwed into the hole, the underneath bone slides towards the fracture site to achieve compression at the fracture site. A third bone holding forceps was clamped across the fracture site at right angles. Then holes were drilled on both sides of the bone through the dynamic compression plate and 3.5mm cortical screws were fitted to secure the plate onto the bone rigidly. In total three screws were fitted onto each side of the fracture site. Once rigid fixation was achieved, the wound was closed in layers and sterile compression dressing was applied with forearm in supination and elbow flexed to 100 to 110 degrees to prevent the radial head redislocation. After removing the tourniquet, the limb was immobilized in a posterior POP slab. Check x-ray was taken to confirm that the radial head has remained reduced and ulna is fixed properly.

POSTOPERATIVE MANAGEMENT:

All the patients were treated with Inj. cefotaxime 1gm twice daily for 5 days followed by Tab. cefixime 200mg twice daily for 5 days. Some cases were treated with Inj. Amikacin 500mg twice daily for 5 days.

Postoperative pain and inflammation was managed using anti inflammatory analgesics, Inj. Diclofenac for 3 days followed by oral Diclofenac sodium 50mg with serratiopeptidase twice daily or Brufen 400mg twice daily. Affected limb was kept in elevation and patient was asked to perform finger movements on day 1 and continued. On tenth day, the posterior slab and the sutures were removed, and a long arm cast was applied with elbow in flexion and patients were discharged. At four weeks the cast was removed and the extremity was supported with cuff and collar sling, maintaining the elbow at 110 to 120 degrees. Gentle pronation and supination motions were permitted, but extension was not permitted below 90 degrees until 6 weeks after injury. At follow up after six weeks, a detailed clinical examination was done and the patient was assessed subjectively for the symptoms like pain and restriction of joint motion. On clinical examination, tenderness, movements of the elbow joint, nutrition and power of the muscles acting on the joint were noted. Check x-rays were taken for radiological assessment of the union of fracture. Patients were instructed to carry out active exercises at home, like active flexion, extension, pronation and supination without loading. Later, patients were advised to report for follow up after 12 weeks and thereafter every 3 months. The results were assessed 3 months after the procedure. At twelve weeks follow up (or) 3 months follow up, patients were assessed similarly as at six weeks. Check x-rays were taken for assessment of radiological union.

EVALUATION OF RESULTS:

The results of all treated Monteggia fracture dislocations were evaluated in our study using "Anderson et al" scoring system (1975).

Using the criteria of Anderson et al., the results were graded as follows. An excellent result meant union of the fracture, loss of flexion and extension at the wrist or elbow of less than 10 degrees, and loss of

pronation and supination of less than 25 per cent. In a satisfactory result, there was union of fracture, loss of flexion or extension at the wrist or elbow of less than 20 degrees, and loss of pronation and supination of less than 50 per cent. A result was unsatisfactory when there was union of the fracture and either loss of flexion and extension at the wrist or elbow of more than 20 degrees or loss of pronation and supination of more than 50 per cent. A failure was a nonunion or unresolved chronic osteomyelitis Anderson et al, scoring system (1975)

Results	Union	Flexion/ extension at elbow joint	Supination & pronation
Excellent	Present	<10° loss	<25% loss
Satisfactory	Present	<20° loss	<50% loss
Unsatisfactory	Present	>20° loss	>50% loss
Failure	Non union with /with or without loss of motion		

Nineteen of the cases were fresh fractures, wherein closed reduction of the radial head was done and ulna fixed with dynamic compression plate. In none of the cases annular ligament reconstruction was done and there was no case of radial head redislocation.

In the patient who presented late to the hospital, radial head was excised; edges of the ulnar fragments freshened and fixed with six holed, dynamic compression plate. Bone grafting was not done in this patient.

