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# FUNCTIONAL AND RADIOLOGICAL OUTCOMES OF ACETABULAR FRACTURES

Radiology

**Dr Sangam Jain**
**Dr Dishit Vaghasia**
**Dr Tanay Nahatkar**
**Dr Spandan Koshire**
**Dr Amol Salve**
**Dr Vinod Kumar Yadav**

## ABSTRACT

**Background:** Trauma is one of the leading cause of acetabular fractures, which are becoming more common in developing nations. The treatment of displaced acetabular fractures is a difficult challenge for the orthopedic surgeon. The current study objective was to look at the functional and radiological outcomes of operated acetabular fractures. **Methods:** From 2018 to 2019, we retrospectively reviewed the medical records of patients who had operatively treated acetabular fractures at a Tertiary Care Centre and had at least a one-year follow-up. The research was completed by 47 patients in total. The key objectives were functional and radiographic outcomes, as well as complications. **Results:** The mean age of patients was 40.06±11.84 years with male predominance (82.97%) and road traffic accident was the main reason of fracture (72.34%). The most prevalent acetabulum fracture pattern was left posterior wall (17.02%) and right both column (17.02%). The mean duration before surgery was 8.02±4.84 days. Most common post-operative complication was arthritis seen in 5(10.63%) cases followed by infection 3(6.38%). Radiological outcome was poorly fixed in 7(14.90%) patients and well-fixed in 40(85.10%) patients at the end of one year. In 53.19% cases Harris Hip Score was excellent followed by good in 29.79% cases. 3(6.38%) patients required secondary surgery. There was significant association of functional outcome and duration of surgery as per Chi-Square test ($p<0.05$). **Conclusion:** Results suggest that operative outcome of acetabular fractures is reliable if judicious operative decision taken at the earliest. Anatomical to fair reduction can give excellent clinical result in these fractures. On follow up, radiological outcomes correlated well with clinical condition of the patient.

## KEYWORDS

Acetabular fractures, Functional, Radiological, Orthopedic, Arthritis, Harris Hip Score

## INTRODUCTION

Acetabular fractures are among the most difficult injuries for orthopedic surgeons to treat due to their rarity and the depth and complexity of their anatomy [1]. They are growing in developing countries with increasing incidence of high-energy trauma like falls from a significant height or road traffic accidents [2, 3]. They are generally the outcome of severe injuries and are common in polytrauma patients. However, in osteoporotic individuals, fragility acetabular fractures can happen as a consequence of simple low energy falls from standing height or minimal trauma [4]. Acetabular fractures occur primarily in young people as a result of high-velocity trauma, but they can occur at any age. The pattern of acetabular damage is determined by the direction and amount of the force, as well as the location of the femoral head. Furthermore, fracture fragment displacement causes articular incongruity of the hip joint, resulting in aberrant pressure distribution on the articular cartilage surface. This can result in a fast degradation of the cartilage surface, culminating in debilitating hip arthritis [5].

Among different treatment options, operative treatment for these fractures is a safe and acceptable method of management [6]. The primary goal of surgical therapy is to accomplish accurate anatomic reduction and secure fixation in order to produce a painless, mobile, and stable hip joint, as well as to reduce the incidence of problems while allowing for early mobility. Numerous factors influence the long-term outcomes of surgical treatment, including fracture type and/or dislocation, femoral head status, intraarticular osteochondral fragments, injury duration, reduction quality, patient age, comorbidity present, associated musculoskeletal complications, and surgical approach [7].

In addition, late complication of fractures like osteonecrosis and heterotopic ossification plays a significant role in final result. Complex anatomy, difficult surgical approaches, and precise anatomical reduction, as well as reduced space for operative mobility, comminution, and delayed presentation, all offer difficulties for the operating surgeon [8]. As a result, the current study was carried out in a Tertiary Care Centre to assess the functional and radiological outcomes of patients with acetabular fracture.

## MATERIAL AND METHODS

The current study was a hospital based retrospective analysis of a total of 47 acetabular fractures treated by various modalities in the Department of Orthopedics at Tertiary Care Centre from 2018 to 2019. Patients with local site infection and patients with severely osteoporotic bone were excluded from the study. The study was done after due permission from the "Institutional Ethics Committee and Review Board" and after taking Written Informed Consent from the patients.

