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Functional outcome of the surgical management of acute acetabular fractures

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ABSTRACT

Objective: To assess the functional outcome of early surgical management of displaced acetabular fractures and the complications associated with the procedure.

Methods: This is a case series study and data was collected using specialized performance. The study included 75 patients and the sampling technique was a non-probability purposive type. Patients presenting with close displaced acetabular fractures of more than 2 mm within 10 days of injury were included. However, elderly patients presenting after 10 days of injury, with evidence of local infection, severe osteoporotic bone and comorbid such as chronic obstructive pulmonary disease were not included in the study. New acetabular scoring system was used for assessing outcome of patients.

Results: A total of 75 patients were operated on. Union was achieved in anatomical position in 66 (88%) patients and in malposition in 9 (12%) patients. Excellent results were obtained in 18 (24%) patients, good results in 41 (54.6%), fair results in 12 (16%), and poor results in 4 (5.4%) patients. Postoperative complications included infection [5 (6.7%)], heterotopic ossification [3 (4%)], sciatic nerve injury [10 (13.3%)], avascular necrosis [3 (4%)] patients.

Conclusions: Patients with displaced acetabular fractures should be referred to specialised centres. Early surgical intervention and experienced management is a prime factor in achieving good results.

1. Introduction

Most acetabular fractures occur primarily in young adults in the setting of significant high velocity trauma secondary to either a motor vehicle accident or a high-velocity fall. Force exerted on the femur, passes through the femoral head, and is transferred to the acetabulum. The direction and magnitude of the force as well as the position of the femoral head determine the pattern of acetabular injury. The anatomical and radiographic classification plays an important role and acts as a first step in decision making for the mode of treatment^[1]. Once the acetabular fracture is classified, appropriate therapy may be planned and implemented. Associated injuries, which are often life threatening are also important as 50% of patients often have

multiple traumatic injuries and are often missed^[2]. Fracture of the extremities, head injuries, chest, abdomen and pelvic ring injuries are the most commonly associated ones^[3].

In our set-up, the incidence of displaced acetabular fractures is on the rise due to increased incidences of automobile and occupational injuries. Among different treatment options, operative treatment for these fractures is a safe and acceptable method of management. Currently, surgical treatment has evolved to be the treatment of choice as restoration of joint congruity is of paramount importance to reduce the incidence of post-traumatic osteoarthritis of the hip joint^[4]. The main purpose of surgical treatment is to achieve precise anatomic reduction and stable fixation to attain a painless, mobile and stable hip joint and to minimize the incidence of complications along with early mobility. The long term results of operative treatment are influenced by numerous factors including fracture type and/or dislocation, femoral head status, intra-articular osteochondral fragments, injury duration, reduction quality, age of the patient, comorbidity present, associated musculoskeletal complications and surgical approach^[5,6].

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Fractures of the acetabulum occur at all ages. Low energy fractures occur in the elderly people with osteopenia while high energy acetabulum fractures are more common in middle age groups. Rehabilitation program is dependent on type of surgery, age of the patient, and associated injuries. These patients have profound functional deficits compared with the normal population. Anatomical reduction alone is not sufficient to restore function^[7].

The objective of the study was to assess the functional outcome of early surgical management of displaced acetabular fractures and the complications associated with the procedure.

2. Materials and methods

This case series study was conducted in the Department of Orthopaedics, Jinnah Postgraduate Medical Center, Karachi for a period of 2 years (17/01/2010–17/02/2012). A total of 75 patients were included using non-probability purposive sampling technique.

Patients included in the study were all those who presented with close displaced acetabular fractures of more than 2 mm diagnosed radiologically within 10 days of injury (Figure 1). However, elderly patients with severe osteoporotic bone, local infection and other co-morbidities such as asthma, COPD at the time of injury, open fractures or those with involved gunshot injuries presenting after 10 days of onset were excluded from the study.



Figure 1. 18 years old male, presented with a Bi-columnar fracture of the acetabulum secondary to RTA. This is an X-ray pelvis, AP view, showing disruption of the iliopectineal and ilioischial lines with ilio-acetabular dissociation.

Data collection procedure was prospective and non-randomized. Informed verbal consent was taken. Clinical and radiological assessment as well as post-operative complications were recorded in a proforma especially prepared for this. Pre-operative and post-operative X-rays were done in all patients undergoing acetabular surgery.

The patients were followed up for up to 3 months post-operatively. At each visit, the patient was examined clinically and radiologically. Clinical examination included checking range of movement (ROM) at the hip joint, status of ambulation and adequate muscle strength especially quadriceps, hamstrings and gluteus. The radiological examination was done at different intervals to look for adequacy of fixation and any complications.