One patient developed signs of posterior interosseous nerve injury [finger drop] during postoperative period. This patient recovered spontaneously after three months

In three patients who had superficial infection, culture and sensitivity was done which showed Staphylococcus aureus and Klebsiella organisms sensitive to Cefoperazone, which was treated using Inj. Cefoperazone 1g twice daily. In all the three cases, superficial infection resolved within ten days.

None of the patients had deep infection.

CASE



Pre-operative X-rays



Immediate close reduction of radial head



Immediate post-operative x-ray



Check x-ray after 6 weeks



Check x-ray after 12 weeks



Flexion



Extension



Pronation



Supination

RESULTS

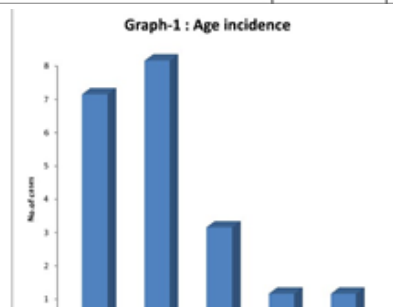
The present study consists of 20 cases of Monteggia fracture dislocations in adults treated by closed reduction of radial head with open reduction and internal fixation of ulna with Dynamic compression plate and screws in SVS Medical College Hospital, Mahabubnagar between September 2014 to September-2016. All the cases were simple fracture dislocations. All cases were followed up periodically during the period 2014 to 2016.

The following are the observations made and the available data are analyzed as follows.

1) AGE INCIDENCE:

TABLE - 1

Age in years	No. of cases	Percentage
21-30	7	35
31-40	8	40
41-50	3	15
51-60	1	5
61-70	1	5



The age of these patients ranged from 21-70 years with fracture dislocation being most common in 3rd and 4th decade and average of 35.9 years.

In this series 7 (35%) patients were between 21-30 years, 8 (40%) patients between 31-40 years, 3 (15%) between 41-50 years, 1 (5%)

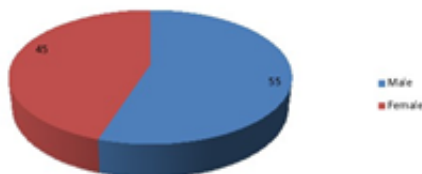
patient between 51-60 years and patients below 70 years were 1 (5%).

2) SEX INCIDENCE

TABLE -2

Sex	No. of cases	Percentage
Male	11	55
Female	9	45

Graph-2 : Sex incidence



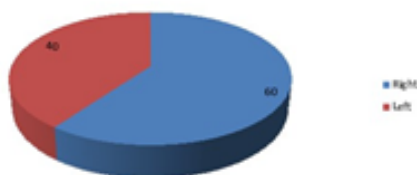
Out of 20 patients 11 (55%) were male and 9 (45%) were females showing male preponderance with ratio M:F - 1.2:1.

3) SIDE OF INVOLVEMENT

TABLE -3

Side	No. Of cases	Percentage
Right	12	60
Left	8	40

Graph-3 : Side involvement



In this series, Monteggia fracture-dislocations on right side of the patient in 12 (60%) and left side of patients in 8 (40%) cases.

4) MODE OF INJURY

TABLE -4

Mechanism of injury	No. of cases	Percentage
Road traffic accidents	11	55
Fall from height	8	40
Assault	1	05

Graph-4 : Mode of injury



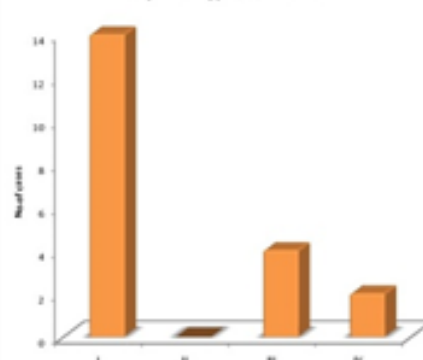
In our study there were 11 (55%) patients with road traffic accidents, 8 (40%) patients with fall and 1(5%) patient with assault.

