

Original Research Article

Acetabular fractures: an analysis on clinical outcomes of surgical treatment

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ABSTRACT

Background: Acetabulum fractures are among the most serious injuries treated by orthopedic surgeons. People of all ages are vulnerable to these injuries. ORIF is considered the right treatment method for acetabular fractures. Patients who underwent this treatment had a good result. For the general orthopedic surgeon the treatment for displaced acetabular fracture is a challenging task. The aim of the study was to evaluate the functional outcome of surgically treated acetabular fractures.

Methods: A prospective longitudinal study was undertaken in our hospital during the period of June 2011–June 2015. A total number of 32 patients were included in the study. All patients with the history of fall and pain in the pelvic region were examined clinically and radiologically by doing an X-ray of plain AP view of the pelvis as well as CT-scan. Fractures that were displaced by more than 5 mm with concomitant disruption of the bony continuity of the acetabular dome were treated surgically. The follow-up schedule was 3, 6 and 12 months post-operatively and subsequently at two years when the operative outcome had been finalized and final evaluation of fracture healing and functional outcome was performed.

Results: Radiologic evaluation showed 88.5% of excellent or good results and 12.5% of fair or poor results, while clinical evaluation showed 90.6% of excellent or good results and 9.4% of fair or poor results. The clinical evaluation was done for the patients based on the D'Aubigne-Postel criterion. . Based on this criterion 90% of the patients had shown good to excellent results and for the remaining 10% of the patients it was between poor and fair.

Conclusions: In acetabular fractures open reduction and internal fixation was consistent with better anatomical reduction and functional outcome provided when it is carried out by an experienced surgeon and intervened within the first few days following the injury.

Keywords: Acetabular fracture, Open reduction, Internal fixation, Radiological and clinical evaluation

INTRODUCTION

Acetabulum fractures are among the most serious injuries treated by orthopedic surgeons. People of all ages are vulnerable to these injuries. Fractures in young individuals usually occur due to high energy injury like vehicular accident such as car collision or fall from the height. While in old individuals who have osteoporotic

bones fracture may occur due to fall from standing or trivial fall. Majority of fractures are because of road traffic accidents because traffic rules are not followed strictly.¹

Acetabular fractures usually produce hip pain, but may also cause diffuse pain in the groin and leg. It may also lead to a vasculossular necrosis in the femoral head and as

well as the acetabulum.² As the bone cells die, the bone gradually crumbles and collapses along with smooth cartilage protecting it. Without this smooth cartilage, bone rubs against bone which leads to increased pain, arthritis and loss of motion and function.³

A CT scan helps the surgeons to view the acetabular fracture. Nonsurgical treatment may be recommended for stable fractures. In case of displacement of the joint, ORIF (open reduction with internal fixation) are followed by surgeons to reposition the bones into their normal alignment using screw and plate fixation. This treatment may return the patient to their pre-injury functional level to the greatest extent possible.⁴

ORIF is considered the right treatment method for acetabular fractures. Patients who underwent this treatment had a good result. For the general orthopedic surgeon the treatment for displaced acetabular fracture is a challenging task. Letournel and Judet system classified acetabular fractures.⁵ They classified the fracture in terms of elementary fractures and associated fractures. Operation is considered the effective method for the management of displaced acetabular fracture.

The current trend treatment for acetabular fracture is open reduction and internal fixation. This treatment has reduced hospital stay. For achieving good results in acetabular fractures the prime factors are early surgical intervention and experienced management. For posterior wall and column fractures Kocher Langenback approach is considered the best.⁶ Whereas for anterior wall of column fractures Anterior ilioinguinal approach can be used. Plates and Screws are also used for stable fixation of fracture. According to the statistics 74.6% of the cases achieved excellent results using ilioinguinal approach for surgical fixation on acetabular fractures.

The present study was designed to evaluate the functional outcome of surgically treated acetabular fractures.

METHODS

A prospective longitudinal study was undertaken in our hospital during the period of June 2011-June 2015. A total number of 32 patients were included in the study. All age group and both the gender were included in the study. All patients with the history of fall and pain in the pelvic region were examined clinically and radiologically by doing an X-ray of plain AP view of the pelvis as well as CT-scan. The computed tomography with three dimensional technique is essential for a more detailed pre-operative planning (choice of approach, extent of displacement, evaluation of coexistence of loose bodies). Based on the radiological findings the acetabular fractures were classified according to the Judet – Letournel classification. Pre-operative skin traction was applied on all patients. Intervention either in the form of closed reduction or internal fixation was planned based on the type of fracture. Fractures that were displaced by

more than 5 mm with concomitant disruption of the bony continuity of the acetabular dome were treated surgically. The main operative goal was to achieve reconstruction of the anatomy of the innominate bone and the articular surface of the acetabulum.

