Clinical and Functional Outcome of Acetabular Fracture Fixation: 5-year follow up Retrospective Cohort Study

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ABSTRACT

Objective: Acetabular fractures are amongst complex injuries that Orthopaedic surgeons manage. Commonest cause of these fractures are high-energy trauma, and are frequently accompanied by additional possible life threatening injuries. If not addressed appropriately, Acetabular fractures may result in early hip osteoarthritis. This study was carried out to assess clinical and functional outcomes of acetabulum fracture fixation at 5 years' follow-up, using Harris hip score.

Methods: This retrospective study was done at Liaquat National Hospital from 2010 to 2022, which included 173 patients who underwent acetabular fracture fixation. After excluding patients who expired, did not respond or were lost to follow-up, final sample size summed up to 72 patients. Data encompassed patient demographics, injury mechanisms, treatment details, and complications. Fracture patterns were classified per Letournel and Judet criteria. Surgical intervention involved acetabulum open reduction and internal fixation (ORIF) by a single surgeon who is specialized in pelvic and acetabulum surgeries. Protocols for postoperative rehabilitation and thromboprophylaxis were followed. Clinical and functional outcome was assessed using HHS at five-year follow-up.

Results: This study group included 72 patients with a mean age of 45.36 ± 16.3 years and included 64 men and 8 women. Road traffic accidents was the leading cause of acetabular fractures (79.2%), with solitary acetabular fractures accounting for the majority of cases (87.5%). Fracture classification revealed anterior column fractures as the most common subtype (66.7%). The mean HHS at the five-year follow-up was 90.78, indicating excellent outcomes in the majority (68%) of patients. 2 patients (2.8%) developed avascular necrosis, and limb length discrepancy was seen in 6 patients (8.3%).

Conclusion: This study underscores the complexity of acetabular fractures and highlights the favorable outcomes of surgical intervention using the Harris Hip Score. Complications like avascular necrosis and limb length discrepancy require regular follow-ups and management accordingly. While acknowledging study limitations, including its retrospective nature and sample size, this research showed excellent clinical and functional outcome after acetabular fracture fixation.

Keywords: Acetabular fractures, orthopedic surgery, Harris Hip Score.

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INTRODUCTION

Acetabular fractures are amongst the most challenging injuries that are managed by orthopedic surgeons. Our maximum understanding of surgical techniques, reduction tactics, problems, and outcomes are from the work produced by Robert

Judet and Émile Letournel in this area[1]. 3 acetabular and pelvic fractures per 100,000 people per year, or 2% to 8% of all fractures, were reported in the United Kingdom[2]. Commonest cause of these fractures are high-energy trauma, and are frequently accompanied with other potentially life threatening injuries. If left untreated, acetabular fractures may lead to early hip osteoarthritis[3].

Acetabular fracture stabilization had been a significant obstacle for trauma surgeons. In the mid-term analysis, 20-25% of patients experienced poor functional outcomes due to complications[4]. The surgeon's training and experience had a substantial impact on the treatment plan, surgical approach, reduction techniques and outcomes[5].

Acetabular fractures ensue when the femoral head is driven into the pelvis, either due to dash board injury in which there is direct impact on knee with hip in abduction and flexion or it is secondary to the impact on the side of the hip. The configuration of the fracture is dependent on the magnitude and direction of the impact and the position of knee and hip during the impact[6]. Numerous acetabular fractures are associated with lower extremities fractures, injuries to head, chest, abdomen and pelvic ring[7,8]. Other variables, such as the patient's age, osteoporosis, fracture type, co-morbidities, surgeon experience, concomitant chondral destruction to the femoral head and acetabulum and concomitant neurovascular impairment may also have an effect on the outcomes[9-10].The objective of this study is to evaluate the mid-term clinical and functional outcome of acetabulum fracture fixation with the help of Harris hip score.

MATERIALS AND METHODS

A retrospective study of 173 patients was carried in Liaquat National Hospital from 2010 to 2022. Institutional and Ethical board review for this study was acquired before it began.

Out of 173 patients, 101 did not respond and/or were lost to follow-up, 9 patients had expired and therefore our sample size was 72 patients. We used our hospital's records to identify the patients who underwent acetabular fracture fixation during our study period, data was then retrieved, patients aged 17-55 years, primarily presenting in our emergency department or referred to our tertiary care facility were all included. Patients with pelvic and pubic ramus fractures not including the acetabulum, patients lost to follow-up or with delayed presentation after 1 month, were excluded from the study.