5) TYPE OF FRACTURE (Bado's classification)

TABLE -5

Type	No. of cases	Percentage
I	14	70
II	0	0
III	4	20
IV	2	10

Graph-5 : Type of fracture



In the present series, 14 (70%) of the cases were of type I Bado's classification, 4(20%) of cases type III, 2 (10%) type IV and none in type II (0%) fractures.

6) DURATION

TABLE -6

Duration	No. Of cases	Percentage
2-10 days	20	100

All the cases were operated on our regular operation theatre days, at earliest possible time. An average being, 5.13 days after surgery, and the range between 2-10 days.

7) TYPE OF FIXATION

All the cases were fixed with AO 3.5mm Dynamic compression plates and screws.

8) RADIAL HEAD EXCISION

In the present series, radial head was reduced in 19(95%) of cases and radial head excision in 1(5%) of cases. Annular ligament reconstruction was not done in any of cases. There was no case with redislocation of radial head.

9) ASSOCIATED INJURY

TABLE -7: ASSOCIATED INJURY

Associated injuries	No. of cases	Percentage
Head injury	1	5
Contra lateral fracture shaft of ulna and ipsilateral upper tibia fracture	1	5

In the present series, one patient had head injury, treated by neurosurgeon, who was diagnosed to have extradural hemorrhage and she was operated for the same. The patient who had fracture shaft of ulna was treated by 3.5mm Dynamic compression plate and screws and fracture upper tibia was treated with intra medullary inter locking nail fixation and both the fractures united by six months after the surgery.

10) DURATION OF FRACTURE UNION:

The fracture was considered united when clinically there was no tenderness and no subjective complaints, radiologically when the fracture line was not visible.

Fractures, which healed 6 months later without, an additional operative procedure was considered as delayed union. Fractures which did not unite after six months or that needed additional operative procedure to unite was considered as nonunion.

TABLE -8 : DURATION OF FRACTURE UNION

Time of union	No. of cases	Percentage
< 4 months	15	75
4-6 months	5	25
6 months- 1 year	-	-
Nonunion	-	-
Total	20	100

15(75%) patients had sound union in less than 4 months, 5 (25%) had union between 4-6 months and no patient developed nonunion

11) RANGE OF MOTION

TABLE - 9

Range of motion	No. Of cases	Percentage
Excellent	13	65
Good	6	30
Fair	1	05

Graph-6 : Ragen of motion



In our series the range of motions were, excellent in 13(65%) cases, good in 6(30%) cases and fair in 1(05%) cases. 1(05%)

12) STATISTICS OF SURGERY

All the cases were operated under general anaesthesia.

Dorsal midline incision over the subcutaneous border of ulna was used for ulnar fixation and posterolateral incision over the radial head was used in case where radial head excision was necessary. Follow up ranged from 5 months to 15 months.

13) IMMOBILIZATION

At ten days, the posterior slab and the sutures were removed and upper limb was immobilized in long arm cast with forearm in supination. During the first four weeks the elbow was maintained in 110 to 120 degrees of flexion. At four weeks the cast was removed and the extremity was supported with cuff and collar sling, maintaining the elbow at 110 to 120 degrees. Gentle pronation and supination motions were permitted, but extension was not permitted below 90 degrees until 6 weeks after injury.

14) CRITERIA FOR EVALUATION OF RESULTS

Anderson et al, scoring system (1975)

Using Anderson et al scoring system we had 13(65%) excellent results, 6(30%) satisfactory results, 1(5%) unsatisfactory results and no failure.

TABLE - 10: RESULTS

Results	No. Of cases	Percentage
Excellent	13	65
Satisfactory	6	30
Unsatisfactory	1	05
Failure	0	0

15) COMPLICATIONS

TABLE - 11

Complications	No. Of cases	Percentage
Superficial infection	3	15

Intraoperative complications:

There were no cases of intra operative complications.