Physiotherapy exercises were started for all surgically treated patients from day one post-operative period and the patients were mobilized to high sitting position with quadriceps training. Following the surgical drain removal, patients were mobilized with non-weight bearing using walking frame for 1 month, partial weight bearing for the following 3 weeks and started full weight bearing from 2 months onwards. Hip abductor and quadriceps strength training was continued throughout these 2 months. All patients received low molecular weight heparin thromboprophylaxis for 2 months.

The follow-up schedule was 3, 6 and 12 months post-operatively and subsequently at two years when the operative outcome had been finalized and final evaluation of fracture healing and functional outcome was performed. The outcome measure in the patients were measured both radiologically and clinically by using Merle d'Aubigné and Postel Method of scoring system which included pain, gait and mobility on a scale of 1 to 6 for each item, where 1 indicates the worst and 6, the best state of the patient. The total minimum score is 3 and the maximum is 18 and the results were expressed in the form of poor, fair, good and excellent.

All data were entered in statistical software of SPSS version 21 and the analysis was made by applying mean and standard deviation for all parametric variables and percentage was applied for non-parametric variables.

RESULTS

In our study population majority of the majority of the patients were in the age group of between 31–40 years with a mean age of 36.2 years and the male : female ratio was 0.8: 1 as shown in Table 1. Majority of the patients presented with acetabular fractures had a history of fall or road traffic accident. Few patients radiographic pictures were shown in Figure 1. The radiographic findings showed that the most common acetabular fracture was involving only the posterior column (43.75%) which is followed by involvement of both the anterior and posterior column in 31.25% of the patients and the remaining 8 patients had fracture in the anterior column with posterior wall involvement of the acetabulum as presented in Table 2. Posterior dislocation of the hip was present in 10 patients (31.2%) in which six patients underwent immediate closed reduction and for the remaining four patients the approach was open reduction and internal fixation which was done with a mean duration of 5 days after the injury.

The main criterion for surgical management for acetabular fractures is the degree of displacement of the

fracture ends of the acetabulum. In our series the criterion used for surgical management was a fracture displacement of more than 5 mm. Patients in our series were operated upon between the 1st and 8th day following the initial injury, with a mean of 4 days. Delay in the operative management was mainly due to the patient being admitted in the ICU for a longer period.

Table 1: Age and gender wise distribution of the study population.

| Age group (in years) | Gender | | Total | Mean (SD) |
|----------------------|-----------|-----------|------------|------------|
| | Male | Female | | |
| 20 – 30 | 2 (13.3%) | 4 (23.5%) | 6 (18.7%) | 36.2 (8.6) |
| 31 – 40 | 9 (60%) | 6 (35.2%) | 15 (46.8%) | |
| 41 – 50 | 1 (6.6%) | 3 (17.6%) | 4 (12.5%) | |
| 51 – 60 | 3 (20%) | 2 (11.7%) | 5 (15.6%) | |
| >60 | 0 | 2 (11.7%) | 2 (6.2%) | |
| Total | 15 (100%) | 17 (100%) | 32 (100%) | |

During the operative procedure the patient was approached through prone position for adequate exposure for the fixation of the fractures of the posterior column of the acetabulum, which was the most common fracture pattern. The goal of operative management was anatomic reduction of the fracture and subsequent stable internal fixation, with combination of inter-fragmentary screws and a reconstruction plate as shown in Figure 2.

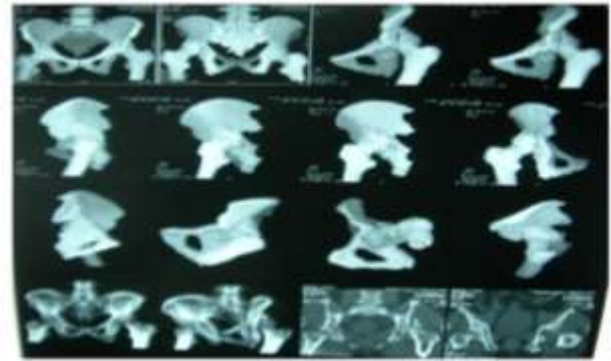


Figure 1: Radiological picture of patients presented with acetabular fractures.



Figure 2: X-ray picture of before and after intervention of acetabular fractures.

