

Evaluation of Results of Open Reduction and Internal Fixation of Acetabular Fractures

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ABSTRACT

Background: Often patients treated conservatively for acetabular fractures tend to do not that good. The aim of our study was to evaluate the functional outcome of surgically treated acetabular fractures with reconstruction plates and cancellous screws. **Methods:** A prospective longitudinal study was undertaken in a tertiary care hospital during the period from Jan 2013 to Dec 2014. A total number of 20 patients with the diagnosis of acetabular fracture were included in the study. The main cause of the acetabular injury was a road traffic accident. All the patients were treated surgically with plates and screws. Outcome was assessed radiologically and functionally, employing the Modified Merle D'Aubigne Score. The mean follow-up period of the patients in the postoperative period was 24 months. **Results:** The results were excellent in 30%, good in 40%, fair in 25%, and poor in 5% of patients. Around 70% of patients were satisfied with the results of acetabular surgeries. **Conclusion:** Our results show that open reduction and internal fixation of acetabular fractures leads to a good outcome in the majority of patients.

Keywords: Acetabulum, Arthroplasty, replacement, hip, Fractures, bone, Hip joint.

INTRODUCTION

Over the last few decades, improvements in automobile safety, prehospital care, resuscitation, and transport as well as standardized protocols for treatment have all contributed to improved survival after severe pelvic injuries. Only 10% of the pelvic disruptions involve acetabulum.^[1] Posterior wall fractures are most common, comprising 24% of acetabular fractures. The primary cause in younger individuals is high-energy trauma. Acetabular fractures generally occur in conjunction with other fractures. Acetabular fracture was an enormous orthopaedic problem in which the treatment was grossly inadequate and many patients were left with incapacitating pain. These fractures were often feared because of the poor outcome as many patients are treated non-operatively.^[2] However many others continued to report good results with conservative treatment and problem of operative treatment such as heterotrophic ossification and

inadequate reduction were feared. Recently it has become obvious that accurate reduction of the fracture is an important factor in achieving satisfactory outcome and open reduction is better than closed reduction which resulted in incongruence of articular surface of hip joint and patients were left with enormous pain and end result stiff and painful suboptimal functioning hip joint.^[3] Rapid increase in the incidence of acetabular fractures and high expectations of the patients has compelled the orthopaedic surgeons across the world to do more research and study acetabular fractures. Surgery is the gold standard to treat unstable and incongruous acetabular fractures. Joint stability and early mobilization are the main goals of the surgery for acetabular fracture which can be achieved by anatomic reduction and rigid internal fixation.^[4]

The treatment of acetabular fractures is an enigmatic area of orthopaedics that is being continually refined. It involves a definite learning curve.

Acetabular fractures are generally associated with other injuries of the pelvis and lower limbs which may influence treatment options, surgical approach and clinical outcomes. Patient age, fracture stability, the presence of co morbidities and

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osteoporosis, combined with surgeon experience also influence treatment options.^[5]

The goals of the treatment should be anatomic reconstruction of articular surface and early mobilisation. This goal can be achieved only when acetabulum is adequately exposed and rigid internal fixation is done. Displaced fractures of the pelvis that involve the acetabulum are difficult to treat. With closed methods, it is difficult, if not impossible, to restore the articular surfaces completely and obtain sufficient stability for early motion of the hip.

The treatment of simple fractures of acetabulum is well known and studied. Treatment of complex Acetabular fracture is difficult as it involves both the column of the acetabulum, For reduction and fixation, both columns have to be manipulated and fixed.

The purpose of this study is to analyse the results and functional outcome of open reduction and internal fixation of fracture involving both acetabular columns (Complex Acetabular Fractures) with the use of Kocher Langenbeck, ilioinguinal or both approaches.^[6]

Based on Judet and Letournel⁷ classification, the fractures included are

1. Transverse fracture
2. Transverse with posterior wall fracture
3. T type fracture
4. Anterior wall or column with posterior hemitransverse
5. Both column fracture.

Aim Of The Study

The aim of this study is to analyze the results and functional outcome of open reduction and internal fixation in patients with acetabular fractures.

