

Original Research Article

A prospective study to analyse the surgical outcome of posterior acetabular fractures

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ABSTRACT

Background: Fractures of acetabulum are relatively uncommon, but because they involve major weight bearing joint in the lower extremity, they assume great clinical importance. Acetabular fractures are still difficult fractures to manage and are a major challenge to treating orthopaedic surgeon. The present study was aimed to study the surgical outcome of posterior acetabulum fractures and postoperative complications and failures.

Methods: A one year prospective study was done after ethical approval. Patients with traumatic injury and posterior acetabular fracture was included and categorized according to the Letournel-Judet classification. Kocher-Langenbeck approach was used for all the cases and clinical follow-up and radiological evaluation was done up to 12 months. Evaluation of different demographic elements with reference to Harris hip score was also carried out. Statistical analysis was performed using the Statistical Package for the Social Sciences software.

Results: Twenty cases with mean age 42.6 years and males 65% were included. Road traffic accident was cause in 65% of cases. 50% of the cases had good, 20% excellent, 25% fair and 5% poor outcome in our study by Harris Hip scoring. Two cases of superficial infection, one deep infection, iatrogenic sciatic nerve injury in one, heterotopic ossification in one and one case of intra-articular screw penetration was observed.

Conclusions: Operative treatment of displaced acetabular fractures gives satisfactory functional results. Thorough evaluation of radiograph/ CT scan and a proper pre-operative planning is necessary for decision making regarding an appropriate surgical approach, the appropriate type of implant and fixation.

Keywords: Acetabular fracture, Letournel-Judet classification, Kocher-Langenbeck approach, Harris hip score

INTRODUCTION

Fractures of acetabulum are relatively uncommon, but because they involve major weight bearing joint in the lower extremity, they assume great clinical importance. Fractures of the acetabulum occur primarily in young adults as a result of high-velocity trauma and in old age even with trivial trauma. Displacement of the fracture fragments leads to articular incongruity of the hip joint that result in abnormal pressure distribution on the articular cartilage surface. This can lead to rapid breakdown of the cartilage surface, resulting in disabling

arthritis of hip joint. Anatomic reduction and stable fixation of the fracture, such that the femoral head is concentrically reduced under an adequate portion of the weight bearing dome of the acetabulum, is the treatment goal in these difficult fractures.

A study by Theodorpea Ntazopoulos and Costas Moljsafirims, concluded that complete or near anatomic reduction is essential for an excellent and long-standing recovery of the hip joint, and this is extremely difficult to accomplish by conservative management.¹ It has been shown by many authors that the proper reduction and

restoration of the acetabular articular surface to as near normal as possible provide the best possibility for a symptomless hip joint. A study by Gansslen and Krettek, concluded open anatomic reduction and stable internal fixation of acetabular fractures by screw and plate osteosynthesis results in excellent prognosis.² Acetabulum fractures require systematic approach for understanding the fracture pattern and also for planning the treatment plan. The fractures have to be correctly identified radiologically and clear definition of fracture patterns should be made before planning. The radiological parameters must be kept in mind in planning of surgical approach and also the fixation method. This may require a long learning curve but these basics have to be kept in mind while dealing with acetabulum fractures. There are new techniques like 3D CT, virtual assessment of the fracture, 3D print modelling of the fractures that may help in complex fractures, but the basic principles remain the same. Advancements in technology simply refine the ways and means of interpretation and implementation of the basic principles.

Acetabular fractures are still difficult fractures to manage and are a major challenge to treating orthopaedic surgeon. Although comprehensive classification is necessary for investigational purposes such as prognosis and outcome studies, it is less important in making decisions on individual cases. Every acetabulum fracture case is different, therefore, trying to force square plug in a round hole is counterproductive. The surgeon must know the basic fracture types, but even more important, he must be able to interpret the radiographs and draw the fracture lines on a dry skeleton. Anatomical reduction of the articular fragment and restoration of a congruent and stable hip are the two most important factors in management of acetabular fractures. Fractures reduced to less than 1 mm of articular step have less incidence of posttraumatic hip arthrosis and a better and long lasting functional restoration as compared to fractures reduced with 1-3 mm residual articular displacement. Hence the present study was aimed to study the surgical outcome of posterior acetabulum fractures and postoperative complications and failures.

