

Outcome of Operative Treatment of Complex Acetabular Fractures :Clinico-Radiological Correlation

Dr Apurba Gorain¹,*Dr Soudip Sinha²,Dr Soumya Ghosh³,
Dr Pradip Kumar Ghosh⁴

¹²³⁴Department of Orthopaedics,, Burdwan Medical College and Hospital, West Bengal University Of Health Sciences, India

*Corresponding author:Dr Soudip Sinha

Abstract

Background: Surgical management of acetabular fractures is a complex area of orthopaedics that is being continually refined. Due to complex surgical anatomy and displacements often pose diagnostic and surgical dilemmas to the managing orthopaedic surgeon.

Aims: the aim of this study is to observe outcome of surgical treatment of complex acetabular fractures both clinically and radiologically and correlate radiological finding with clinical outcome at followups.

Materials And Methods: This pilot project was conducted in a tertiary care center of eastern india with institutional ethical clearance and informed consent of the subjects. Ten patients were selected according to inclusion criteria. They were followed up after operative management in the institution for 18 months.

Results:There were 10 patients who underwent surgical fixation for acetabular fractures and available for review with minimum 18 months follow up. There were 2 females and 8 male patients. Mean age at surgery was 37 years. Mechanism of injury included road traffic accidents in 8 patients (80%) and fall from height (24 ft) in 2 patients(20%). No other associated injuries were present as per inclusion criteria. There were 4 patients with anterior column fracture, 4patients with post wall fracture, 1 patient with posterior column with post wall fracture, 1 patient with transverse fracture pattern. One of them had undisplaced anterior column fracture with post wall and column fracture. 7 patients were (70%) operated at first week of admission, 2(20%) were operated on 2nd week, one(10%) was treated late at end of 2nd week. Mean time of operation from accident is 10days. No patient in this study was found to have any post operative neurovascular compromise. 1 patient had surgical site infection on 2nd week of hospital stay, managed with wound debridement and intravenous antibiotics. Grade 1 pressure sore noted in 1 patient. No DVT was there in the study group. 1 patient presented later with post traumatic hip osteoarthritis at 18month follow up. Time for patients with uncomplicated surgery to heal and return to full weight bearing underwent an average of 16.3 weeks. Anatomical reduction were achieved in 70 % patients as shown at immediate post reduction radiographs. Radiological outcome at follow up in 18 months showed excellent in 60% and good result in 30% patients. No heterotopic ossification noted except 10% patient presented with collapse of femoral head and hip arthritis late. Clinical outcome is good in 60% patients with no residual hip pain and 30% patients have excellent outcome those can return to pre injury occupation.

Conclusion: Though surgical approaches for these fractures are complicated and fracture orientation is often complex, adequate reduction is achievable in majority of cases. Therefore operative treatment is a good choice for treatment of these fractures. And radiological status of the fracture correlates well with functional outcome.

Keywords: acetabulum, anterior coloumn fracture, transverse fracture, posterior column fracture.

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I. Introduction

There is an increased incidence of high velocity trauma due to modernization resulting in rise in number of complicated acetabular fractures. Due to high energy transfer involved during accidents, a significant number of these patients presents with polytrauma and often create diagnostic and surgical dilemmas to the managing orthopaedic surgeon. Management of the entire patient should follow Advanced Trauma Life Support (ATLS) protocol with orthopaedic treatment of acetabular fractures properly integrated into the treatment plan. Non operative management, traditionally used in the past, has been criticised mainly because of inability to restore joint congruity and an increased risk of early hip osteoarthritis and poor functional outcome. Operative treatment is now considered to be treatment of choice for acetabular fractures. Many authors have stressed that this is the unique way to achieve precise anatomical reductions, adequate internal fixation and early mobilisation of joint. However, the outcome is dependent on many variables, these are initial displacement of

the fracture fragments, involvement of the superior weight bearing dome of acetabulum and accuracy of the reduction. In addition, late complication of fractures like osteonecrosis and heterotopic ossification play a significant role in final result. Problems like complex anatomy, difficult surgical approaches, perfect anatomical reduction, less space for operative manoeuvrability, comminution and delayed presentation pose a challenge for operating surgeon. Hence we decided to study patients admitted at our facility for functional and radiological outcome following operative treatment with complex acetabular fractures.

II. Materials And Methods

In this study consecutive case series of patients undergoing surgical fixation of acetabular fractures over 18 months period in our institution evaluated for clinical, radiological results, rate of successful fracture reduction, and the rate of surgical complications.

