

A PROSPECTIVE COHORT STUDY ON CLINICAL OUTCOME OF SURGICALLY TREATED ACETABULAR FRACTURE, PATNA, INDIA.

Raman Kumar^a, Kumar Rahul^a, Nilesh Kumar Agrawal^a, Santosh Kumar^b

^aSenior Resident, Department of Orthopaedics, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India

^bProfessor, Department of Orthopaedics, IGIMS, Patna, Bihar, India

Page | 1

Abstract

Background

The aim of the study is to evaluate the efficacy and outcomes of open reduction internal fixation (ORIF) as a surgical treatment for acetabular fractures. Specifically, the study seeks to assess the restoration of hip function, the incidence of postoperative complications, and the long-term health of the joint following surgical intervention, to determine the effectiveness of this treatment approach across different patient demographics.

Method

This study was carried out prospectively at the Department of Orthopaedics, IGIMS, Patna for 4 years. In total 50 patients participated in the study. All of them had fractures in their acetabulum. They were treated with open reduction internal fixation surgery for their fractures. screws and plates were used for the reconstruction. The patients followed up for a period of 2 and half years.

Results

In total 50 patients participated in the study, the outcome of the last follow-up showed that in 80% of the patients, the functional abilities of the hip bone were restored. As for the complications, osteoarthritis was found in 3 patients, Heterotopic ossification was reported in 2 patients, nerve injury in 1, dermal infection in 2, necrosis of the blood vessel in 2, and imperfect reduction in 1 patient.

Conclusion

Early treatment and longer follow-up improve the outcome of the reduction fixation irrespective of the age and bone health of the patients

Recommendation

Early diagnosis, treatment, and longer duration of effective follow-up improve the outcome of acetabular fracture reduction.

Keywords: Acetabular fracture, reduction fixation, satisfactory outcome

Submitted: 2024-03-26 Accepted: 2024-03-28

Corresponding Author- Nilesh Kumar Agrawal,

Email: nileshagrwal16@gmail.com

Senior Resident, Department of Orthopaedics, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India

Introduction

Considering the reported cases of the fracture of the acetabulum, this type of fracture is quite rare [1], however numerically the reported cases are increasing. The fracture of the acetabulum occurs due to falls but in the case of the younger population, the trauma is of high energy and in the case of the older population the trauma is of lower energy [2]. Fracture in the acetabulum usually requires surgical intervention. The surgical procedure is to reduce the fracture and its fixation internally. Intraoperative and postoperative complication associated with the surgery makes the surgery challenging. Postoperative complication includes arthritis due to trauma, destruction of the cartilage, ossification in the muscles and surrounding areas and nerve injury due to

surgery [3]. If any of the stated complications arise then arthroplasty of the total hip bone is required [4]. The occurrence of the complication depends on a variety of factors such as the age of the patient, allied injuries in the surrounding area, and trauma associated with the injury.

The allied injuries can occur in the surrounding bones, muscles as well as nerves [5]. There is high-energy trauma in younger patients but in patients above 35 years of age, the trauma is of minimal energy [5]. Incidences of such trauma fractures are due to impact falls on the hips, especially in the case of geriatric patients [4,5]. Such fall affects the posterior part of the acetabulum [6]. Along with the fracture of the posterior part of the acetabulum the injuries in the surrounding areas add to the challenges associated with the surgery for the treatment of fracture [7]. Apart from the open

reduction internal fixation another method of the treatment such as skeletal fraction (conservative method) and total arthroplasty are available [4,5] Although fixation method is best preferred the other factors such trauma, age, associated comorbidity, allied injuries, and skeletal traction and total arthroplasty are to be considered [4,5]. some of the surgical procedures reported in the literature are Kocher–Langenbeck, Iliioinguinal, extended iliofemoral, and triradiate methods also a combination of the mentioned methods [5,8]. The aim of the study is to evaluate the efficacy and outcomes of open reduction internal fixation (ORIF) as a surgical treatment for acetabular fractures. Specifically, the study seeks to assess the restoration of hip function, the incidence of postoperative complications, and the long-term health of the joint following surgical intervention, to determine the effectiveness of this treatment approach across different patient demographics.

Method

Study design

A prospective cohort study

Study setting

The study was carried out at the Department of Orthopaedics, Indira Gandhi Institute of Medical Science (IGIMS), Patna, Bihar India, spanning from January 2020 to January 2024.

Participants

In total 50 patients participated in the study. All of them had fractures in their acetabulum. They were treated with open reduction internal fixation surgery for their fractures. Screws and plates were used for the reconstruction. The surgery was performed under general anaesthesia. The patients were followed up for a period of 2 and a half years.

