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Study and results of reconstruction plating in fracture posterior column and posterior wall of acetabulum

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Abstract

Background: Posterior acetabulum fractures are the most common type of acetabular fractures. Acetabular fracture was an enormous orthopaedic problem in which the treatment was grossly inadequate and many patients were left with incapacitating pain. These fractures were often feared because of the poor outcome in many patients treated non-operatively. There are few published studies with a prolonged follow up. Thus this study was to review the displaced posterior acetabular fractures treated operatively in our hospital during last 3 years with regards to clinical, radiological results, the rate of surgical complication and the rate of successful fracture reduction.

Methods: The patients with posterior acetabulum fractures were diagnosed on basis of clinical suspicion and confirmed on x-rays and CT scans. Displaced fractures were treated surgically in lateral position through Kocher- Langenbeck approach and fractures were fixed with reconstruction plates and cancellous screws and results studied.

Results: Clinical grading was based on Merle d'Aubigne and Postel scoring which has been modified by Matta, According to this scale excellent to good results seen in 76.66% and fair results seen in 23.33% of cases. Radiological assessment grading according to the criteria developed by Matta, According to this criteria excellent to good radiological results are seen in 79.66% and poor results in 6.66% of cases.

Conclusions: Displaced posterior acetabular fractures treated by open reduction and internal fixation with anatomical reduction allow early mobilisation and weight bearing and gives excellent results.

Keywords: Fracture posterior column-wall acetabulum, reconstruction-plate, results

Introduction

The subject of acetabular fractures is one that will interest most trauma surgeons. Although posterior acetabular fractures may appear to be simple on plain radiographs, many surgeons face difficulties. They pose a challenge both in their diagnosis and their management. Open reduction and internal fixation is now the standard treatment protocol for displaced acetabulum fractures^[1-8]. Most posterior acetabular fractures are comminuted or they are associated with an impaction injury of the articular surface into the underlying cancellous bone along the margin of the fracture line^[4-6]. In addition it is difficult to judge the quality of reduction and congruity of articular surface due to its three dimensional complex shape. Therefore it's of prime importance to achieve anatomical reduction during primary surgery. There are few published studies with a prolonged follow up. This case series reviews patient profile, operative techniques together with functional and radiological outcome.

Methods

The present study "study and results of reconstruction plating in fracture posterior column and posterior wall of acetabulum" was undertaken at the department of orthopaedics SSG Hospital and medical college Baroda. This study was conducted prospectively from June 2018 to October 2019 on 15 patients having fractures of posterior acetabulum which includes fracture posterior wall and fracture posterior column of acetabulum. Study duration 1 year and 5 months.

Inclusion criteria

Inclusion criteria were age group between 20 to 65 years; displaced fractures of the posterior acetabulum which includes fractures of posterior column and fractures of posterior wall of acetabulum; joint incongruence with fracture posterior acetabulum caused mainly by intra-articular osteochondral fracture fragments; patient was ambulatory prior to fracture, though they may have used an aid such as a cane or a walker; anticipated medical optimization for operation.

Exclusion criteria

Exclusion criteria were age less than 20 years and age more than 70 years; fracture of posterior acetabulum with fracture anterior column or wall of acetabulum; patients not suitable for internal fixation (i.e. severe infection around acetabulum, severe osteoarthritis, or pathologic fracture); associated comorbid conditions making patient unfit for surgery, moderate or severe cognitively impaired patients; pregnancy.

