

Acetabular Fractures: An Analysis of Functional and Radiological Outcome and It's Determinants

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Abstract

Introduction: Acetabular fractures are one of the most complex and challenging fractures for orthopaedic surgeons. Motor vehicle accidents and high impact falls are the most common cause for acetabular fracture. These intra-articular fractures may lead to many complications like disabling traumatic arthropathy. In this study we have evaluated the radiological and functional outcome and factors influencing the outcome of acetabulum fractures. **Materials And Methods:** A prospective follow-up study was conducted on radiological proven acetabular fracture patients admitted at Mahatma Gandhi Medical College & Hospital, Sitapura, Jaipur, during January 2018 to June 2019. All patients were followed up for a post-operative period of 12 months. The clinical outcome was graded based on Merle d'Aubigné Clinical grading system and the Radiological outcome was evaluated by Matta's criteria. **Results:** Study includes 31 patients with age range from 06 years to 72 years. More than 50% of patients were in the age group of 20 to 39 years. Acetabular fracture was more commonly seen in males (87.1%) as compared to females (12.9%). Most common cause of acetabular fracture was motor vehicle accident (67.7%). Patients managed by operative intervention has excellent to good functional outcome in 85% of the cases as compared to 50% of nonoperative patients. Radiological outcome was found excellent to good in 84% of operated cases as compared to 25% of patients managed conservatively. **Conclusion:** Acetabular fractures are complex injuries and should be viewed as an operative problem unless the criteria for nonoperative management are met. The outcome results are influenced by the age of the patient, fracture pattern, associated injuries, and delay to surgical fixation. Long term follow ups of the patients are required to determine the effectiveness of the management in preventing the late complications.

Keywords: Acetabulum Fracture, Functional Outcome, Radiological Outcome.

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Introduction

Out of all fracture treated by orthopedic surgeons, acetabulum fractures are among the most serious one. These injuries are equally common among all age groups[1]. Complexity of these fractures along with infrequency provide a challenge for surgeons to treat them[2]. MVA (motor vehicle accidents) or High-impact falls are most common cause of acetabulum fracture due to passing of impact force through the greater trochanter or through flexed position of knee[3,4]. These intra-articular fractures may lead to many complication like disabling traumatic arthropathy, which are more common in younger adult population[5].

Hip pain is most common feature of acetabular fracture, but it may also cause diffuse groin pain and leg pain. Some time it may also cause to femoral head vascular necrosis and as well as the acetabulum.⁶ The original work of Letournel and Judet is basis of current classification of acetabular fractures[3,7]. Therefore, for interpretation of these fracture following radiographic projections are used : The antero-posterior view of the pelvis, the iliac (or 45-degree external, Judet) oblique view and the obturator (or 45-degree internal, Judet) oblique view[3]. A CT scan helps the treating surgeons to better understand the acetabulum fracture.

Earlier conservative treatment was mainstay treatment option for majority of patients with acetabular fractures and still, it may be recommended for stable type fractures now days also. Later on, with efforts of Letournel and Judet, operative treatment become standard for displaced acetabulum fractures to achieve reposition the bones into their normal alignment. Aim of this treatment is to achieve the pre-injury functional level of patient as much as possible[8,9].

Returning to work or walking ability or pain at joint were main basis to assess function outcome during initial days but later on numerical scoring system developed. Modified Merle d'Aubigné and Postel Clinical grading System are the most acceptable systems for measurement for outcome in acetabular fracture[4].

In this study we have evaluated the outcome of acetabular fractures treated by both conservative and surgical method, using radiological and functional criteria. We also evaluated the factors influencing the outcome of acetabular fractures.

Objectives

1. To assess functional and radiological outcome of acetabular fractures.
2. To assess the factors influencing outcome of acetabular fractures.

