

## OUTCOME OF PRIMARY FIXATION OF TRAUMATIC ACETABULAR FRACTURES PRESENTING TO PRIVATE SECTOR HOSPITALS.

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### Abstract

**Background and Objective:** Traumatic acetabular fracture is a rare injury with high mortality, morbidity and long recovery period. Incidence of acetabular fracture is 3 per 100000(0.003%) population. Surgical management of acetabular fracture is a technical challenge needing high level of skills and vigilance because of the complex anatomy and risk to surrounding structures. We aim to look at two surgical techniques for fixation of acetabular fracture and their outcome in this study.

**Methods:** Between April 2018 and March 2023, we performed a retrospective analysis of rare acetabular fractures at the department of Orthopedic Kazi hospital Lahore and Doctor's hospital and Medical Centre Lahore. Record of total of 26 patients (15 males and 11 females) who were treated for acetabular fracture fixation were analyzed. Among these 10 were treated with minimal invasive technique i.e. Close reduction and per-cutaneous fixation as good reduction was achieved under image guidance and 16 patients had open reduction and internal fixation (ORIF) with use of various recon plates, screws and wires.

**Results:** Record of all the patients who were followed up for 12 months was retrieved. Among all patients, the clinical outcomes were recorded as excellent in 17 patients (65%), good in 5 (19%), fair in 2 (7.7%), and poor in 2 (7.7%), according to the modified Merle d'Aubigné-Postel score. The average modified Merle d'Aubigné-Postel score was  $15 \pm 2.0$  points (range, 10–18 points). The radiological healing was assessed according to the Matta score [22] and were reported excellent in 15 patients (15/26, 57.6%), good in 7 (7/26, 26.8%), fair in 1 (1/26, 3.8%), and poor in 3 (3/26, 11.5%).

**Conclusion:** Our study shows comparable clinical outcome for acetabular fracture fixation using either ORIF or CRPF technique. Right patient choice and good knowledge of anatomy is of paramount importance.

**Keywords:** Acetabular fracture, hip dislocation, Illo-inguinal approach for acetabulum

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Traumatic acetabular fracture is rare injury with reported incidence of 3 per 100,000 (0.003%) patient population.<sup>1</sup> It has high association of mortality, morbidity and long recovery period. Sequel of acetabular fracture has a very high incidence of Hip joint arthritis which necessitates further treatment and adds to patient's recovery process and quality of life. Trau-

matic acetabular fractures with hips dislocation is very rare injury.<sup>2</sup>

Surgical management of acetabular fracture is mostly recommended, and it is a technical challenge needing high level of skills and vigilance for the orthopedic surgeon because of the complex anatomy and risk to surrounding structures.<sup>1-3</sup>

One study looking at 1612 patients with pelvic and/or acetabular fractures found only one patient with bilateral acetabular fractures and hip dislocation.<sup>3</sup> Such injuries are due to high-energy trauma and may be associated with other life threatening injuries.<sup>4</sup> A thorough multidisciplinary evaluation should be

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considered for all such patients.<sup>5</sup>

Traditional Methods of fixation include the recon plates, screws, wires and combination of above implants.<sup>3</sup> Though these implants can achieve a satisfactory outcome but it's very demanding and that's why plays an important limiting factor in many surgeons will to perform pelvic surgery. Pelvis fracture is rarely simple pattern and frequently has comminution and associated injuries which adds up to challenge.<sup>6,7</sup> If bones are osteoporotic, traditional fixation may lead to loss of fixation, metal work failure and fracture deformity will be left leading to poor congruence of hip joint or sacroiliac joint and resultant poor outcomes.<sup>7,8</sup> Open reduction and internal fixation (ORIF) will be associated with longer operating time, increase blood loss and anesthetic risks to the patient. If under image guidance fracture can be reduced to within acceptable limits and held with per-cutaneous screws or k-wires, this can save several challenges associated with ORIF. But to achieve this technique a sound knowledge of anatomy and use of image intensifier is mandatory.<sup>9,10</sup>

After reduction fracture healing, rehabilitation and future risks of chronic pelvic pain, dysfunction and post-traumatic arthritis remains the main issues which surgeons need to address over an extended period and need multi-disciplinary input.

