Treatment of posterior wall fractures of acetabulum

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Objective: To explore the treatment methods and outcome of posterior wall fractures of the acetabulum.

Methods: The data of 31 patients (25 males and 6 females, aged 19-59 years, mean: 40.5 years) with posterior wall fractures of the acetabulum hospitalized in our department from 2002 to 2006 were analyzed retrospectively in this study. The types of fractures, number of fragments, combined dislocations, and sciatic nerve function were documented before admission. All the fractures were treated with open reduction and internal fixation. Based on the fracture type and site, either screws alone or reconstructive plates were used. The patients were immobilized for an average of 12 weeks before partial weight bearing was permitted. After follow-up for 12-70 months (43.6 months on average), modified Merle d’Aubigne score was adopted to evaluate the outcomes of the operations.

Results: The percentages of the excellent, good, fair and poor results were 48.4%, 41.9%, 6.5%, and 3.3%, respectively, with a good to excellent rate of 90.2%. Idiopathic sciatic nerve injury occurred in only one case.

Conclusions: The sciatic nerve should be routinely exposed and protected during the surgery. The type of fixation should be based on the fracture type and site. Prolonged immobilization may be helpful in improving the final outcomes.

Key words: Acetabulum; Fractures; Internal fixators

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osterior wall fractures are the most common type of acetabular fractures. Despite a seemingly uncomplicated fracture pattern and relatively easy operative approach, poor outcomes occur in about 30% of all patients.1, 2 Recently, Moed et al3 reported an improved result with a good to excellent rate of 90%. The data of 31 patients with posterior wall fracture treated in our department were reviewed and analyzed in this study. We also showed our experiences concerning surgical indication, operative approach, fixation method, and postoperative rehabilitation of these patients in this article.

METHODS

A total of 31 patients (25 males and 6 females, aged 19-59 years, mean: 40.5 years) with posterior wall acetabular fractures underwent operation in the Department of Orthopedic Surgery, First Affiliated Hospital, Jilin University, Changchun, China, from 2002 to 2006.

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pending on the fracture type and site. Multiple screws were chosen when the fracture was just mildly comminuted with a main fragment large enough to accommodate at least two screws and when the principal fracture was located at the superior-posterior aspect of the acetabulum (Fig. 1). Reconstruction plating was selected when the fracture was severely comminuted and when the principal fracture was located at the middle-inferior aspect of the acetabulum (Fig. 2).

![Fig.1. X-ray examination of a 39-year old man. A: Right acetabular posterior wall fracture is combined with hip dislocation. B: The fracture is restored after closed reduction. C: The fracture is severe and located at the superior-posterior aspect of the acetabulum and no obvious comminution is found on the CT photograph after reduction. D: The fracture is fixed by screws only.](image1)

After operation, reduction was evaluated by routine roentgenography. The average period of immobilization was 12 weeks (ranging 10-15 weeks). Afterwards, partial weight bearing was allowed, which was gradually progressed to total weight bearing within 20 weeks after surgery. A modified Merle d’Aubigne system was used to evaluate the hip function during regular follow-ups. Scores obtained at the last visit were documented.

**RESULTS**

Thirty-one patients with posterior wall acetabular fractures accounted for 32.9% of 94 patients with acetabular fractures in our hospital during the study period.
Traffic accidents were the main cause of injury. Among the 31 patients, 4 (15.1%) had combined mild internal organ injuries, 5 (16.1%) showed signs of incomplete common peroneal nerve injury, and 7 (25%) had simple fractures with less than 3 pieces of fracture fragments (the average number of fragments of the 31 patients was 3.2), which was proved by preoperative CT scanning. Reduction was performed from 1 hour to 4 weeks after injury, mostly within 12 hours. Eighteen cases had fractures involving more than 50% of the posterior wall. Among them, 2 cases failed to perform closed reduction. All the other 13 cases showed instability of the joints after reduction.