Materials and methods

A prospective follow-up study was conducted on radiological proven acetabular fracture patients admitted at Mahatma Gandhi Medical College & Hospital, Sitapura, Jaipur, during January 2018 to June

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2019. In the study all age and both sex group were included. The proforma which was used to collect relevant information of patients were Predesigned and pretested. Proforma include various domains for socio-demographic variables, clinical variables, investigation, mode of treatment, outcome and follow-up. Separate sheet was used for each patient.

Patients were assessed clinically and subjected to required investigations including hematological and radiological (X-ray, CT scan). Acetabular fractures were classified based on Letournel and Judet criteria. Based on radiological findings and clinical assessment of joint stability, mode of treatment (conservative or surgical) was decided accordingly. All patients were followed up for a post-operative period of one year. They were followed up at 2 weeks, 6 weeks, 12 weeks and 24 weeks and 1 year postoperatively. The patients were followed up by direct examination and questionnaires. X-rays were taken to assess radiological union.

The clinical outcome was graded as excellent, good, fair, poor based on Merle d'Aubigné Clinical grading system which included 3 parameters - pain, range of motion of hip & walking ability.¹⁰ The Radiological outcome was evaluated by Matta's criteria which included 3 parameters- osteophytes, joint space narrowing & sclerosis. Based on which it has been graded as excellent, good, fair & poor.¹¹

Ethical Consideration

Study was started after taking ethical approval from institutional ethic committee. Patients were enrolled in study after taking written consent.

Statistical Analysis

Data was coded and entered in SPSS 24.0 trial version. Data was presented in tables, graph and charts. Analysis was done by using chi-square test. P value <0.05 will be considered statically significant

Results

Total 36 patients were admitted in our institute during study period. Out of 36, five patients were excluded due to neuropsychiatric condition (01), lost to follow-up (03) and one patient did not give consent. Study includes 31 patients with age range from 06 years to 72 years. More than 50% of patients were in the age group of 20 to 39 years. Acetabular fracture was more commonly seen in males (87.1%) as compared to females (12.9%). (Table 1)

Most common cause of acetabular fracture was motor vehicle accident (67.7%) which also explains the occurrence of acetabular fracture more commonly in young age and in males. On clinical

examination, compression /distraction test, limb length discrepancy, morel lavalée lesion, distal neurovascular deficit was found in 96.8%, 71.0%, 3.2% and 12.9% of patients respectively. (Table 1)

Injuries in upper and lower limb were associated in 41.9% of patients while head and chest injury found in 9.7% and 3.2% of patients. No associated abdominal and urogenital injuries were seen in these patients. (Table 1)

According to Letournel and Judet criteria, simple type of fracture was found in 45.2% and associated type was found in 54.8%. In LJ simple type, anterior column involvement was seen in 25.8% patients, posterior column involvement was seen 3.2% patients, posterior wall involvement was seen in 6.5% patients and transverse involvement in 9.7% patients. In LJ associated type, anterior column and posterior hemi-transverse involvement was seen in 12.9% patients, posterior column and posterior wall involvement was seen in 19.4% patients, both column involvement was seen in 6.5% patients, transverse with posterior wall involvement in 3.2% patients, T-type in 12.9% patients. Out of 31 patients, 87.1% patients underwent operative management and 12.9% of them underwent conservative management. Among LJ simple type of fracture, 11 were managed by operative treatment and 03 were treated conservatively. Among LJ associated type of fracture, 16 were managed by operative treatment and 01 were treated conservatively. (Table 2)

Among the patients underwent conservative management, there were no early complications although later on, 25% had chronic pain and 25% suffered from bedsores. Among the patients underwent operative management, they had no complications neither early nor late.

Length of hospital stay was significantly different in patient treated conservatively or by surgery ($p=0.01$) as operated patient has to stay at hospital for longer duration. (Figure 1)

Table 3 shows functional outcome of patients according to Merle d'Aubigné Clinical grading system. Among the patients underwent conservative management, 50% had good, 25% fair and 25% had poor outcome. Among the patients underwent operative management, 33.3% had excellent, 51.8% good, 11.1% fair and 3.7% had poor outcome. Outcome in these two groups was significantly different ($p=0.03$).

