Section:Orthopedics

Original Research Article

A PROSPECTIVE STUDY OF FUNCTIONAL AND RADIOLOGICAL OUTCOME OF ACETABULAR FRACTURES TREATED WITH OPEN REDUCTION WITH INTERNAL FIXATION

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ABSTRACT

Background: To study the functional and radiological outcome of Acetabular fractures treated by open reduction and internal fixation.

Materials and Methods: It was a prospective study, in our study we have selected cases of unstable acetabular fractures. The study was done from November 2023 to December 2024.The age group differs from 18 – 70 years, among them16 males and 4 females.Among 20 patients right side involvement is seen in 13patientsand left side involvement is seen in 7 patients.Mean follow up was done for 12 months. All the classification have been classified by Letournel and Judet classification. All the cases were followed up and were evaluated for radiological and functional outcome .X-ray pelvis isused for assessing the radiological outcome, AP view, Obturator Oblique view and Iliac oblique views were used for assessment. For evaluating the functional outcome Merle D'Aubigne and Postel modified clinical grading system is used.

Results: In the present study, According to Matta's criteria, 8 patients had anatomical reduction, 8 patients had satisfactory reduction and 4 patients had poor reduction (>3mm gap). Out of 20 patients, 6 patients had excellent, 3 patients very good, 6 patients good, 3 patients fair, 2 patients had poor results. 70% of the patients are having near normal life and 10% patients are having satisfactory result in our study Functional outcome score for the patients ranged from11 –18, (maximum score –18).The poor result (score – 8,9) in 2 patients was due to post traumatic arthritis, improper post op mobilisation due to poly trauma. All patients with anterior column fracture, posterior wall had excellent or good result 00 'except one patient who had fair result due to Heterotopic ossification. Three patients with fair outcome had minor wound infections treated with antibiotics and it healed.

Conclusion: From our study we conclude that complex acetabular fractures treated by open reduction and internal fixation have satisfactory functional outcome.

Keywords: Acetabular fractures, Matta's Criteria, Anatomical Reduction, Heterotopic Ossification, Poly trauma.

INTRODUCTION

Acetabular fracture are still difficult fracture to manage and is a challenge to many Orthopedic surgeon.The incidence ofacetabular fracture goes on increasing due to high velocity road traffic accident. In early days Acetabular fracture management had many difficulties.[1] Literature from 1950 – 1960 offered conflicting recommendation regarding optimal care for a fracture acetabulum. There was a confusion inmanagement recommendation.

Previously there was no accepted fracture classification and fracture evaluation was tough with poor radiological knowledge.[2]

In 1964 Judet et al provide more clarity regarding radiographic finding, a standard classification of acetabular fracture and outlined a proper plan of action.[3,4]

With further studies of Letournel &Judet and by Matta, it was proved,to attain a best result hip joint congruity and stability must be accompanied by a good anatomical reduction (<2mm of residual displacement).[5,6,7]Hence accurate intra articular reduction of fracture fragment is more important.

The time interval between injury and surgery, initial displacement of fracture fragment play a vital role in obtaining anatomical reduction. Acetabular fracture need not to be fixed in emergency basis unless it is associated with irreducible hip dislocation, progressing neurologic deficit or vascular injury.

In general fracture with hip instability, hip incongruity, fracture with superior weight bearing dome needs a open reduction and internal fixation. The surgery is complex and demanding for even experienced surgeon. Certain factors such as patients Age, fracture pattern, medical condition, associated injury should be considered before making management decision.

The operated procedure will be well executed by specialized surgeon who routinely care for such patients and all orthopedic surgeon should be able to diagnose the fracture and determine whether it requires surgical management or not.[8]

Aim of thestudy

To study the functional and radiological outcome of Acetabular fractures treated by open reduction and internal fixation.

MATERIALS AND METHODS

In our institution we have selected cases of unstable acetabular fractures. Our study is a prospective study done from November 2023 to December 2024. The age group differs from 18 – 70 years, among them16 males and 4 females. Among 20 patients right side involvement is seen in 13patientsand left side involvement is seen in 7 patients.

Mean follow up was done for 12 months .All the classification have been classified by Letournel and Judet classification .