Postoperative complications:

- 1) Superficial infection: Three patients developed superficial infection for which culture and sensitivity was done which yielded *Staphylococcus aureus* and *Klebsiella* organisms sensitive to cefoperazone which was treated using Inj.cefoperazone 1g twice daily for 10 days.
- 2) There was one complication of posterior interosseous nerve injury (finger drops) which recovered spontaneously after 3 months

DISCUSSION

Monteggia fracture-dislocations in adults is a treacherous condition to treat. Fracture dislocations have been known as one of the difficult

fractures known to orthopaedicians since the results of treatment of these fractures are notoriously poor and have been associated with various complications. Although historically Monteggia injuries have been treated by closed manipulations and casting, closed methods are now considered to be satisfactory only in paediatric patients. Bado and Evans all used closed reduction and casting, but Speed and Boyd found that this method did not produce optimum results in adults. Most recent authors like Anderson, Boyd et al and Reckling recommend open reduction and compression plate fixation of ulna and closed reduction of radial head. These fractures have been called "Fracture of Necessity", implying that it is mandatory to treat them by open reduction and internal fixation of ulna with closed reduction of radial head in fresh cases. This is achieved by open reduction and internal fixation of ulna with dynamic compression plate and screws.

The present study was undertaken to verify the claims of various authors regarding surgical management of Monteggia fracture dislocations and the outcome of treatment of these fractures using 3.5mm dynamic compression plates and screws.

We evaluated our results and compared with those obtained by various other studies utilizing different modalities of treatment. Our analysis is as follows.

Age distribution:

Series	Minimum age in years	Maximum age in years	Average age in years
David ring ²⁹	18	88	52
Present Series	21	70	35.9

In our study, Fracture dislocation was common in third and fourth decade with an average age of 35.9 years.

Range:

Age Incidence

Age in Years	Bruce	Present series percentage
21-30	29.5	35
31-40	35.30	40
41-50	23.50	15
51-60	-	5
60-70	11.70	5

Our findings are comparable to study made by Henry E. Bruce, J.Paul Harvey and John Wilson in 1974, showing the fracture dislocation being common in third and fourth decade of life.

In 1998 David ring, Jesse B. Jupiter and N.Shaun Simpson conducted studies which showed average age 52 years (18-88) and our series showed average of 35.9 years (21-70 years)

Sex distribution

Series	Male (%)	Female (%)
David Ring	52.1	47.9
Present series	55	45

Our series had male preponderance of 55% and 45% female patients, which could be compared to studies of David Ring with similar observations.

Follow up duration:

Series	Range	Average
David Ring ²⁹	2-14 yrs	6.5 yrs
Fredrick W. Reckling ²⁷	6 months - 5 yrs	2.5 yrs
Present study	5-15 months	9.5 months

In the series conducted by David Ring average duration of follow up being 6.5 years (2-14 years), in Fredrick W. Reckling study, average duration of follow up was 2.5 years (6 months - 5 years). In our series the average follow up was from 9.5 months (5-15 months).

1) Mode of injury:

Series	RTA	Fall	Assault
David Ring ²⁹	35.5	64.5	-

Henry E. Bruce ⁸	43.0	31.7	25.3
Fredrick W. Reckling ¹⁷	29.75	64.84	15
Present studies	55	40	5

David ring accounted to 35.5% of his cases to road traffic accidents. 64.5% to fall and none to assault.

Henry Bruce observed 43.0% of cases were due to road traffic accidents; 31.7% was due to fall and 25.3% to assault.

Study conducted by Fredrick W. Reckling showed Road traffic accidents in 29.75%, fall in 64.84% and assault in 15% of cases.

In the present series, road traffic accidents were in about 55% of cases, fall in 40% cases and assault in 5% cases.

4) Type of Fracture: Bado's classification

Type of Fracture	Henry bruce ⁸ (%)	Fredrick W.Reckling ¹⁷ (%)	David ring ²⁹ (%)	Present series (%)
I	79	70	14.51	70
II	12	18	79.25	-
III	06	0	2.09	20
IV	03	12	4.16	10

Based on Bado's classification, study conducted by Henry showed 79% of cases to be Type-I, 12% of cases Type II, 6% of cases Type III, and 3% of cases Type IV.

