

FUNCTIONAL OUTCOME OF SURGICAL FIXATION OF ACETABULAR FRACTURES

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ABSTRACT

Introduction: Fractures of the acetabulum occur primarily as a result of high-velocity trauma. Anatomic reduction and stable fixation of the fracture, such that the femoral head is concentrically reduced under an adequate portion of the weight bearing dome of the acetabulum, is the treatment goal in these difficult fractures. Aim of this study was to determine the functional outcome in patients after reconstruction of displaced acetabular fractures.

Methodology: Descriptive case series was conducted from January 2013 till June 2016 in orthopaedic ward at Lahore General Hospital. 25 consecutive patients had open reduction and internal fixation of acetabular fractures performed in our orthopedic unit. Five patients were lost to follow-up. The outcome measure was noted in 20 patients after one-year follow-up using Modified Merle D'Aubigné & Postal score.

Results: Excellent result was found in 9(45%), good in 5(25%), fair in 2(10%) and poor in 4(20%) cases.

Conclusion: Complications were common and outcome was variable. Though surgical fixation remains a challenge, still it is the gold standard treatment of displaced acetabular fractures.

Key Words: Displaced acetabular fracture, Modified Merle D'Aubigné and Postal score.

INTRODUCTION

Fractures of the acetabulum occur primarily as a result of high-velocity trauma. These fractures are often associated with other life-threatening injuries. Displacement of the fracture fragments leads to articular incongruity of the hip joint that results in abnormal pressure distribution on the articular cartilage surface. This can lead to rapid breakdown of the cartilage surface, resulting in disabling arthritis of the hip joint¹. Anatomic reduction and stable fixation of the fracture, such that the femoral head is concentrically reduced under an adequate portion of the weight bearing dome of the acetabulum, is the treatment goal in these difficult fractures² since 1964, first proposed by Judet, Judet and Letournel². Only 10% of the pelvic disruptions involve the acetabulum. Posterior wall fractures are most common, comprising 24% of acetabular fractures³.

Major challenge to orthopaedic surgeon is the fixation of acetabular fractures. Complications are common with 20%-25% patients having poor functional outcome in medium term³. Surgeon's training and expertise strongly influence the decision to treat the fracture surgically, the surgical approach and the accuracy of reduction⁴. Factors known to influence outcome include a delay in surgical treatment⁵⁻⁷, the

fracture pattern^{8,9,15}, the patient's age^{10,11}, associated chondral damage to femoral head and acetabulum¹², dislocation at the time of injury¹³, associated neurovascular compromise as a result of the injury and its mechanism, and the patient's pre-existing comorbidities^{10,14}.

We present the medium term outcome of operative fixation of acetabular fractures in twenty patients followed for a minimum of one year.

METHODOLOGY

This is a prospective case series study in which we followed-up 25 displaced acetabular fractures managed surgically in our department. Patients were followed for a minimum of one year. Those lost to follow-up were excluded from the study, leaving 20 patients.

An acetabular admission protocol for all was followed; data recorded included the mechanism of injury, classification of the fracture, associated injuries, complications and comorbidities. Standard plain radiographs, including antero-posterior pelvis, obturator oblique and iliac oblique views, as well as CT scans, were obtained to assess and classify all fractures pre-operatively according to Letournel and Judet².

Intra-operatively patients were routinely catheterized. No intra-operative nerve monitoring was used. The surgical approach was determined by the pattern of the fracture and the state of the soft tissue. Kocher-langenback, ilio-inguinal or combined approaches were used. Intra-operative fluoroscopy was used to assess reduction and ensure metal work did not transgress the hip joint. In patients with pre-operative sciatic nerve palsy, intra-operative exploration of the nerve was done.

Post-operatively, three standard radiographs (anteroposterior pelvic and Judet views) were obtained to categorized the quality of reduction into three groups: anatomical, imperfect and poor using Matta's radiological principle^{1,15}. Displacement was noted in five anatomical lines (ilio-inguinal, ilio-ischial, dome, posterior wall, anterior wall) in all three standard radiographs.

Anatomical is Residual articular displacement of $\leq 1\text{mm}$ in all the three standard radiographs. **Imperfect (congruent)** is Displacement of $\leq 3\text{mm}$ in all the three standard radiographs. **Poor (incongruent)** is Displacement of $> 3\text{mm}$ in any of three standard radiographs

Post-operatively, all patients received indomethacin 25mg three times daily to reduce the risk for heterotrophic ossification for six weeks along with pain management. Some patients were given low molecular weight heparin(40mg) pre, peri and post operatively. Antibiotics (Cefuroxime) were also given initially intra-venously then per oral as required.

All patients were followed up clinically and radiologically at six weeks, twelve weeks, six months and then yearly. Functional outcome was recorded after One year post-operatively using Modified Merle D'Aubigné and Postal score^{1,16}.



