

Study of Functional Outcome in Posterior Wall / Column Acetabular Fracture Using Open Reduction Internal Fixation with Plates and Screws

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Abstract

Background: The majority of acetabular fractures in young people are caused by high-velocity injuries, such as falls from heights or car accidents. Early Open Reduction and Internal Fixation (ORIF) is the standard for instability, with techniques like the modified Kocher-Langenbeck approach and spring plates often used for posterior wall injuries. **Material and Methods:** The present study was conducted in Department of Orthopaedics, Govt. Stanley medical college & hospital. The study comprised 20 patients who had acetabular fractures in the posterior wall and posterior column and who were treated with open reduction and internal plate and screw fixation. **Results:** There were 17 men and 3 women in the age range of 18 to 70, with 16 cases involving the right side and 4 involving the left. There was minimal follow-up for eight months. The most common fracture type in our study was posterior column fractures. **Conclusion:** The prevalence of acetabulum fractures is rising as a result of more automobile accidents. Since these fractures affect the lower limb's weight-bearing joints, they need to be repaired to the greatest extent feasible. Even with the finest efforts, posterior wall fractures may result in malreduction and insufficient fixation.

Keywords: Merle D'Aubigne score, open reduction, internal fixation, and the posterior wall of the acetabulum.

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INTRODUCTION

The majority of acetabular fractures in young people are caused by high-velocity injuries, such as falls from heights or car accidents.^[1] The majority of patients have concomitant injuries, including musculoskeletal injuries, soft tissue injuries, nerve injuries, and vascular injuries.^[2] By applying Letournel and Judet classification to diagnose the fractures, we discovered a learning curve.^[3,4] Prompt ATLS with resuscitation and acetabular fracture fixation are the first steps in the management of acetabular fractures. Hip joint dislocation or subluxation, either central or posterior, may be linked to acetabular fractures.^[5-7]

In order to achieve satisfactory results and an anatomical reduction of fractures, the timing of surgery is crucial. The surgeon finds it quite challenging to act as soon as feasible because of the related injuries. According to some research, if the operation is done within 15 days for elementary fracture patterns and within 5 days for the linked pattern of acetabular fracture, there is a greater chance of an anatomical reduction. Additionally, completing the task within the allotted time frame increases the likelihood of a good to excellent function outcome. The majority of fractures are not appropriately treated. Skeletal traction should therefore be used to immobilize and stop additional hip joint injury during the interval. However, anatomical reduction becomes more difficult beyond two to three weeks following the fracture, leading to a significantly inferior functional and radiological prognosis. Additional factors that affect the outcome of an acetabular fracture include the patient's age, osteoporosis, co-morbidity, experience of the surgeon, and the original pattern

and displacement of the fracture.^[8-10]

The majority of surgeons choose internal fixation and open reduction as their primary treatment. Operative management may involve the use of ilioinguinal, modified stoppa, Kocher-Langenbeck, extended iliofemoral, or triradiate surgical procedures, or a combination of these. When an acetabular fracture is treated with open reduction and internal fixation, the aim is to create a congruent joint that is pain-free, flexible, and stable so that daily activities and employment can continue without the risk of further degenerative changes.^[11,12]

MATERIALS AND METHODS

This study was conducted in Department of Orthopaedics, Government Stanley Medical College, between June 2018 to September 2019 after getting clearance from Institutional Ethics Committee (dated 27.06.2018). Twenty cases of acetabular fractures of the posterior wall and posterior column were treated with open reduction and internal plate and screw fixation during

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this time.

Patients who were older than 18 years old were included in the current investigation. acetabular fractures of the anterior wall and anterior column. Both open and closed posterior wall and column acetabular fractures after three weeks of injury were excluded from the study.

Initial assessment – Pre-op

A thorough history on sociodemographic traits, the type of injury, and the initial course of therapy was gathered following the acquisition of informed consent and assent.

Letournel and Judet's categorization has been applied to all fractures.

