

Study of operative results of fracture acetabulum in adults



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ABSTRACT

Background: Acetabular fractures are relatively rare intra-articular fractures and due to its complex anatomy, require absolute stability in the form of articular reduction and rigid fixation. Specific approaches need to be taken to operate such fractures and planned protocol needs to be followed to mobilize those patients postoperatively. **Aims and Objectives:** Primary objective of the study is to analyze the operative results of fracture acetabulum in terms of the operative technique used, clinico-radiological outcome, post-operative range of motion achieved, and time taken for mobilization. Secondary objective is to estimate early and late complication encountered related to technique, implants and to compare our study to other published studies. **Materials and Methods:** This study is a retrospective study of 26 patients with acetabular fractures operated at our institute from the period of May 2019 to May 2022. All patients who gave consent have been included in our study. **Results:** There was an improvement in functional and radiological outcomes of all the patients. Twenty-four patients showed excellent to good according to the Merle'd Aubigne Postel scoring in our study. Twenty-five patients achieved excellent to good according to Harris hip score. About 90% of patients in our study returned to their pre fracture work in 4 months. **Conclusion:** The quality of reduction and fixation is strongly associated with clinical results. In acetabular surgery, for fixing the fracture if we follow established protocols we can get good to excellent outcome in patients.

Key words: Acetabulum; Internal fixation; Approaches; Outcomes; Scoring

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INTRODUCTION

Fractures of acetabulum are life-threatening injuries that commonly occur in young individuals of society. The occurrence of this fracture is <5% of total fractures of human skeleton.^{1,2} Road traffic accidents and fall from height constitutes commonest causes of pelvic trauma.³ Over last few years, increased knowledge of anatomy of pelvis, better fracture visualization and improved surgical approaches have helped treat acetabular fractures. These contribute 10% of the pelvic disruptions. Posterior wall fractures, often associated with hip dislocation comprise around 25% of all acetabular fracture.⁴ Fractures of acetabulum may be polytraumatic involving vital organs of body which also affects treatment options, surgical approaches, and clinical outcomes. Age of patient,

comorbidities, fracture stability, and osteoporosis also influence treatment options.⁵ The main aim of treatment is to achieve rigid internal fixation by anatomical reduction so that early mobilization may be possible. At the same time, a close follow-up of treated patients must be done to note developing complications so that constant improvements can be made in terms of choice of implant, surgical approaches as well as pre-operative planning.

Aims and objectives

To analyze post operative outcomes of fracture acetabulum in terms of radiological outcome, range of motion, complications, to calculate functional outcome using various scores and to compare our study with other studies.

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MATERIALS AND METHODS

The current retrospective study was carried out in our institute and data of 26 patients having acetabulum fractures operated in our hospital from May 2019 to May 2022 were collected. All operated cases of displaced acetabular fracture in adults, who gave consent to be a part of this study have been included after obtaining Ethical Institutional Committee approval as - NHLIRB/2022/August/17/01. Patients were followed up for at least 6 months postoperatively. All patients were initially stabilized hemodynamically first after ruling out injuries to head, chest and abdomen. Ultrasonography was performed in all patients to rule out any internal blunt chest or abdominal organ injuries. After stabilizing the patient hemodynamically, we took standard X-rays in the form of antero-posterior (AP) and Judet views of Pelvis and computed tomography (CT) scan with 3D reconstruction was taken to get better morphology of fracture pattern and fractures were classified according to Letournel and Judet classification system. Fractures of acetabulum with posterior and central hip dislocation were reduced with linear and lateral skeletal traction. In case of only posterior hip dislocation, linear skin or skeletal traction was given preoperatively. After obtaining fitness for anesthesia, patients were operated for the fracture. Patients were discharged on an average of 14 days after suture removal. They were followed up every monthly thereafter up to 6 months of surgery. All patients having displaced fractures (>2 mm articular step), intact roof arc angle <30°, medial roof arc angle of 45° or less, anterior roof arc angle of 25° or less, or posterior roof arc angle of 70° or less were operated in our hospital. Patients who failed to maintain closed reduction were also operated. Depending on the fracture morphology we have

mainly used three approaches: 1 Kocher-Langenbeck, 2 Ilio-inguinal approach, and 3 Modified Stoppa (Anterior Intra Pelvic) approach in which first a transverse skin incision is made 2 cm above pubic symphysis (Figure 1a) followed by elevation of abdominal fascia over rectus abdominis (Figure 1b) and splitting rectus abdominis at the midline (Figure 1c). Thereafter, identification of obturator neurovascular bundle is done and retracted (Figure 1d), corona mortis if present is ligated (Figure 1e) and finally subperiosteal dissection is done after which open reduction internal fixation is done (Figure 1f). These approaches were combined with each other in case of hemi-transverse and columnar fractures. Reducing acetabular fractures is one of the most challenging tasks. It requires patience and skill. One needs to do thorough analysis of fracture pattern, displacement of fragments, and meticulous pre-operative planning to ease the difficulties faced in the surgical treatment of acetabular fracture. Provisional fixation is usually established by means of Kirschner wires. Definitive fixation is established with screws and plates. The primary fixation is by means of inter-fragmentary screw. This is usually a 3.5 mm cortical screw used as a lag screw or 4 mm cancellous screw. Screws measuring 6.5 mm can also be used. Because of the curvaceous pelvic anatomy, implants that are too rigid must be avoided, as they need to be molded perfectly to avoid malreduction. The 3.5 mm reconstruction plate, either curved or straight, and 1/3rd tubular plate are ideal for this purpose.