Basic details comprising of age, gender, site of injury, mechanism of injury, associated injuries, treatment plans and complications were recorded. Initial evaluation was done using plain antero-posterior and Judet views. CT scan was done in displaced fractures to identify fracture patterns and plan accordingly or patients in whom there was doubt about the acetabular involvement. There was only one patient who had bilateral acetabular fractures in our sample size. Due to the complex anatomy of acetabulum, numerous classification systems have been proposed, but the Judet-Letournel classification is still the most widely accepted classification system[13-15], our study also used this classification system.

Patients sustaining fractures with ≥2 mm displacement, with intra-articular fragments, instability or incongruence of the hip joint or fracture dislocation underwent acetabulum ORIF. Surgery was performed by one surgeon who was specialized in pelvis and acetabulum reconstruction. Patients were started on thromboprophylaxis (Clexane S/C 40mg once a day) as soon as they were admitted, dose was hold on the day of surgery. Patient was allowed on bed mobilization with a 45-degree head end elevation during sitting for 6-8 weeks depending on fracture type.

Patients were assessed on follow up by the primary surgeon at 6 and 12 weeks, 6 and 12 months and then yearly for a total of 5 years. Functional outcome was evaluated using Harris Hip Score (HHS). HHS is a clinical and functional outcome scoring system consisting of categories for pain severity, function (walking, limping, stairs, sitting and need of support devices), presence of any deformity, and range of motion. These scores encompass a range from 0, indicating more significant disability, to 100, representing lesser disability. These scores categorized as less than 70 indicated a poor outcome, 70 to 79 indicated a fair outcome, scores within 80 to 89 indicating a good outcome, and scores greater than 90 indicating an excellent outcome.

Mean and standard deviation were calculated for quantitative variables like age, range of motion (ROM) and HHS. Frequency and percentage were calculated for qualitative variables like gender, symptoms, function and complications, categorical analysis done by chi-square test with p-value <0.05 being significant. Statistical analysis was done using the Statistical software SPSS Version 25.

RESULTS

In our study, we included 72 patients, with an average age of 45.36 years. The gender distribution of these patients being, 64 patients (89%) were males, while 8 patients (11%) were females. By the mean of the mechanisms of injury, majority of cases were attributed to road traffic accidents (RTA) consisting of 79.2%. Additionally, 8.3% patients had experienced falls from heights, 9.7% had slipped or ground-level falls, electrocuted report in one patient, and another patient was harmed by animal. Among these participants, 87.5% had fractures of isolated acetabular, while 12.5% were identified as polytrauma cases.

Classification of fracture patterns were done according to the criteria of Letournel and Judet[16]. Of 72 patients, 48 patients (66.7%) had elementary fracture type with anterior column fracture being the most common subtype, whereas 24 patients (33.3%) had associated fracture type with anterior and posterior column fracture was the most common subtype.

SUMMARIZED DATA (N=72)	
GENDER	**64** males, **8** females
AGE	**45.36** ± 16.3 years
MECHANISM OF INJURY	**57** RTA, **6** fall from height, **1** electrocuted, **1** hit by animal
INJURY	**63** isolated acetabular fractures, **9** polytrauma
FRACTURE CLASSIFICATION	**48** elementary fracture type, **24** associated fracture type
COMPLICATIONS	**2** avascular necrosis (AVN), **6** limb length discrepancy
HARRIS HIP SCORE	**49** excellent**, 13** good**, 10** fair