Table 4 shows radiological outcome of patients according to Matta's score. As per Matta's score, radiological outcome of patients underwent conservative management, was fair in 50% patients while good and poor in 25% patients each. Patients underwent operative management, Matta's score was excellent in 54.8% patients, 29.0% of patients had good outcome, 12.9% had fair outcome and 3.2% had poor outcome. Difference in radiological outcome in these two groups was statistically significant ($p=0.033$).

Table 1: Distribution of study participants according to socio-demographic and clinical variables

Variables	Acetabular (N=31)	%
Age in years	<20	1
	20-39	16
	40-59	11
	≥60	3
Gender	Male	27
	Female	4
Mode of injury	Fall from height	3
	Fall of heavy object	4
	Motor vehicle accidents	21
	Pedestrian injury	3
Clinical findings	Unstable hemodynamics	6
	Compression/distraction test	30
	Limb length discrepancy	22
	Morel lavalée lesion	1
	Distal neurovascular deficit	4
Associated injury	Chest injury	1
	Head injury	3
	Limb (UL & LL) injury	13

Table 2: Type of acetabular fractures

Classification	Subtype	N=31	%
LJ simple	Anterior column	8	25.8
	Posterior column	1	3.2
	Posterior wall	2	6.5
	Transverse	3	9.7
LJ associated	Anterior column and posterior hemi-transverse	4	12.9
	Both column	2	6.5
	Posterior column and posterior wall	6	19.4
	Transverse with posterior wall	1	3.2
	T-type	4	12.9
Management	Conservative	4	12.9
	Operative	27	87.1

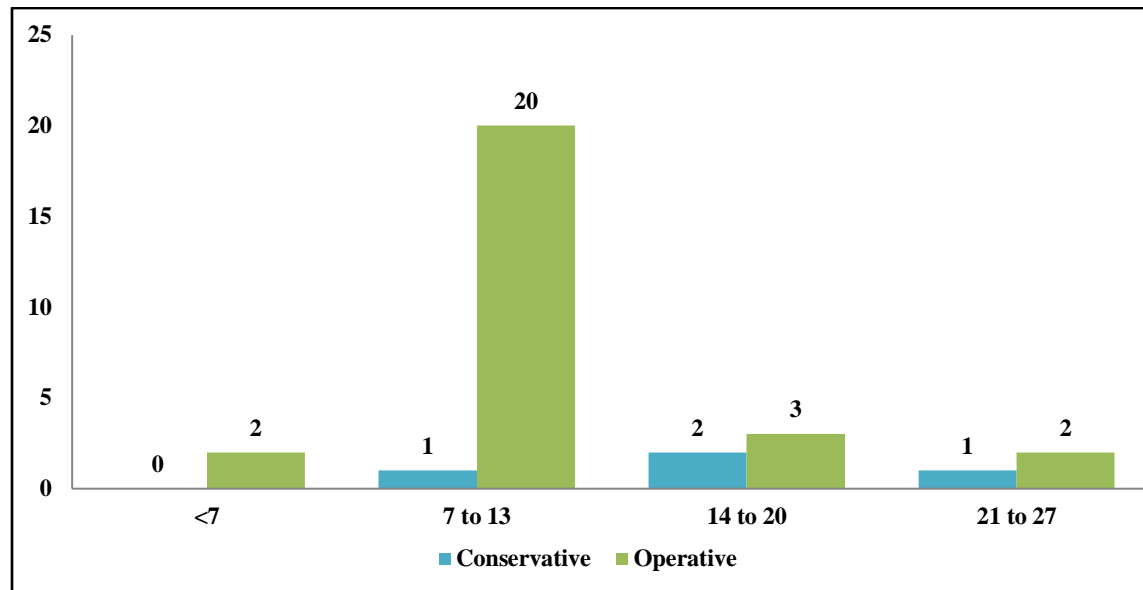


Fig 1: Duration of stay in hospital among study participants.

