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ORIGINAL ARTICLE

Acetabular Fracture; its Management and Early Functional Outcome

MUHAMMAD INAM[1], HUSSAIN BUX PALH[2], TAUSEEF RAZA[3], FARHAD ALAM[4], IRSHAD AHMED[5], SYED ABDUR RUB ABIDI[6], ANAM ULLAH[7], MUHAMMAD ADEEL[8], ABDUL AKBAR[9]

[1]*Associate Professor of Orthopaedic and Trauma, Medical Teaching Institute Lady Reading Hospital, Peshawar*
[2]*Assistant Professor, Department of Orthopaedic, Gambat Medical College, Pir Syed Abdul Qadir Shah Jeelani Institute of Medical Science, GIMS, Gambat, Sindh Pakistan*
[3]*Assistant Professor, Department of Orthopaedic, KMU Institute of Medical Sciences, Kohat*
[4]*Assistant Professor of Orthopaedic Surgery, Abwa Medical College, Faisalabad*
[5]*Associate Professor, Department of Orthopaedic Surgery and Traumatology, Liaquat University of Medical and Health Sciences, Jamshoro Hyderabad*
[6]*Associate Professor, Department of Orthopaedic Surgery, Jinnah Medical and Dental College, Karachi*
[7]*PGR Trauma and Orthopaedics of First Affiliated Hospital of Xinjiang Medical University Urumqi, China*
[8]*Associate Professor, Orthopaedic Unit, Ayub Medical College and Ayub Teaching Hospital, Abbottabad*
[9]*Trainee Medical Officer, Department of Orthopedic and Trauma, Medical Teaching Institute Lady Reading Hospital, Peshawar*
Correspondence to Abdul Akbar, Email: drminamkhan71@gamil.com

ABSTRACT

Aim: To evaluate the functional results of open reduction and rigid internal fixation with Reconstruction plates and screws in acetabular fractures

Methods: This prospective case series study was carried out on 47 consecutive patients, of either gender and age ranging from 18 to 60 years, who presented with an acetabular fracture within a month of injury at the Orthopedic and Trauma Department of the Medical Teaching Institute Lady Reading Hospital (LRH) in Peshawar, Pakistan, from January 2018 to September 2023. Excluded from the research were patients receiving traction therapy with a trochanteric pin for an open fracture. A non-probabilistic sequential sampling method was applied. Clinical grading followed D'aubigne and Postel's guidelines, with Matta's modifications. We measured range of motion, pain, and gait.

Results: There were 47 patients in total, ages ranging from 20 to 60, with an average age of 37.52. there were 31 males (66.0%) and 16 females (33%). In 19(40.4%) patients, 5(10.6%) patients have physical violence and 23(48.9%) of the patients, the cause of injury was a road traffic collision. Our study shows that of the patients, 29(61.7%) were involved on the right side and 18(38.3%) on the left. In five (10.6%) of the instances, there was plate loosing. It is shown that 24(51.1%) cases, excellent outcomes were attained, in 15(31.9%) case good, 5(10.6%) cases fair, 3(6.4%) cases poor outcome were attained.

Conclusion: According to Matta Grading, all acetabular fractures, including those involving osteoporotic bone, respond excellently to rather well to open reduction and internal fixation using a 3.5-millimeter reconstruction plate and screws.

Keywords: Acetabulam, Fracture, Internal fixation, Open Reduction, Rigid Fixation.

INTRODUCTION

High intensity traumas, such as car crashes or falls from a height, can cause acetabulum fractures[1]. It affects young individuals more frequently. Skeletal traction and bed rest were the conservative methods used in the past to treat these fractures. Judet and Leuternal's contributions have shifted therapy from conservative to surgical[1,2]. Since then, the accepted course of care has been stiff internal fixation combined with open anatomical reduction3–7. Better clinical outcomes and a reduction in the overall incidence of post-traumatic osteoarthritis and AVN have resulted from this[3,4].

One of the biggest challenges for a trauma surgeon is the acetabulum surgical surgery[5]. There are several complications, with 20–25% leading to unsatisfactory results[6,7]. Factors that impact the final functional outcome include the surgeon's experience, the fracture pattern, the age of the patient, dislocation at the time of injury, age related to osteochondral damage to the femur head and acetabulum, and delays in operative treatment[8-11]. When acetabulum fractures are treated 3–4 weeks after trauma, the outcome is usually not good. Ideally, they should be treated during the first week following trauma[12,13].

The objective of this study is to evaluate the functional results of open reduction and internal fixation with Reconstruction plates and screws in acetabulum fractures.