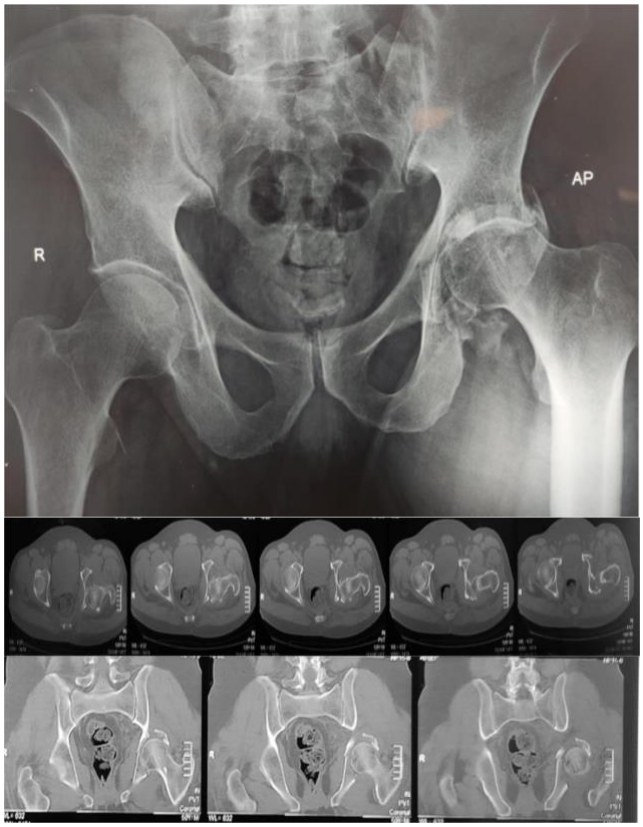

Figure 1-3: CASE 1: 50 year old male, was seen in emergency department after he was involved in a road traffic accident, was diagnosed with posterior wall acetabular fracture.

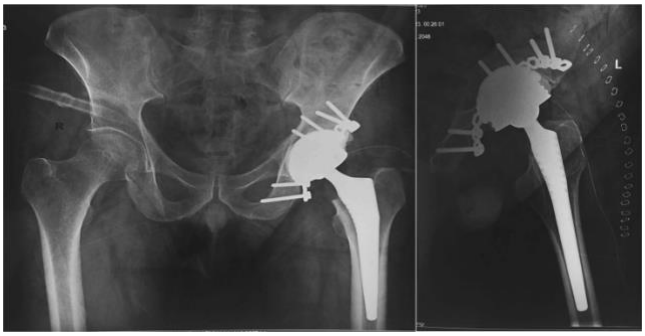

Figure 4-5: CASE 1: Post-operative x-rays after THR with acetabulum ORIF was done.

Figure 6: CASE 2: 56-year-old male, history of left acetabular ORIF 3 months back, presented with complains of left hip pain.

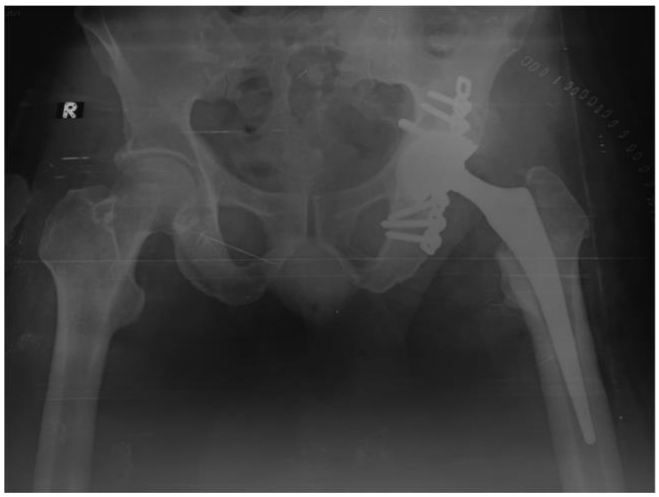

Figure 7: CASE 2: Post-operative x-rays following THR

Figure 8: CASE 2: X-ray at one year follow-up post-THR

When assessing the functional outcome using Harris hip score, mean score at 5-year follow-up was 90.78 which was an excellent outcome. Among the 72 patients in our study, 49 (68%) achieved excellent outcomes, 13 (18%) had good outcomes, and 10 (14%) had fair outcomes. Notably, 66.7% of the nine polytrauma patients and 80% of the ten patients with concurrent femoral head dislocation had good and excellent outcomes.

There was no immediate post-surgical complications were noted in our cases. Out of 72 patients 10 (13.9%) had femoral head dislocation with acetabulum fracture, 6 of these patients underwent total hip replacement along with acetabulum ORIF, of the remaining 4 patients, on 5-year follow-up 2 patients developed avascular necrosis (AVN), this complication was significant in patients with femoral head dislocation, with p-value of <0.05. Six (8.3%) out of 72 patients developed a limb length discrepancy (≤3 cm), with four cases resulting from osteoarthritis and two from avascular necrosis.

