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Clinical outcome and complications of acetabular fractures treated with surgical intervention

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Abstract
Background: Acetabular fractures are complex fracture encountered by orthopaedic surgeon. The incidence of acetabular fracture is approximately 3 per 1 lakh population. Currently surgical treatment has evolved to be the treatment of choice displaced acetabular fractures. The aim of the study was to evaluate functional outcome of surgery in acetabular fracture and the complication associated with procedure.
Methods: A prospective study was conducted in department of orthopaedic surgery Adichunagiri institute of medical sciences, Mandya from sep 2018 to aug 2020. A total of 20 patients were included in the study. All patients with the history of trauma and pain in the pelvic region were examined clinically and radiologically by doing an X-ray AP view and judet views of the pelvis as well as CTscan. Fractures that were displaced by more than 2 mm with concomitant disruption of the bony continuity of the acetabular dome were treated surgically. The follow-up schedule was 6 weeks, 3 months, 6 months and 12 months post-operatively. Functional outcome was measured using Merle D aubignr and portal methods of scoring system.
Results: Radiologic evaluation showed 90% of excellent or good results and 10% of fair or poor results. The clinical evaluation was done for the patients based on the D'Aubigne-Postel criterion. Clinical evaluation showed 95% of excellent or good results and 5% of fair results.
Conclusion: In acetabular fractures open reduction and internal fixation was consistent with better anatomical reduction and functional outcome provided when it is carried out by an experienced surgeon and intervened within 2 weeks which prevent complication like OA, AVN and avoid need of THR.

Keywords: Acetabular fracture, open reduction, internal fixation, radiological and clinical evaluation

Introduction
Acetabular fracture are complex fracture encountered by orthopedic surgeon. The incidence of acetabular fracture is approximately 3 per 1 lakh population [1]. High velocity injury or motor vehicle accident accounts for majority of cases. Most of the times young adults are the victims. They are bimodular pattern of occurrence of acetabular fracture. Osteoporotic bones in old Individual or due to any cause for osteoporosis, it is usually produced by trivial fall or low energy trauma, in young adults it is produced by high energy trauma.
Patients usually complaints of hip pain, but may also cause diffuse pain in the groin and leg. Invariably they are associated multiple other injuries like Fracture of the extremities, head injuries, chest, abdomen and pelvic ring injuries which are often missed [2]. As we all know acetabular injuries are commonly due to high velocity fall or motor vehicle accident. Chance of associated traumatic Hip dislocation is more. Posterior hip dislocation can result in sciatic nerve damage, this should be recognised early. Close reduction should be done before definitive treatment. Diagnosis of acetabular fracture mainly by radio graphic examination include anterior posterior and oblique view (judet view) to know the fracture pattern and for pre operative evaluation CT scan is gold standard. Letournal and judet system classified acetabular fracture [3] into elementary fracture and associated fracture.
Before seventies most acetabular fracture were treated conservatively. The incidence of displaced fracture is more when compared to undisplaced fracture. Currently, surgical treatment has evolved to be the treatment of choice as restoration of joint congruity is of paramount importance to reduce the incidence of post-traumatic osteoarthritis of the hip joint [4]. Orthopaedic surgeon required laborius training and skill in management of acetabular injuries due to its complex anatomy of acetabular region.

By surgical treatment we can achieve good anatomic reduction and stable fixation to attain a painless, mobile stable hip joint and to minimize the incidence of complications along with early ambulation.

In patients with comminution of roof of acetabulum prognosis is poor in spite of good reconstruction. In the long run degenerative process will start and pain will start to increase. Acetabular fractures can lead to joint tamponade, which will raise intracapsular pressure compromising blood supply of the head. Vascular assessment is also done preoperatively for prevention of vascular accidents during hip surgery. It helps in placing acetabular implants safely.

Variable such as intial injury to articular surface, residual intra articular step, lost of vascularity of femoral head etc define the outcome including degenerative changes in the hip joint. Hence surgery should be done ideal with in 2 weeks.

Precise congruity of joint after surgical treatment decides the long term clinical and radiological outcome and morbidity of patients with displaced fractures. Displacement is defined as incongruence of the femoral head with the superior acetabulum out of traction on x-ray pelvis. Posterior wall fractures including more than 50% of the acetabulum, and both column fractures are considered as displaced fractures.