In our hospital, post-operative patients are given intravenous antibiotics and analgesics for 5 days and dressing done on day 2, day 5, and day 10. On day 14, skin stitches are removed and patient is usually discharged. In case of stable fixation, we try to mobilize patient as early as possible. Usually, on 1st post-operative day, Quadriceps

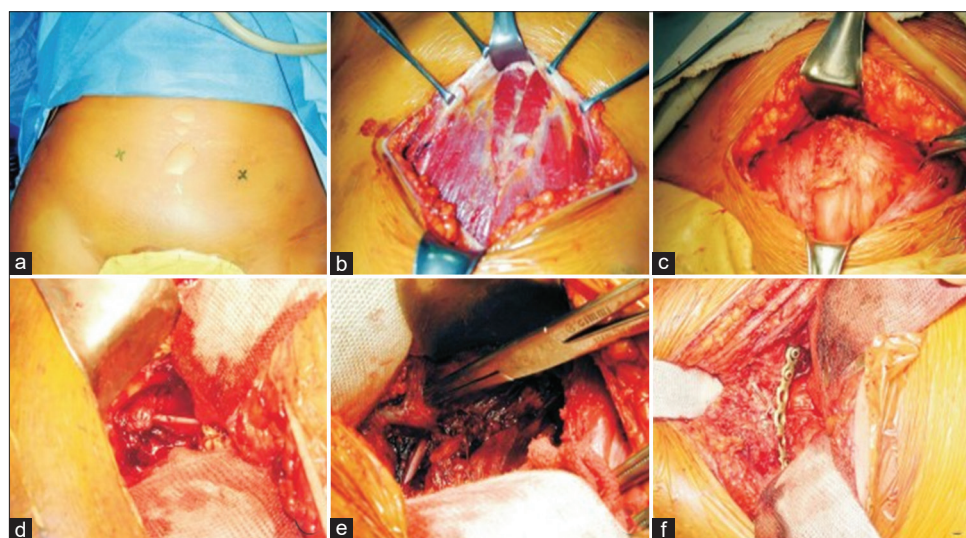


Figure 1: (a-f) Modified Stoppa approach

drill, ankle pumping, quadriceps strengthening, and toe mobilization are started. On 2nd post-operative day, bed side knee bending is started. After 1 month, we start non weight bearing walking with walker and then depending on radiological union, partial weight bearing with walker is started (6–8 weeks). After complete union (Figure 2), we start full weight bearing walking between 14 weeks and 18 weeks as per patients tolerance. After that patients are allowed to resume their work. AP and Judet views of Pelvis with both hips are taken once postoperatively and then on regular follow-up every month. Most important aspect of operative acetabulum fracture is to start early mobilization. At 6 months follow-up (Figure 3), clinical evaluation of patient is done using Modified Merle'D Aubigne and Postel scoring system and Harris hip score.

RESULTS

In our study, the most common age group affected was 31–50 years (46%) and maximum patients were under

50 years of age (65.3%) with average age of 45.6 years. Out of the 26 patients, 25 patients were male (96%) and only one patient was female (4%) which suggests that acetabulum fracture is more common in males. We had 15 patients with the right side of acetabulum fracture (58%) and 11 patients involving the left side (42%). Most common mode of injury was road traffic accident involving 20 patients (77%) while rest of the six patients (23%) were due to self-fall down from height. Most common type of acetabulum fracture operated was posterior wall fracture in six patients (23%). Second most common fracture was simple transverse fracture in five patients (19.2%) (Table 1). As shown in Table 2, different fractures had different patterns and hence they were fixed using different approaches, either single or in combination. In our study, ten patients (approximately 38%) had associated injuries to the body along with acetabular fracture. If we talk about complications, only one patient developed post-operative infection which was superficial and treated with debridement and antibiotics. One patient developed Grade 1 bed sore over right gluteal region. One patient had Grade-1 Osteoarthritis according to Tonnis grading system of hip joint osteoarthritis. During the 6 month short term follow-up, none of the patients developed avascular necrosis (AVN) of the head of the femur, heterotopic ossification, or non-union. If



Figure 2: X-ray of acetabular fracture fixed through anterior approach (a) pre-operative 3D CT scan, (b) immediate post-operative X-ray, (c) Final follow-up at 6 months

Table 1: Fracture type and number of patients operated

Fracture type	No. of patient (%)
Elementary type	
Posterior wall	6 (23)
Posterior column	1 (3.8)
Anterior wall	0
Anterior column	2 (7.7)
Transverse fracture	5 (19.2)
Associated fracture	
T- shaped	3 (11.5)
Posterior wall and posterior column	1 (3.8)
Transverse-posterior wall	2 (7.7)
Anterior wall/column with posterior hemi-transverse	4 (15.4)
Both column	2 (7.7)



