

## Study of Acetabular Fractures Treated With Reconstruction Plate

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### ABSTRACT-

**BACKGROUND:** The purpose of this study is to analyze the use of reconstruction plates as an effective measure to get a near anatomical reduction and stable fixation in acetabular fractures and document their clinical, radiological and functional outcome.

**MATERIAL AND METHODS:** A prospective study carried out under the Department of Orthopaedics, S.R.G. medical college Jhalawar. The study consists of 20 patients of fracture acetabulum who were treated by ORIF with a reconstruction plate and fulfilling the inclusion criteria operated at our institute by or under the supervision of senior professors of the Orthopaedics department from June 2019 to December 2020. The patients were followed up at 2week, 4week, 3 months, 6 months & 1 year clinically and with radiographs.

**RESULT:** All the patients had a good union. Only one patient was with a displacement of fragment and further going in malunion. According to the modified merle d'Aubigne' score, the functional outcome was excellent in 11 cases, good for 7 cases and fair for 2cases. None of the reconstruction plates experienced any hardware failure.

**CONCLUSION:** The reconstruction plate is quick and easy to apply to acetabular fractures. It can be secured, providing a strong tension buttress that maintains reduction. We recommend this plate as the implant of choice for the internal fixation of acetabular fractures.

**KEYWORDS-** acetabular fractures, reconstruction plate, modified Merle d'Aubigné score.

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### I. Introduction

Remedy of acetabular fractures is a complex and difficult place of orthopedics that has been recently refined and the pelvis and acetabulum fractures had been undergone less conservative and extra surgical remedy.

To allow early mobilization, to improve functional outcomes, and to lessen the risk of debilitating arthritis, in preference to conservative management, open reduction and internal fixation (ORIF) is the gold standard for the fracture acetabulum [1, 2]. Letournel-Judet is one of the maximum typically used clinical classes of acetabular fractures. Following acetabular double-column precept, acetabular fractures are divided into 10 classes which include 5 principle fractures and 5 complex fractures.

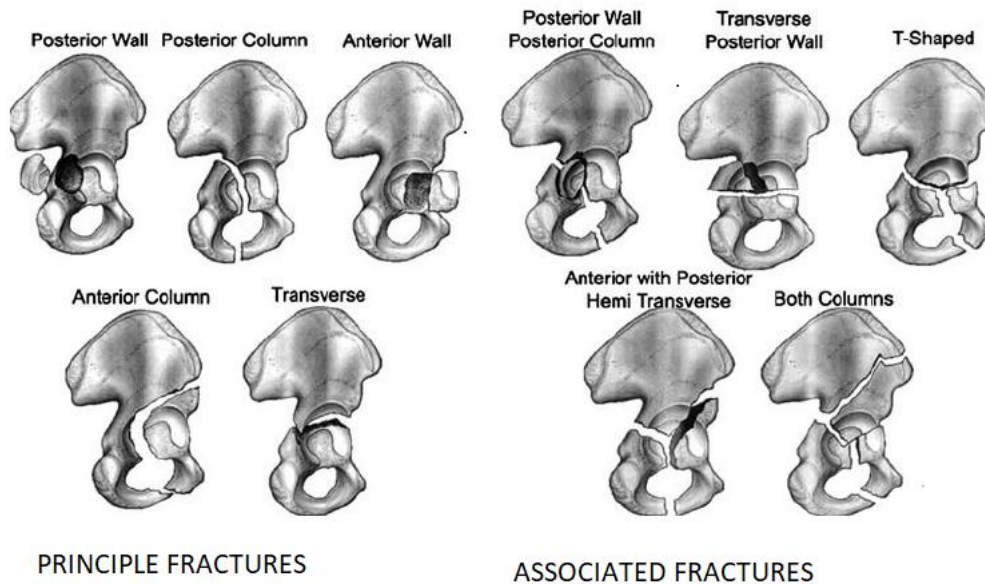
Simple fractures –

1. Posterior wall fracture
2. Posterior column fracture
3. Anterior wall fracture
4. Anterior column fracture
5. Transverse fracture

Associated fracture-

1. Posterior wall and posterior column 2. Transverse and posterior wall fracture
2. T-shape fracture
3. Anterior column and posterior Hemi-transverse fracture
4. Both column fractures

**Figure 1** classification of the acetabulum



Judet and Letournel had been the first to record surgical remedies at the pelvis and acetabulum [3]. In their first article, they recommended either using plates and screw construct or screws only for fixing acetabular fractures. Tile and Pennal recommend dynamic compression plates for the fixation of acetabular fractures [4].