MATERIALS AND METHODS

This is a prospective study done to assess the functional and outcome of complex acetabular fractures treated by open reduction and internal fixation in 20 patients over the period of two and half years from Jan 2013 to Dec 2014 in a tertiary care hospital.

Inclusion criteria

1. Age greater than or equal to 18 years ,
2. Closed fractures,
3. Complex acetabular fractures including
4. Transverse fractures,
5. Transverse with posterior wall fracture,
6. T Type fracture,
7. Anterior column or wall with posterior hemitransverse fracture ,
8. Both column fractures.

Exclusion criteria

1. Open injuries,

2. Simple fractures,
3. Fracture greater than 3 weeks old ,
4. Patient operated within last six months

At the time of arrival, after initial management and stabilisation, all the patients were evaluated with three radiological views – AP Pelvis and 45* oblique views of Judet and CT scan. Those patients with instability of the hip, displacement of a fragment by > 2 mm, dislocation with a posterior wall fracture, and articular impaction or depression as seen on the pre-operative CT scan were considered candidates for surgery. All patients were operated using single approach (Kocher-Langenbeck, ilioinguinal, or extended ilioinguinal). Open Reduction and Internal Fixation was attempted to achieve anatomical reduction of the articular surface of the acetabulum. Suction drain was used routinely and was removed after 48 hours. Post operatively skin traction was applied and no prophylaxis for heterotopic ossification was used in any patient. DVT prophylaxis was started in obese Patients with limited mobilization post-operative. Immediate post operatively, ankle mobilization was started.

We retrieved the post-operative radiographic images (AP Pelvis) of these patients and was evaluated for reduction and comparison with the latest radiographs. In all patients, immediate post-operative complications were noted. Mobilization was done as early as possible with the aid of physiotherapist. Toe touch weight bearing was allowed till around 6 weeks, partial weight bearing for next 6 weeks and full weight bearing from 3 months onwards. Clinical and radiological assessment and functional scoring was undertaken at six and 12 weeks, four, six and 12 months post-operatively and annually thereafter using (Modified Merle D’Aubigne Score and Harris Hip Score). Heterotopic ossification, Avascular Necrosis and Osteoarthritis were diagnosed based on clinical and X ray findings.

RESULTS

Table 1: Age incidence and distribution

| Age | No of Patients | Percentage |
|----------------|----------------|------------|
| < 20 Years | 03 | 15 % |
| 21 to 30 Years | 05 | 25% |
| 31 to 40 Years | 07 | 35% |
| 41 to 50 Years | 02 | 10% |
| 51to 60 years | 03 | 15% |

The Mean age of the patients was 35.45 year ranging from 18 to 60 years.

Males dominated in our study with M:F ratio of 8:2.

Table 2: Mode of injury

| Mode of injury | No. of Patients | Percentage |
|------------------|-----------------|------------|
| RTA | 16 | 80% |
| Fall from Height | 4 | 20% |

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

Table 3: Fracture distribution

| Fracture type (Judet and Letournal) | No. of Patients | Percentage |
|---|-----------------|------------|
| Transverse | 7 | 35% |
| Transverse with posterior wall | 4 | 20% |
| Anterior column with posterior hemitransverse | 2 | 10% |
| T type | 4 | 20% |
| Both column | 3 | 15% |

Table 4: Associated injuries

| Associated injuries | No. of Patients |
|---|-----------------|
| Fracture of clavicle | 1 |
| Fracture of Distal radius | 2 |
| Fracture of superior pubic rami B/L | 1 |
| Fracture of Inferior pubic rami B/L | 1 |
| Fracture Neck Of contralateral Femur | 1 |
| Intertrochanteric Fracture of ipsilateral Femur | 1 |
| Fracture shaft of contra lateral Femur | 1 |
| Fracture supracondylar femur ipsilateral side | 1 |
| Fracture both bone contralateral leg | 2 |
| Fracture Medial malleolus contra lateral side | 1 |
| Fracture Metacarpal | 1 |
| Sciatic Nerve palsy | 1 |
| Urethral injury | 1 |

In our study 8 patients had associated injuries.