David ring noted about 14.51% Type I fracture dislocations 79.25% of cases Type II, 2.09% of cases Type III, and Type IV in 4.16% cases.

Fredrick noted that 70% of cases are Type I, 18% are Type-II, 12% of cases Type IV and no cases in Type III.

In the present series, we had 70% of fracture dislocations to be Type I, No cases in Type II, 20% cases in Type III, and Type IV comprising of 10% of cases which correlated with studies of Henry Bruce and Fredrick W. Reckling.

5) Radial head Excision:

Radial head	Fredrick W. Reckling ¹⁷	Present series (%)
Reduction	63.45	95
Excision	36.55	5

In series conducted by Fredrick W. Reckling, Radial head reduction was done in 63.45% of cases and excision in 36.55% of cases. In the present series 95% of cases, radial head was reduced and in 5% of cases it was excised.

6) Complications:

Complications	Fredrick W.Reckling ¹⁷ (%)	David Ring ²⁹ (%)	Henry Bruce ⁸ (%)	Michael W. Chapman: (%)	Present series (%)
Proximal radioulnar Synostosis	6.25	6.25	6	-	-
Superficial infection	-	-	6	-	15
Nerve palsy	-	8.3	17	-	5
Non union	6.25	2.1	35.5	-	-
Delayed union	-	4.1	-	7.5	-
Malunion	31.25	-	-	-	-

In series conducted by Fredrick W.Reckling, 6.25% cases had proximal radio ulnar synostosis, 6.25% nonunion, 31.25% malunion.

David ring noted 6.25% cases had proximal radio ulnar synostosis, 8.3% nerve palsies, 2.1% nonunion cases and 4.1% delayed union cases.

Henry Bruce stated that, 6% of cases in his study had proximal

radioulnar synostosis, 6% superficial infection, 17% nerve involvement and 35.5% of cases went for non union.

Michael w. Chapman noted 7.5% delayed union cases In our studies, superficial infection in 15% of cases, and posterior interosseous nerve injury were noted.

7) Functional results:

Result	David ring (%)	Henry Bruce (%)	Fredrick W Reckling (%)	Michael W Chapman (%)	Present Series (%)
Excellent	37.5	-	-	67	13 (65%)
Satisfactory	43.75	30	23	15	6 (30%)
Unsatisfactory	8.3	20	58	18	01 (5%)
Failure	10.45	50	19	-	-

The functional result of our series was assessed by determining the range of motion and evaluated using Anderson et al., scoring system. David ring reported that 37.5% of excellent results, 43.75% of satisfactory results, 8.3% of unsatisfactory results and failure in 10.45% of cases.

Henry reported 30% cases of to be satisfactory, 20% unsatisfactory and 50% failure.

Fredrick W. Reckling reported that no case had excellent results. 23% of cases being satisfactory, 58% unsatisfactory and 19% cases to be nonunion.

Michael w. Chapman reported that, 67% have excellent results, 15% satisfactory and 18% unsatisfactory results.

The present series had 65% of cases to be excellent, 30% satisfactory, 5% unsatisfactory and no cases went for failure.

CONCLUSION

The present study was undertaken to evaluate the type of Monteggia fracture - dislocation and functional outcome after closed reduction of radial head and open reduction and internal fixation of ulna and its complications. From the present study it is concluded that the technique of early closed reduction of radial head and open reduction and internal fixation of ulna using minimum of six holed AO 3.5mm dynamic compression plate is a simple and effective means of treating Monteggia fracture dislocation in adults with excellent functional outcome. The commonest type of Monteggia fracture dislocation in adults according to Bado's classification is type-I. Upper limb should be immobilized in 110-120 degrees of elbow flexion and forearm in supination to prevent radial head redislocation.

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