Data collection procedure was retrospective. All participants underwent routine pre-operative evaluation, which also included a thorough history (mechanism of injury), examination (overlying skin, neurovascular status), and imaging like an X-ray pelvis (anteroposterior view) and Judet views (iliac oblique and obturator views) to evaluate degree of displacement and fracture pattern. Functional and radiological assessments as well as post-operative complications were recorded. Preoperative and post-operative X-rays were done in all patients undergoing acetabular surgery as well as serial X-rays for all patients till 1 year follow up. At each visit, the patients were examined functionally and radiologically. Functional examination included checking for presence of pain, range of movement (ROM) at the hip joint, status of ambulation, adequate muscle strength especially quadriceps, hamstrings and gluteus and ability to carry out ground level activities. The radiological examination was done at different intervals to look for adequacy of fixation and any complications. It is routine and the standard of care to do serial X-rays in the follow ups thereby not incurring any kind of excessive burden on the patients.

Patients were evaluated post operatively at 1 year interval, functionally with Harris hip score (HHS). The maximum score possible is 100. Results were graded as: "Excellent = 90-100, Good = 80-90, Fair = 70-80 and Poor = <70". Also, patients with fair and poor score were considered as failed results. Patients were evaluated radiologically with congruency of fixation i.e., well fixed (<2mm step) or poorly fixed

(>2mm step). Age, gender, fracture pattern, duration between injury and operation, initial displacement, and the quality of reduction on the ultimate result were all investigated.

### Statistical Analysis

Mean and standard deviation were used to display quantitative data. The unpaired t test was used to compare the research groups based on the findings of the normality test. A frequency and percentage table was used to show qualitative data. The Fisher test, student t test, and Chi-Square test were used to examine the association between study groups. A 'P' value of less than 0.05 was considered significant. SPSS ver. 20 statistics software was used for statistical analysis.

## OBSERVATIONS AND RESULTS

A total of 47 patients treated for acetabular fractures were retrospectively analyzed in this study, of them 39 (82.97%) were males and 8 (17.03%) were females. The maximum numbers of patients were in the age range of 41-50 years (31.91%) followed by 31-40 years (27.65%) as shown in table 1. The average age of patients was 40.06 ± 11.84 years.

**Table 1: Patients Distribution According To Age**

| Age (years) | No. of patients | Percentage |
|---|---|---|
| 11-20 | 03 | 6.38 |
| 21-30 | 09 | 19.14 |
| 31-40 | 13 | 27.65 |
| 41-50 | 15 | 31.91 |
| 51-60 | 04 | 8.51 |
| 61-70 | 03 | 6.38 |
| Total | 47 | 100% |

Road Traffic Accident (RTA) was observed to be the main cause of fracture 34(72.34%) followed by fall 13(27.65%). 4(8.51%) patients had hypertension and 3(6.38%) patients had diabetes mellitus while 1(2.12%) patient had both hypertension and diabetes mellitus. The most common acetabulum fracture pattern was left posterior wall (17.02%) and right both column (17.02%) followed by left both column (14.89%) and right posterior wall (10.63%) as shown in table 2.

**Table 2: Distribution Of Patients According To Acetabulum Fracture Pattern**

| Acetabulum Fracture Pattern | No. of patients | Percentage |
|---|---|---|
| Left Posterior Wall | 8 | 17.02 |
| Right Both Column | 8 | 17.02 |
| Left Both Column | 7 | 14.89 |
| Right Posterior Wall | 5 | 10.63 |
| Left Anterior Column | 2 | 4.25 |
| Right Transverse | 2 | 4.25 |
| Right Anterior Column | 1 | 2.12 |
| Left Anterior Column with Posterior Hemi transverse | 1 | 2.12 |
| Left Posterior Wall with Posterior Column | 1 | 2.12 |
| Left T Type | 1 | 2.12 |
| Left Transverse | 2 | 4.25 |
| Left Transverse with Posterior Wall | 3 | 6.38 |
| Right Anterior Column with Posterior Hemi transverse | 2 | 4.25 |
| Right Posterior Column with Posterior Wall | 2 | 4.25 |
| Right T Type | 1 | 2.12 |
| Right Transverse with Posterior Wall | 1 | 2.12 |
| Total | 47 | 100 |