Table 3: Functional outcome of study participants according to Merle d'Aubigné Clinical grading system

Functional outcome	Conservative		Operative		Total	
	N=4	%	N=27	%	N=31	%
Excellent	0	0	09	33.3	09	29.0
Good	02	50.0	14	51.8	16	51.6
Fair	01	25.0	03	11.1	04	12.9
Poor	01	25.0	01	3.7	02	6.5

Chi-square = 6.271 with 4 degrees of freedom; P = 0.03(S)

Table 4: Radiological outcome study participants according to Matta's score

Functional outcome	Conservative		Operative		Total	
	N=4	%	N=27	%	N=31	%
Excellent	0	0	17	62.9	17	54.8
Good	1	25	8	29.6	9	29.0
Fair	02	50	2	7.4	04	12.9
Poor	1	25	0	0.0	1	3.2

Chi-square = 9.311 with 3 degrees of freedom; P = 0.033 (S)

Discussion

Surgical treatment allows anatomical reconstruction of the hip joint. So it is treatment of choice for displaced acetabular fractures. Undisplaced & minimally displaced fractures do well with a trial of conservative management[12,13]. Age range of study participants was 6 to 72 years with mean age 31.2±5.6 years. Acetabular fracture was more common in males (87.1%) and young age (51.6%). Most common cause of acetabular fracture was motor vehicle accident (67.7%). Patients under 40 years of age had a better outcome than

patients above 40 years as their functional score is significantly better ($p=0.023$). Similar result was observed by Liebergall et al[14] and Ramachandra et al[15].

In present study, head injury was associated in 9.7% patients and Porter et al[16] also found similar incidence (9%) of head injury with acetabular fracture. In Acetabular fracture Morel Lavallee lesion was 3.2%. Similar observation (4%) was obtained by Takashi et al[17] Distal neurovascular deficit including foot drop was associated in 12.9%. Similar data (13.5%) obtained in a study of Ong-art et

al[18] although incidence of nerve injury was very low (4%) in a study conducted by Wolfgang Lehmann et al[19].

In Acetabular fracture out of 31 fracture 45.2% were simple type according to Letournel and Judet classification and 54.8% were associated type which is similar to study conducted by Ong-art et al. i.e. 47% simple type and 52.6% associated type[18]. In simple pattern anterior column were 57.1% similar to study done by Ong-art et al. i.e. 54.9%. In associated pattern most common pattern was posterior column with posterior wall (35.3%) where as in study of Ong-art et al. both column was the most common pattern. In study of Steven et al. Posterior wall was the most common pattern among simple/elementary and among associated Transverse with posterior wall was most common pattern[20]

Among acetabular fractures functional outcome calculated with Merle d' Aubigne score. In 29.0% patients with excellent outcome, 51.6% with good, 12.9% with fair and 6.5% with poor outcome was observed. In study of Ramachandra et al. 37% with excellent, 47% with good 9% with fair and 7% with poor result was observed.¹⁵

In our study among 31 patients of acetabular fracture, 54.8% patients with excellent outcome, 29.0% with good, 12.9% with fair and 3.2% with poor radiological outcome observed. Excellent results in 97(92.38%) patients & fair outcome in 8(7.62%) in terms of radiological outcome was observed by Ramachandra et al.¹⁵ Radiologic evaluation showed 88.5% of excellent or good results and 12.5% of fair or poor results, while clinical evaluation showed 90.6% of excellent or good results and 9.4% of fair or poor results in study done by Kandasamy MS et al[21]

Conclusion

In countries like India fractures of the acetabulum are increasing in frequency due to an increase in automobile accidents as it is found most common cause of acetabulum fracture. Since these fractures involve major weight bearing joints of the lower limb, hence they must be restored to as much normal as possible. Acetabular fractures are complex injuries and should be viewed as an operative problem unless the criteria for nonoperative management are met. The outcome results are influenced by the age of the patient, fracture pattern, associated injuries, and delay to surgical fixation. Long term follow ups of the patients are required to determine the effectiveness of the management in preventing the late complications.

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