Tiny intra-articular free bone fragments were found and removed in 5 cases. Marginal impactions for more than 3 mm were elevated in 4 cases. Femoral head fractures were fixed with absorbable screws in 2 cases. Among the 31 patients, 7 were fixed with screws only and 24 with reconstruction plates. One case suffered from iatrogenic sciatic nerve injury and had no improvement after follow-up for 2 years. All the patients with combined common peroneal nerve injury recovered within 6 months postoperatively. Deep vein thrombosis formed in 2 cases and superficial infection occurred in 2 cases. No necrosis of either bone fragment or femoral head was found. There were no fixation failures or arthritis. The mean follow-up period was 43.6 (12-70) months. Modified Merle d’Aubigne scoring was adopted to evaluate the outcomes of the surgeries. The percentages of the excellent, good, fair and poor results were 48.4% (15/31), 41.9% (13/31), 6.5% (2/31), 3.3% (1/31), respectively, comprising a good to excellent rate of 90.2% (28/31).

DISCUSSION

Posterior wall fracture of the acetabulum is one of the most common fracture patterns of the hip joint. All the cases in this study were simple posterior wall fractures without combining with posterior column fractures or transverse fractures, namely, Type A acetabular fracture as described by Letournel and Judet. The 31 patients with posterior wall acetabular fractures accounted for 32.9% of all the patients with acetabular fractures during the same period in our hospital, a ratio similar to the 1/4-1/3 of that is reported by others in literature. Compared with other types of acetabular fractures, posterior wall fractures are less complicated and can be dealt with by a well-established Kocher-Langenbeck approach, which is familiar to most orthopedic surgeons. However, in many instances, the results of surgery are not satisfactory. Letournel et al’s series of 569 patients with acetabular fractures is the largest report. They reported that 117 cases of simple posterior wall fractures had a good to excellent treatment rate of 82%, following a follow-up for 1-33 years. Matta et al reported a good to excellent rate of 68% in 22 cases after a follow-up for 1-14 years. In Saterbak et al’s report, among the 20 cases of simple posterior wall fractures, 7 had complete loss of the joint space one year after surgery when determined with plain radiograph. Variables identified as risk factors for unsatisfactory clinical results included incomplete reduction, fixation failure, marginal impaction, elderly age at the time of injury, and sciatic nerve injury.

Usually, indications for operative treatment of posterior wall fractures include reduction failure, free intra-articular osteochondral fragments that block joint motion, severe osteochondral impaction, and instability of the fractures. Sometimes, the posterior wall fragments can be spontaneously restored during reduction, but the stability of the fractures should be determined. In order to evaluate the stability of the joint, Calkins et al used CT scan to measure the percentage of remaining posterior wall of the acetabulum in fracture/dislocations cases. The fractured percentages less than 45% of the remaining posterior wall of the acetabulum were stable and dislocation was rare. Based on a study of cadaveric specimens, Vailas et al found that the fragments involving 25% or less of the acetabulum were insignificant, i.e., the joint stability was not affected, while the fragments involving 50% or more were significant. The significance of transitional fragments (25%-50% of the acetabulum) was determined by the integrity of the posterior joint capsule. Therefore, open reduction and fixation are necessary if the percentage of the acetabular fracture is larger than 50% on preoperative CT scan. If it is smaller than 50%, the stability should be determined after reduction under general anesthesia. Severe damage of the capsule could permit dislocation, making open reduction and fixation mandatory.