Surgical approach to acetabular can be classified as anterior, posterior, extensile or combined and mostly include the ilio inguinal, iliofemoral, extended iliofemoral, kocher-langenbeck triradiate, stoppa and combined anterior and posterior approach [5, 6]. Ilioinguinal approach is most common approach for anterior acetabular fixation and the kocher-langenbecks approach is most common approach for posterior acetabular fixation [7]

The aim of the treatment for displaced fractures of the acetabulum is to obtain an accurate and stable anatomical reduction as well as a functional, mobile and painless hip joint.

The long term outcome of operative procedure depends on many factors

- Femoral head status
- Fracture type and dislocation
- Injury duration
- Wound healing and infection
- Infection
- Reduction achieved
- Osteochondral fragments
- Associated musculoskeletal complications
- Surgical approach

The objective of this study was to evaluate function outcome of surgery in acetabular fracture and the complications associated with the procedure

Materials and methods

A prospective study was conducted in department of orthopaedic surgery Adichunagiri institute of medical sciences, Mandya from sep 2018 to aug 2020. A total of 20 patients were included in the study.

Inclusion criteria

- Closed acetabular fracture of more than 2mm displacement
- Patient aged b/w 20 to 60 year
- Patient with displaced acetabular fracture who would present with in 2 weeks period of injury

Exclusion criteria

- Elderly patient with severly osteoporotic bone
- Local infection
- Patient with associated life threatening injuries
- Open acetabular fracture
- Patient with ipsilateral femoral shaft fracture
- Patient with pre operative sciatic nerve injury

Informed consent was taken explaining about the diagnosis and management and further complications.

Patient were intially stabilized then examined clinically and radiologically by doing an x-ray AP view and judet view. CT scan with cuts and 3D reconstruction was done for evaluation of extent of displacement, evaluation of co-existence of loose bodies, planning of approach. Acetabular fracture was classified by using letournel and judet classification with the help of radiograph and CT images.

Pre operatively skin traction or skeletal traction was applied on all patients, all operation was performed by a single Orthopaedic surgeon experienced in treatment of acetabular fracture. Open reduction and internal fixation was carried out using ilio inguinal approach in anterior fracture, the kocher's langenbach approach in the posterior fracture and combined approach in extensile and bicoloumnar fractures. The implants used were Recon Plates, Buttress plate and long cortical screws.

Post operatively x-ray were taken and patients were followed up at 6 weeks, 3months, 6 months and 12 months post operatively and at each visit the patients were examined clinically and radiologically. Clinical examination include status of ambulation, range of movement, hamstring, quadriceps, gluteal muscle strength. Post operatively physiotherapy exercise were started on day one and patients were mobilised with non weight bearing using walking aid from 3rd post-operative day, partial weight bearing from 4 weeks and started full weight bearing from 2 months.

The functional outcome was measured using Merle D 'aubigne and portal method of scoring system which include pain, gait and mobility on scale of 1 to 6 for each item where 1 indicates the worst and 6 the best state of the patient. The total minimum score is 3 and the maximum is 18 and the results were expressed in the form of poor, fair, good and excellent.

Results

Total of 20 patients were taken up for the study. Mode of injury in majority of cases were RTA 15(75%) and fall (25%) shown in figure 1.

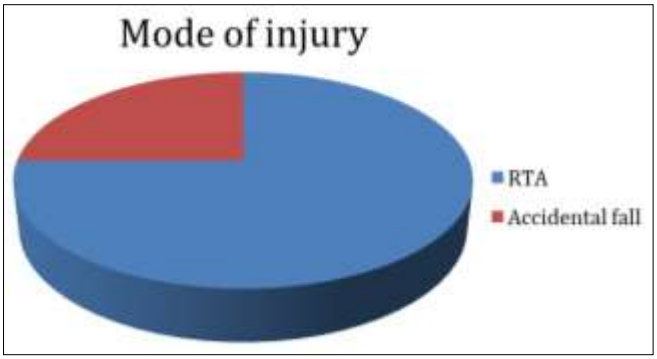

Fig 1: The mean age of patient was 36 years. Distribution of age is shown in table 1.

Table 1: Age Distribution

Age group(years)	No	Mean (SD)
20-30	6(30%)	37.25
31-40	8(40%)	
41-50	4(20%)	
51-60	2(10%)	

Male patients were 16(80%) while females were 4(20%), showing males were more affected depicted in Figure -2. Majority of the patient in our study were young adult who were the earning members of the family.

