



FUNCTIONAL OUTCOME OF ACETABULAR FRACTURE MANAGED BY SURGICAL PROCEDURE: A HOSPITAL BASED INTERVENTIONAL STUDY

Orthopaedics

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ABSTRACT

Objective: This study was conducted to determine the functional outcome of acetabulum fracture managed by open reduction and internal fixation.

Material and Methods: This Prospective interventional study was conducted in department of Orthopaedics of a tertiary care centre of western Rajasthan(india) from April 2017 to March 2019 including 60 consecutive patients of acetabular fracture managed by open reduction and internal fixation. Functional outcome was assessed using Modified Merle d'Aubigné and postal grading system. With minimum duration of follow up one year.

Results: Most of the acetabular fracture patients were male (80%). Common site of fracture was posterior wall (23.4%), anterior column (16.7%) and both columns (16.7%). Most common approach used for open reduction and internal fixation was Kocher-Langenbeck approach (60%). Most of the patients showed good (53.3%) to excellent (26.7%) functional outcome. Osteoarthritis was the most common complication seen in 6 patients (10%).

Conclusion: Most of the patients with displaced acetabular fractures achieve good to excellent functional outcome when treated by open reduction and internal fixation.

KEYWORDS

Acetabular Fracture, Open Reduction, Internal Fixation

INTRODUCTION

Acetabular fractures are among the most serious injuries treated by orthopedic surgeons. Acetabular fractures are growing in developing countries with increasing incidence of high energy trauma like road traffic accidents or falls from a significant height. Acetabular fracture contributes to 10% of the pelvic disruption. Posterior wall fracture is most common. The treatment of the acetabular fracture is an enigmatic area of orthopedic that is being continually refined. It involves a definite learning curve.¹

The goals of the treatment of acetabular fracture are anatomic reconstruction of articular surface and early mobilization. Management of acetabular fractures are difficult due to the complicated anatomy of the acetabular region. Before the 1964 study,¹ most acetabular fracture were treated with closed reduction and traction. Nowadays, open reduction and internal fixation is the gold standard treatment for displaced acetabular fractures involving weight bearing dome and fractures of intra-articular fragments.²

Most studies have reported good to excellent functional outcomes in 71–88% patients after surgical treatment of acetabular fractures.^{3,4} The important prognostic factors to influence clinical outcome described include associated fracture type, damage to the femoral head, associated injuries, and dislocation at the time of injury, inadequate fracture reduction, age of patient, development of heterotrophic ossification, and a delay in surgical treatment.⁵ In addition, the surgeon's training and expertise is also said to be a crucial factor.⁶

In spite of extensive international research work, data on functional outcome of acetabular fracture managed by surgical procedure are still

lacking in this part of the world. No study has been conducted in recent past that emphasizes on mechanism of injury, time between injury and surgery, degree of displacement and effect on functional outcome of surgery. Hence present study was done with the objective to determine the functional outcome of patients with acetabular fracture.

METHODS AND MATERIALS

A Hospital based prospective interventional study was carried out in department of Orthopaedics of tertiary care centre of western Rajasthan from April 2017 to March 2019. A total of 60 patients aged 18 to 70 years, of either gender, presenting with any closed types of displaced acetabular fractures and operated within 30 days of injury were included in the study. Sample size was calculated at 95% confidence interval to verify an expected favourable outcome (good, very good and excellent) rate of 79%, based on DAP score with 15% relative allowable error. Sample size was calculated to be a minimum of 48 subjects, considering 10% loss to follow up sample size was enhanced and rounded to 60 subjects.

Acetabular fracture associated with fracture neck of femur and pelvic fractures were excluded from the study. Eligible subjects were recruited consecutively till desired sample size was achieved. All patients were evaluated and managed using a standardized protocol circulated to all operating orthopaedic surgeons. Open reduction and internal fixation was the management for these displaced acetabular fractures by various approach- modified Stoppa approach, Kocher-Langenbeck approach, iliofemoral approach and ilio inguinal approach. The functional outcome following fixation of acetabular fracture were done by using modified Merle d'Aubigne and Postel grading system.⁷

Ethical clearance was obtained from Institutional Ethical Committee prior to initiation of study. Written informed consent was obtained from all subjects prior to inclusion into the study.