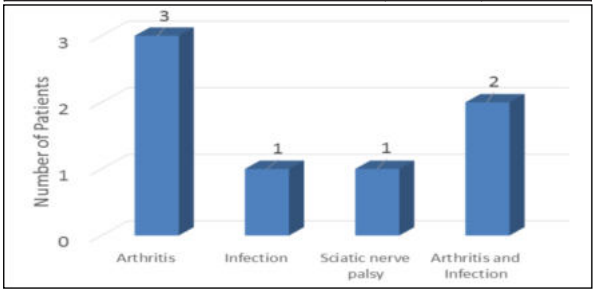


**Figure 1:** Distribution of patients according to Post-operative Complications

The majority of the patients, 33 (70.21 percent), were operated on within 10 days, whereas 14 (29.79 percent) were operated on beyond 10 days. The mean duration before surgery was 8.02±4.84 days. Most common post-operative complication was arthritis seen in 5(10.63%) cases followed by infection 3(6.38%) as depicted in figure 1.

The radiological outcome was poorly fixed in 7 (14.90%) patients and well-fixed in 40(85.10%) patients at the end of one year (Figure 3). In maximum number of patients i.e., in 53.19% cases Harris Hip Score was excellent followed by good in 29.79% cases as shown in table 3.

**Table 3: Patient Distribution As Per Radiological (Quality of Reduction) And Functional Outcome**

| Outcomes | | No. of patients | Percentage |
|---|---|---|---|
| Radiological Outcome | Poorly fixed | 07 | 14.90 |
| | Well fixed | 40 | 85.10 |
| Functional Outcome as per Harris Hip Score | Excellent | 25 (53.19%) | 53.19 |
| | Good | 14 (29.79%) | 29.79 |
| | Fair | 6 (12.76%) | 12.76 |
| | Poor | 2(4.26%) | 4.26 |

Out of 47 patients, 3 (6.38%) patients required secondary surgery (Figure 1), of them 1(2.13%)patient underwent Austin Moore's replacement (Figure 4) while 2(4.25%)patients underwent Total Hip Replacement.(Figure 5)

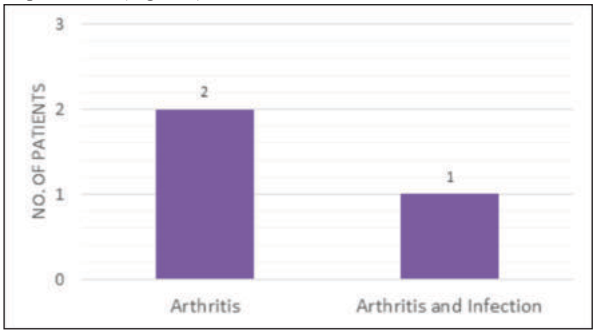


**Figure 2:** Patients That Required Secondary Surgery (N=3)


**Figure 3.** Radiologically Well Fixed Outcome


**Figure 4.** Post Operative Arthritis Requiring Secondary Surgery With Austin Moore Replacement


**Figure 5.** Post Operative Arthritis Requiring Secondary Surgery With Total Hip Replacement

Majority of patients operated within 10 days had excellent results (40.42%) while majority of patients operated after 10 days had excellent results (12.76%). According to the t test, there was a significant relationship between functional outcome and surgery duration (p0.05). (Table 4).

**Table 4: Association Of Functional Outcome And Duration Of Surgery**

| Harris Hip Score | ≤10 days | >10 days | Total | P value |
|---|---|---|---|---|
| Excellent | 19 (40.42%) | 06 (12.76%) | 25 (53.19%) | 0.035 |
| Good | 09 (19.15%) | 05 (10.64%) | 14 (29.79%) | |
| Fair | 05 (10.64%) | 01 (2.12%) | 6 (12.76%) | |
| Poor | 0(0%) | 02(4.26%) | 2(4.26%) | |
| Total | 33 (70.21%) | 14 (29.79%) | 47 (100%) | |

## DISCUSSION

Fractures of the acetabulum are increasing in frequency due to an increase in road traffic 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 operation and correct approach [9]. Better clinical outcomes were associated with open reduction and internal fixation.