The following protocol was used in management of acetabular fractures

1. Administration of first aid on reception of the patient in casualty department.
2. Stabilization of the patient with i.e. fluids, oxygen, and blood transfusion whenever required.
3. Careful assessment of the injured limb as regards to side affected, type of fracture (closed/ compound), extent of soft tissue injury, deformity, and neurovascular status.
4. Look for shortening of the entire limb, limb position of a posterior dislocation (flexion, adduction, and internal rotation of the hip with a shortened lower extremity)
5. Musculoskeletal examination to rule out associated fractures.
6. Thorough examination of the patient to rule out head/chest/spinal and abdominal injury.
7. Primary immobilization of the injured limb and transportation of the patient to radiology department. For X-rays. Patients are maintained in skeletal traction preoperatively, and reduction of the femoral head is confirmed roentgenographically.
8. The patient was then admitted to respective ward and evaluated in terms of time, mode of injury, radiological assessment with three standard plain radiographs (one AP and two oblique Judet views), a two dimensional computed tomography scan and a three dimensional computed tomography scan.

On radiological assessment all the fractures were classified according to Judet and Letournel system of classification. Then patients were selected for open reduction and internal fixation properly according to the inclusion criteria. Surgical treatment was performed as soon as the patient's general medical condition allowed.

Preoperative planning

All surgeries were performed mostly between 2 to 8 days, fracture pattern was meticulously studied and suitable approach and proper implant was selected.

Preoperative preparation of the patients

- Patients were kept nil by mouth for 6 to 8 hours before surgery.
- Blood reserved
- Preparation of whole extremity.

- Written informed consent.
- Tranquilizers H.S
- I.V. antibiotics 30 min before the procedure.
- Shifting the patient 30 min before the surgery to operation theatre.

Surgical technique

Patients were operated under spinal/general anaesthesia. Patient is placed in lateral over a radiolucent operating table. For all patients with fracture posterior acetabulum Kocher Langenbeck approach was used. It provides direct visualisation of the entire lateral aspect of the posterior column. Visualisation may be extended anterosuperiorly by dividing a portion of gluteus medius or performing a transtrochanteric osteotomy. Limited access to the quadrilateral surface can be attained by the palpating finger.

Surgical sequence/reduction techniques

After reduction of the wall fragments, provisional fixation with Kirschner wires is performed, while definitive fixation is performed with cancellous screws and a contoured reconstruction plate placed from the ischium, over the retroacetabular surface onto the lateral ileum.

The reduction and screw positions are checked on C-arm image intensifier. Drain is kept and incision closed in layers and dressing is applied.

Postoperative care**Immediate**

- N.B.M. for 6hours.
- I.V. fluids/blood transfusion.
- I.V antibiotics– cefoparazone sulbactam 1.5gm BID, 500 mg amikacin BID, 500 mg metronidazole TDS and I.M inj. Diclofenac sodium 3 cc TDS were started to the patients..
- Active toe movements
- TPR/BP chart hourly
- Input/output chart
- Check X-ray of the operated acetabulum with three standard radiographic views i.e. A.P. view, obturator oblique view and iliac oblique view.
- Postoperatively I.V. antibiotic was given for 5 days, drain was removed after 48 hours, wound was checked on fifth day and accordingly patient was shifted to oral antibiotics (e.g. tab. Cefuroxime 500 mg. BD for another 5days).

Mobilization protocol

- Day 1: Static quadriceps exercises are started.
- Days 3-7: Dynamic quadriceps exercises are performed.
- Weeks 8-12: Weight bearing is limited for 8-12 weeks postoperatively.
- Week 12: Full weight bearing ambulation is permitted only after the fracture unites. One year: Return to sporting activity
- Follow up: Patients were followed up initially at 3 weeks interval for first 2 months and thereafter at 6 weekly intervals for next 6 months. All the patients were assessed clinically and radio graphically.

At the final follow-up examination, functional outcomes were evaluated according to the clinical grading system developed by Merled' Aubigné and Postel as modified by Matta^[5, 6]. The three individual scores are then summed to derive the final clinical score. According to the final scores, the clinical

results were classified as excellent (18 points), good (15-17 points), fair (13-14 points), or poor (<13 points).

The radiographs were then graded according to the criteria described by Matta.

Table 1: Radiographic grading system, modified by Matta [1, 5, 6].