Table 1: Components of Modified Merle d'Aubigne hip score

Pain	
Intense and permanent	0
Severe even at night	1
Severe when walking, prevents any activity	2
Tolerable with limited activity	3
Mild when walking, disappearing at rest	4
Mild and inconsistent; normal activity	5
No pain	6
Mobility	
Ankylosis with bad position of hip	0
No movement, pain or slight deformity	1
Flexion <40°	2
Flexion 40°-59°	3
Flexion 60°-79°, foot can be reached	4
Flexion 80°-90°, abduction of at least 15°	5
Flexion exceeds 90°, abduction of 30°	6
Walking	
None	0
Only with crutches	1
Only with canes	2
With one cane, less than an hour, very difficult without cane	3
A long time with a cane, short time without cane and limping	4
Without cane, slight limp	5
Normal	6

The Modified Merle d'Aubigné hip score includes the parameters pain, mobility, and ability to walk, with each rated from 0 points (worst condition) to 6 points (best condition). Addition of the scores for pain, mobility and ability to walk results in an absolute estimation of hip function graded as follows- Excellent – 18; Good -17,16, 15; Fair - 13 or 14; Poor - <13.

Statistical analysis:

Qualitative / categorical variables were summarized as frequency and proportion. Quantitative / continuous variables were summarized as mean and standard deviation. Variables were depicted graphically for easy visualization. All statistical analyses were done using Epi info version 7.2.1.0 statistical software.

RESULTS

The mean age of acetabular fracture patients in our study was 38.77 ± 14.36 years with more than half aged below 40 years, with male predominance (80%). Road traffic accident forms the major mode (76.7 %) of injury in these patients. Common site of fracture was posterior wall (23.4%), anterior column (16.7%) and both columns (16.7%) as shown in Table 1. Most of the patients were operated between 5 - 9 days from the day of injury. Most common (60%) approach used for open reduction and internal fixation was Kocher-Langebach approach. Fourteen patients required double surgeries (Table 2). Most patients showed Good functional outcome (53.3%) and 26.7% had excellent functional outcome. Only two patient showed poor outcome (Figure 1). Considering the complications, in present study, osteoarthritis was seen in 6 cases where as heterotopic ossification, avascular necrosis of femur head and sciatic nerve injury was seen in two patients each (Figure 2).

Table 1: Demographic characteristics of study subjects

	Age group (years)	N	Percentage
Age (Years)	< 40 years	34	56.7
	40 – 59 years	18	30
	≥ 60 years	8	13.3
Gender	Male	48	80
	Female	12	20
Mechanism of injury	Fall from height	14	23.3
	Road traffic accident	46	76.7
Side of fracture	Left	24	40
	Right	36	60
Associated injury	Present	28	46.7
	Absent	32	53.3
Final fracture diagnosis	# Anterior column	10	16.7

# Post column	8	13.3
# Both column	10	16.7
# Post wall	10	16.7
#Posterior column with posterior wall	4	6.7
#posterior wall with hip dislocation	4	6.7
T type #	4	6.7
Transverse # with central dislocation	8	13.3
transverse fracture	2	3.2

Table 2: Surgical characteristic among acetabular fracture patients

		N	Percentage
Time from injury to surgery (days)	<5 days	18	30
	5-9 days	26	43.3
	10-14 days	10	16.7
	15-19 days	6	10
Surgical approach	Ilio-inguinal Approach	2	3.4
	Kocher Langebeck Approach	36	60
	Kocher Langenbeck & modified stoppa Approach	14	23.3
	Modified stoppa approach	8	13.3
Number of surgeries	Single	46	76.7
	Double	14	23.3
Duration of surgery	< 100(minutes)	14	18.9
	100 – 120(minutes)	38	51.4
	>120(minutes)	22	29.7

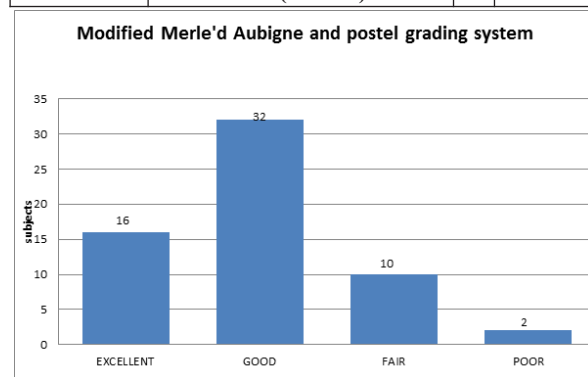


Figure 1: Functional outcome of acetabular fracture

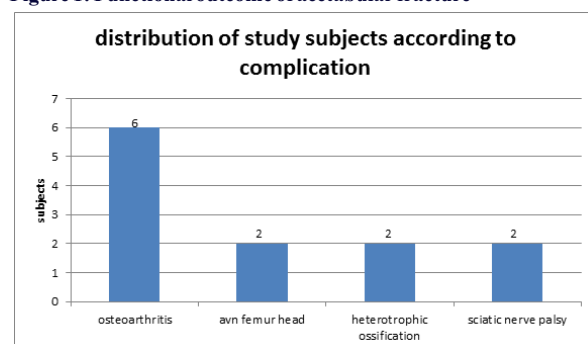


Figure 2: Complications of surgical management of acetabular fracture

DISCUSSION:

Acetabular fractures are being reported with increasing frequencies to orthopaedic surgeons and both conservative and surgical management are being used. Present study evaluated the role of surgical management in acetabular fracture among 60 patients. The mean age of acetabular fracture patients in our study was 38.77 years which was comparable with the findings of Lal SR et al⁹ (mean age of 44 years) and Swiontkowski et al⁹ on complex acetabular fracture. Most of the patients in present study were males (80%). Males predominance was found in other studies like Lal SR⁸ (65%).

Management of displaced acetabular fracture requires adequate exposure with minimal morbidity. An ideal approach would allow visualization of both columns and the joint surface with minimal complications. Kocher Langenbeck approach and modified stoppa

approach were the most commonly used approach in present study followed by ilio inguinal approach. We used single approach in most of the patients except in 14 patients in whom combined Kocher-Langenbeck and modified stoppa approach was used.

Kocher-Langenbeck approach is one of the preferred surgical approaches by many pelvis acetabular surgeons and used in majority of fractures not involving anterior wall, anterior column. It is used frequently in about 90% of cases in many studies.¹⁰

Regarding intra operative positioning of patient, the Kocher-Langenbeck approach was originally described in lateral position. There were various studies comparing between the prone and lateral position. In 2009, Negrin et al^{11,12} published a study on 27 cases of transverse acetabular fractures in which all were operated through Kocher-Langenbeck approach and followed for a period of 9 months. They found more number of unsatisfactory reductions and arthritis with respect to lateral position.

In present study excellent or good functional outcome was seen in 80% of the acetabular fracture cases. Past literature indicates that 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 displaced acetabular fractures and we were still able to get good functional outcome in 80% patients.

H. J. Kreder et al¹³ listed factors influencing the outcome which includes - 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. Giannoudis et al¹⁴ in his meta-analysis reported 5.6 % of AVN in posterior approaches. In our study, We had a two cases of avascular necrosis of femoral head leading to poor outcome (3.3%).

Zhu et al¹⁵, in their study on retrospective evaluation of 80 cases of associated acetabular fractures (including 5 T-shaped fractures, 53 transverse and posterior wall fractures, 18 posterior column and posterior wall fractures, 4 both column fractures and 1 anterior column with posterior hemitransverse fractures) with average follow up of 51 months found that excellent reductions and satisfactory functional outcome can be achieved by single Kocher-Langenbeck approach. They also said that restoration of joint function is purely based on the accuracy of articular reduction.

El-khadrawe T.A. et al¹⁶ studied 55 patients of which 54% of case operated by Kocher-Langenbeck approach concluded that functional outcome was based on the personality of the fracture determined by the degree of damage to the articular cartilage and on the other hand, to the ability of the surgeon to obtain an anatomical reduction. The other factors resulting in poor functional outcome are advanced age, injury of the femoral head and delaying in the treatment. Extensile approaches around the hip joint have reported a high rate of complications.

Two cases of heterotopic ossification was seen in our study. Heterotopic ossification was reported as high as 20% in non extensile approaches used for complex fractures in past studies. Sciatic nerve injury was seen in two patients (3.3%) in present study. Giannoudis et al¹⁴ reported 8% of iatrogenic sciatic nerve palsy in posterior approaches. The complication rate in our study was low when compared to past studies like Bal SR⁷ and Matta et al¹⁷. Avascular necrosis of head of femur was seen in only two cases in present study. The incidence of AVN could not be solely attributed to the approach, as it may be also due to various other factors such as initial violence of injury, prolonged duration of unreduced femoral head dislocation and finally it may also be iatrogenic.

CONCLUSION:

Most of the patients with displaced acetabular fractures treated by open reduction and internal fixation have a good to excellent functional outcome. Staged surgical procedure was followed in bi column fracture and transverse fracture with central hip dislocation to reduce morbidity and mortality. The more damaging, single stage procedure was avoided in bi column fracture and two stage procedure using posterior Kocher Langenbeck approach followed by modified stoppa approach was used. Every chance of reducing the fragments

anatomically, fixing rigidly and mobilizing early must be done for better functional outcome 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, nonextensile exposure, accurate reduction, rigid fixation and early rehabilitation, it is possible to produce an improved outcome.

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