The literature has a wealth of data on various additives of surgical strategies however little is known about the kind of implants used, aside from those that explain using spring plates for posterior wall acetabular fractures [5]. Many papers point out the use of reconstruction plates for fractures concerning the acetabular wall or columns [6 - 10]. Initially, the AO small fragment plate was used for this fixation, but because of restricted length and the necessity to bend this plate in the plane of its flat surface, which proved difficult, the reconstruction plate was introduced, at first just with increased length and later with a choice of pre-contoured plates.

At our center, we found pre-contoured reconstruction plates which can be most effective in the anterior and posterior column and wall of the acetabulum. The reconstruction plates work pleasant inside the flat location of the posterior column, in addition to the complicated configuration of the acetabular posterior wall. For the posterior wall fracture, we use a low profile reconstruction plate that is easy to contour.

### AIM

The reason for this have a look at is to analyze using reconstruction plates as a powerful degree to get a close to anatomical reduction and strong fixation in acetabular fractures and record their medical, radiological and functional outcome.

## II. Material And Methods

A prospective study was carried out under the Department of Orthopaedics, S.R.G. medical college Jhalawar. The study consists of 20 patients of fracture acetabulum who fulfilling the inclusion criteria operated at our institute by or under the supervision of senior professors of the Orthopaedics department from June 2019 to December 2020.

### INCLUSION CRITERIA

1. Male and female patients with acetabular fractures who have given their consent for surgery.
2. Patients who are medically fit for surgery.

### **EXCLUSION CRITERIA**

1. Patients unfit for surgery.
2. Patients not willing for surgery.
3. Associated fracture of neck of femur.
4. Associated with neurovascular injuries.

All the patients were subjected to detailed history and clinical examination with emphasis on age, sex, mode of injuries, fracture pattern, medical comorbidities, other associated bony injuries, neurovascular injuries, duration reporting after injuries, and the time interval between injuries and surgery.

X-rays, AP views, and Judet were taken to diagnose and differentiate fractures. In every case, a CT scan and 3D reconstruction were performed before surgery.

Pre-operatively all patients were given chemoprophylaxis against DVT and preoperative intravenous cephalosporin antibiotics were given.

### **III. Operative Procedure**

All patients were taken under spinal anesthesia.

All posterior column and wall fractures were plated with the patient in a lateral position [Figure2] and through a posterior (Kocher-Langenbeck) approach [Figure3] using a reconstruction plate [Figure4].

Care was taken at the time cutting to external rotators to avoid damage to the posterior ascending branch of the medial femoral circumflex artery, which supplies the femoral head. Associated anterior column fractures were managed by the cc screw by the same approach or sometimes required an additional anterior approach for reconstruction plate fixation.

If the fracture extended superiorly into the dome, a trochanteric osteotomy was performed to allow additional exposure.

For isolated fracture of the anterior column, we used the anterior approach (ilioinguinal ).

Care was taken at the time of placing the screw so as not to place any screws into the joint. Passive flexion, extension, and rotation of the hip were done to ensure a smooth range of movement. Intra-operative c-arm imaging was used [Figure 5].

Routine closure of the wound was done in layers.

Figure2-Position



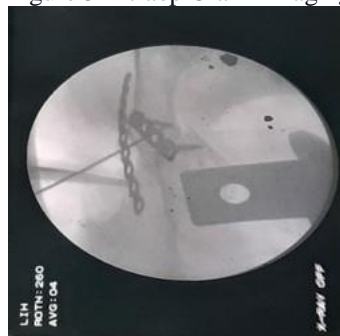
Figure3-Incision



Figure4- Plate application



Figure 5-Intraop C-arm imaging



Follow-up was done on 2week, 4week, 3month, 6 months and 1 year. The patient was assessed clinically and radiologically. Weight-bearing at the affected side for three months is no longer allowed. Radiographs are checked for the union, for any signs of the plate break or screw removal, or any loss of the fracture fragment reduction. Weight-bearing was allowed based on radiological observations. The functional result was assessed following the revised Merle d'Aubigné score.

