

## Where Do We Need More than One Approach for Acetabular Fractures and Which One First?

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### Abstract

Acetabular fractures are often difficult to manage. The majority of fractures require anatomical reduction to prevent secondary osteoarthritis and instability. Often a single approach is sufficient to fix these fractures. The choice of approach depends on the major anatomical involvement of the acetabulum. However, some fracture patterns require more than a single approach to fixing the fractured fragments adequately. This article addresses this particular issue.

**Keywords:** Acetabulum, fractures, pelvic, surgical approaches.

**What to Learn from this Article?** The fixation of all the acetabular fractures cannot be achieved with a single approach, at all the times. Hence, it is necessary to do a good pre-operative planning and identify the fractures which may require a dual approach to achieve satisfactory fixation.

### Introduction

The basic fracture fixation principles in the lower extremity are anatomical reduction and the possibility of early rehabilitation. A combination of these two factors can help one achieve good prognosis and outcomes. The acetabular fractures are no different. They should be managed aggressively, and an attempt should be made to achieve anatomical reduction so as to prevent the most common complication of osteoarthritis [1]. There are some restrictions on the surgical management of acetabulum fractures which may influence the decision of the treating surgeon toward an operative or conservative treatment. Factors such as the proximity to important anatomical structures, the difficulty in achieving surgical exposure, and the lack of experience in managing these fractures, all influence the decision-making [1].

With advances in imaging technology and improved approaches for acetabular fracture fixation, focus is shifting toward an effort to achieve anatomical reduction [2]. The first step in achieving anatomical reduction for any fracture is a good surgical exposure.

The most commonly used approaches are the Kocher-Langenbeck and ilioinguinal approaches, which have been the workhorse for acetabular surgeons. Recently, further modifications and some extensile approaches such as iliofemoral, Stoppa's, and trochanteric osteotomy have also been introduced [3, 4, 5, 6, 7, 8]. The type and combination of the surgical approach to be used are of paramount importance in achieving a good outcome.

### Limitations of a Single Approach

The first step is to understand the anatomy, displacement, and the direction of displacement of the fracture. The second step is to plan an approach which would allow proper visualization and accurate reduction of the fracture fragments [2]. The ilioinguinal approach is useful for fixation of the anterior column and wall fractures, but they are unable to help in achieving an accurate reduction in cases of displaced posterior column fractures (Fig. 1) [1]. Similarly, the Kocher-Langenbeck approach can be used for a good visualization of the posterior column and wall

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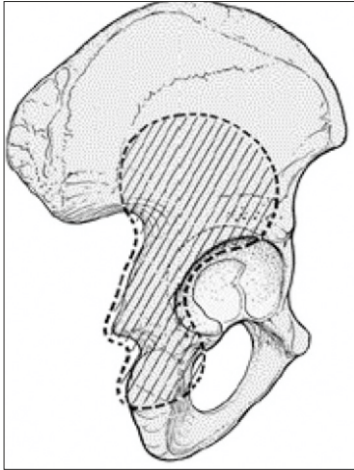


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**Figure 1:** The posterior approach to the acetabulum allows access to the posterior column, posterior lip, and dome segment of the acetabulum.

fractures, but they provide inadequate exposure to the anterior column and wall (Fig. 2) [1].

Matta emphasized the need for anatomical reduction of the fracture fragments in acetabulum for optimal results [9]. The key to anatomical reduction is good exposure and visualization of the fracture fragments. A single approach can adequately manage fractures involving a single column or wall. Furthermore, certain bicolumnar fractures which have minimal displacement in one of the columns can also be managed by approaching the more displaced column directly.

However, in certain fractures such as T-type fractures with significant displacement in both columns cannot be managed with a single approach. They require either the use of the described extensile approaches such as iliofemoral and triradiate or the use of sequential approaches. These approaches are not without their sets of complications such as increased rates of infection, delayed rehabilitation, higher rates of ectopic ossification, and prolonged abductor weakness [2]. Hence, whenever an extensile or a sequential approach is planned, the decision should be based on sound scientific judgement.