A simple posterior wall fracture of the acetabulum is usually exposed through a Kocher-Langenbeck approach. Most orthopedic surgeons are familiar with this approach because of its wide usage in total hip
reduction. Some might consider that routine exposure of the sciatic nerve is unnecessary, ignoring the fact that iatrogenic sciatic nerve injury is not rare. The worst outcome in our series was caused by intraoperative sciatic nerve injury. Sciatic nerve palsies, as a result of acetabular fractures, occur in approximately 27% of all the patients according to Giannoudis et al’s14 report. We found that the common peroneal nerve was often involved and that the symptoms of this could be easily overlooked. We believed that the sciatic nerve should be exposed and protected during surgery, especially for those with preoperative signs of injury. The fragments should be isolated carefully and retracted gently to prevent further damage. Exposure and protection of the sciatic nerve can also facilitate positioning of metal prostheses, avoiding nerve injury from plates and screws. Recently, Carr et al10 have demonstrated a small-incision and gluteal-splitting approach for the treatment of selected fractures involving the posterior acetabulum. The approach essentially involves the proximal portion of the Kocher-Langenbeck incision and it can be extended to a larger one if necessary. Although no iatrogenic nerve injury is found, we still recommend that this less-invasive approach should only be performed by sufficiently experienced surgeons.

There are only a few studies comparing the biomechanical stability of different fixation methods and it is not surprising that selection of the fixation methods2,11-14 varies among surgeons. The most commonly-used two methods are simple screw fixation and installation of a reconstruction plate. Generally speaking, when the fracture is simple, single fragments are large and they are located at the posterior-superior aspect of the acetabulum, multiple screws are selected; when a comminuted fracture is identified at the posterior and posterior-inferior aspects of the acetabulum, especially with the minor fracture lines paralleling to the acetabular rim, the reconstruction plate becomes the method of choice. Single posterior-superior fracture has a large cross-section and can usually hold multiple screws. The screws can be easily directed to avoid intrusion into the joint. Therefore, this type of fracture can be steadily fixed by lag screws. In our series, 7 cases out of 31 (22.6%) had simple fractures, which were fixed with 3.5-mm screws, resulting in a good to excellent rate of 92%. Similar to our experience, Im et al15 retrospectively studied 15 patients with a single fragmented or moderately comminuted posterior wall fracture of the acetabulum who had been treated with internal fixation of screws alone. The clinical results were good except for one with poor hip recovery after a follow-up period of more than 2 years. With regard to comminuted fractures, reconstruction plates should be considered to be used, especially when the fragments lay in the posterior-inferior part behind the acetabulum and so the fracture contact area is limited. Since the orientation of the screws cannot be easily controlled, screws may penetrate into the joint. Because of the tiny fragment volume, a reconstruction plate should be used for stability. When treating other intra-articular fractures, rigid fixation is one of the most important principles. However, due to the special irregular anatomy of the acetabulum, rigid fixation may not be readily achieved. Even the rigidity of the plate is limited, as mechanical analysis shows that, with plating, internal fixation fails at a load of 1 666 N.16

Many studies have discussed the factors affecting the outcomes of acetabular fractures. Delayed reduction of hip dislocation, incongruous anatomical reduction, elderly age at the time of injury, and avascular necrosis of the femoral head, all adversely affect the outcomes of these fractures.15 Our study shows a higher good to excellent rate than that reported by many others.2,4,6,15 We thought that the reasons for this may be as follows: main younger patients at the time of injury, no severe complications, comparatively lower energy trauma, no fractures on the loading surface of the femoral head, acceptable intraoperative reduction, restoration of the compressed rim, and reliable internal fixation methods. When compared with other reports, we found that postoperative immobilization in our study was significantly longer. The postoperative protocol included bed rest for at least 10 weeks, while some patients rested for as long as 14 weeks. Resting was followed by toe touch weight bearing, which lasted for 6 weeks. Other researchers have reported that touch-down weight bearing began 6 or 8 weeks postoperatively and total weight bearing 12 weeks postoperatively. We thought that the fracture line may disappear and bony bridge may cross the gap 12 weeks after surgery,16 but the bone does not regain enough mechanical strength at that time. Posttraumatic arthritis was not found in our series because of the short follow-up period.

In conclusion, the sciatic nerve should be routinely exposed and protected during surgery. The type of fixation should be selected based on the fracture type and
site. Prolonged immobilization may be helpful to improve the final outcomes.

REFERENCES


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