All the cases were followed up and were evaluated for radiological and functional outcome.X-ray pelvis isused for assessing the radiological outcome, AP view, Obturator Oblique view and Iliac oblique views were used for assessment.[11] For evaluating the functional outcome Merle D'Aubigne and Postel modified clinical grading system is used.

Mode OF Injury

Road traffic accident: 18

Accidental fall from height: 2

Associated Injuries

- Out of 20 patients10 patients have associated injuries.
- Femoral head fracture for1patient,
- Sacroiliac joint fracture for 4 patients,
- Sciatic nerve injury1patient,
- Ipsilateral shaft of femurfracture1patient
- Ipsilateral both bone leg fracture 2patient
- Patella fracture1patient
- Most of the pelvic ring fractures managed surgically.

Inclusion Criteria

1. An acetabular # with 2 mm or more of displacement in the dome of the acetabulum
2. Roof arc measurements<45 degrees
3. Posterior joint in stability
4. Irreducible#/dislocation

Exclusion Criteria:

1. Age-<18 yearsand>70years
2. Non displaced and minimally displaced fractures (<2mmdisplacementintheweight bearing dome)
3. Roof arc angle>45degree (averageroofarcangleinall3views)
4. No femoral head subluxationon 3 views taken out of traction.
5. Secondary congruence in displaced both column fractures.

PRE–OPERATIVEPLANNING

For all the patients X- ray pelvis with both hips AP view, Obturator Oblique view and Iliac oblique view, Axial CT and 3D reconstruction were taken.

TIME INTERVAL BETWEEN INJURY ANDSURGERY

Out of 20 patients 9 patients operated between 1 to 2 weeks,7 patients were operated between 2 to 3 weeks. 4 patients operated between >3 weeks. The mean time interval between injury and surgery was10days.

ANAESTHESIA

Spinal anaesthesia was used in all patients.

POSITION

For surgery 2positions were used10 patients were operated in lateral position, 7 patients were operated in supine position and 3 patients in both positions.

SURGICALAPPROACH

KocherLangenbeck approach in10 patients, Stoppa's approach was used in 1 patient and Ilioinguinal approach was used in 6 patients. The amount of displacement of each column and the degree of superior articular surface involvement at each limb of the fracture determines the direction of surgical approach.[27]

SURGICALTECHNIQUE

After exposing the fracture site, the fracture configuration was verified with C–Arm. The fracture fragments were reduced using special clamps and ball tipped spikes. K-wires (1.6mm) were passed to maintain the reduction lag screw fixation with with 3.5mm cortical screws was done.

Buttress plating was done using contoured 3.5mm reconstruction plate or semi tubular plate. In case the lag screw fixation becomes impossible then the fracture was reduced and fixed with the contoured 3.5mm reconstruction plate or semi tubular plate

POST OPERATIVE FOLLOWUP

For all the patients prophylactic intravenous antibiotics were used for the first seven days. Also closed suction drain was used in all the patients. suction drain was removed on day 2 and EOT was done on day two. On 12th POD sutures were removed.In our study no prophylactic steps taken for Deep vein thrombosis. For the prophylaxis against Heterotopic ossification the following measures taken, they are supplementation of Indomethacin 25mg TDS from II POD to 6 weeks post operatively.

The patients were mobilised as soon as tolerated. The patients were made to sit up on first day after post operative period and then they were made to perform physical therapy for muscle strengthening and active range of motion exercises.

Patients are made for partial weight bearing by following steps, they are toe touch walking with walker/crutches was started at 6 weeks and was maintained upto12weeks. This was also dictated by other injuries of the patients. Full weight bearing was started after 3 months of time. Physical therapy was made to continue until range of motion and muscle strength regained.

For the post – operative assessment plain X-rays AP view, obturator oblique view, and iliac oblique view were taken for all the patients. Serial radiographs (all the 3 standard views) were scheduled for 2 weeks, 3 months, 6 months and 1 year.

Grading system of Merle D' Aubigne and Postel modified score were used for evaluating the final outcome.

