Complex acetabular fractures: Combined anterior and posterior approaches during same procedure

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ABSTRACT

The operative treatment of complex acetabular fractures is often difficult and technically demanding. To obtain an anatomic reduction with lowest incidence of complications, it is essential to select the appropriate approaches to allow adequate visualisation and palpation of these fractures.

Complex acetabular fractures are often treated through extensile approaches and a variety of them have been described. Some of these approaches are often associated with complications like infection, heterotopic ossification and increased blood loss in addition to increased operative time.

A review of 12 patients who had open reduction and internal fixation of complex acetabular fractures during the period January 2008 to January 2011 using anterior (modified ilioinguinal) and posterior (Kocher Langenbeck) approaches for the same procedure is being described in this study.

Anteriorly, the modified ilioinguinal approach was used with a lateral and medial window only, without isolating the external iliac vessels or exposing the inguinal canal. Posteriorly, the standard Kocher Langenbeck approach was used.

The results clearly showed better anatomical reduction with decreased intra and post operative complications with a combined anterior and posterior approach as compared to the standard extensile approaches. A modified ilioinguinal approach is found to be very effective, easy and a simple procedure with fewer complications as compared to the standard ilioinguinal approach for exposing anterior column fractures.

Keywords : Acetabular fractures, open reduction, anterior approach, posterior approach

INTRODUCTION

The work of Judet and Letournel¹ began the changes which have led to the management of displaced fractures of the acetabulum by operative rather than conservative methods. They recommended that the principles applied to the treatment of displaced articular fractures should also be applied to the acetabulum.

Subsequently open anatomical reduction of articular surfaces combined with rigid internal fixation and early mobilisation became the standard treatment of these injuries. The purpose of this study was to determine the feasibility of anatomical reduction and rigid internal fixation of complex acetabular fractures with the use of combined minimally invasive anterior and posterior exposures during the same period of anaesthesia.

In Letournel's experience¹, two approaches were performed sequentially rather than simultaneously. The extensile approaches are associated with higher rate of complications and morbidity. Rarely, surgeons have promoted the use of simultaneous anterior and posterior approaches to treat complex acetabular fractures in floppy lateral position.

The modified ilioinguinal approach in conjunction with posterior Kocher Langenbeck approach in a single procedure appears to have several advantages over other existing approaches for the management of complicated acetabular fractures.

This procedure is simple, giving excellent accessibility to fractures, good anatomical reduction, less operative time and blood loss.

We recommend the use of this technique for selected patients as a potential alternative to the classic ilioinguinal approach when anterior exposure of the acetabulum is required.
Surgical technique
The patient is positioned supine on a radiolucent fracture table permitting undisturbed fluoroscopic visualisation. Proper positioning and draping are critical so that both approaches can be used. The ipsilateral limb is draped freely with hip and the knee flexed, relaxing the iliopsoas muscle and the external iliac vessels. Urinary bladder is catheterised for bladder protection, improved visualisation and monitoring fluid balance. The surgical field includes the entire abdomen well above the iliac crest to below the palpable pubic bodies.

A transverse and slightly curvilinear skin incision one to two fingerbreadths superior to pubic symphysis is made on the bikini line (Figure 1a). Sharp dissection is carried to the anterior rectus fascia. Care must be taken not to dissect too far laterally as it may result in injury to spermatic cord or round ligament as they exit the external ring.

The rectus abdominis muscle and the transversalis fascia are cut sharply 2 cm above the pubic symphysis allowing access to the potential retropubic space of Retzius which is then developed bluntly with finger dissection to mobilise the bladder away from the anterior pelvic ring. The dissection at all times remains in the extra peritoneal space of true and false pelvis.

Vascular anastomosis (corona mortis) between the external iliac and obturator vessels are readily apparent as they course over the superior pubic ramus towards the obturator foramen. These vessels must be ligated or clipped before proceeding further along the pubic root and the pelvic brim.

Incising the peristeum and the iliopsectineal fascia along the pelvic brim allows subperiosteal elevation of iliopsoas. Once this plane is developed, a Deaver retractor is placed under the iliopsoas to protect the external iliac vessels. Elevate the iliopsoas and expose the anterior column and internal iliac fossa up to the sacroiliac joint and entire pelvic brim.

A second incision is made exposing the lateral window of ilioinguinal approach along the iliac crest starting 1-2 cm below the anterior superior iliac spine along the crest posteriorly. The insertion of the external oblique muscle is released permitting dissection over the crest into the internal iliac fossa where the iliacus muscle is elevated subperiosteally to the pelvic brim and anterior aspect of sacroiliac joint.

A ball-spiked pusher with laterally directed force on the quadrilateral plate and lateral traction of the femoral head aids in reduction of anterior column fractures. The high anterior column fracture reduction is started from the periphery, i.e., from the iliac crest to the hip joint. It is finally reinforced with properly pre-bent pelvic reconstruction plate along the pelvic brim (Figure 1b). Intraoperative reduction and placement of fixation are checked with fluoroscopy.

After the reduction of the anterior column, patient is positioned in the lateral decubitus position and a standard posterior Kocher Langenbeck approach is used, posterior column is reduced and fixed with properly contoured reconstruction plate.