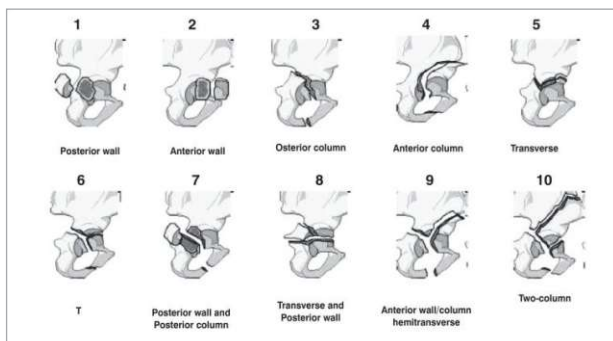
We present our study of 26 pelvis fractures fixed at two hospitals over a period of 5 years. Our patients received both ORIF and MIS techniques to achieve best outcome.

**METHODS**

We performed a retrospective analysis of patients of acetabular fractures who underwent open or close surgical fixation at Orthopedic Kazi hospital Lahore and Doctor's hospital and Medical Centre Lahore. We received approval from the institutional review board (Kazi Hospital/22/105). The records of the patient who were eligible for study and were complete as per inclusion criteria were enrolled. Moreover, only record of those patients were included who were managed and followed up by the principal investigator to ensure uniformity in data. Records of any procedures not

involving incisions, such as manipulations were excluded. Poly-trauma patients with head injuries were also excluded from the study. Between April 2018 and March 2023, a total of 35 patients were admitted with acetabular fracture diagnosis. Of which, 29 patients were treated by the surgical intervention. Of the 29 patients, 3 (10.3%) patients were lost to follow-up after surgery. The 26 remaining patients (15 males and 11 females) with acute fracture of acetabulum, with or without hip dislocation were treated by surgery. Out of these 26 patients, 10 were treated with minimal invasive technique i.e. close reduction and per-cutaneous fixation as good reduction was achieved under image guidance and 16 patients had ORIF with use of various recon plates, screws and wires Table 1. Aim was to achieve a stable fixation which will allow early weight bearing and rehabilitation.

Letournel's classification system was used to define the fracture type and documented.<sup>11,12</sup>



**Figure 1-** Acetabulum fractures: classification

Quality of fracture reduction was assessed intra operatively and post operatively and graded as anatomical (0 mm to 1 mm of displacement), imperfect (2 mm to 3 mm displacement) or poor (more than 3 mm displacement) as defined by Matta.<sup>13</sup> The patients were placed in a lateral position on a radiolucent operation table and image intensifier was used. Surgical approach and decision to perform open vs. Close reduction and per-cutaneous fixation (CRPF) was decided after patient was anesthetized, reduction under image guide and a satisfactory position was achieved. Out of 15 patients who underwent ORIF, 10 patients had Kocher-Langenbeck and 5 patients were operated through Standard-Ilioinguinal approach. Details of operative technique

have been described by Zha et al.<sup>14</sup> For ORIF patient population drain was always placed and removed after 48 hours of surgery. Standard antibiotic prophylaxis was given as per local infection control guidelines. All patients received mechanical and chemical venous thrombosis prophylaxis for two weeks. Post operative rehabilitation started as soon as from next day after surgery with in-bed mobilization, chest physiotherapy, static quadriceps and hamstring exercises were started.