RADIOLOGICALOUTCOME

Matta criteria used for assessing the radiographs. The radiographs were assessed at the end of 6 months. A grade of Excellent signifies normal appearing hip joint: good denotes mild changes with minimal sclerosis and joint narrowing (<1 mm). fair signifies the intermediate changes moderate osteophytes moderate narrowing (less than 50%) of the joint and moderate sclerosis;and poor indicates advanced changes, large osteophytes, severe narrowing (morethan50%)of the hip joint, collapse or wear of the femoral head and acetabular wear.

For evaluating the reduction of fracture the residual post operative displacements on three plain radiographs should be measured.

FUNCTIONALOUTCOME

For assessing the functional outcome Merle d' Aubigne and postel modified score was used.[22] It assess the pain, walking and the range of motion with each component carrying 6 points. The results were graded as Excellent,[18] Very good,[17] Good (15or16), fair(13 or 14), poor (<13).

RESULTS

Table 1: AGE INCIDENCE AND DISTRIBUTION

AGE	NO.OFPATIENTS	PERCENTAGE
21–30YEARS	4	20
31–40YEARS	7	35
41–50YEARS	3	15
51–60YEARS	4	20
61–70YEARS	2	10

Table 2: SIDE DISTRIBUTION

SIDE	NO.OFPATIENTS	PERCENTAGE
RIGHT	13	65
LEFT	7	35

Table 3: MODEOFINJURY

MODE OF INJURY	NO.OF PATIENTS	PERCENTAGE
RTA	18	90
FallfromHeight	2	10
Others	Nil	0

Majority of the patients suffered Road Traffic Accidents followed by fall from height.

Table 4: FRACTURE DISTRIBUTION

FRACTURE TYPE	NO.OF PATIENTS	PERCENTAGE
Posterior wall	5	25
Anteriorcolumn	6	30
Posterior wall and column	5	25
Both column	3	15
Ant.column withpost.hemitransverse	1	5

Table 5: ASSOCIATED INJURIES

ASSOCIATED INJURIES	NO.OF.PATIENTS
Femoral head fracture	1
Ipsi lateral calcaneal fracture	1
Sacroiliac joint disruption	3
Sacral fracture	1
Sciatic nervei njury	1
Shaft of femur fracture	1
Ipsi lateral both bone leg fracture	2
Patella fracture	1

Table 6: SURGICAL APPROACHES

PROCEDURE	NO.OF PATIENTS
ILIOINGUINAL	6
KOCHER LANGENBECK APPROACH	10
COMBINED(ILIOINGUINAL&KOCHER LANGENBECK)	3
STOPPA APPROACH	1

Table 7: CLINICAL OUTCOME

GRADING	NO:OF PATIENTS
EXCELLENT	**6**
VERYGOOD	**3**
GOOD	**6**
FAIR	**3**
POOR	**2**

MERLED'AUBIGNEAND POSTALCLINICAL GRADING SYSTEM

Table 8:TIMEOFSURGERY AND ITS CLINICAL OUTCOME

Time of surgery	Excellent	Very good	Good	Fair	Poor	Total
1 – 2 weeks	4	3	2	1	0	10
2 – 3 weeks	2	0	3	1	0	6
>3weeks	0	-	1	1	2	4

Table 9: TYPE OF FRACTURE AND ITS CLINICAL OUTCOME

Type of fracture	cases	Excellent	Very good	Good	fair	Poor
Anterior column fracture	6	2	1	1	1	1
Posterior wall fracture	5	2	1	2	0	0
Postwall+column fracture	5	1	1	2	1	0
Bicolumn fracture	3	1	0	1	1	0
Ant.column with post.hemitransverse	1	0	0	0	0	1

Table 10: INITIALDISPLACEMENTANDITSCLINICALOUTCOME

INITIAL DISPLACEMENT	TOTAL CASES	EXCELLENT	VERY GOOD	GOOD	FAIR	POOR
<10mm	9	4	2	2	1	0
10–15mm	6	2	1	2	1	0
15–20mm	3	0	0	2	1	0
>20 mm	2	0	0	0	0	2

Observation and Results

20 patients with acetabular fractures were treated surgically and analysed with average follow up of 12months ranging from 6 months to 18 months.