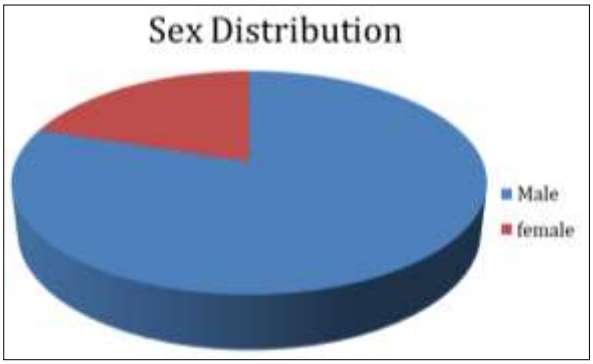

Fig 2: Sex distribution

The radiographic findings showed that the most common acetabular fracture was involving only the posterior column 8(40%) which is followed by both anterior and posterior column 6(30%). the remaining 6(30%) patient had in anterior column with+ posterior Hemitransverse acetabular farcture Table- 2.

Table 2: Classification of acetabular fractures based on Judet – Letournel classification of fractures.

Type of fracture	frequency	percentage
Posterior column +posterior wall	10	50%
Bicolumnar	6	30%
Anterior column + posterior Hemitransverse acetabular farcture	4	20%
Total	20	100%

Posterior dislocation of lower limb was present in 3(15%) of patient, all 3 patients underwent immediate closed reduction.

Patient underwent surgery with in 2 weeks following the initial injury. During the procedure the patient was approached through Kocher-Langenbeck approach (Figure 3) in lateral position for the fixation of posterior column fractures and combined Kocher Langenbeck and ilioinguinal approach (Figure 4) for bicolumnar fractures. Extensile approaches used were not included in the study.

Fig 3: Kocher langnbeck approach

Fig 4: Ilioinguinal approach

The goal of operative management is to achieve good anatomical reduction of the fracture and subsequent stable internal fixation. Anatomical reduction was achieved in 12 patients (60%) which is satisfactory. No skeletal traction/skin traction was applied post-operatively to any of the patients as it would become cumbersome for the patient.

Radiological evaluation showed 60% Excellent, 30% good results 5% fair and 5% poor results as shown in Table 3. Functional outcome was assessed based on D'Aubigne-Postel criterion (Figure 5).

Table 3: Outcome assessment based radiological features among the study subjects.

Results	Anatomical criteria-Displacement	No. of patients (%)
Excellent	0 mm	12(60%)
Good	0-1 mm	6(30%)
Fair	2-3 mm	1(5%)
Poor	>3 mm	1(5%)

Score	Pain	Mobility	Ability to walk
0	Pain is intense and permanent	Ankylosis in abnormal position	Impossible
1	Pain is severe, disturbing sleep	Ankylosis in normal position or in a very slight abnormal position	Only with crutches
2	Pain is severe when walking, prevents any activity	Flexion < 40° (abduction = 0°) or very light joint deformity	Only with two canes
3	Pain is severe but may be tolerated with limited activity	Flexion < 40° - 60°	Limited with one cane (less than one hour). Very difficult without a cane
4	Pain only after walking and disappearing with rest	Flexion > 60° - 80° (can tie shoelaces)	Prolonged with one cane; limited without a cane (limp)
5	Very little pain and intermittent, does not preclude normal activity	Flexion > 80° - 90°. Limited abduction (>25°)	Without a cane but slight limp
6	No pain at all	Normal. Flexion > 90°, Abduction > 25°	Normal

Fig 5: on D'Aubigne-Postel criterion

Among 20 patients 15(75%) patient showed excellent results, 4(20%) patients showed good results and 1 patient showed fair result depicted in Table-4.

Table 4: Outcome assessment based functional outcome among the study subjects.

Grade	Points	No. of patients (%)
Excellent	17-18	15(75%)
Good	15-16	4(20%)
Fair	12-14	1(5%)
Poor	<12	0(%)

Fig 6A: Pre op xrays of Posterior wall/ column fracture

Fig 6B: Immediate post op Xray

Fig 6C: 6 Months follow up xray

Fig 7B: Immediate post op xray

Fig 7C: 6 months follow up xray

The type of fracture and the clinical outcome of the fracture after intervention did not show any significant association (Table 5)

Table 5: Clinical fracture outcome based on Judet-Letournel classification and the type of fracture.