2.1 Specific Objective Of The Study

1. Clinical outcome related to three domains of hip joint: pain, ambulation and Range Of Motion movement on follow up at 6 weeks, 3 months, 6 months, 12 months and then 12 monthly. Criteria used for clinical grading is of **Merle D'Aubigne & Postels Hip scoring system modified by Matta**.
2. Radiological outcome assessment in form of pre operative and immediate post operative fracture reduction and radiographs on follow up at 6 weeks, 3 months, 6 months, 12 months and then 6 monthly. Acetabulum were evaluated radiographically with plain radiographs (3 views included: AP view of pelvis, obturator oblique view and iliac oblique view) and computed tomography with 3D reconstruction as an advanced method of investigation. Techniques were reviewed radiographically by using a modified criteria described by **Matta et al**.

2.2 Inclusion Criteria

1. All age group were included.
2. Fractures duration less than 21 days.
3. Clinically and radiologically proven acetabular fractures having indication of operative treatment.

2.3 Indication for operative treatment:

1. An acetabular fracture with 2mm or more displacement in the dome of the acetabulum as measured by any roof arc measurements less than 45 degrees.
2. Any subluxation of femoral head from a displaced acetabular fracture.
3. Posterior wall fractures with more than 50% involvement of articular surface, or less than 50% involvement with clinical instability on hip flexion to 90 degrees.
4. Intra articular fragment
5. Patients who give informed consent and willing for follow up.

2.4 Exclusion Criteria

1. Polytrauma patient presented with lower limb fractures.
2. Associated head injury
3. Patient anaesthetically unfit for surgery
4. Associated comorbid conditions history of suffering from Myocardial Infarction (MI) less than 1 year, psychiatric illness.

2.5 Preoperative Investigations And Planning:

10 patients admitted in our hospital through ER facility, sustaining acetabular fracture were primarily resuscitated in emergency with blood, crystalloids to maintain vitals. Acute dislocations were reduced under general anaesthesia, followed by radiographic evaluation of fracture pattern done with AP, Lat, Judet views and CT scans. Operative planning done for those fractures. All three standard approach to the acetabulum were done ie, anterior ilioinguinal, stoppa and posterior kocher langenbeck.

Pre operatively all of them were kept in skeletal traction, prophylaxis for DVT started with subcutaneous enoxaparin and pneumatic compression device. Operative decisions are taken and done within 3 to 10 days for all. Pre operative investigations: Hb%, TC, DC, ESR, FBS, PPBS Urea, Creatinine, Sodium, Potassium, BT, CT,

PT-INR, screening for HIV, HBSAg, HCV. Adequate amount of preoperative haemoglobin(10 gm%) ensured with blood for intra and post operative period kept.

III. Operative Procedure

Posterior Approach To The Acetabulum: Kocher Langenbeck Approach: Position of the patient is proper lateral on table with knee in flexion. Skin incision over greater trochanter and extended up to 6 cm of posterior superior iliac spine proximally and distally up to 10cm. Tensor fascia lata and gluteus maximus divided protecting inferior gluteal nerve. Sciatic nerve lying over quadratus femoris identified and protected. Tendinous insertions of short external rotators reflected from greater trochanter. Posterior wall and column fracture of the acetabulum are reduced in this exposure. We used recon plates with 3.5 mm cortical and cancellous screws after proper templating for fixation

3.1 Anterior Ilioingunalapproach:

Anterior wall with column fracture are fixed with this exposure. Position of patient was supine with traction applied on the affected side through pin given earlier. Skin incised from 3cm above the symphysis pubis to anterior superior iliac spine. Exposure of the whole inner table of the innominate bone from symphysis pubis to anterior aspect of sacroiliac joint including quadrilateral surface is obtained. Fixation done with recon plates with 3.5 mm cortical and cancellous screws after proper templating.

3.2 Modified Stoppa Approach:

Done in two patients with anterior column with quadrilateral plate fracture. Position of the patient supine with ipsilateral knee and hip in semiflexed position. Transverse incision 2cm above the symphysis pubis extended up to short of the external inguinal ring for lateral window incision is made 2cm posterior to ASIS which is extended posteriorly along the iliac crest. Identification corona mortis over lateral 1/3rd of superior pubic rami is important. In our cases it was not present. A foley's catheter in bladder was kept and all time bladder was protected with a retractor.

3.3 Post Operative Treatment:

All patient were kept in skeletal traction. Blood is given for correction of operative loss. Intravenous antibiotics are given for three days. Prophylaxis for DVT continued till mobilisation of limb started that up to fifth post operative day. Thereafter active and assisted knee and hip movement encouraged. Weight bearing started on later follow ups till union is seen that was 12 weeks in average.

3.4 Post Operative Reduction Assesment:

Done with standard radiographs. Maximum displacement seen at any of the radiographic line of the acetabulum was recorded in millimetres and the highest of the three values was used to grade the reduction according to the one of the three catagories: anatomical (0-1mm displacement), imperfect (2-3mm), poor (more than 3 mm).