Inclusion criteria

- patients between 20 to 80 years of age
- Closed fractures
- fractures in the posterior, anterior and both the column of acetabulum

Exclusion criteria

- Fractures that were not reported for 3 weeks.

Bias

There was a chance that bias would arise when the study first started, but it was avoided by giving all participants the identical information and hiding the group allocation from the nurses who collected the data.

Sample size:

Patients who enrolled after filling the inclusion criteria. For calculating sample size the following formula was used:

$$N\Delta = \frac{2(Z_{\alpha} + Z_{1-\beta})^2 \sigma^2}{2}$$

Where, N= sample size, Z is a constant

Z_α is set by convention according to accepted a error of 5% as 1.649 Z_{1-β} is set by convention according to accepted 1-β or power of study of 80% as 0.8416σ is standard deviation estimated Δ is difference in the effect between two interventions (estimated effect size).

The patients admitted for the treatment were first stabilized hemodynamically and then the examination of the fracture was carried out using radiological test. The demography of all the patients was noted, along with their radiological findings such as X-ray and CT scan. There was dislocation in the hip for 30 patients and six of them suffered from central dislocation. The type of surgical method was chosen as per the requirements of the fracture. The majority of the patients (35) underwent surgery by the Kocher–Langenbeck method, for 13 patients' incision was made on the iliouguinal region, and two patients had an incision on their iliofemoral region. The incisions were placed according to the area fracture. For the anterior fractures, an incision was made on the iliouguinal region and for posterior fracture the incision was made by the Kocher–Langenbeck method. Whereas for transverse fractures the incision was made in the iliofemoral region. 90% of the patients under study required plates and screws for rigid fixation however 5 patients required only screws for fixation. After reduction fixation the gap of 1-3 mm was considered acceptable, and beyond 3mm indicated that fixation was not optimum. A physiotherapist consulted all the patients on the range of motion and duration of the motion. All the clinical examinations done before the surgery were repeated at each follow-up. If none of the complications were observed in a patient then they followed up for a year and if complications such as osteoarthritis occurred then they followed up in intervals of six months. They followed up for the period between 24 months to 36 months. The average period of follow-up was 30 months.

Ethical consideration

The institutional ethics committee approved the study.

Statistical analysis

The data obtained from the patients was arranged in the Excel sheet in a tabular format, and average values and percentages were calculated.

Result

In total 50 patients participated in the study 30 of them were males and 20 were females. These patients had fractures on

either side of the acetabulum, 60% of them had fractures on the right side and 40% of them had fractures on the left side. The patients were categorized into three groups as per the age of the patients. The young adult population included patients between the age group of 20 to 40 years. The mid-age population included patients between the age of 40 to 60 years. The geriatric population group included patients with age more than 60 years. The cause of the fracture was either a road accident or a fall. The majority of the patients had fractures in the posterior part of their acetabulum (74%), 9% of them had fractures in the transverse region, another 9% of them had fractures in the anterior region, and the remaining 8% had fractures in both anterior and posterior column.

Table no. 1: Demographic characteristics

Demographic Factor	Description
Gender Distribution	
- Male	30
- Female	20
Side of Fracture	
- Right side	60%
- Left side	40%
Location of Fracture	
- Posterior part	74%
- Transverse region	9%
- Anterior region	9%
- Both anterior and posterior columns	8%

After the clinical examination, it took approximately 4 days to perform surgery on all the patients. Letournel and Judet recommended the criteria under which the method of surgery for acetabular fracture could be determined, according to the mentioned criteria Kocher–Langenbeck approach was used for 35 patients, the ilioinguinal incision approach was used in 12 patients, and two patients was an incision on their iliofemoral region. The reduction fixation (RIF) surgery was successful in 46 patients and the required reduction in the fracture was achieved. whereas 4 patients had an imperfect reduction. the case of imperfect reduction was observed in patients with a fracture in the posterior wall,

posterior column, and in both columns. strong reduction was obtained with plates and screws in 45 patients and 5 patients required only screws for reduction. The average follow-up period was 30 months with the maximum being 36 months and the minimum being 24 months. As per the criteria of Harris and Ruesch et al., the X-ray reports obtained and all the other clinical examinations for each patient were scored from 0 to 100 [11,12]. Table no. 2 illustrates the scores of the patients according to the radiological findings, level of pain, range of motion achieved, and overall functioning of the pelvic area. It also demonstrates the level of satisfaction of the patients.