#### Fractures which cannot be Accessed through K-L Approach Alone

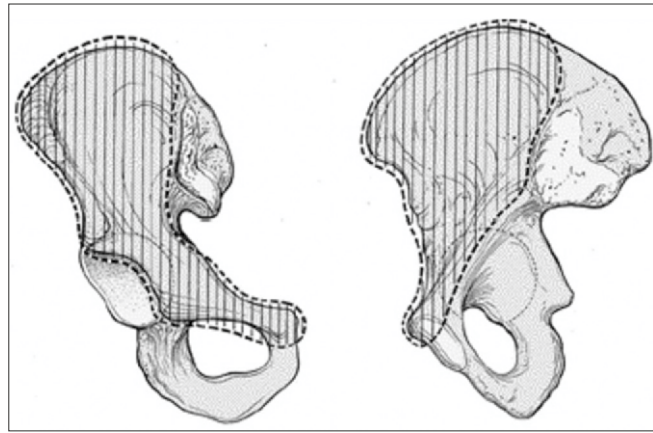
1. Both column fractures
2. Anterior column fractures
3. Anterior column and posterior hemitransverse fracture.

Fractures which cannot be accessed through ilioinguinal approach alone:

1. T-type fractures
2. Isolated posterior column fractures.

#### Fractures Needing More than One Approach

The fractures which may require more than one approach for an optimal result include:



**Figure 2:** The ilioinguinal approach allows access to the anterior column and medial aspect of the acetabulum. It also allows visualization of the inner side of the pelvis from the sacroiliac joint to the symphysis pubis.

1. T-type fractures
2. Selected both column fractures with significant displacement (>10mm) in both the columns
3. Transtectal transverse fractures
4. Transverse fractures with the posterior wall fracture with wide displacement.

T-type and complete both column fractures.

The T-type fractures and complete both column fractures need special mention. In these types of fractures, the femoral head is displaced medially, and both the columns rotate around the femoral head in the opposite directions. This mechanism of rotation of the two columns can be understood as one similar to the two doors of a gate opening up in the opposite direction around a central hinge. Any attempt at indirect reduction of the columns in these types of fractures will only lead to maintenance of the malrotation and the persistence of inaccurate reduction [1]. These fractures are an absolute indication for open reduction, direct visualization, and internal fixation. Hence, these fractures may sometimes require the use of extensile approach or two sequential approaches for optimal fixation (Fig. 3) [2].

Transtectal fractures which have an anterior displacement also may require sequential approaches for fixation of these fractures. Some of the transtectal fractures may be fixed using a single anterior or posterior approach, especially, if they have isolated posterior displacement. Some fractures with high anterior obliquity, on Judet views, with minimal displacement may also be fixed with an isolated posterior approach. Fractures with large displacement (>10 mm) in the anterior direction usually need sequential surgical approaches [10].

In the transtectal fractures, the vertical nature of the fracture line makes it difficult to palpate the reduction through the greater sciatic notch [11]. Moreover, since the fracture line passes through the supra-acetabular dome, imperfect reductions are very poorly tolerated [11]. An adequate fixation may require in some of these fractures to utilize two approaches (Fig. 4).

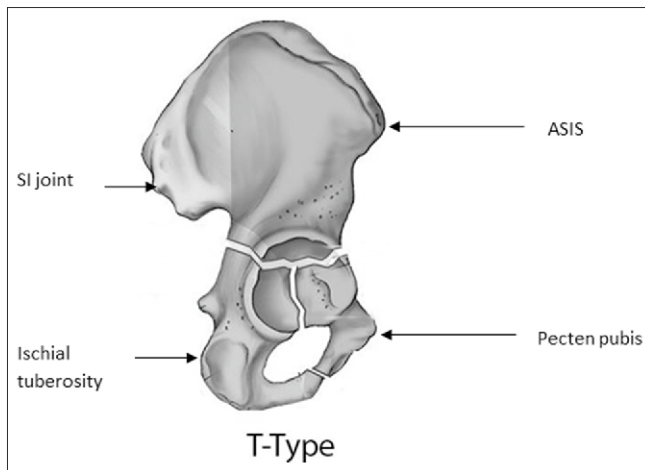


Figure 3: T-type fractures.

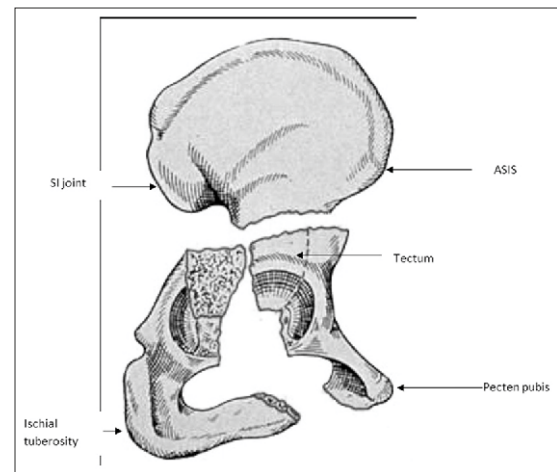


Figure 4: Transtectal fractures.