Excellent normal: Appearing hip joint
Good: Mild changes, small osteophytes, moderate joint narrowing (1 mm), and minimal sclerosis
Fair: Intermediate changes, moderate osteophytes, moderate joint narrowing (<50%), and moderate Sclerosis
Poor: Advanced changes, large osteophytes, severe joint narrowing (>50%), collapse or wear of the femoral head, and acetabular wear.

Table 2: Clinical grading system, modified by Matta [1, 5, 6]

Pain
<ul style="list-style-type: none"> ▪ 6 = none ▪ 5 = slight or intermittent ▪ 4 = after walking but resolves ▪ 3 = moderately severe but patient is able to walk ▪ 2 = severe, prevents walking
Walking
<ul style="list-style-type: none"> ▪ 6 = normal ▪ 5 = no cane but slight limp ▪ 4 = long distance with cane or crutch ▪ 3 = limited even with support ▪ 2 = very limited ▪ 1 = unable to walk
Range of motion
<ul style="list-style-type: none"> ▪ 6 = 95-100% ▪ 5 = 80-94% ▪ 4 = 70-79% ▪ 3 = 60-69% ▪ 2 = 50-59% ▪ 1 = <50%

Results

Clinical grading was based on Merle d' Aubigne and Postel scoring which has been modified by Matta (Table 3).

Table 3: Clinical grading.

Result	Posterior wall	Posterior column	Total	%
Excellent	3	2	5	33.33
Good	5	1	6	40
Fair	4	0	4	26.67
Poor	0	0	0	0

In our series excellent to good results are seen in 73.33% of patients.

Radiological assessment grading was according to the criteria developed by Matta (Table 4).

Table 4: Radiological assessment grading.

Results	Posterior wall	Posterior column	Total	%
Excellent	5	2	7	46.66
Good	5	1	6	40
Fair	1	0	1	6.67
Poor	1	0	1	6.67

Satisfactory results seen in 93.33% of cases and poor outcome in 6.67%

Table 5: Full weight bearing.

Period in months	Cases	%
<12 weeks	0	0
12 to 16 weeks	11	73.33
>16 weeks	4	26.67

Full weight bearing was allowed in majority of our patients after 12 weeks as per their pain tolerance and radiological union.

Table 6: Union time in weeks.

Weeks	No of cases
12 to 14	9
14 to 16	2
16 to 18	2
>18	2

Our patients united as per standard union time mostly between 12 to 18 weeks.

Complications

The 1 patients had superficial infection, and resolved with daily dressings and antibiotics and delayed mobilisation without the need of wound debridement. 3 patients had post traumatic arthritis with hip stiffness which were on physiotherapy. 1 patient had a partial sciatic neuropraxia which recovered four months after operation. No patient had deep vein thrombosis as ankle dorsiflexion, static quadriceps exercises and knee mobilization were started early.

Discussion

In present series of 15 cases of fractures of posterior acetabulum treated primarily by reconstruction plates and cancellous screws over a period of 1 year 5 months from June 2018 to October 2019 with follow up period ranging from 2 months to 1 year. We evaluated our results and compared them with the result of various studies in the literature.

Age and sex of patient

Moed *et al.* reported in their study results of operative treatment of fractures of the posterior wall of the acetabulum, the patient's ages ranged from 16 to 74 years with an average of 38 years, there were 74 male and 26 females among total of 100 patients [1].

Xin *et al.* reported treatment of posterior wall fractures of acetabulum total 31 patients 25 males and 6 females aged 19 to 59 years with mean age 40.5 years [25].

In the present study the ages range from 20 to 65 years. The average age of the patient is 38 years. The most common age group was 30 to 39 years, there were 13(86.67%) were males and 2 (13.33%) were females. The results found are comparable to the previous standard studies.