Table no. 2: Patient’s healing score and degree of satisfaction

Score of the patient according to Harris and Ruesch	Frequency of the patient
Between 90 to 100	30
Between 80 to 89	11
Between 70 to 79	5
Less than 70	4
Degree of satisfaction by the patients	Frequency of the patient
Complacent	30
Satisfied	15
Not satisfied	5

Surgical procedures



Figure 1 shows Skin Incision- Stoppa Approach



Figure 2 shows the Soft Tissue Dissection

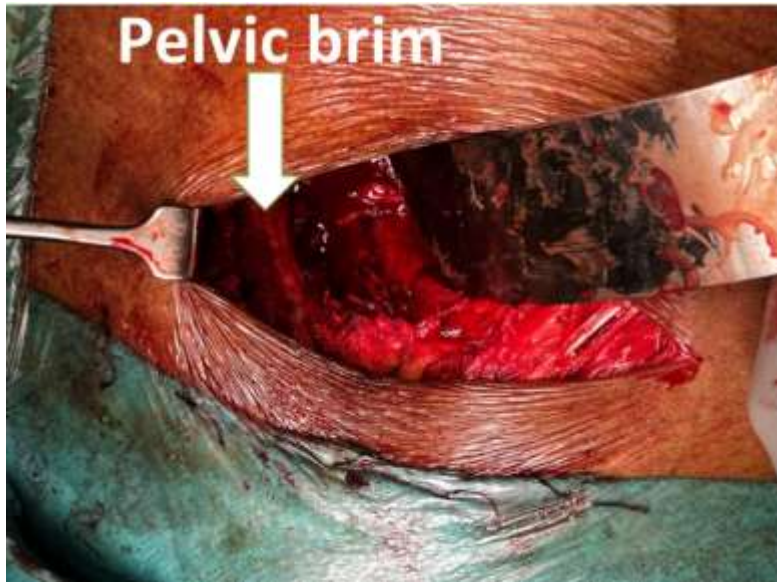


Figure 3 shows the Pelvic Brim Exposed



Figure 4 shows the Reduction Technique



Figure 5 shows the Plate Fixation



Figure 6 shows the Case 1



Figure 7 shows the Post Op Xray of Case 1



Figure 8 shows the Check Xray - Case 1



Figure 11 shows the CT image of Case 2



Figure 12 shows the CT Imaging of Case 2



Figure 13 shows the CT image of Case 2



Figure 14 shows the Post Op Xray of Case 2



Figure 15 shows the Post Op Xray of Case 2



Figure 16 shows the CASE 2- Post op



Figure 17 shows the Case 2- 6 mt follow up



Figure 18 shows the Case 2-
Follow Up



Figure 19 shows the Case 2- Follow Up after 6mts

Table no. 3: Post-operative complication

Type of complication	Frequency of patient
Osteoarthritis	03
Heterotopic ossification	02
Nerve injury	01
Dermal infection	02
Necrosis of the blood vessels	02
Imperfect reduction	01

Those patients who were not satisfied underwent the other surgery. The average time required for the surgery was 3 hours. Post-operative complications were reported in various cases which are stated in table no. 3.

Discussion

Acetabular fractures are the most difficult to treat. The surgery of these fractures requires skilled surgeons. In our study, it was found that treatment of acetabular fracture

required consideration of a variety of fractures. The main cause of the fracture was road accidents and the region most affected was posterior wall fracture, this was found consistent with another study [9]. A study demonstrated that the Kocher–Langenbeck approach was used for 48.7% of patients, the ilio-inguinal incision approach was used in 21.9% of patients, and 12.4% of patients had incisions on their iliofemoral region. In 17% of the patients the other approaches such as direct lateral, and combination of stated approaches [10]. In this study majority of the cases Kocher–Langenbeck approach was used for 35 patients, the ilio-

inguinal incision approach was used in 12 patients, and two patients had incisions on their iliofemoral region. Post-operative surgery complications include osteoarthritis, necrosis, nerve damage, and imperfect reduction can lead to improper construction which might require a second surgery [11]. The surgical intervention aims to restore the functional abilities of the hip bone. Although the reduction cannot completely restore the abilities of the hip bone because the articular cartilage becomes non-viable. This non-viable cartilage can lead to osteoarthritis. A study indicated if the reduction is not achieved properly then it increases the probability of arthritis significantly [12]. In this study, it was found that the longer duration of follow-up helps in the early diagnosis and treatment of osteoarthritis as it usually develops within a year and a half of the postoperative period. The outcome of the last follow-up showed that in 80% of the patients, the functional abilities of the hip bone were restored, this finding was comparable to the other study [12,13]. In our study, Osteoarthritis was found in three patients, Heterotopic ossification was reported in two patients, nerve injury in one patient, dermal infection in two patients, necrosis of the blood vessels in two patients, and imperfect reduction in one patient. This study had a lesser number of complications because the surgical intervention was earlier compared to other studies and the post-operative were regular and elaborated [14]. 80% of the patients had satisfactory outcomes which was again comparable with another study [15].