MATERIALS AND METHODS

After IRB permission, this prospective case series study was carried out on 47 consecutive patients, of either gender and age ranging from 18 to 60 years, who presented with an acetabular fracture within a month of injury at the Orthopedic and Trauma Department, Medical Teaching Institute Lady Reading Hospital (LRH) in Peshawar, Pakistan, from January 2018 to September 2023. Excluded from the research were patients receiving traction therapy with a trochanteric pin for an open fracture. A non-probabilistic sequential sampling method was applied. A minimum of six months was spent monitoring the patients. Clinical grading followed D'aubigne and Postel's guidelines, with Matta's modifications. We measured range of motion, pain, and gait. The most recent visit included a radiological grade based on the Matta criteria, which are excellent, good, fair, and poor.

Standard radiographs (Pelvis AP and Judet views) and computerized three-dimensional tomography (3D CT) were used in the patient evaluation process to determine the amount of the acetabulum's column/wall involvement and to help design the operation. Following hospital ethical board permission, patients who met the inclusion criteria were admitted to the LRH Orthopedic unit. The goal of the study was explained before obtaining a formal informed permission. Age, gender, and the extent of the injury were among the demographic details recorded. Both a physical examination and a thorough history were obtained. For general anesthesia fitness, baseline tests such as CBC, LFT, RFT, serum electrolyte, and chest x-ray were performed.

The Kocher-Langenbeck, Ilioinguinal, and Triradiate extensile techniques were utilized throughout the surgical procedure. In few situations, a posterior technique was employed to perform trochanteric osteotomy. Reconstruction (Recon) plates and 3.5mm screws were the implants utilized. For fractures of the posterior wall and column, double recon plates were employed. In several cases, plating of the posterior column was combined with indirect fixation of the anterior column using a 4.5mm cortical screw. When required, reduction was evaluated using per-operative fluoroscopy.

Patients were followed for a minimum of 6 months. Clinical grading was done according to D'aubigne and Postel modified by Matta[14]. Pain, gait and range of motion were assessed. Radiological grading was done on last visit according to Matta14 criteria as: excellent (normal appearing hip joint), good (mild changes with minimal sclerosis and joint narrowing less than

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1mm), fair (intermediate changes with moderate sclerosis and joint narrowing less than 50%), and poor (advanced changes). Both the clinical and radiological findings were calculated and the results were summed in Matta Grading[14] (Figure 1).

Data was input on proforma that were specifically created. SPSS version 27.0 was used for data entry and analysis. Quantitative data such as age and length of injury were calculated to determine the mean and standard deviation. With regard to categorical variables like gender and hip discomfort, frequency and percentage were computed. Using data stratification, effect modifiers such as age, gender, and extent of injury were taken into account. Chi square post-stratification analysis was done. A statistically significant P value was defined as ≤0.05.

Figure : Matta Grading[14]

Grades	Description
1. Excellent	Normal appearing hip joint and fracture unites in 4 months, no pain, normal gait, with good range of joint moments and the patient can walk without support.
2. Good	Fracture unites in 6 months with minimal sclerosis, no pain with good range of joint moments or patient can work/ walk without support.
3. Fair	Fracture union after 6 months with moderate sclerosis or joint narrowing, pain on prolonged walking, or limping gait, or mild limited range of motion.
4. Poor	OA/AVN (osteoarthritis/ avascular necrosis) and the patients can-not walk without support, pain on walking and had limping gait and severely restricted range of motion

RESULTS

Table 1 lists 47 patients in total, ages ranging from 20 to 60, with an average age of 37.52. Table 2 shows that there were 31 males (66.0%) and 16 females (33%). In 19(40.4%) patients; falls, 5(10.6%) of patients have physical violence and 23(48.9%) of the patients, the cause of injury was a road traffic collision (Table 3). Table 4 shows that 29(61.7%) patients were involved on right side and 18(38.3%) on the left. In 5(10.6%) of the instances, there was plate loosing (Table 5). Table 6 shows that in 24(51.1%) cases, excellent outcomes were attained, in 15(31.9%) case good, in 5(10.6%) cases fair, in 3(6.4%)cases poor outcome were attained.