Patients with limb length discrepancy were given shoe lift, and these patients had no complains on follow-up. 2 patients who developed avascular necrosis underwent total hip replacement (THR).

DISCUSSION

Acetabular fractures represent a challenging orthopedic condition that demands a comprehensive understanding of surgical techniques, treatment strategies, complications, and long-term outcomes[1]. This study intended to evaluate the clinical and functional outcomes of acetabular fracture fixation by using Harris Hip Score (HHS). In our study, the majority of acetabular fractures resulted from high-energy trauma, often accompanied by severe concomitant injuries, emphasizing the gravity of these cases. Without timely intervention, displaced acetabular fractures may lead to early hip osteoarthritis, further stressing the importance of effective management[17,25]. The demographics of our patient cohort align with previous studies, showcasing that acetabular fractures predominantly occur in individuals aged 18-55 years, with a male predominance[18]. Mechanisms of injury, high energy such as road traffic accidents, fall from height or crush injury, or low energy trauma in elderly like ground level fall, further substantiate the multifactorial nature of these fractures. Fracture classification according to Latourell and Jude criteria revealed that the elementary fracture type, particularly anterior column fractures, was the most common subtype in our study, consistent with previous literature[19]. This classification system aids in defining fracture patterns and guiding surgical strategies. Our results demonstrate that surgical intervention, specifically acetabulum open reduction and internal fixation (ORIF), was the prime treatment option in patients with displaced acetabular fractures, intra-articular fragments, or hip joint instability. Surgery performed by a specialized surgeon yielded favorable outcomes, aligning with previous findings that highlight the importance of surgeon expertise in acetabular fracture management[20].

The observed mean HHS at the five-year follow-up of 90.78 is indicative of excellent outcomes in the majority of cases (68%). Our results are consistent with previous studies that have utilized HHS as a reliable measure of functional outcome[21]. Notably, our study identified complications such as femoral head dislocation and limb length discrepancy. The femoral head dislocation in acetabular fractures is associated with a higher risk of avascular necrosis (AVN), which was seen in a subset of our participants. This observation emphasizes the importance of close evaluation and appropriate management of such cases.

A similar study by A. B. Petrov[22] regarding long term outcomes, showed good and satisfactory outcomes in 43 (54.4 %) patients with radiological outcome showing complete reduction or 1–2 mm residual displacement. Severe posttraumatic osteoarthritis of hip joint, complications like avascular necrosis of the femoral head or incomplete reduction with residual displacement of > 2 mm was documented in 36 (45.6 %) patients who were graded as a poor outcome. Patients with above mentioned complications were planned for total hip replacement.

In a study by m. Boudissa[23], operative vs conservative treatment of displaced acetabular fractures, concerning clinical outcomes, the HHS and PMA (Postel-merle d'aubigné) scores were better for operative patients ($p < 0.05$). In a similar study by B. P. McCormick[24], patients treated with ORIF had a significantly high frequency of complications than those treated with ORIF along with THR, THR alone, CRPP (closed reduction percutaneous pinning), or non-operative management ($p < 0.01$)

Further research in this field would enhance advancements in surgical techniques and rehabilitation measures. The goal is to continue optimizing patient outcomes while minimizing complications. This may involve investigating innovative approaches to surgical fixation, postoperative rehabilitation strategies, and the development of predictive models to identify patients at higher risk of complications.

We should acknowledge certain limitations in this study. As retrospective analysis is based on historical medical records, there may be constraints on the accuracy and comprehensiveness of the data. The ability to extend our findings to larger populations may be limited due to relatively small sample size. Moreover, the patient inclusion criteria might introduce bias in patient selection, various demographic groups and healthcare settings influencing potentially.

CONCLUSION

This study highlights how crucial it is to perform surgery as soon as an acetabular fracture occurs as accomplishing it can improve clinical and functional results. We found that the majority of patients had favorable outcomes after using the Harris Hip Score as a reliable evaluation tool. However, it is essential to maintain monitoring when handling complications like femoral head dislocation and limb length discrepancy. We would like to continue following these patients, to assess long term clinical and functional outcomes.

Conflict of Interest: None

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