Intra-op

A posterior approach to the acetabulum using the Kocher-Langenbeck technique was performed on all twenty patients. Following the exposure of the fracture site, the C-arm was used to confirm the fracture pattern. K-wires, Schanz 64 pins, ball-tipped spikes, and special clamps were employed to reduce the fracture fragments. After the reduction was accomplished, a 3.5mm reconstruction plate with a contoured buttress plate was used to fix it. Then, 3.5mm cortical screws or 4mm cannulated cancellous screws were used to fix the lag screw. The fragment is covered by the typical posterior wall plates, which run from the ilium's ischial to supraacetabular region.

Post-op

To evaluate the quality of reduction, AP and Judet images of the pelvis were obtained during the postoperative follow-up. According to Matta, these views were classified as anatomical and near anatomical. Every time a suction drain was utilized, it was taken out on day two. On the 12th POD, the sutures were removed. From the second POD until six weeks, indomethacin 25 mg TDS was administered as a preventative measure against heterotopic ossification. As soon as the patients were able to sit, they were moved. They were then required to engage in active range-of-motion activities and physical muscle strengthening. For the first six weeks, walking without weight on crutches was recommended using the unaffected limb; after that, partial weight bearing with crutches was recommended for a total of twelve weeks. Additionally, this was tailored to the patient's previous injuries. After three months, full weight bearing walking was initiated, and physiotherapy was continued until muscle strength and range of motion were restored. After surgery, serial radiographs were taken of every patient at six weeks, three months, and six months.

To assess the functional outcome, the Modified Merle d'Aubigne and Postel score was employed.

Radiological Assessment: The patients' Judet and pelvic AP views were captured on post-operative x-rays at the time of surgery, six weeks later, three months later, and six months later. Matta's principle (anatomical 0-1 mm displacement,

Using the near anatomical 1-3 mm displacement and poor >3 mm displacement criteria, the accuracy of the reduction was rated.

The femoral head and acetabulum roof's relationship was explained as following Letournel's description:

1. Ensured that the head and roof were in sync.
2. The upper joint space loses parallelism.
3. The head subluxates and loses parallelism.
4. Secondary congruence in surgery

Assessment of Functional Outcome: The functional outcome was assessed using the Modified Merle d'Aubigne and Postel score, which integrates walking, range of motion, and discomfort and gives each category six points. There were four marks given to the results: Poor (<13), Fair (13 or 14), Good (15,16, or 17), and Excellent (18). After obtaining the necessary consent, all of the study's data was gathered from the patients while they were in the hospital, at routine follow-up visits, and from their medical records.

Statistical Analysis: Quantitative data were expressed as mean ± standard deviation (SD), while categorical variables were expressed as percentages. The Wilcoxon rank sum test was used to calculate the correlation between the functional and radiological scores. age-functional outcome correlation determined by the unpaired t-test. A p-value of less than 0.05 is regarded as statistically meaningful.

RESULTS

Twenty cases of posterior wall and posterior column acetabular fractures underwent surgery between June 2018 and September 2019. There were 17 men and 3 women in the age range of 18 to 70, with 16 cases involving the right side and 4 involving the left. There was minimal follow-up for eight months.

Three (15%) cases of the research participants had a fractured posterior wall, eight (40%) had a fractured posterior column, three (15%) had a fractured posterior wall and column, and six (30%) had a fractured posterior column and anterior column. Six of the 20 patients had related injuries. One patient had a chest injury. Five patients had fractures in their extremities. Ten of the patients in our study had hip dislocations, which were minimized as soon as feasible after the patient was stabilized and skeletal pin traction was applied until the patient underwent surgery.

As early as three weeks after the incident, the patients were scheduled for surgery. The patients who were operated between 0-14 days and between 14-21 days were 18 and 2 respectively. 9.1 days was the average period between the injury and operation.

Twelve patients in our study achieved anatomical reduction, and eight out of twenty patients achieved near anatomical reduction. Three patients in our study had poor functional outcomes, two had fair functional outcomes, eleven had good functional outcomes, and four had exceptional functional outcomes.