Postoperatively all the patients were placed in skeletal traction for 3 weeks and discharged from the hospital after 8 (10–12)

days with instructions for range of motion and muscle strengthening exercises. Non weight bearing ambulation was started at 6 weeks post-op and full weight bearing at 3 months.

Fractures of the posterior lip, posterior column, transverse fractures and T fractures were approached through the Kocher Langenback approach (Figure 2) and fractures involving the anterior column were approached through both Kocher Langenbeck and ilioinguinal. No case was treated with extensile screws (Figure 3).

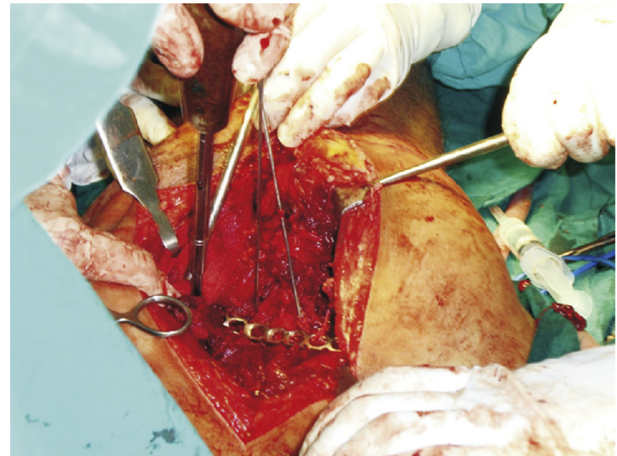


Figure 2. Kocher Langenbeck approach, Recon Plates used for fixation.



Figure 3. Surgically fixed with Recon Plates, 2nd day post-op. This is an X-ray of the pelvis, AP view, showing a posterior column acetabular fracture fixed with recon plate through Kocher Lagenbeck approach and an avulsion fracture of greater trochanter which has been stabilized with two cancellous screws with washer.

3. Results

A total of 75 patients were operated on and all 75 patients were available for review and evaluation of results. Mean age of

Table 1

Functional outcome with respect to age groups.

Age groups	n	Excellent (n = 18)	Good (n = 41)	Fair (n = 12)	Poor (n = 4)
21–30 years	25	9	12	3	1
31–40 years	30	6	19	3	2
41–50 years	10	2	5	2	1
51–60 years	10	1	5	4	0

patients was (38.63 ± 8.90) years with a gender distribution of 69 (92%) male patients and 9 (12%) female patients.

All cases were managed by a single surgeon (GM) experienced in managing pelvic trauma patients. Mode of injury in majority of the cases was RTA 66 (88%) and only 9 (12%) patients had fall from height. Sixty-five (86.7%) patients presented within the first 24 h, 7 (9.3%) patients presented within the first week and 3 (4%) patients after 14 days.

Most common fracture pattern was posterior column seen in 28 (37.3%) patients, anterior column in 12 (9%), bicolumnar in 9 (12%), transverse in 21 (28%) and T-type in 5 (6.6%) patients. Of all the patients, 63 (84%) patients were operated through Kocher Langenbeck approach, 2 (2.6%) patients operated through both Kocher Langenbeck and ilioinguinal approach and 10 (13.3%) patients operated through the ilioinguinal approach.

The mean duration of surgery was 147 (125–190) min with mean blood loss 752 (600–1500) mL. The mean hospital stay was 8.2 (5–12) days and minimum follow-up was up to 3 months. In all patients, the fracture was united. Union was achieved in anatomical position in 66 (88%) patients and in malposition in 9 (12%) patients.

Excellent reductions were obtained in 18 (24%) of patients, good results in 41 (54.6%), fair results in 12 (16%) and poor results in 4 (5.4%) patients. Further, functional outcome was assessed after dividing the 75 enrolled patients in 4 age groups: 21–30, 31–40, 41–50 and 51–60 years. The results for excellent and good outcomes were evaluated cumulatively as 84%, 83.3%, 70% and 60% respectively (Table 1). Quantitative and qualitative analysis was based on the New Acetabular Fracture Score System^[8].

Excellent results were attributed to the less severe initial trauma, anatomical reduction and stable internal fixation after operation and adequate postoperative care and rehabilitation programme. Postoperatively, infection in our series was 5 (6.7%) patients, heterotopic ossification was 3 (4%), sciatic nerve injury was 10 (13.3%) and avascular necrosis was 3 (4%) patients.

