

Rotator Sparing Approach for Posterior Acetabular Fractures

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Abstract

Background

The Kocher-Langenbeck approach is the main approach for management of posterior acetabular injuries. It provides direct access to the posterior column and posterior wall. This is accomplished through the splitting of the muscle fibers of the gluteus maximus and release of the piriformis and the short external rotators from their insertion at the greater trochanter. Protection of the medial femoral circumflex artery is highly important. In cases with fracture posterior wall without intraarticular fragments and posterior column fracture, sparing lateral rotators with trial reduction and fixation of fracture without cutting of lateral rotators will decrease the risk of injury of medial circumflex femoral artery and subsequent risk of avascular necrosis of the head of femur. The aim of this study is to report our results with sparing the lateral rotators in acetabular fractures in both AVN risk and postoperative rehabilitation of the patients.

Patients and methods

Fifty cases of posterior acetabular fracture were treated surgically using lateral rotators sparing technique. We followed those patients for a range of 24-30 months with mean of 27 months and we compared results of patients at 24 months follow up period. Thirty cases (60%) were posterior wall fracture, 12 cases (24%) were posterior column fracture and 8 cases (16%) were combined posterior wall and column fracture. Clinical results were assessed according to D'aubigne and Postel. Radiological results were assessed according to Matta.

Results

According to D'aubigne and Postel score for functional outcome, At 12 month follow up we had 36 cases with excellent results (72%), 9 cases with good results (18%), 4 case of fair results (8%), 1 case with poor results (2%). Cases with fair and poor results were those with avascular necrosis of head of femur. According to Matta we had 39 cases had anatomic reduction (78%), 8 cases had congruent reduction (16%), 3 cases had incongruent reduction (6%).

Conclusion

Many complications in fracture acetabulum surgeries related to surgical approaches. Minimizing tissue dissection will definitely decrease the rate of complications and subsequently improve the results of surgery. Osteonecrosis of femoral head is one of the complications which significantly affects the result of surgery and related to affection of blood supply of the head of femur. Sparing of lateral rotators of the hip will significantly decrease risk of injury of blood supply of the head of femur.

Keywords

rotator sparing approach, modified Kocher-Langenbeck approach, posterior wall fractures, satisfactory results.

Introduction

The Kocher-Langenbeck approach is the main approach for management of posterior acetabular injuries. It provides direct access to posterior column and posterior wall. [1]

This is accomplished through the splitting of the muscle fibers of the gluteus maximus and release of the piriformis and the short external rotators from their insertion at the greater trochanter. Protection of the medial femoral circumflex artery is highly important.[2]

In cases with fracture posterior wall without intraarticular fragments and posterior column fracture, sparing lateral rotators with trial reduction and fixation of fracture without cutting of lateral rotators will decrease the risk of injury of medial circumflex femoral artery and subsequent risk of avascular necrosis of the head of femur.

The aim of this study is to report our results with sparing the lateral rotators in acetabular fractures in both AVN risk and postoperative rehabilitation of the patients.

Patients and methods

This prospective work was done at Ain Shams university hospitals, Cairo, Egypt during the period from January 2015 till January 2017.

Fifty cases of posterior acetabular fracture were treated surgically using lateral rotators sparing technique.

Inclusion criteria:

- Sex: Both sexes.
- Injury: Posterior acetabular fracture either wall or column.

Exclusion Criteria:

- Associated sciatic nerve injury.
- Presence of intraarticular fragments in hip joint.
- Associated displaced anterior column fracture.

We followed those patients for a range of 24-30 months with mean of 27 months and we compared results of patients at 24 months follow up period.

Mode of trauma: 31 patients were subjected to motor car accident, 19 patients were pedestrian hits by motor vehicle.

30 cases (60%) were posterior wall fracture, 12 cases (24%) were posterior column fracture and 8 cases (16%) were combined posterior wall and column fracture.

We had 14 cases associated with brain injury, 11 cases with chest injury and 25 cases without associated injuries.

All our patients were surgically treated within 10 days of the injury.

Prophylactic IV antibiotics were given at anesthetic induction and were continued for 2 days postoperatively then oral antibiotics were given for 4 more days. Type of antibiotic was determined by the policy of the infection control unit of our university hospitals.

31 cases were operated upon under general anesthesia, 19 under spinal anesthesia.

Surgical technique

- The surgical site preparation was done.
- Patients were placed in a semi prone position on the radiolucent normal operating table.
- An incision centered over the greater trochanter and

then curving posteriorsuperiorly towards point 2 fingerbreadth inferior and lateral to posterior superior iliac spine and inferiorly over the shaft of the femur.

-Dissection of gluteus maximus along its fibers was done till its tendinous insertion in the femur.

-Identification of the sciatic nerve can be done at this step.

-Now we can identify 3 safe windows to work through without cutting the lateral rotators:

First one above the piriformis muscle with retraction of muscle inferiorly. (Fig 1)

Second one between piriformis and superior gemellus.

Third one at posterior ischium with release of semimembranosus origin

-Protection of the sciatic nerve all through operation with finger or retractor is mandatory.