Fracture outcome	Posterior Column	Both Column fracture	Anterior column + Posterior hemitransverse acetabular fracture	Total	P value
Excellent	9	4	3	16	0.637
Good	1	2	1	4	

Discussion

Acetabular fracture is complex and high energy injury. Our results were evaluated on the basis of both clinical and radiological criteria. Radiological evaluation showed 90% excellent or good results, 10% fair and poor results while clinical evaluation showed 95% excellent or good results, 5% fair or poor results. Results are satisfactory. Male preponderance was seen in our study. Patients suffering from acetabular fracture are either due to road traffic accidents or fall. In our study 75% of patients were victims from road traffic accidents. The diagnosis was made by radiographic examination and clinical examination. Posterior column + posterior wall fracture accounts for 50% (10 patients) in our study. 30% (6 patients) with both anterior and posterior column fracture. Delay in reduction and definitive fixation of displaced fractures results in an increase in the formation of scar tissue between bony fragments and the formation of early callus at the fracture site. In these circumstances the surgeon will be faced with a more difficult exposure of less mobile fracture fragments, which are harder to reduce. Techniques of indirect reduction are less likely to be effective. The reduced likelihood of obtaining an accurate and stable anatomical reduction will lead to a poor outcome. Delay in fixation may also be detrimental to the viability of the femoral head in cases of persistent subluxation. There is an increase in the incidence of both chondrolysis and osteonecrosis of the head with delayed reconstruction. Johnson *et al* [8] described a rate of anatomical reduction of only 52% in fractures which were operated on more than 21 days from the time of injury. the displaced acetabular fracture surgical intervention should be done as early as possible. In our study all the cases were operated with in 2 weeks.

Ilio inguinal approach in anterior fracture, the kocher langenbeck approach in the posterior fracture and combined approach for bicoloumnar fractures. extended iliofemoral or tri-radiate approaches presented with the greatest risk of heterotropic ossification hence extensile approach was not used.

In our study series suction drain was placed in all the cases, intraoperatively and postoperatively for minimum 48 h iv antibiotics was given, DVT prophylaxis was given patient who were 50 + years and indomethacin 25 mg TID for 4 weeks was given to all patient.

Outcome is based on reduction, osteochondral defects in either the acetabulum or the femur at the time of injury, osteoarthritis, AVN of the femoral head, heterotropic ossification, sciatic nerve injury and infection. Murphy *et al*[9] studied prognostic factors and their relationship to the functional outcome of fractures of the acetabulum. He identified four dominant prognostic factors which were associated with a suboptimal outcome: complex fracture type, imperfect reduction, the presence of local complications, and heterotopic bone.

Traumatic hip dislocations are most commonly associated with acetabular fracture. Posterior dislocation should be recognized early because it can result in sciatic nerve damage. Posterior dislocation of lower limb was present in 3(15%) of patient, all 3 patients underwent immediate closed reduction

Matta jm *et al*. [10] in a series of 262 patients where no prophylaxis against heterotopic ossification was administered, reports a rate of heterotopic ossification as high as 82%. We administered indomethacin to all of our patients and we believe Indomethacin and early mobilization has drastically lowered the rate of heterotopic ossification. Indomethacin is believed to decrease the rate of this complication to about 30-45%. Heterotopic ossification was not a seen in our series of patients.

Matta reports a rate of femoral head osteonecrosis of 3%, Femoral head osteonecrosis was recorded in one patient who subsequently underwent a total hip replacement. None of patient developed wound infection. Literatures had reported 20-55% of post traumatic osteoarthritis, Post-traumatic osteoarthritis was recorded in 1 patient (5%) who underwent a total hip replacement.

Conclusion

India being the fastest growing country in world has shown fast urban growth Land development, faster transport etc. These factors have led to a manifold increase in RTA and construction injuries (fall from height) therefore crippling many young lives. Fractures of the acetabulum are increasing in frequency due to an increase in automobile accidents. These fractures involve major weight bearing joints of the lower limb, hence they must be restored to as much normal as possible and this satisfactory reduction is only possible with open reduction internal fixation which would markedly reduce the hospital stay and was consistent with better anatomical reduction and functional outcome provided when it is carried out by an experienced surgeon and intervened within 2 weeks which prevent complication like OA, AVN and avoid need of THR.

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