Table 5: Surgical approaches

| Procedure | No. of Patients |
|-----------------------------|-----------------|
| Kocher Langen beck Approach | 12 |
| Ilioinguinal Approach | 4 |

Table 6: Evaluation of score

| Fracture | Average score | Result | | | |
|---|---------------|-----------|---------|---------|--------|
| | | Excellent | Good | Fair | Poor |
| Transverse | 16.5 | 4 | 3 | 2 | 0 |
| Transverse with posterior wall | 14.5 | 2 | 2 | 1 | 0 |
| Anterior column with posterior hemitransverse | 14.5 | 0 | 2 | 1 | 0 |
| T type | 15 | 1 | 0 | 1 | 0 |
| Both column | 17 | 1 | 1 | 0 | 1 |
| | | 6 (30%) | 8 (40%) | 5 (25%) | 1 (5%) |

One patient had a deep circumflex vein tear managed by ligation following which he developed DVT that resolved with heparin. One patient was found have intraarticular screw after being operated via anterior approach. One patient operated by posterior Kocher langenbeck approach developed sciatic nerve palsy. No patient had sacroiliac disruption or pubic diastasis. No patient died during treatment or follow up. According to Matta's criteria, 6 patients had anatomic reduction, 7 patients had satisfactory reduction and 7 patients had poor reduction (>3mm gap). The mean score in anatomically reduced fractures was 15.1, in imperfect reduction is 15.8 and in poorly reduced fracture is 14.5 Out of 18 patients, four patients had

| | |
|--|---|
| Ilioinguinal approach Followed by Kocher langenbeck Approach | 2 |
| Kocher Langenbeck Approach followed by ilioinguinal approach | 2 |

Radiologic assessment was done post operatively by Matta's criteria and Functional status of the patient was assessed by Modified Merle'd Aubinge and Postel score.

Twenty patients with complex acetabular fractures were treated surgically and analysed with average follow up of 10.5 months ranging from 6 months to 2 ½ years.

75% belong to less than 40 years. 35% patients belong to 4th decade followed by 3rd decade (25%). Road traffic accidents contributed to the injury in 80% of our patients and rest sustained by fall from height. Transverse fracture was the most common type in our study (7 cases). Anterior column with posterior hemi transverse was least common type (2 cases). Eight patients had associated skeletal injuries. One patient had sciatic nerve injury and one patient had urethral injury.

Most of the patient was operated by Kocher langenbeck approach (12 Patients). Three patients was operated by ilioinguinal approach. Three patients was operated by combined approach. In contrast to pelvic injuries, all patients were hemodynamically stable at the time of admission. In our study the average surgical time delay was 6 days ranging from 5 to 11 days. The average surgical time was 127 minutes ranging from 60 minutes to 4 hours. Four patients have encountered operative complications. One patient operated by ilioinguinal approach had superficial infection which settled with antibiotics.

excellent, eight patient had good five patient had fair and 1 patient had a poor results. 60% patient are having near normal life and 94% patient are having satisfactory result in our study. Function outcome score for the patients ranged from 10 to 18 (Maximum Score- 18). The poor result (Score-10) in one patient was due to Avascular necrosis of femoral head. Patient had transverse with posterior wall fracture operated by posterior Kocher Langen beck approach. Total hip replacement was done for this patient at 8 months after surgery. There are seven patients with transverse fracture. One was lost to follow up. All patients with transverse fracture had excellent or good result except one patient who had fair result due to associated

multiple skeletal injuries in lower limb. Two patients with both column fracture was operated by anterior Ilioinguinal approach and one patient had excellent and other had good result. Associated posterior wall fracture had reduced the outcome score. T type fracture, Anterior column with posterior hemitransverse and Transverse with posterior wall fracture had reduced outcome score than other two types.

DISCUSSION

The treatment of simple acetabular fractures has been studied in detail and there has not been much of change over time. The options for treatment of complex acetabular fractures are wide and are continuously refined over time. The treatment of complex acetabular fracture is difficult because it involves both the columns and reduction of the both by single or double approach is must.^[8]

The highlight of open reduction and internal fixation is anatomic reduction, rigid fixation and early mobilization which will keep the joint functional as described by Matta. Pennal et al reported that the quality of the clinical result depends directly on the quality of the reduction that was achieved when open reduction and internal fixation were performed. In our study, there is decreased mean functional score (14.5) in the fracture group with poor reduction compared to rest (Anatomical Reduction 15.1 and Imperfect reduction -15.8).