METHODS

A prospective observational study was conducted for a period of one year in department of orthopaedics at ACSR government Medical College and Hospital a tertiary care hospital of Andhra Pradesh. The study period was from August 2018 to July 2019. The study design was presented before the institutional ethical committee and approved. The guidelines of the ethical committee were followed strictly throughout the study period. The study protocol was clearly explained to all the participants in the study and a written consent was obtained in both local and English language. The complications were clearly explained to all participants. A detailed history was recorded in a predesigned questionnaire sheet including age, sex, type of injury and

cause of injury etc. A thorough physical examination and clinical examination was done for all the other systems and noted for any other sites of injury and if found noted. After stabilization radiological evaluation was performed using X-ray, CT scan and other imaging modalities (ultrasound, colour Doppler) if necessary. Standard anteroposterior and Judet view X-rays of pelvis with bilateral hip was taken in emergency room and CT scan was obtained once the patient becomes stable. The acetabular fracture pattern was categorized according to the Letournel-Judet classification.³

Inclusion criteria

Inclusion criteria were age group 18 to 70 years of either sex; fracture duration less than 14 days after haemodynamic stabilization; failed internal fixation less than 15 days; patients who give informed consent and willing for follow up; patient with isolated posterior acetabulum (wall/column /both) fracture.

Exclusion criteria

Exclusion criteria were patients having isolated anterior column fractures with associated dislocation of hips; compound fractures of pelvis; associated lower limb fractures of long bones; patients unfit for surgery or pregnancy; pathological fracture or bicolumnar fractures or peri prosthetic fractures.

Kocher-Langenbeck approach was used for all the cases in our study. After reduction of the fractured site, a plastic aluminium plate as a template was adjusted by pressing it along the curvature of the acetabulum. One-third of the tubular plate was bent as a spring plate, followed by overlapping of the reconstruction plates as posterior wall buttress plates or posterior column plates according to the shape of templates. Postoperatively check X-ray AP view of pelvis with bilateral hip obtained on day one. Drain removal was performed on day 2.

Rehabilitation program

Started from 2nd day of surgery in the form of passive movements of the hip and isometric quadriceps strengthening and hip passive motion, was started 1 week after the surgery. Non weight-bearing training was prescribed about 4 weeks postoperatively. Partial weight-bearing training with crutches was permitted when radiography results during the outpatient follow-up indicated a partial callus formation. Full weight-bearing was tolerated at 2 months postoperatively.

Clinical follow-up and radiological evaluation was done at 2 weeks, 8 weeks, 12 weeks, 4 months, 6 months and 12 months intervals. Regarding radiological evaluation end point was to achieve radiological union and functional evaluation, by use of Harris hip score. Evaluation of different demographic elements with reference to Harris hip score was also carried out.

Statistical analysis

Quantitative data were expressed as means±standard deviation. Statistical analyses were performed using the Statistical Package for the Social Sciences software (version 22, SPSS, Inc., Chicago, IL, USA). The independent test or chi-squared test was used for comparison. A p<0.05 was considered statistically significant.

RESULTS

In the present observational cross sectional study, 20 patients fulfilling the inclusion criteria were included. In the present study, the age group range was between 20 and 67 years, and the mean age in the study was 42.6 years. Seven cases were from 51-60 years with five male and two female cases, followed by six cases in age group of 31-40 years with four male and two female cases. No cases were registered in age group of 41-50 years. Two cases of male and two cases of female were in the group of 61-70 years and three cases with two male and one female were in 21-30 years group (Table 1). Males accounted for 65% (13/20) and females 35% (7/20) in the entire study with a predominance of males in the present study.

Table 1: Age and sex distribution of cases in the study.

Age group (years)	Male		Female		Total
	No	%	No	%	
20-30	2	75	1	25	3
31-40	4	75	2	25	6
41-50	0		0		0
51-60	5	71.5	2	28.5	7
61-70	2	50	2	50	4
Total	13		7		20

Table 2: Data of study cases.

Variable	No	%
Mode of injury		
Road traffic accident	17	85
Fall	3	15
Affected side		
Right	8	40
Left	12	60
Time duration for intervention		
<7 days	10	50
7-14 days	10	50
Anatomical reduction		
Yes	17	85
No	3	15

Road traffic accident was the most common cause of fracture (85%) followed by accidental fall (15%) in our study. Left acetabular fracture was the most common (60%) followed by right (40%). No associated injury was

observed in 75% of cases in the present study, with 10% of cases having head injury, upper limb trauma and 5% (1/20) had chest injury (Table 2). In our study operative intervention was done on or before 7 days of injury in half the cases and between 7 to 14 days in rest of the cases. Anatomical reduction was achieved in 17 cases accounting for 85% of cases and in 3 cases it was not possible (anatomical reduction defined as less than 2 mm displacement on postoperative check X-ray).