Materials and methods
A review of 12 patients who had open reduction and internal fixation of complex acetabular fractures during the period from January 2008 to January 2011 using anterior and posterior approaches in a single procedure is being presented in our study. All patients were reviewed for operative time, estimated blood loss and complications (early and late).

Radiographs were evaluated to determine the fracture type (Letournel and Judet),1 quality of reduction (Matta)2,3 and the presence of heterotopic ossification. The quality of reduction
was assessed by measuring the greatest displacement of a major fracture line in any of the three radiographic views and the medial joint space.

The radiographs were examined for union of fracture, failure of fixation, aseptic necrosis of femoral head and narrowing of joint space after one year. Reduction was classified into three groups as used by Matta: 0-1mm (anatomic), 2-3mm (imperfect) and greater than 3 mm (unsatisfactory).

Heterotopic ossification was classified using the method described by Brooker et al. with a twelve months follow up radiograph. Clinical outcome was assessed using the Merle D Aubigne scoring system.

Among the twelve patients, there were 9 men and 3 women. The mean age was 35 years. The fracture types were both column in 7 patients, T type in 4 patients and anterior column with posterior hemi transverse in 1 patient. The mean time to surgery was 5 days. In all patients, the anterior column was fixed first via the modified ilioinguinal approach followed by the posterior approach.

**RESULTS**

The mean duration of surgery was 3 hours 40 minutes (2 hours 30 minutes to 4 hours 20 minutes) with an average blood loss of 800 mL (500 - 1000mL). The major complications included one superior gluteal artery injury which required internal iliac artery ligation and one corona mortis bleeding controlled with clipping. Brooker grade 2 heterotopic ossification occurred in two patients without impairing the range of motion. Other complications included one direct inguinal hernia through the supra pubic incision. The quality of reduction was anatomic in 83% and imperfect in 17% of the patients. Functional outcome results (Merle d Aubigne) at 1 year follow up were excellent in 90% and good in 10% of the patients.

**Discussion**

Several authors have reported combined exposures of the acetabulum. Matta reported combined exposures in 2% of his cases, when necessary to complete reduction which could not be performed through the initial incision. Letournel used combined exposures in 3% of his 849 cases and most of them were performed before the development of the extended ilio-femoral approach. Mayo reported that 4% of 163 acetabular fractures required combined approaches. Routt and Swiontkowski reported combined exposures in 24 patients and performed sequentially with these patients in a floppy lateral position. We agree with Pennal et al. that, as a general rule, the quality of the...
clinical result depends on the quality of reduction that was achieved when open reduction and internal fixation were performed. We also support the view of Judet et al., that anatomical reduction of fractures of the acetabulum depends on the selection of proper operative exposure.

We have used both exposures in complicated, complex acetabular fractures like both column fractures, T type fractures and anterior column with posterior hemi transverse fractures for better anatomical reduction. We did not attempt to reduce these fractures through a single approach. The reported series showed that the authors used either extended iliofemoral or other extensile approaches to reduce these complex fractures in a single approach.

In the early 1990s, Cole and Hirvensalo independently described an approach to the anterior column and pelvis through an intrapelvic dissection from the midline. The principal difference between the ilioinguinal approach and this approach was in avoiding the ‘middle window’ thus sparing dissection of the inguinal canal, femoral nerve and external iliac vessels. This method was a modification of the intrapelvic approach described by Rives and Stoppa for the repair of inguinal hernias.

As treatment protocols, intrapelvic imaging and reduction tools have evolved over time, so has the use of less invasive approaches in an attempt to minimise surgical morbidity. The purpose of this study is to report on the technical aspects, radiographic results and complications using a modified approach as an alternative to the ilioinguinal approach for the treatment of acetabular fractures.

We tried to reduce the anterior column fractures indirectly with a lateral pusher or lateral traction with properly pre-bent pelvic reconstruction plate and screws through proximal and distal holes only in the anterior column without entering the posterior column which will not prevent reduction of the posterior column through posterior exposure.

We believe that in complex fractures, it is always better to do with both exposures and reduce each column separately for anatomical reduction. The standard ilioinguinal approach was modified, as it was a simple and easy procedure with less operative time and morbidity.

Mears et al. showed in his study that associated fractures could be reduced anatomically in only 59% and Matta achieved this in 64% with a single approach.

Routt reported an anatomic reduction of 87% treated with both exposures. In our series, we had 83% anatomic reduction with functional outcome of 90%. The only limitation of this procedure is the need to position the patient twice.

**CONCLUSION**

The majority of complex acetabular fractures can effectively be managed through combined approaches during the same procedure.

The modified anterior ilioinguinal and posterior exposures of the acetabulum are safe and useful alternative to other extensile exposures and can be performed with less morbidity. We recommend both exposures for reducing each column separately for anatomical reduction. It is important, at operation, to obtain the most accurate reduction of the fractures. This when possible with a minimal surgical approach influences the final outcome. Modified anterior approach can be used as a potential alternative but not as a replacement to the classic ilioinguinal approach.

**REFERENCES**


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