Management of displaced acetabular fracture requires adequate exposure with minimal morbidity. An ideal approach would allow visualisation of both columns and the joint surface with minimal complications. We used only two non-extensile approaches - Posterior Kocher Langenbeck approach and anterior Ilioinguinal approach.^[9-11]

We used single approach in most of the patients except in 3 patients. With this single approach we are able to get 65% of satisfactory reduction and 94% of favourable result in short term. According to Tile, even with best hands depending on the type and complexity of fracture, anatomic reduction can be obtained in 70% cases of acetabular fractures. In our study we included only complex fractures and we were able to get satisfactory reduction in 65% patients. H. J. Kreder et al listed factors influencing the outcome- degree of initial displacement, damage to the superior weight bearing dome or femoral head, degree of hip joint instability caused by posterior wall fracture, adequacy of open or closed reduction and late complications like AVN, heterotrophic ossification, chondrolysis or nerve injuries are assessed.^[11-13] In our study associated posterior wall fracture has reduced the functional outcome. Giannoudis et al 20 in his meta-analysis reported 5.6 % of AVN in posterior approaches. In

our study, We had a case of avascular necrosis of femoral head leading to poor outcome (5%). Patient came with AVN at 8 month follow up for whom total hip replacement was done.

Extensile approaches around the hip joint have reported a high rate of complications. Alonso et al. reported 53% incidence of heterotopic ossification with Triradiate approach and 86% incidence with the use of Extended iliofemoral approach. No case of heterotopic ossification has been encountered till date in our study. Heterotopic ossification was reported as high as 20% in non extensile approaches used for complex fractures according to Jiong Jiong Guo, et al .We used Indomethacin for patients for 6 weeks as prophylaxis for heterotopic ossification.^[14-16]

Giannoudis et al,^[20] reported 8% of iatrogenic sciatic nerve palsy in posterior approaches. In Our Study, We report one case of sciatic nerve palsy in posterior approach (5.8%). Swiontkowski et al also showed 8.3 % iatrogenic sciatic nerve palsy in his study. One case of DVT in anterior ilioinguinal approach .We had a case of intra articular screw penetration in anterior approach, but the patient was asymptomatic and had excellent functional outcome. The complication rate is very low when compared to Matta and Swiontkowski studies.^[17-20]

The non-extensile approaches which we advocated have operating time and average blood loss which are similar to those reported by others (Matta et al 1986; Goulet and Bray 1988; Reinert et al 1988; Routt and Swiontkowski 1990; Helfet et al 1992). The mean functional outcome score is 15.4 ranging from 10 to 18 (Maximum—18). The least score is seen in a patient with transverse with posterior hemitransverse fracture operated by Kocher langenbeck approach and developed Avacular necrosis of femoral head.^[21-25]

According to Kumar A26, Transverse has the best and T Type and anterior column and posterior hemitransverse fracture has worst prognosis. In our study Transverse fractures and both column fractures showed better results. T Type and anterior column with posterior hemitransverse had reduced outcome.

Even though our study comprised of small group of 20 patients with good pre-operative planning, use of non-extensile approaches and early rehabilitation, we have been able to produce 94 % good to satisfactory result according to modified Merle d Aubigne and Postel scoring systems. However, further follow up is needed to comment on long term outcome.

CONCLUSION

From our study, We conclude that Complex acetabular fractures treated by open reduction and internal fixation have a satisfactory functional outcome. Use of non-extensile approaches itself is

sufficient to produce adequate fracture reduction with reduced complications. Every chance of reducing the fragments anatomically, fixing rigidly and mobilizing early must be done for better function which is not possible by conservative means. Treatment of acetabular fractures is a challenging task for any orthopaedic surgeon. With definite learning curve, proper pre-operative planning, non-extensile exposure, accurate reduction, rigid fixation and early rehabilitation, it is possible to produce a improved outcome.

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