Table 1: Statistics

		Gender of Patient	Age of the Patient
N	Valid	47	47
	Missing	0	0
Mean			36.81
Median			39.00
Mode			35
Std. Deviation			9.934
Minimum			20
Maximum			60

Table 2: Gender of patient

Valid	Frequency	Percent	Valid%	Cumulative%
Female	16	34.0	34.0	34.0
Male	31	66.0	66.0	100.0
Total	47	100.0	100.0	

Table 3: Mechanism of trauma

Valid	Frequency	%	Valid%	Cumulative%
Fall	19	40.4	40.4	40.4
Motor vehicle accident	23	48.9	48.9	89.4
Physical violence	5	10.6	10.6	100.0
Total	47	100.0	100.0	

Table 4: Side of involvement

Valid	Frequency	Percent	Valid %	Cumulative%
Left	18	38.3	38.3	38.3
Right	29	61.7	61.7	100.0
Total	47	100.0	100.0	

Table 5: x-ray finding in first follow up

Valid	Frequency	Percent	Valid%	Cumulative%
No	42	89.4	89.4	89.4
Yes	5	10.6	10.6	100.0
Total	47	100.0	100.0	

Table 6: Result in final follow up

Valid	Frequency	Percent	Valid%	Cumulative%
Excellent	24	51.1	51.1	51.1
Fair	5	10.6	10.6	61.7
Good	15	31.9	31.9	93.6
Poor	3	6.4	6.4	100.0
Total	47	100.0	100.0	

DISCUSSION

These days, the mainstay of treating acetabular fractures is surgery. Although there are other methods, the Kocher-Langenbeck and Ilioinguinal methods are still the most often used surgical techniques, while the Anterior Intra-Pelvic method is becoming less often used[10].

Open rigid fixation of acetabulum fractures requires specialized training in surgery, and its efficacy in treating elderly patients is debatable due to conflicting findings from many researches. The quality of the patient's bone and the likelihood of a satisfactory reduction should be considered before doing surgery on an elderly patient. About 255 acetabular fractures treated with open reduction and internal fixation, with an average follow-up of six years, were examined in a research by Matta.[14] He came to the conclusion that fracture reduction was essential for successful clinical outcomes and that both the reduction and the outcomes are negatively impacted by the patient's advancing age.

According to Tannast et al[15] analysis of 816 patients treated with fixation, advanced age was a poor indicator of hip joint survival. He also demonstrated that anterior wall fractures of the acetabulum had a poor prognosis.

Anatomical reduction of 61% was seen in post-operative radiographs in the Anglen et al[16] research, which involved ORIF of acetabular fractures in patients older than 60 years. While seven patients had good outcomes following incomplete fracture treatment, several studies have found poor outcomes in older patients following acetabular fractures[16].

Miller et al[17] examined 45 patients with a mean age of 67 (range: 59–82) years to determine the post-operative fracture reduction following ORIF[17]. Only on post-operative radiographs did the authors accomplish anatomical reduction in 26 patients; on CT scans, there was no anatomical reduction in any of the patients. At an average follow-up of 72.4 months, there was no correlation observed between the radiological decrease and the clinical outcomes.

Similarly, Archdeacon et al[18] found in their research that in older individuals, good functional outcomes can be attained even in the absence of morphological reduction of acetabular fractures. Helfet et al[19] examined the data from 18 patients, whose ages ranged from 60 to 81 years on average. They concluded that senior individuals may benefit from open reduction and internal fixation of acetabular fractures.

The study conducted by Kelly J et al[20] examined 8389 acetabular fractures from 8372 individuals. 38.6 to 45.2 was the range of the patient's mean age. 25.8% of fractures were brought on by falls, while motor vehicle accidents (MVA) accounted for 66.5% of cases. Injury mechanisms are shown to have changed, with a decline in motor vehicle accidents (MVAs) that was formerly over 80% and an increase in falls (previously 10.7%). Additionally, he observed a discernible shift in the fracture pattern, with anterior column-based fractures (anterior column and anterior column posterior hemi-transverse) considerably increasing with time while all other fracture patterns decreased. Iatrogenic sciatic nerve damage has been decreased, which is the most notable difference in consequences. One still exists for hip joint osteoarthritis following trauma.

With 16.9% of patients having Matta grade III/IV alterations by 44 months in our research, post-traumatic osteoarthritis of the hip joint continues to be one of the most common complications of acetabulum fractures. It is nevertheless usual to encounter heterotopic ossification14.

Post-traumatic osteoarthritis of the hip joint remains one of the most complication of acetabulum fracture, with 6.4% -10.6% of cases developing Matta grade III/IV changes by 12 months in this review. Heterotopic ossification also remains a common problem[14].

CONCLUSION

According to Matta Grading, all acetabular fractures, including those with osteoporotic bone, respond excellently to rather well to open reduction and internal fixation anatomically using 3.5-millimeter reconstructive plates and screws.

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1. Conception and design of or acquisition of data or analysis and interpretation of data.
2. Drafting the manuscript or revising it critically for important intellectual content.
3. Final approval of the version for publication.

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