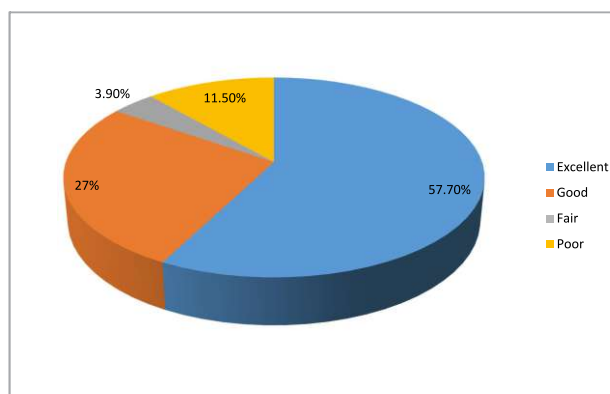
After surgery each patient received an individual assessment to start weight bearing after discussion with the operating surgeon and review of fixation. Mostly partial weight bearing was allowed from 4 weeks and gradually full weight bearing as serial radiographs were monitored for response of fracture healing within three months all patients were walking full weight bearing. The patients were seen at regular intervals after surgery with x-rays performed at each follow up until there was radiological and clinical evidence of fracture healing. Patient ward notes and outpatient follow ups were carefully recorded for identification of any post-operative non-union, infection, chronic pain, sexual dysfunction and post-traumatic arthritis. After that patient were kept under review for up to one year.

At last decided follow up, fracture healing and overall outcome was documented as excellent (18 points), good (15–17 points), fair (13–14 points) or poor (< 13 points) in terms to the modified Merle d'Aubigné-Postel score<sup>15,16</sup> and radiological healing was scored as excellent, good, fair, or poor based on Matta score.<sup>13</sup>

## RESULTS

All patients were followed up for 12 months. One surgical site infection was reported which was successfully treated with antibiotics. Average surgical fixation time was 120 minutes for ORIF and 45 minutes for Close reduction and per-cutaneous fixation (CRPF). Blood loss was associated with ORIF and average loss was  $900 \pm 300$  ml (range, 400–1500 ml). Of the 26 patients in the study, 2 patients (7.6%) developed heterotrophic ossification (two Brooker grade I17) which

was not causing any functional hindrance and was managed with physiotherapy. We used standard Venous Thromboembolism protocol for our post-operative patients and none of the patient developed deep vein thrombosis (DVT) or Pulmonary embolism (PE). At final follow up no fixation failure was noted although minor loss of reduction was noted on serial radiographs among the CRPF group. Overall among the ORIF group anatomical reduction was achieved in 11 patients (68.7%), imperfect in 3 patients (18.7%), and poor in 2 patients (12.5%). Among CRPF group anatomical reduction was achieved in 6 patients (60%), imperfect in 3 patients (30%), and poor in 1 patient (10%). All fractures were united at an average of  $4 \pm 2$  months (range, 4–7 months). Among all patients, the clinical outcomes were recorded as excellent in 17 patients (65%), good in 5 (19%), fair in 2 (7.7%), and poor in 2 (7.7%), according to the modified Merle d'Aubigné-Postel score.<sup>15,16</sup> The average modified Merle d'Aubigné-Postel score was  $15 \pm 2.0$  points (range, 10–18 points). The radio-logical healing was assessed according to the Matta score [22] and were reported excellent in 15 patients (57.6%), good in 7 (26.8%), fair in 1 (3.8%), and poor in 3 (11.5%) Figure 2.



**Figure 2:** Healing on the basis of Matta Radiological Score

Incidence of post traumatic hip arthritis is high after acetabular fracture and by the end of our last follow up there were 3 patients who reported hip joint pain and moderate arthritis was noted. These patients were advised of need for total hip replacement in future. Table 2.

**DISCUSSION**

Pelvic trauma is a major injury with several challenges associated with treatment. Surgical skill and decision-making plays pivotal role in treating these

**Table 1: Patient Profile (n=26)**

Patient Demographics	ORIF Group (n=16)	CRPF Group(n=10)
Male	12 (75%)	8 (80%)
Female	4 (25%)	2 (20%)
Mean Age (range)	45 (range 23-58)	43 (range 21-54)
<b>ASA Grade</b>		
ASA Grade I	8 (50%)	6 (60%)
ASA Grade II	6 (37.5%)	2 (20%)
ASA Grade III	2 (12.5%)	2 (20%)
<b>Mechanism of Injury</b>		
Pedestrian hit by Motor Vehicle	4 (25%)	3 (30%)
Fall from height	2 (12.5%)	1 (10)
Bike accident	6 (37.5%)	4 (40%)
Other	4 (25%)	2 (20%)
<b>Type of acetabular fracture</b>		
Anterior column	2 (12.5%)	6 (60%)
Anterior column + posterior hemitransverse	8 (50%)	1 (10%)
Associated both column	4 (25%)	0
T-shaped	2 (12.5%)	3 (30%)
<b>Associated Injuries</b>		
Hip Dislocation	3 (18.75%)	0
Bladder Injury	1 (6.25%)	0
Open fracture grade II	1 (6.25%)	1 (10%)