Figure 3: Posterior wall of acetabulum fixed through Kocher Langenbeck approach, (a) pre-operative, (b) immediate post-operative, (c) final follow-up

Table 2: Type of fracture and the surgical approach chosen for it

Fracture type	Kocher-Langenbeck (KL)	Ilio-Inguinal (II)	Modified Stoppa (MS)	Both approach
Elementary type				
Posterior wall	6	0	0	0
Posterior column	1	0	0	0
Anterior wall	0	0	0	0
Anterior column	0	2	0	0
Transverse	0	5	0	0
Associated type				
Posterior wall posterior column	1	0	0	0
Transverse posterior wall	0	0	0	1(KL+II) 1(KL+MS)
T shaped	1	0	1	1(KL+II)
Anterior wall/column and posterior hemi transverse	0	2	0	2(KL+II)
Both column	0	0	0	1(KL+II) 1(KL+MS)

Table 3: Comparison of functional outcome using Modified Merle'D Aubigne and Postel score

Study	Excellent (%)	Good (%)	Fair (%)	Poor (%)	Total (%)
Meena <i>et al.</i> , ⁵	27 (22.9)	52 (44.2)	20 (16.9)	19 (16.1)	118 (100)
Matta <i>et al.</i> , ⁶	104 (40)	95 (36)	21 (8)	42 (16)	262 (100)
Giannoudis <i>et al.</i> , ¹³	543 (62.4)	203 (23.4)	46 (5.3)	77 (8.9)	869 (100)
Fica <i>et al.</i> , ⁷	32 (38)	24 (29)	7 (9)	20 (24)	84 (100)
This study	9 (34.6)	15 (57.7)	2 (7.7)	0	26 (100)

we calculate scoring of all the patients, 24 patients have achieved excellent to good according to Merle'd Aubigne Postel scoring, while 25 patients have achieved excellent to good according to Harris hip scoring. We have compared our study to that of other studies as shown in Table 3 and found to have similar results.

DISCUSSION

In our study, average age is 45.6 years. About 64% of these patients are of 18–50 years age group, which is similar to observation in the study of Matta *et al.*,⁶ and is due to young and active individual who are involved in high energy accidents. Common fracture pattern in our study was posterior wall with 23% which is similar to the study of Fica *et al.*⁷ A total of 12 patients (46%) had fracture dislocation. The dislocation was posterior in six patients (23%). These dislocations were treated by means of closed reduction before the surgical fixation of fracture, which when compared to Tannast *et al.*,⁸ had 24% posterior fracture dislocations. Transverse type acetabular fracture and anterior wall/column with posterior hemi-transverse fracture incidence were 19.2% and 15.4%, respectively. Most common fracture pattern (25%), according to the study of Deo *et al.*,⁹ was both column fracture and only 10% patients had posterior wall acetabulum fracture. Frequency of anterior column fracture was similar to the study of Deo *et al.*, with 7.7% incidence of fractures. Kreder *et al.*,¹⁰ 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 fracture, adequacy of

open or closed reduction, and late complications like AVN, heterotopic ossification, chondrolysis, or nerve injuries. In our study, associated posterior wall fractures had fair to good functional outcome. Harris¹¹ in his meta-analysis reported 5.6% of AVN of femoral head and 8% of Sciatic nerve palsy in posterior approaches. We have not had any cases of AVN of femoral head, sciatic nerve palsy, or any other such major complications. It has been generally thought that surgery within 24 h after injury places the patient at risk for increased blood loss but, it has been shown that the posterior wall fractures can be treated immediately without increased risk of excessive blood loss¹². In our study of 26 patients, six patients had posterior wall fractures out of which four patients were operated within 24 h and two patients within 48 h without any complications intraoperatively or postoperatively. 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. We used three approaches - Posterior Kocher Langenbeck approach, anterior Ilio-Inguinal approach, and Modified Stoppa approach. With this single approach in most of the patients, we were able to get satisfactory reduction and functional outcome in short term without major complications. We used single approach in most of the patients except six patients where combined approaches were unavoidable. Hence, for that to happen, we recommend CT scan with 3D reconstruction in all the patients having pelvic trauma so that preoperatively, correct approaches can be planned, size of fracture fragments estimated as well as correct surgical implants decided for the surgery.

Limitations of the study

No comments can be made regarding long term arthritic changes or need for conversion to Total hip replacement.

CONCLUSION

- The most common cause of simple and complex acetabulum fracture is Road traffic accidents in young active male.
- As anatomy of pelvis is complex, type of acetabulum fracture and planning of surgical management should be done using various pelvic x-rays and CT scan with 3D reconstruction.
- The most common type of fracture pattern is Posterior wall followed by Transverse fracture.
- The quality of reduction and fixation is strongly associated with clinical results.

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Authors Contributions:

NPS- Concept and design of the study; **NBP**- Interpreted the results; **PMT**- Concept, coordination and interpretation; **PVS**- Preparation of manuscript and revision of the manuscript; **DVP**- Necessary error correction.

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