-Traction of the muscle allows working on reduction of the fracture through this windows and fixation with either screws or sliding reconstruction plate 3.5 mm through the windows underneath the muscles for more rigid and stable fixation according to fracture type and configuration. (Fig 2&3)

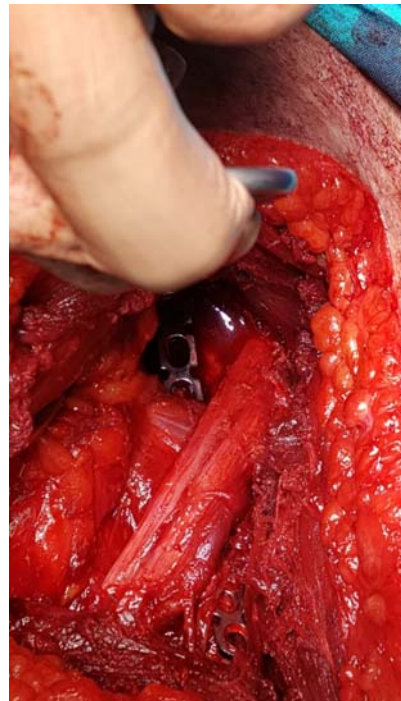


Figure 1: Traction of the piriformis inferiorly to allow insertion of proximal iliac screws

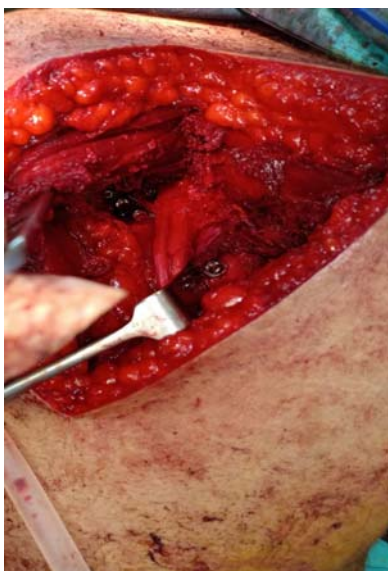


Figure 2: Sliding of the plate with retraction of sciatic nerve to allow ischial screws

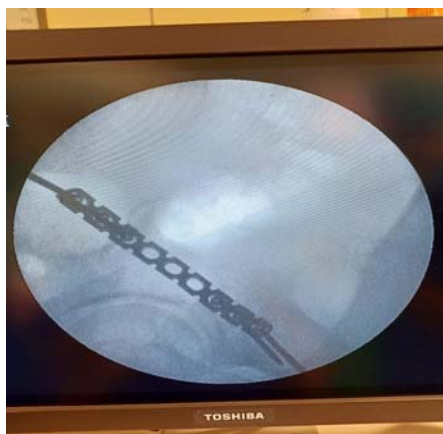


Figure 3: Checking site of the screws by image intensifier

Postoperative protocol

Suction drains were removed the day after surgery, and intravenous third-generation cephalosporins were given for 3 days.

Thromboembolic prophylaxis was given for 1 month. The patients started active and passive range of motion of the operated hip joint 2 weeks after surgery.

Then patients started mobilization with absolute non-weight bearing for another 2 weeks and then partial weight bearing – as tolerated – for another 4 weeks, and then full weight bearing was allowed from the 8th postoperative week. Clinical and radiological assessment was recorded at 1.5, 3, and 6 months and 1 year.

Follow up

Clinical results were assessed according to D’aubigne and Postel score⁽³⁾ that includes pain, ambulation, and range of motion with a maximum of six points for each, (Table 1) and the total is classified as:

- Excellent (18 points),
- Good (15 to 17 points),
- Fair (12 or 14 points),
- Poor (<12 points).

Table 1: D’aubigne and Postel score (3)

Score	Pain	Mobility	Ability to walk
0	Pain is intense and permanent	Ankylosis in abnormal position	Impossible
1	Pain is severe, disturbing sleep	Ankylosis in normal position or in a very slight abnormal position	Only with crutches
2	Pain is severe when walking, prevents any activity	Flexion < 40° (abduction = 0°) or very light joint deformity	Only with two canes
3	Pain is severe but may be tolerated with limited activity	Flexion < 40° - 60°	Limited with one cane (less than one hour). Very difficult without a cane
4	Pain only after walking and disappearing with rest	Flexion > 60° - 80° (can tie shoelaces)	Prolonged with one cane; limited without a cane (limp)
5	Very little pain and intermittent, does not preclude normal activity	Flexion > 80° - 90°. Limited abduction (>25°)	Without a cane but slight limp
6	No pain at all	Normal. Flexion > 90°, Abduction > 25°	Normal

Radiological results were assessed according to Matta [4]. Follow-up reduction was assessed on anteroposterior and Judet views of the pelvis. A displacement of 1 mm or less was considered as anatomic, congruent, and incongruent.

Statistical analysis

Statistical analysis was performed by using the chi-square and Fisher's exact tests. A value of less than 0.05 was considered statistically significant (IBM SPSS Statistics for Windows, Version 20.0, IBM Corp., Armonk, NY, USA).

Results

We had 32 cases with posterior wall fracture, 11 cases with posterior wall and column fracture and 7 cases with posterior column fracture.