Table 2: Classification of acetabular fractures based on Judet – Letournel classification of fractures.

| Type of fracture | Frequency | Percentage |
|----------------------------------|-----------|------------|
| Posterior column | 14 | 43.75 |
| Anterior and posterior column | 10 | 31.25 |
| Anterior column + Posterior wall | 8 | 25 |
| Total | 32 | 100 |

Table 3: Post-operative clinical evaluation of the patients by using D’Aubigne-Postel evaluation.

| Pain | Movement | Walking | Grade |
|-----------------------------|---|-------------------|-------|
| Continuous | Ankylosis – in bad place | Impossible | 0 |
| Persistent nightly | Ankylosis - Movement < 40 % – Poor clinically | With crutches | 1 |
| Persistent in walking | Movement 50 – 60%, Flexion < 40° | With crutches | 2 |
| Permissible pain in walking | Movement 60-70% Flexion 40° - 60° | With canes | 3 |
| Moderate in walking | Movement 70-80% Flexion 80° - 90° | Good with cane | 4 |
| Light periodical | Movement 80° - 90° Flexion 85° - 90° | Free without cane | 5 |
| Absent | Abduction 25° Movement 80° - 90° Flexion 90° | Physiologic | 6 |

Anatomic reduction was achieved in 18 (56.25%) of cases, which is considered to be very satisfactory. We

have not used skeletal traction post-operatively in our patients who had undergone surgery as it would prolong

their rehabilitation time. Radiologic evaluation showed 88.5% of excellent or good results and 12.5% of fair or poor results, while clinical evaluation showed 90.6% of excellent or good results and 9.4% of fair or poor results as given in Table 4. The clinical evaluation was done for the patients based on the D'Aubigne-Postel criterion

which was shown in Table 3. Based on this criterion 90% of the patients had shown good to excellent results and for the remaining 10% of the patients it was between poor and fair as in Table 4. The type of fracture and the clinical outcome of the fracture after intervention did not show any significant association as given in Table 5.

Table 4: Outcome assessment based on clinical and radiological features among the study subjects.

| Results (radiological) | | | Clinical criteria - (Clinical - D'Aubigne-Postel scoring system) | | |
|------------------------|------------------------------------|---------------------|--|---------|---------------------|
| Grade | Anatomical criteria - displacement | No. of patients (%) | Grade | Points | No. of patients (%) |
| Excellent | Anatomic 0 mm | 18 (56.25%) | Excellent | 17 – 18 | 23 (71.9%) |
| Good | 0-1 mm | 10 (31.25)% | Good | 15 – 16 | 6 (18.7)% |
| Fair | 2-3mm | 2 (6.25%) | Fair | 12 – 14 | 2 (6.3%) |
| Poor | >3 mm | 2 (6.25%) | Poor | <12 | 1 (3.1%) |

Table 5: Clinical fracture outcome based on Judet – Letournel classification and the type of fracture.

| Fracture outcome | Posterior Column (n=14) | Both Column fracture (n=10) | Anterior column + Posterior Wall (n=8) | Total | P value |
|------------------|-------------------------|-----------------------------|--|-----------|---------|
| Excellent + Good | 12 | 9 | 8 | 29 | 0.681 |
| Fair + Poor | 2 | 1 | 0 | 3 | 0.395 |
| Total | 14 | 10 | 8 | 32 | |

P value derived by applying Chi-square test

DISCUSSION

Our results were evaluated on the basis of both clinical and radiologic criteria, as well as according to fracture type.⁸ Radiologic evaluation showed 88.5% of excellent or good results and 12.5% of fair or poor results, while clinical evaluation showed 90.6% of excellent or good results and 9.4% of fair or poor results. An analogy between clinical and radiologic results was recorded in our cases, a fact supported by the literature as well.⁹ The rate of excellent and good results in our series 90.6% is considered very satisfactory. Similar results have been reported by Letournel and Matta.^{10,11} If results were associated with the fracture type it was clear that simple fractures gave a better outcome than complex fractures, as expected, because in simple fractures anatomic reduction was achieved more often.

Literatures had shown that traumatic hip dislocations are most commonly associated with acetabular fracture. Posterior dislocation should be recognized early because it can result in sciatic nerve damage. So closed reduction should be performed for those cases followed by surgery within 2 weeks after injury. Posterior wall fracture and both column fractures with 50% of the acetabulum are considered as displaced fractures.³ Our study had also shown that majority of the patients had history of trauma and both column fracture involving the posterior wall seems to be the most common site of acetabular fracture.

The long term results of any surgery are influenced by number of factors like fracture type, femoral-head status, injury duration, local complications associated with

surgical approach and injuries.¹² In our study majority of the patients had a better outcome post-operatively.

Heterotopic ossification was not seen in our series of patients. The rates of heterotopic ossification reported by various authors in series of acetabular fractures surpass 50% in some series.^{5,13-15} Matta in a series of 262 patients where no prophylaxis against heterotopic ossification was administered reports a rate of heterotopic ossification as high as 82%.¹² We administered indomethacin to all of our patients and we believe it has drastically lowered the rate of heterotopic ossification. Indomethacin is believed to decrease the rate of this complication to about 30-45%.