70% belongs to less than 50 years of age. Males dominated in our study group with 80%

Road traffic accident contributed to the injury in 90% of our patients and rest sustained by fall from height. Anterior column acetabular fracture, posterior wall fracture were the most common type in our study, anterior column with posterior hemitransverse fracture is the least common type(1 case). Ten patients had associated skeletal injuries.

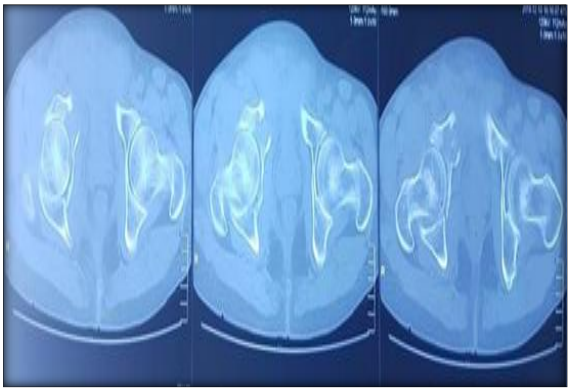
Most of the patients were operated by Kocherlangenbeck approach(10patients). 6 patients wereoperatedby Ilioinguinal approach, 3 patients with combined Kocher langenbeck and Ilioinguinal approach and 1 patient was treated by Stoppa approach. In our study the average surgical time delay was 12 days ranging from 7 days to 24 days. The average surgical time was 164 minutes ranging from 120 mins to 230 mins and average blood loss is 1312ml.

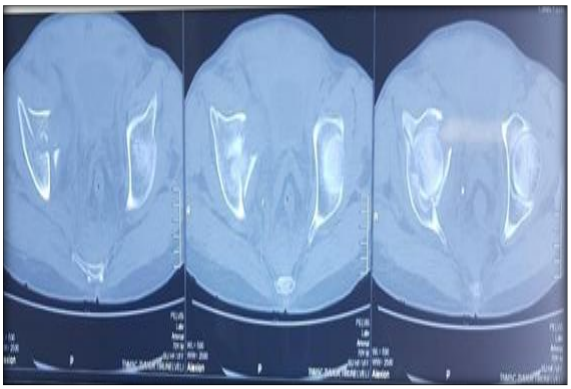
CASE –1

Yadaiah70/male

Closed right anterior column fracture with quadrilateral plate fracture without dnvd.

CTIMAGES





IMMEDIATEPOST OP

3monthsfollowup

6MONTHSFOLLOWUP

1YRFOLLOWUP

DISCUSSIONS

Treatment of acetabular fractures till remains acomplex task for orthopedic surgeons due to lack of technical expertise and inadequate infra structure.[9,10] Reduction of acetabular fracture is difficult because if it involves both column, the visualization and reduction of both column by single approach his difficult and needs a double approach.

There are certain variables such as initial displacement of fracture fragment,time delay to surgery,difficult fracture pattern which makes fracture pattern a difficult task.

In our study the average age group is 45 – 50 years which is comparable with Swiontkowski et al study on complex acetabular fracture. And male dominates over female with majority of fracture occurring in right side in the form of Road traffic Accidents.

It was proved in our study that open reduction and internal fixation after attain in ganatomic reduction followed by early mobilization will keep the joint function as described by Matta. A good quality of clinical result was achieved with accurate anatomical reduction.[11,12,13]

Pennal et alreported that the quality of clinical result depends directly on quality of reduction that was achieved when open reduction and internal fixation were performed.

An ideal approach is needed to allow visualization of both column and joint surface with minimal morbidity.

In our study we use Kocher langenbeck approach in 10 patients and Ilioinguinal approach in 6 patients and in 3 patients due to inadequate exposure we used combined approach. We are able to achieve satisfactory reduction in 65% cases using a single approach including both simple and complex fractures.

In our study the infective rate is 10% which may be due to longer duration of surgery and is comparable with 5.6% in, Ravi K Gupta,[12] 4%with Mayo et al. Patient who were treated early had better outcome and treated with in 1 – 2 weeks had better reduction as compared to Merle D'Aubigne'R et al,[11] study time delay was 8.9+_ 2.3 days.