Mode of trauma

Berton *et al.* stated in their study, results of operative treatment of fractures of the posterior wall of the acetabulum, 89 out of 100 cases were caused by road traffic accident 6 by fall from height and 3 by sports related activity [1].

Ebraheim *et al.* informed reconstruction of comminuted posterior wall fractures using the buttress technique: a review of 32 fractures, in this study of 32 patients 28 were from road traffic accident, 2 due fall from height and 2 due to snow board injuries [2].

In the present series out of 15 patients 14 had road traffic accidents, 1 had fall from height, the most common mode of trauma was RTA in 14 (93.33%). The results were found similar to previous studies.

Type of fractures

Kim *et al.* in their findings reported reconstruction of acetabular posterior wall fractures, in this series of 33 patient, according to the Letournel-Judet system there were 21 (63.6%) simple posterior wall fractures 12 (36.4%) were complex fractures associated with other types of fractures^[3]. In our present series posterior wall fractures were seen in 12 (80%) of patients and posterior column fractures were seen in 3 (20%) of cases. The results match previous studies.

Full weight bearing

Moed *et al.* stated in their study results of operative treatment of fractures of the posterior wall of the acetabulum, progression to full weight-bearing was individualized depending upon tolerance to pain after 12 weeks^[1].

Lee *et al.* stated surgical treatment of posterior fracture-dislocation of the acetabulum: Five-year follow up, in this study full weight-bearing was individualized and was allowed 8 weeks after the operation^[6].

In the present series 11 (73.33%) cases started full weight bearing in 12-16 weeks weeks, and 4 (26.67%) cases started full weight bearing after 16 weeks due to superficial wound infection and associated injuries.

Radiographic grading results

Ebraheim *et al.* found reconstruction of comminuted posterior wall fractures using the buttress technique. The postoperative reduction was graded as anatomical in 28 patients (88%) and imperfect in 4 patients (12%)^[2].

Kim *et al.*, in their series, according to the radiologic criteria of Matta, 10 patients (30.3%) had excellent results, 14 (42.4%) had good results, 4 (12.1%) had fair results and 5 (15.2%) were poor^[3].

Moed *et al.* informed open reduction and internal fixation of posterior wall fractures of the acetabulum, in this series. Radiographic results were excellent in 79 hips (84%), good in four (4%), fair in two (2%), and poor in nine (10%)^[13].

In the present series excellent to good radiological results were seen in 86.66%, and poor in 6.67%. These results are comparable to other standard studies conducted for posterior acetabular fractures.

Clinical outcome

Ebraheim *et al.* found that reconstruction of comminuted posterior wall fractures using the buttress technique the results for clinical outcome according to modified Merle d'Aubigne and Postel scoring system were as follows: excellent 11 (34%), very good 9 (28%), good 4 (12%), fair 3 (9%) and poor 5 (15%)^[2].

Kim *et al.* discussed in their study, reconstruction of acetabular posterior wall fractures in this series. The D'Aubigne and Postel scores at the final follow-up visit were as follows: excellent and very good in 15 patients (45.5%), good in 5 (15.2%), fair in 3 (9.1%), and poor in 10 (30.3%)^[3]. Moed *et al.* stated open reduction and internal fixation of posterior wall fractures of the acetabulum, in this series). Clinical outcome was graded as excellent in 34 patients (36%), good in 49 (52%), fair in two (2%), and poor in nine (10%)^[13].

In the present series excellent to good clinical results were

seen in 73.33%, and fair in 26.67% of cases.

Conclusion

Thus the conclusion is reconstruction of the posterior acetabular fracture with open reduction and internal fixation produces good to excellent results in majority of patients with acceptable rate of complication. They provide a stable fixation with good joint congruency of the hip joint amenable to early range of motion and weight bearing. Therefore our study establishes that the intrarticular posterior acetabulum fractures are best treated operatively and we recommend that open reduction and internal fixation of posterior acetabular fractures as the treatment of choice in displaced fractures.

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