**Table 2: Outcome of Fracture reduction among two groups**

Fracture Outcome	ORIF (n=16)	CRPF (n=10)
Anatomical Reduction Achieved	11 (68.75%)	6 (60%)
Displaced Reduction	3 (18.75%)	3 (30%)
Poor Reduction	2 (12.5%)	1 (10%)

fractures. Lot of research work has been done to show that adequate stability and early rehabilitation is important factors for successful outcome.<sup>5,7,18,19</sup> We performed two surgical techniques on our patients ORIF and CRPF, and both achieved satisfactory results in terms of patient outcome and radiological healing. This is comparable to results in other published literature<sup>3, 20</sup>. ORIF group was associated with increased bleeding and surgical time but fixation was more stable.

CRPF group had higher incidence of loss of reduction. Both techniques are demanding and need good skill set and sound anatomical knowledge for successful outcome. Right patient selection is also important. We were inclined to achieve CRPF in patient with BMI above 35 to minimize the risk of surgical dissection, wound infection and blood loss. In our study, patients who had loss of reduction on follow up were closely monitored with delay in their rehabilitation and weight bearing status and all of them eventually went on to achieve complete healing without need for second intervention. When we compare our outcome with other studies,<sup>3,18</sup> anatomical reduction was achieved in 70% study population,<sup>23,24</sup> all fractures were healed at average 4±2 months,<sup>19,21</sup> excellent clinical outcome in 62.5%<sup>21,24</sup> and infection rate was 1.2%.<sup>18,24</sup> Incidence of post traumatic and post surgical osteoarthritis in acetabular fractures is high. With one study reported upto 40% incidence in communitied impacted fractures of acetabulum despite achieving anatomical reduction and stable fixation.<sup>24</sup> This high incidence of post traumatic arthritis is very important regarding patient reported outcome measures and should be explained in details to the patient before proceeding with surgical intervention. Because established arthritis will need further surgery in the form of removal of metal work, total hip replacement and patient need to make a informed decision about this potential complication.<sup>21,23,24</sup> Keeping in view these literature statistics, we achieved comparable clinical scores and an added advantage of close reduction and per-cutaneous fixation (CRPF). We had no reported surgical site infection, although our study population was small. We attribute our good clinical results with Surgeon experience, support staff training level, early intervention and latest equipment. We had no reported arthritis because our study follow up was limited and further follow up will be needed to diagnose post traumatic arthritis which is beyond the scope of our study.

A French study shows that surgical fixation is preferred choice in young patient with high energy trauma.<sup>24</sup> These injuries are challenging in terms of immediate as well as definitive management<sup>25</sup>. Mor-

bidly obese patients tend to have higher rates of complications and longer hospital stay<sup>12</sup>. One study shows that early concentric reduction of hip after acetabular fracture is the most important factor in hip arthritis prevention. And this is associated with early surgical treatment within seven days.<sup>13</sup> Fracture type, gender and age are few other important prognostic factors for optimal outcome.<sup>24,25,26</sup>

## CONCLUSION

Acetabulum fractures with or without communication a high energy trauma associated with poor outcomes if not treated in a timely and skillful way. Incidence of pelvic fractures is rising due to increase in high-velocity injuries. Most of these patients are young and need urgent attention of orthopedic team for best outcome. Our study discussed two surgical techniques with comparable outcomes in rightly selected patients and performed by a surgeon trained in pelvic fractures management.

### Ethical Approval:

The ethical Approval was obtained from Kazi Hospital Lahore(KaziHospital/22/105)

**Conflict of Interest:** *None*

**Funding Source:** *None*

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