Table 1: Characteristics of the study population

Variable	Frequency (n=20)	Percentage
Age (in years)		
18 -30 years	8	40
31 – 50 years	10	50
51 – 70 years	2	10
Gender		

Male	17	85
Female	3	15
Side		
Right side	14	70
Left side	6	30
Fracture types		
Elementary type		
Posterior wall	3	15
Posterior column	8	40
Associated type		
Both columns	6	30
Posterior column + Posterior wall	3	15
Dislocation		
Present	10	50
Absent	10	50
Associated injuries (n=6)		
Chest injury (b/l rib fracture)	1	5
Extremity Fracture	5	25
Modified Merle D' Aubigne and Postel Score		
Excellent	4	20
Good	11	55
Fair	2	10
Poor	3	15
Reduction		
Anatomical	12	60
Near anatomical	8	40

DISCUSSION

Acetabular fractures are most commonly classified as displaced fractures of the acetabulum's posterior wall and column. The posterior wall serves as the weight-bearing component of the hip joint; thus, any displaced fracture significantly impacts hip joint stability. The outcome is contingent upon injury severity, patient age, radiographic fracture pattern, accompanying injuries, the surgeon's knowledge of acetabular anatomy, and the precise reduction of fracture fragments to ensure a pain-free hip joint postoperatively.

In our analysis, posterior column fractures accounted for 40% of all fractures, followed by anterior column fractures (30%) and posterior wall fractures (15%). Lim et al in their study had reported that posterior wall fractures were the commonest acetabular fractures, while Rao et al,^[13] had also reported similar findings, their second most commonly observed fracture type was coupled posterior wall and column fractures comprised 30%. Kim et al had observed that simple posterior wall fractures were more common as compared to complex fractures.^[14] Lim et al reported in their study that 60% of the cases exhibited posterior wall fractures. Various observations have indicated that patients with fractures involving the posterior wall either isolated or in combination with fractures of the posterior column led to significant functional impairments and an unfavourable prognosis.^[7-9] In these conditions in particular the anatomical reduction alone is insufficient for restoring normal function. Matta et al documented 262 fractures of the acetabular region that affect the posterior wall, they noted that 68% achieved a satisfactory or excellent clinical outcome based on the radiological observations.⁸ Radiographic results for open reduction and internal fixation of acetabulum posterior wall fractures were satisfactory in 4 percent of cases and excellent in 84% of cases, according to Moed et al. Rao et al had also

documented that there was a significant association between fracture type and both functional and radiological outcomes.^[13] In our study we have also made similar observations.

Ebraheim et al,^[12] reported that upon reconstruction of comminuted posterior wall fractures utilizing the buttress technique and upon assessment by the modified Merle d'Aubigne and Postel scoring system excellent, very good and good results were reported by 34%, 28% and 12% respectively. Kim et al in their study reported that after reconstruction of acetabular posterior wall fractures, they observed excellent and very good responses among 45.5% and good in 15.2% of the patients respectively.^[14] Rao et al,^[13] had reported that 75% had excellent and good outcomes, our findings are also in line with the observations by made by our predecessors.

Rao et al a strong link between the anatomic reduction of the joint surface and the patient's functional outcome.^[13] Mesbahi et al indicated a substantial correlation between the quality of reduction, clinical outcomes, and fracture type.^[16] Various studies conducted by Mayo et al, Briffa et al and Gupta et al have reported excellent to good results among more than 70% of the study participants.^[17-19]

CONCLUSION

Acetabulum fractures are becoming more common as a result of an increase in traffic accidents. Since the lower limb's weight-bearing joints are affected by these fractures, maximum restoration is required. Even with the finest efforts, posterior wall fractures may result in malreduction and insufficient fixation. Total hip replacement may be required in those situations after primary fixation fails due to a fracture. Undoubtedly, Acetabular fractures have a high learning curve, and success depends on understanding the anatomy of the fracture, preoperative planning, technique, and type of reduction.

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Conflicts of interest

There are no conflicts of interest.

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