Another factors (ie) initial displacement of fracture fragment, patient with <10 mm of displacement had better reduction and good radiological result than the other patients. Age of the patient did not have any effect in the outcome of the study.

We use single exposure in 90% of patients and reduced the opposite column by indirect method which reduced the morbidity of our patient to a greater extent.

Four of our patient went for post traumatic arthritis and one among them was operated for total hip replacement. 4 patients 20% had heterotopic calcification compared to 53% in Alonso et al study.we are able to contain heterotrphic calcification by giving treatment with T.Indomethacin for 6 weeks .

Letuornel E et al,[13] reported 8% of iatrogenic sciatic nerve palsy in posterior approach. Swiontkowski et al showed 8.3% iatrogenic sciatic nerve palsy in his study. But our study has only 5% of sciatic nerve palsy.

The complication rate in our study is low when compared to matta and Swiontkowski et al studies.

In our study anterior column,posterior wall fractures has better outcome and posterior hemitransverse fractures have poor outcome,but according to Marwin M Tile transvers fracture has best functional outcome.

The approaches which we opted has the same operating time and blood loss when compared to others studies like Matta et al,[2]

We observed that length of follow up is critical and with longer follow up, arthritis is more likely to develop even in perfectly reduced fractures.

CONCLUSION

From our study we conclude that complex acetabular fractures treated by open reduction and internal fixation have satisfactory functional outcome X-rays and CT imaging are essential in pre – operative evaluation of fractures. A good pre – operative planning ismore important for selecting

the surgical approach and reduction of fracture fragments. There should not be much delay in surgery since good fracture reduction could be attained if surgery is done within 10 – 14 days from injury. The functional outcome of fracture depends upon the accurate fracture reduction and stable fixation, because of which early rehabilitationis possible to produce a satisfactory outcome.

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REFERENCES

1. Stewart MJ. Discussion of prognosis of fractures of acetabulum JBJS Am1961 43: A 59)
2. Matta J.Fractures of the acetabulum: Accuracy of reduction and clinical results in patients managed operatively within three weeks after the injury JBJS Am: 1996:78A 1632-1645)
3. Kebaish AS, Roy A, Rennie W: Displaced acetabular fractures: long term follow- uo, J Trauma 1991;31:1539
4. DeanDB, Moed BR. Latesalv age of failed open reduction and internal fixation of posterior wall fractures of the acetabulum. J ortho Trauma 1999; 23:180-185)
5. Eric E.Johnson, Joel M Matta, Jeffrey W.Mast, Emile Letournel. Delayed reconstruction of acetabular fractures 21 - 120 days following injury. Clin Orthop Relat Res 1994; 305: 20-30
6. McKee MD, Garay ME, Schemitsch EH, et al. Irreducible fracture-dislocation of the hip: a severe injury with a poor prognosis. J Orthop Trauma
7. Christopher C. Schmidt, Gary S.Gruen. Non- Extensile surgical approaches for two column acetabular fractures. JBJS Br 1993; 75-B: 556-561
8. Moed BR, Letournel E. Low dose irradiation and indometahcin prevent heterotopic ossification after acetabular fracture surgery JBJSBr.199476B:895- 900
9. Moed BR, Maxey JW. The effect of indomethacin on heterotopic ossification following acetabular fracture surgery J ortho Trauma 1993; 7:33-38
10. Moore KD, Goss K, Anglen JO. Indomethacin versus radiation therapy for prophylaxis against heterotpic ossification in acetabular fractures: A randomized prospective study. JBJS Br 1998; 80-B: 259-263.
11. Merle D'Aubigne'R, Postel M. Functional Results of hiparthro plasty with acrylic prosthesis JBJS Am. 1954; 36:451-475
12. Ravi K Gupta, Harmeet Singh, Bias Dev, Rajeev Kansay, Parman and Gupta and Sudhir Garg. Results of operative treatment of acetabular fractures from the third world-how local factors affect the outcome.IntOrthop. 2009April;3 3(2):347-352
13. Letuornel E, Judet R,. Fractures of the Acetabulum.2nd Edition New York: Springer-Verlag, 1993
14. Letournel E. Acetabulum fractures: classification and management. Clin Orthop Relat Res 1980; (151):81-106