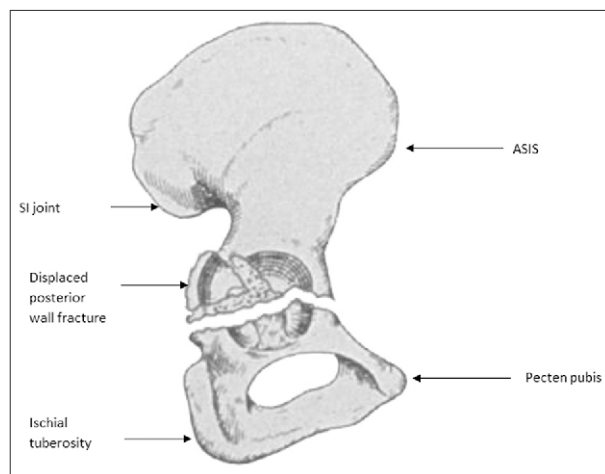


Figure 5: Transverse posterior wall with displacement.

Transverse plus posterior wall fractures may make it difficult to be fixed through the isolated anterior approach. If approached through the K-L approach alone, the reduction of the transverse fractures may be difficult to assess through the posterior wall window, even after femoral head distraction. This may make it useful that the surgeon fixes the posterior wall using the K-L approach and then uses the ilioinguinal approach for fixation and assessment of the transverse fracture reduction and fixation (Fig. 5) [1].

### Decision-making

The decision-making for the choice of effective approach depends on the pre-operative computed tomography (CT) scan [10]. The first choice of fixation of the fractures mentioned is the Kocher-Langenbeck approach in preferably prone or lateral decubitus position. The pre-operative CT scan should be assessed, and if there is a vertical fracture pattern or greater anterior displacement, then it would not be amenable to fixation through the isolated posterior approach but would require an additional anterior approach for optimal fixation [1, 10].

### Which Approach First?

The decision of the first approach to be used depends on various factors. The amount of communication in one of the columns is one of the major determinants. The column which has a greater amount of communication should be fixed first. In the presence of a dislocation, the approach which gives direct access to the side of dislocation should be approached first. In case, both the columns have equal communication or are equally displaced, most of the surgeons prefer making the posterior approach first in the prone or the floppy lateral position [2]. The anterior approach is made after making the patient supine.

The T-type fractures are a special case in the combined approach. It is often impossible to fix the posterior column through the K-L approach, without the screws passing through the anterior column fractures [11]. Thus, the fractures of the anterior column must be reduced first, which makes the subsequent reduction of the posterior column and wall more amenable.

There have been some studies in the recent English literature, which have used the simultaneous anterior and the posterior approaches by two surgical teams [2]. The advantages of simultaneous anterior and posterior approaches are decreased surgical time and simultaneous assessment of the reduction from anterior as well as the posterior directions. The disadvantages of this simultaneous approach are the requirement of two surgical teams which are equally adept and versed with acetabular fractures [2]. Furthermore, the anterior exposure is a bit difficult in the floppy lateral position, and the exposure is tough in obese patients [2].

### Disadvantages

The disadvantages with the use of simultaneous or sequential approaches for acetabular fixation are:

1. Increased blood loss
2. Increased morbidity
3. Increased incidence of heterotopic ossification - due to increased soft tissue manipulation
4. Increased surgical time.

### Literature Review

Combined exposures of the acetabulum have been used in the literature. Matta reported a very low incidence of 2% of a total of 262 fractures operated [9]. Letournel and Judet used a sequentially combined approach in only 3% of the cases of a total of 849 cases [3]. Similarly, Mayo reported an incidence of 4% for combined approaches in their series of the acetabulum fractures [12].

The most important aim in acetabular fractures is anatomical reduction and adequate fixation. Even though all these studies emphasize that the number of fractures requiring more than one approach be limited, surgeon awareness is important so that an

inaccurate reduction is not accepted. Adequate pre-operative planning using all the possible radiographic views and the CT scans available should be done so that the surgeon is aware of the possibility of using two approaches based on the type of fracture and the displacement. This information can help the surgeon as well his team, including anesthetists and assistants, be aware and prepared for the same.

The decision regarding whether the approach is made simultaneous or sequential and under the same or different anesthesia should be taken by surgeon expertise and OT backup. In most scenarios, the column with more communication should be approached first, and in the setting of equal communication, the posterior column should be approached first.

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