Femoral head osteonecrosis was recorded in one patient who subsequently underwent a total hip replacement. Matta reports a rate of femoral head osteonecrosis of 3%, while Moroni brings it up to 7%.^{11,12} Post-traumatic osteoarthritis was recorded in 1 patient (5%) who underwent a total hip replacement. This rate of post-traumatic osteoarthritis is considered quite satisfactory, in view of the fact that rates of 20-55% are reported in the literature.¹⁶⁻¹⁸ The presence of posterior dislocation of the hip, a chondral lesion of the femoral head or the acetabulum, failure to obtain anatomical reduction and complex as opposed to simple fractures are thought to be the main predisposing factors for the advent of post-traumatic osteoarthritis and femoral head osteonecrosis.¹⁹

CONCLUSION

In countries like India fractures of the acetabulum are increasing in frequency due to an increase in automobile

accidents proportionate to the number of vehicles. Since these fractures involve major weight bearing joints of the lower limb, hence they must be restored to as much normal as possible and this satisfactory reduction is only possible with open reduction and internal fixation which would markedly reduce the hospital stay and was consistent with better anatomical reduction and functional outcome provided when it is carried out by an experienced surgeon and intervened within the first few days following the injury.

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REFERENCES

1. Eliezer EN, Haonga B, Mrita FS, Liu MB, Wu H. Functional outcome and Quality of Life after Surgical Management of Displaced Acetabular Fractures in Tanzania. *East African Orthopaed J.* 2016;10:16-20.
2. Bhat NA, Kangoo KA, Wanil IH, Wali GR, Muzaffar N, Dar RA. Operative Management of Displaced Acetabular Fractures: an Institutional Experience with a Midterm Follow-up. *Orthopedia Traumatologia Rehabilitacja.* 2014;3(6):245-52.
3. Khan SH, Ara I, Raza S, Sipra S. Functional outcome of Surgery in Patients with Acetabular Fractures. *J Ayub Med Coll Abbottabad.* 2013;25(1-2):60-3.
4. Rahimi H, Gharahdaghi M, Parsa A, Assadian M. Surgical Management of Acetabular Fractures: A Case Series. *Trauma Mon.* 2013;18(1):28-31.
5. Judet R, Judet J, Letournel E. Fractures of the Acetabulum. *Acta Orthop Belg.* 1964;30:285-93.
6. Kumar A, Shah NA, Kershaw SA, Clayson AD. Operative management of acetabular fractures. A review of 73 fractures. *Injury.* 2005;36(5):605-12.
7. Gupta RK, Singh H, Dev B, Kansay R, Gupta P, Garg S. Results of operative treatment of acetabular fractures from the Third World—how local factors affect the outcome. *Int Orthop.* 2009;33(2):347-52.
8. Judet T, Judet J, Letournel E. Fractures of the Acetabulum: Classification and surgical approaches for open reduction. *J Bone Joint Surg.* 1964;46:1615.
9. Letournel E. Acetabular Fractures. Classification and Management. *Clin Orthop.* 1980;151:81.
10. Matta MJ, Anderson ML, Epsein CH, Hendrics P. Fractures of the Acetabulum. *Clin Orthop Rel Res.* 1986;205:230-40.
11. Moroni A, Caja LV, Sabato C, Zinghi G. Surgical treatment of both - column fractures by staged combined ilioinguinal and Kocher -Langenbeck approaches. *Injury.* 1995;26(4):219-24.
12. Matta JM. Fractures of the acetabulum: accuracy of reduction and clinical results in patients managed operatively within three weeks after the injury. *J Bone Joint Surg Am.* 1993;78:1632-45.
13. Bosse JM, Reinert M, Ellwanger F, Slawson R, Mc Devitt. Heterotopic Ossification as a Complication of Acetabular Fracture. *J Bone and Joint Surg.* 1988;70(8):1231-7.
14. Bray JT, Esser M, Fulkerson L. Osteotomy of the Trochader in Open Reduction and Internal Fixation of Acetabular Fractures. *J Bone Joint Surg.* 1987;69(5):711-7.
15. Chip Routt LM, Swiontkowski FM. Operative Treatment of Complex Acetabular Fractures. *J Bone Joint Surg.* 1990;72(6):897-904.
16. Gansslen A, Steinke B, Krettek C. Internal fixation of acetabular posterior wall fractures. *Oper Orthop Traumatol.* 2009;21(3):283-95.
17. Kumar A, Shah NA, Kershaw SA, Clayson AD. Operative management of acetabular fracture: a review of 73 fractures. *Injury.* 2005;36(5):605-12.
18. Pavelka T, Houcek P. Complications associated with the surgical treatment of acetabular fracture. *Acta Chir Orthop Traumatol Cech.* 2009;76(3):186-93.
19. El-khadrawe TA, Hammad AS, Hassaan AE. Indicators of outcome after internal fixation of complex acetabular fractures. *Alex J Med.* 2012;48:99-107.

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