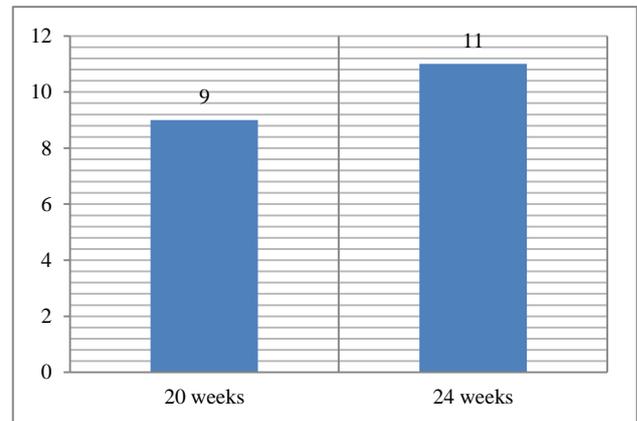


Figure 1: Radiological union among the cases in the study.

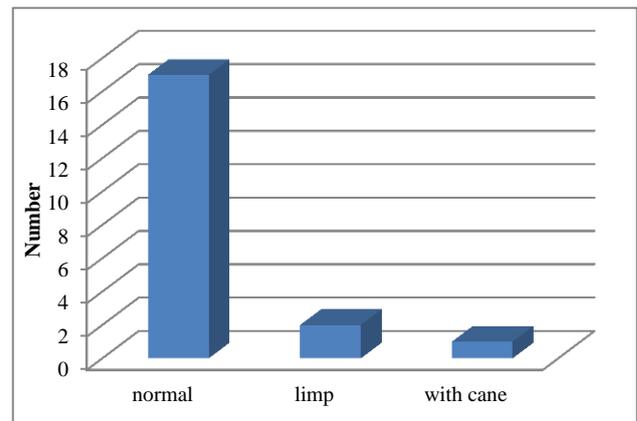


Figure 2: Type of gait.

Radiological union was achieved in nine cases (45%) by 3 months and in eleven cases (55%) by the end of six months. All the cases achieved radiological union (Figure 1). Of the 20 cases in the study, 17 (85%) patients had normal gait, 2 patients walk with limp without any walking aid and one patient walks with the help of cane (Figure 2).

Functional outcomes of all the cases were assessed in terms of Harris hip score grading. 50% of the cases had good, 20% excellent, 25% fair and 5% poor outcome in our study (Figure 3). In our study we had two cases of superficial infection and one deep infection. Iatrogenic sciatic nerve injury in one, heterotopic ossification in one and one case of intra-articular screw penetration was

observed. None had osteoarthritis at final follow up. 70% cases were without any complications (Table 3).

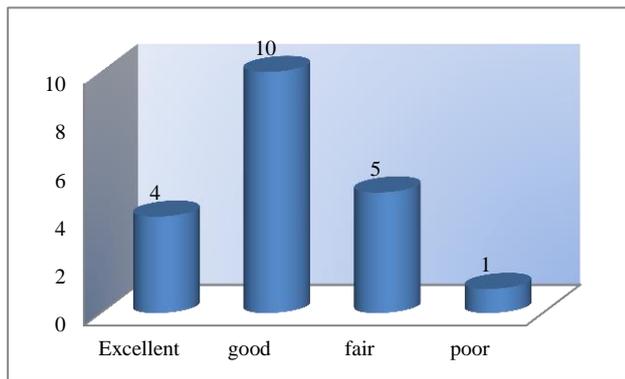


Figure 3: Functional outcome in terms of Harris hip score grading.

Table 3: Complications among the cases in the study.

Complications	No	%
None	14	70
Deep infection	1	5
Intra articular screw	1	5
Nerve injury	1	5
Superficial infection	2	10
Heterogenous ossification	1	5
Osteoarthritis	0	0

Table 4: Comparison of mean Harris hip score between the age group.

Age (in years)	Excellent	Good	Fair	Poor	MHHS
<40	4	4	1	0	87.88
>40	0	6	4	1	77.9

In our study, comparison of mean Harris hip score was done between age group <40 years (Group-1) and >40 years (Group 2), outcome was better in 1st group compared with 2nd group. P value was insignificant (0.07). In group age <40 years, we had 4 excellent, 4 good, 1 fair and no poor results. In group age >40 years we had 6 good, 4 fair, 1 poor and no excellent results (Table 4).