4. Discussion

Acetabular fractures are complex, high energy injuries and have the potential for a poor outcome regardless of the treatment method. The contributing factors may include an imperfect reduction, osteochondral defects in either the acetabulum or the femur at the time of injury, osteoarthritis, AVN of the femoral head, heterotopic ossification, sciatic nerve injury and infection^[9]. Although the incidence of infection has been reduced due to modern theatre facilities and aseptic measures, in developing countries its prevalence is still high and this may lead to increased antibiotic use, prolonged hospital stay, repeated debridement, change of infected implant, prolong rehabilitation, morbidity and mortality^[10]. The fracture

pattern, marginal impaction and residual displacement of > 2 mm are known to be associated with the development of arthritis.

According to the statistics at a local hospital in India following the surgical fixation of fractures of the acetabulum, excellent results/union was achieved in 74.6% of the cases using the ilioinguinal approach which was comparable to the results of international studies, while in the remainder of the cases complications were recorded^[11].

The use of the extended iliofemoral or tri-radiate approaches presented with the greatest risk of heterotopic ossification (significant bone formation) while the ilioinguinal approach carries with it the least risk. Those reported with higher incidence were series where the extensile approach was used^[12].

Over the past 40 years, the management of displaced fractures of the acetabulum has changed from conservative to operative. A meta-analysis to evaluate the classification, the incidence of complications and the functional outcome of patients who had undergone operative treatment of such injuries was undertaken in which the authors analyzed a total of 3670 fractures of acetabulum fixed surgically. The meta-analysis demonstrated an overall incidence of post-traumatic nerve palsies associated with acetabular fractures of 16.4%, which is comparable with the findings of Letournel and Judet^[13]. The wound infections were recorded to have an overall incidence of 4.4%. The incidence of avascular necrosis of the femoral head (AVN) was noted in 18 studies with 2010 patients with an overall incidence of 5.6%^[14].

In our study, 75 patients were included and majority of our patients were male. This is due to the fact that most of these fractures result from high velocity trauma (RTA) thus males are more prone to these kinds of injuries in our setting^[15].

Operative complications were comparable to other major orthopaedics procedures and other international acetabular fracture series. Prophylaxis of infection and aggressive wound management early in the course of suspected infection cannot be overemphasised. Established infection is unpredictable and may be anticipated leading to poor results.

The case of infection often cannot be clearly identified and may be related to the magnitude of the initial injury, the added soft tissue, lymphatic and osseous trauma imposed surgically. However, patient selection, antibiotic prophylaxis and appropriate intra-operative management help to reduce the infection rates. Surgery can be delayed until fever and leucocytosis can be evaluated and treated before the operation. Second or third generation cephalosporin should be routinely given intra-operatively and postoperatively for 48 h at least and suction drain should be placed in every recesses of wound.

The incidence of heterotopic ossification in the present study was found in 3 (4%) patients after 3 months follow up. Heterotopic ossification is a common problem in acetabular injury. Formation of large amounts of heterotopic bone occurs unpredictably^[16]. Theories that seek to explain ectopic bone formation implicate excessive stripping of gluteal musculature from external iliac fossa, multiple operative procedures, large sized patient, and increased trauma to abduction mechanism especially in extensile approach (which was not used in our series). Methods for prevention of heterotopic ossification were not employed in this series but in literature various methods are described such as administration of bisphosphonates, indomethacin and low dose radiation^[17,18].

In the current series, post-operative sciatic nerve injury occurred in ten patients *i.e.* 13.3% and this was without somatosensory potential monitoring^[19]. The sciatic nerve injury may be due to just traction on retraction of sciatic nerve at the time of surgery.

There are numerous scoring systems used to evaluate surgical outcomes of interventions involving the hip region by various authors, many of which have reported high success rates. However, it is believed that these hip scoring systems were designed primarily to evaluate total hip arthroplasty and not optimal for patients with acetabular fractures. Therefore, it was proposed that the “New Acetabular Fracture Score System” is a better method for more uniform reporting of results of acetabular fractures^[8].

Fractures of the acetabulum are increasing in frequency due to an increase in automobile accidents. These fractures involve major weight bearing joints of the lower limb, hence they must be restored to as much normal as possible and this satisfactory reduction is only possible with open operation and correct approach.

Patients with complex acetabular fractures in Pakistan should be referred to relatively better centres where the surgeons are most aware of the complexity of these fractures as experience appears to be a prime factor in achieving good results.

Open reduction and internal fixation markedly reduced hospital stay and was consistent with better clinical results.

Conflict of interest statement

The authors report no conflict of interest.

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