The mean duration of surgery was 76.4 minutes.

The mean blood loss was 164.8 milliliters.

Screws only were the method of fixation in 21 cases, using of plate and screws was in 29 cases.

Avascular necrosis of the femoral head occurs in 3 cases (6%).

We had 5 cases of superficial infection (10%) treated by antibiotics according to culture and sensitivity and wound dressing.

We had 1 case of deep infection (2%) treated by surgical debridement and antibiotics according to culture and sensitivity without hardware removal.

We 2 cases (4%) of iatrogenic sciatic injury in our series. One of them had complete recovery after 6 months.

We had two case (4%) of heterotopic ossification.

We had no cases of broken screws or implant failure.

We had 6 cases (12%) of post traumatic osteoarthritis.

According to D'aubigne and Postel [3] score for functional outcome, At 12 month follow up we had:

-36 cases with excellent results (72%),

-9 cases with good results (18%),

-4 case of fair results (8%),

-1 case with poor results (2%).

Cases with fair and poor results were those with avascular necrosis of head of femur.

According to Matta [4]. Follow-up reduction was assessed on anteroposterior and Judet views of the pelvis as follows:

-39 cases had anatomic reduction (78%).

-8 cases had congruent reduction (16%).

-3 cases had incongruent reduction (6%).

Discussion

Due to their close proximity to neurovascular structures and internal organs, acetabular fractures are complex injuries, and surgical treatment requires experience. Many surgeons select the treatment method according to their experience. Since minimally invasive surgery became common practice, there has been research into methods to both minimize morbidity rates and enable anatomical reduction and stability. Thus, modifications of classic approaches are always tried and researched in order to decrease intraoperative and postoperative complication as neurovascular injuries with subsequent effect on outcome.

In posterior Kocher-Langenbeck approach there is risk of injury of medial circumflex femoral artery which is the main blood supply to the head of femur with subsequent high risk of avascular necrosis which poorly affects the result of surgery.

We found that the step of cutting tendons of lateral rotators of the hip near their insertion at greater trochanter has high risk of injury of medial circumflex femoral artery so working through windows between the tendons without cutting and sliding plates or putting the screws for posterior wall and/or columnar fracture will decrease that risk.

Also, risk of heterotrophic ossification increases with massive dissection of tissues, so minimization of tissue dissection will decrease the risk of heterotrophic ossification and subsequently improves the functional outcome.

Kaempffe FA, Bone LB, Border JR. report heterotopic ossification in up to 80% of cases treated with the posterior surgical approach[5]. While using radiation reduced the rate of heterotopic ossification following extensile approaches, in certain cases the formation of heterotopic bone may become clinically significant requiring additional surgery to regain hip range of motion[5]. In Giannoudis' meta-analysis of 2394 displaced fractures, HO reported in 25.6% of cases with Brooker grade III or IV[6]. In our study heterotrophic ossification reported in 2 cases (4%).

Letournel E, Judet R. reported that although they had 94% perfect reductions of posterior wall fractures, only 79.5% achieved at least a very good result. They attributed this discrepancy to occurrence of osteonecrosis[7].

Complications in his series were: mortality 2.3%, post-operative infection 4.2% compared to 12% in our study, post-operative sciatic palsy 6.3% compared to 4% in our study, avascular necrosis 4.5% compared to 6% in our study, post-traumatic arthritis 19.7% compared to 12% in our study, and ectopic bone formation 28.2% compared to 4% in our study.

Although not an evidence-based prognostic indicator, hip muscle/soft tissue compromise may affect functional outcome after acetabular surgeries [8].

Occurrence of sciatic nerve palsy occurs is common with posterior acetabular approach. Rates of iatrogenic sciatic nerve injury are highly variable in the research. Middlebrooks ES, Sims SH, Kellam JF, et al. have reported a 2% incidence of sciatic nerve injury with intraoperative [9]. Letournel, as mentioned above, had a 6.3% incidence of post-operative sciatic nerve palsy(10). Prior to distal femur traction with the knee flexed, his incidence was 18.4%. He attributed the decrease to less tension on the nerve (hip extension/knee flexion, careful placement of retractors with attention paid to retractor effect on nerve tension). Out of 34 cases with motor impairment, 9 completely recovered and 21 had significant recovery [10].

In a meta-analysis done of 2010 patients done by Giannoudis, AVN incidence was 5.6% [6]. Patients who sustain a posterior dislocation have a statistically significant higher incidence of AVN (9.2%) than those who did not (5%). [10]

Conclusion

Many complications in fracture acetabulum surgeries related to surgical approaches. Minimizing tissue dissection will definitely decrease the rate of complications and subsequently improve the results of surgery. Osteonecrosis of femoral head is one of the complications which significantly affects the result of surgery and related to affection of blood supply of the head of femur. Sparring of lateral rotators of the hip will sig-

nificantly decrease risk of injury of blood supply of the head of femur. Heterotrophic ossification risk will also decrease with minimization of soft tissue dissection. Further comparative studies with higher number of patients and follow up over longer period required for more statistically-significant support to this modification.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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