DISCUSSION

Acetabular fractures are always challenging tasks for the orthopaedic surgeons to manage. They form one of the complex injuries to be managed effectively and require great skills. Most are managed by surgery and success of the surgery is to restore a smooth, gliding hip surface. However the success of this is dependable upon multiple factors like type of fracture, level of injury, timing of open reduction and internal fixation and type of surgery performed. In our present study, male preponderance was clearly observed with 65% which is similar to the

findings in the report of Heeg et al with 81.5% and Briffa et al with 76% in their studies.^{4,5} The mean age of cases in our study was 46.2 years which was similar to the findings in the study of Sahin et al who reported 42.8 years.⁶ The main cause of injury of the acetabulum in our study was road traffic accident (85%) which is similar to the Amaravati et al who reported around 78% in their study, but our findings were contrary to the report of Dakin et al who reported accidental fall as a main cause of fracture in his study with 64% of the cause.^{7,8} This is due to the study population and place of study which was mainly rural setting traumatic care hospital in his study.

In our study left hip was affected in 12 (60%) patients and right in 8 (40%) patients, Alonso reports right side affection in 21% and left in 79% cases which were almost similar to the results of our study finding.⁹ However there was ‘n’ significance associated with the side involvement in outcome or recovery after surgical procedure. In our present study, 75% cases had no associated injury where as 25% of cases had associated injury, in the form of head injury in 2, upper limb trauma in 2 and chest trauma in 1 case. However the findings of our study were in contrary to the findings of Pape who reported a significant higher number of limb injuries, chest injuries with 38% in his study.¹⁰ The relative number of associated limb injury in our cases is significantly less because we excluded the patients with associated lower limb injury. In the present all the cases were operated within 3-11 days of injury (5.6 days on the average). The intervention ranged between 2nd to 13th day. The outcome was better in group with early intervention where fixation was performed within 7 days of injury when compared with that of late intervention. Yates chi square p value is 4.35 and p value is found to be insignificant. Lim et al reports in his study that, in the 23 cases the time duration for operative intervention as 1 week in 7 cases and more than 1 weeks in rest of the cases.¹¹ Fica et al reports in their study of the 84 patients 48 cases were operated within a week and 36 cases after a week.¹²

The Kocher-Langenbeck approach was used in all the operated cases in the study. Other approaches were excluded because in our study, cases with isolated anterior wall or column fractures were excluded from the study. The decision regarding fixation was made on CT scan findings preoperatively and also on peroperative findings of reduction and stability. Satisfactory anatomical reduction was achieved in 17 (85%) cases and in 3 cases it was not possible. When we compared the functional outcome with anatomical reduction, outcome was better in patients where anatomical reduction was achieved. Outcome was poor in 1 out of 3 cases where anatomical reduction was not obtained. On statistical analysis chi square p value is 2.67 and Yates p value is found to be insignificant (0.44). Giannoudis in a meta-analysis reports anatomical reduction in 85.6% cases and displacement of more than 2 mm in 14.4% cases and he also reported unfavourable outcome if initial reduction is unsatisfactory.¹³ In present study clinical union was

assessed by pelvic compression test and pain free movements of hip. Radiological union was assessed by taking X-ray where union was achieved in 9 cases by 20 weeks, and in 11 cases by 24 weeks. Anizar-Faizi et al reported radiological union in 80 cases achieved fracture union at 10-24 weeks after operation (mean, 14 weeks) and 2 cases had fracture delayed union at 10 months and 12 months after operation in 82 cases.¹⁴

In present study we had 4 (20%) excellent, 10 (50%) good, 5 fair (25%) and 1 (5%) poor outcome according to modified Harris hip score. We had good to excellent results in 70% of cases which is comparable to good to excellent results in 72% and 68% of cases in reports of Ovre et al and Giordano respectively. We had poor results in 5% cases, which were significantly less compared to the other studies where they have reported >20% poor results.^{15,16} When mean Harris Hip score was compared between age group <40 and >40 years, outcome was better in 1st group compared with 2nd group. In 1st group 4 had excellent, 4 good, 1 fair and no poor results. In 2nd group 6 had good, 4 fair, 1 poor and no excellent results. On applying the Pearson's chi square test value found to be 6.42 and p value is found to be insignificant (0.093). The results were comparable with other studies.¹⁷

CONCLUSION

Operative treatment of displaced acetabular fractures gives satisfactory functional results. Thorough evaluation of radiograph/ CT scan and a proper pre-operative planning is necessary for decision making regarding an appropriate surgical approach, the appropriate type of implant and fixation. Functional outcome is better with patient operated within one week of injury than a delay of more than one week. In most of acetabular fractures can be fixed by single approach; however some associated fractures require combined approach.

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Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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