Acetabular fracture is encountered mostly in young individuals and mainly due to road traffic accidents. Present study confirms the same. The mean age of patient was 40.06±11.84 year comparable with Routt et al [10]. Males predominated as in other studies [3,9,11]. The male gender being more prevalent might be linked to the fact that males in this society are more interested in travel for a variety of reasons [12]. In line with earlier findings, our study found that the majority of fractures were caused by vehicle accidents or falls from a substantial height [3,9,11].

Additionally, the left posterior wall (17.02%) and right both column (17.02%) were two most common fracture patterns in our population. This is consistent with significant prior research' findings [2,3,13,14]. In contrast, anterior wall fractures had the most frequency in a Germany's population; however, they just included elderly patients [15]. It was observed in current study that majority of the patients (70.21%) were operated in ≤10 days while (29.78%) patients were operated after 10 days. The mean duration before surgery was 8.02±4.84 days. This is consistent with the reports of Mesbahi et al [3], Munshi et al [9] and Iqbal et al [11].

The marginal impaction, fracture pattern, and residual displacement of more than 2 mm have all been linked to the development of arthritis. Acetabular fractures and the surgical procedures associated with fracture care might result in sciatic nerve damage. Prophylaxis of infection and aggressive wound management early in the course of suspected infection cannot be overemphasized. Established infection is unpredictable and may be anticipated leading to poor results. The case of infection often cannot be clearly identified and may be associated to the magnitude of the initial injury, the added soft tissue, lymphatic and osseous trauma imposed surgically. However, patient selection, antibiotic prophylaxis and appropriate intra-operative management help to reduce the infection rates. Second or third generation cephalosporin should be routinely given intraoperatively and postoperatively and suction drain should be placed in every recess of wound. In the present study, 5(10.63%) patients had arthritis while 3(6.38%) patients had infection. 1 (2.12%) patient had sciatic nerve palsy and no patient had heterotrophic ossification or deep vein thrombosis (DVT). This is in concordance to the other studies [3, 9, 11, 16, and 17].

The radiological outcome was poorly fixed in 7(14.90%) patients and well-fixed in 40(85.10%) patients, previous studies [2, 3, 9] noted similar observations. Functional outcomes of the patients were assessed by means of the HHS, score was good in 14(29.79%) patients and excellent in 25(53.19%) patients. 6 (12.76%) patients had fair results and 2(4.26%) patients had poor result. This finding is correlated well with the earlier studies [2, 3, 9, 11, 13, 16]. However, 82.98 percent of patients treated surgically had a good to outstanding functional outcome, and 85.10 percent had a well-fixed radiological outcome. Moreover, the rate of complication was acceptable in our study. As a result, surgical therapy for acetabular fractures produces universally satisfactory outcomes.

It was observed that 3 (6.38%) patients required secondary surgery, of them 1 patient underwent Austin Moore's replacement while 2 patients underwent Total Hip Replacement. Among the patients that required secondary surgery, 2 patients had arthritis and 1 patient had arthritis with infection. This is consistent with the report of Do-Hyun et al [16]. Majority of patients operated within 10 days had excellent results (40.42%) while majority of patients operated after 10 days had also excellent results (12.76%) but there was significant association of functional outcome and duration of surgery as per t test ($p<0.05$). Similar observations were observed in the studies of Mesbahi et al [3], Iqbal et al [11] and Do-Hyun et al [16].

### Limitations

The main restrictions of the current study are that it was retrospective and the number of patients in study was smaller, because of rarity of the cases. Longer follow up and a multi-centric study is required for assessing the functional outcome especially regarding the incidence of avascular complications, osteoarthritis and other complications.

## CONCLUSION

The results of present study suggest that operative outcome of acetabular fractures is reliable if judicious operative decision taken at earliest. Anatomical to fair reduction can give excellent clinical result in these fractures. Radiological outcome correlated well with functional condition of the patient.

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