Conclusion

Early treatment and longer follow-ups improve the outcome of the fracture fixation irrespective of the age and bone health of the patients.

Limitation

The sample size for the study is small and to confirm the findings of the study on a larger population should be carried out.

Recommendation

Early diagnosis, treatment, and longer duration of effective follow-up improve the outcome of acetabular fracture.

Acknowledgement

We are grateful to the hospital's staff and patients involved in the study for their cooperation during the study.

List of abbreviation

CT scan- Computed Tomography scan

RIF-Reduction Internal fixation

Source of funding:

The study was not funded

Conflict of interest

There was no conflict of interest

References

1. Giannoudis PV, Grotz MRW, Papakostidis C, Dinopoulos H. Operative treatment of displaced fractures of the acetabulum. A meta-analysis. *J Bone Joint Surg Br.* 2005;87:29.
2. Henry PDG, Kreder HJ, Jenkinson RJ. The Osteoporotic Acetabular Fracture. *Orthopedic Clinics of North America.* 2013;44:201–15.
3. Matta JM, Mehne DK, Roffi R. Fractures of the acetabulum. Early results of a prospective study. *Clin Orthop Relat Res.* 1986;:241–50.
4. Wu ES, Jauregui JJ, Banerjee S, Cherian JJ, Mont MA. Outcomes of delayed total hip arthroplasty in patients with a previous ipsilateral acetabular fracture. *Expert Rev Med Devices.* 2015;12:297–306.
5. Kandasamy MS, Duraisamy M, Ganeshsankar K, Kurup VG, Radhakrishnan S. Acetabular fractures: an analysis on clinical outcomes of surgical treatment. *Int J Res Orthop.* 2017;3(1):122–6.
6. Munde SL, Bhatti MJ, Siwach RC, Gulia A, Kundu ZS, Bansal S, et al. Double tension band osteosynthesis in inter-condylar humeral fractures. *J Clin Diagn Res.* 2015;9(12):RC08–11.
7. Hussain KS, Kancherla NR, Kanugula SK, Patnala C. Analysis of displaced acetabular fractures in adults treated with open reduction and internal fixation. *Int J Res Orthop.* 2016;2(3):99–103.
8. Schreiner AJ, de Zwart PM, Stuby FM, Ochs BG. Fraktur endoprothetik des Azetabulums. *Open J.* 2016;32(3):196–205.5. Judet R, Judet J, Letournel E. Fractures of the acetabulum: classification and surgical approaches for open reduction. Preliminary report. *J Bone Joint Surg Am.* 1964;46:1615–46.
9. Harris WH. Traumatic arthritis of the hip after dislocation and acetabular fractures: treatment by mold arthroplasty. An end-result study using a new method of result evaluation. *J Bone Joint Surg Am.* 1969;51(4):737–55.

10. Ruesch PD, Holdener H, Ciaramitaro M, Mast JW. A prospective study of surgically treated acetabular fractures. *Clin Orthop Relat Res.* 1994;(305):38–46.
11. Iqbal F, Taufiq I, Najjad MK, Khan N, Zia OB. Functional and radiological outcome of surgical management of acetabular fractures in tertiary care hospital. *Hip Pelvis.* 2016;28(4):217–24.
12. Anizar-Faizi A, Hisam A, Sudhagar KP, Moganadass M, Suresh C. Outcome of surgical treatment for displaced acetabular fractures. *Malays Orthop J.* 2014;8(3):1–6.
13. Qadir RI, Bukhari SI. Outcome of operative treatment of acetabular fractures: short term follow-up. *J Ayub Med Coll Abbottabad.* 2015;27(2):287–91.
14. Peter RE. Open reduction and internal fixation of osteoporotic acetabular fractures through the ilio-inguinal approach: use of buttress plates to control medial displacement of the quadrilateral surface. *Injury.* 2015;46 Suppl. 1:S2–7.
15. Giannoudis PV, Grotz MR, Papakostidis C, Dinopoulos H. Operative treatment of displaced fractures of the acetabulum. A meta-analysis. *J Bone Joint Surg Br.* 2005;87(1):2–9.

Publisher details

SJC PUBLISHERS COMPANY LIMITED



Category: Non-Government & Non-profit Organisation

Contact: +256775434261(WhatsApp)

Email: admin@sjpublisher.org, info@sjpublisher.org or studentsjournal2020@gmail.com

Website: <https://sjpublisher.org>

Location: Wisdom Centre Annex, P.O. BOX. 113407 Wakiso, Uganda, East Africa.