RESULTS

20 out of 25 patients were followed for one year. 75% were males and 25% were females. Mean age of the patients was 38years (25-65years). 80% of the patients were from low-income background. 85% of the patients had road traffic accident while 15% had fall from height.

The functional outcome according to Modified Merle D'Aubigné and Postal score was excellent in 9 (45%) patients and poor in 4 (20%).

Table 1

Functional outcome	Excellent	Good	Fair	Poor
Modified Merle D'Aubigné and Postal score	9 (45%)	5 (25%)	2 (10%)	4 (20%)

DISCUSSION

The aim of treatment of displaced acetabular fractures is to obtain stable anatomical reduction with a functional, mobile and pain free hip¹⁵. The accuracy of reduction strongly correlates with the outcome¹⁰. A thorough understanding of the fracture pattern, impact force, position of hip and bone quality is important. Sometimes, it is necessary to accept extra-articular malalignment to achieve intra-articular anatomical reduction as plastic deformations may occur making it difficult to judge fracture lines.

The correct classification is vital in choosing the surgical approach. Judet's classification² lists five simple fractures and five most commonly associated fracture patterns. Classifying a fracture pattern is difficult as there is high intra and inter observer variability on plain radiographs¹⁷⁻¹⁹. Letournel and Judet classification² was originally based entirely on plain radiographs, which with recent advancement in CT scanning has questioned the need for Judet's oblique views²⁰⁻²².

Many factors influence the outcome following acetabular fractures. Some are those which are beyond surgeon's control like mechanism of injury, damage to femoral head, sciatic nerve injury, dislocation of femoral head, fracture pattern, associated injuries, patient's age and co-morbidities. Crucial yet controllable factors include the timing of surgery, surgical approach and quality of reduction and fixation. Restoration of articular congruity with stable fixation is the most significant predictive factor of post traumatic osteoarthritis. We found that early fixation (within 5-10 days) gives good results than those fixed late. In Letournel original series, the outcome of all reconstructions undertaken beyond three weeks was

significantly worse²³. Most of the delays were due to availability of bed, imaging problems^{5,24} and work burden of other trauma on the ward which we believe is totally unacceptable, necessitating the need of fully developed and equipped state of the art specialized pelvic trauma unit.

The quality of reduction depends on the size of gap or step^{8-10,13}. We found that accurate assessment of gaps and steps was very difficult unless intra-operative and so felt justified to use congruency as part of assessment of reduction judged on post-operative radiographs, especially for those fracture patterns revealed small gaps in articular surface of some anatomical classified reductions. We found strong correlation between reduction and outcome. In congruent group there was much higher incidence of good outcomes. Incongruent reductions correlate strongly with poor outcome¹². However excellent results have been achieved even with poor reduction provided the step or gap is outside the weight bearing area²⁵.

We found that posterior column fracture, T-shaped fracture and associated damage to femoral head and cartilage have negative impact on outcome. This suggests that biology of the fracture (primary articular cartilage damage) has now become the limiting factor. The role of primary arthroplasty may become more important in carefully selected patients. So, a question should arise in every orthopaedic surgeon that is this fracture worth fixing or should primary arthroplasty a more suitable option?

Complications include infection, nerve damage, deep vein thrombosis, heterotopic ossification and osteoarthritis. To reduce the risk of infection antibiotics were given and patients were followed up with regular ESR and CRP check. Although intra-operative nerve monitoring was not used but it is useful in reducing the risk of iatrogenic sciatic nerve damage during posterior approach. Obturator nerve is vulnerable during anterior ilio-inguinal approach. Delayed sciatic nerve palsy could be due to hematoma formation in sciatic notch. Patients receiving low molecular weight heparin did not develop deep vein thrombosis but it is a known complication. Osteoarthritis remains the primary complication according to Matta et al¹⁵ following acetabular fracture. The overall incidence of osteoarthritis was 26.6% by Giannoudis et al³. We feel that the length of follow-up is important, as arthritis is likely to develop in even perfectly reduced fractures. Longer follow-up ideally for life is required to understand the natural history of perfectly reduced fractures.

There are several limitations to our study. The study is underpowered and the number of patients may

be insufficient to draw concrete conclusions. However since the study is still ongoing we will be enrolling more patients and follow-up time targeted as minimal 3 years so as to present a comprehensive study of these displaced acetabular fractures.

CONCLUSION

Present study indicates that 70% patients have good to excellent functional outcome, however a longer follow up and an appropriately powered study is essential to make other conclusions regarding these fractures. At present the aim should be to achieve surgically, anatomical reduction and stable fixation of displaced acetabular fractures as early as possible, thereby maintaining the congruence of the joint.

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