3.5 Follow Up:

All patients were followed up in OPD after discharge at 6 wks ,3 months, 6 month, 12 month and then 6 monthly. Radiographic and clinical assessment is done at each visit with repeated rdiographs and clinical scoring.

IV. Results

There were 10 patients who underwent surgical fixation for acetabular fractures and available for review with minimum 18 months follow up. There were 2 females and 8 male patients. Mean age at surgery was 37 years. Mechanism of injury included road traffic accidents in 8 patients (80%) and fall from height (24 ft) in 2 patients(20%). No other associated injuries were present as per inclusion criteria. There were 4 patients with anterior column fracture, 4 patients with post wall fracture, 1 patient with posterior column with post wall fracture, 1 patient with transverse fracture pattern. One of them had undisplaced anterior column fracture with post wall and column fracture. 7 patients were (70%) operated at first week of admission, 2(20%) were operated on 2nd week, one(10%) was treated late at end of 2nd week. Mean time of operation from accident is 10 days. No patient in this study was found to have any post operative neurovascular compromise. 1 patient had surgical site infection on 2nd week of hospital stay, managed with wound debridement and intravenous antibiotics. Grade 1 pressure sore noted in 1 patient. No DVT was there in the study group. 1 patient presented later with post traumatic hip osteoarthritis at 18 month follow up.

Table:1operative Complication:

C o m p l i c a t i o n s	N o O f C a s e s	P e r c e n t a g e
Neurovascular Compromise	0	
Surgical Site Infection	1	10 %

Pressure Sore	1	1	0	%
Dvt	0			
Post Traumatic Hip Oa	1	1	0	%

Time for patients with uncomplicated surgery to heal and return to full weight bearing underwent an average of 16.3 weeks. Anatomical reduction were achieved in 70 % patients as shown at immediate post reduction radiographs. Radiological outcome at follow up in 18 months showed excellent in 60% and good result in 30% patients. No heterotopic ossification noted except 10% patient presented with collapse of femoral head and hip arthritis late.

Table 2: Immediate Post Operative Radiology

Post Operative Reduction Category	No Of Patients	Percentage
Anatomical	7	70
Imperfect	3	30
Poor	0	0
Total	10	100

Table: 3radiological Grading Of X-Rays At Follow Up:

Grading	At 3 Month Fu (No Of Patients)	At 6 Month Fu (No Of Patients)	At 12 Month Fu (No Of Patients)	At 18 Month Fu (No Of Patients)
Excellent	7	7	6	6
Good	3	3	3	3
Fair	0	0	1	0
Poor	0	0	0	1
Total	10	10	10	10

Clinical outcome is good in 60% patients with no residual hip pain and 30% patients have excellent outcome those can return to pre injury occupation.

Table:4clinical Grading Of Patients At Followup:

Grading	At 3 Month Fu (No Of Patients)	At 6 month Fu (No Of Patients)	At 12 Month Fu (No Of Patients)	At 18 Month Fu (No Of Patients)
Excellent	0	2	3	3
Good	0	6	6	6
Fair	8	2	1	0
Poor	2	0	0	1
Total	10	10	10	10

V. Discussion

This study was done to evaluate operative outcome of complex acetabular fractures in form of radiological outcome , functional outcome, morbidity due to operative procedures in forms of days of hospital stay, postoperative complications. Aim was also to look for injury type in patients, effectivity of operative planning in a tertiary centre and surgeons experiences with these fractures.

1. A study by Stephen A. Kottmeier, et al concluded Surgical management of acetabular fractures needs a precise fracture pattern analysis and selection of an appropriate approach.
2. A study by Theodorpea ntazopoulos and costas moljsafirims, says that complete or near anatomic reduction is essential for an excellent and longterm recovery of the hip joint, and this is extremely difficult to accomplish by conservative management. It has been shown by many authors that the proper reduction and restoration of the acetabular articular surface to as near normal as possible provide the best possibility for a painless hip joint.
3. A study by Kelly A. Lefavrethe, et al concludes that treatment of complex anterior column fractures remains difficult. They have presented a modification of a traditional Smith-Peterson approach with osteotomies for extensile exposure to the anterior column of the acetabulum.
4. In this study follow up of the patients shows anatomical reduction is necessary for excellent clinical outcome. Osteoarthritis following fixation of fracture fragment occurred in one patient who had a fair post operative reduction.
5. Operative morbidity is less in these group.

VI. Conclusion

Results suggest that operative outcome of complex acetabular fractures are reliable if judicious operative decision taken at earliest. Anatomical to fair reduction can give excellent clinical result in this fractures. Radiological outcome on follow up well correlate with clinical condition of the patient.

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