#### **Merle d'Aubigné score**

This scoring system was mainly evaluated the hip joint from three aspects including pain, range of movement and walking ability. The rankings have been labeled as excellent (18 points), appropriate (15-17 points), fair (13-14), or poor (<13).

#### **IV. Result**

A total of 20 cases of acetabular fractures were operated as per our study protocol. There were 14 males (70%) and 6 females (30%) out of 20. Males are more than double that of females. All the cases belonged to ages between 17 years to 68 years. The average age of the study population was 36 years, with the males being slightly younger than the females. The cause of the injury was a high-risk car accident in most cases. The distribution of fractures is shown in Table1.

Type of fracture	No. of cases
Posterior Wall fracture	7
Posterior column fracture	5
posterior wall plus posterior column	4
Both column fracture	4

The common time interval among trauma and surgical procedure was 3 days. The average time during surgery was 150 minutes. The average duration of surgery where reconstruction plates were used to fix the posterior column and wall was 140 minutes compared to 210 minutes where Additional ilioinguinal approaches were required in 2 patients to address the associated anterior column fractures.

Radiological evidence of union was seen in 16 cases at 3month follow-up and in the remaining 4 cases at 6-month follow-up in which one was malunion due to loss of reduction but the functional outcome was fair. Any hardware failure was not noted with reconstruction plate fixation.

**Case1**

Figure6- Preop



Figure7 Immediate postop



Figure8- 3month follow-up



Figure 9 -6month follow up



**Case2**

Figure 10-Preop



Figure11- Immediate postop



Figure12- 3month follow up



Figure 13 -6month follow up



For functional outcome using modified merle d'Aubigne' score results were excellent in 11 cases, good in 7 cases and fair in 2 cases.

Out of 7 posterior wall fractures, 4 patients showed excellent results, 2 showed good outcomes and one patient showed fair outcome.

In the case of posterior column fracture, all showed excellent outcomes.

Out of 4 patients with posterior wall plus column fracture, 1 showed the excellent result, 2 showed good results and one showed fair outcome.

Out of 4 patients with both column fractures, 1 showed excellent results and 3 patients showed good outcomes.

## **V. Complications**

In one case of posterior wall plus posterior column fracture, after 6 months, there was AVN of femur head noted for which we did total hip arthroplasty. In two cases one each of posterior wall plus posterior column and posterior wall fracture, there was the stiffness of hip joint noticed for which we give physiotherapy and both cases were relieved by the physiotherapy.

## **VI. Discussion**

As expected, there have been two times as many men injured as women, indicating their most risky behavior. A lot of these sufferers were injured in car accidents, highlighting the risks of our roads and the excessive energy required to purpose these fractures.

Acetabular fractures classify with the aid of Letournel and he recognized 5 easy patterns and five associated samples. In number one sample part of one column or all of 1 column of the acetabulum is broken. Five associated patterns consist by way of at least fundamental fractures [1]. Because of this, the corresponding patterns are considered too complex. In an examination of acetabular fractures, Matta cited that in 96% instances anatomic discount is feasible in fundamental fracture patterns and sixty 4% times in associated fracture patterns [11].

Herman C. Epstein published some studies of the first effect on acetabular fracture pattern describe using letournel classification [12]. He has proven superior results with the removal of incarcerated fragments and a discount in open reduction and internal fixation compared with a closed reduction[13].

Many authors have advised their surgical treatment results for posterior wall acetabular fractures Letournel discovered 75% incredible effects in 87 fractures [14]. Matta said 76% of 20 years survival in 107 acetabular posterior wall fracture treated operatively [15].

In some other evaluations of ninety-four patients handled operatively followed for 5 years, the authors said 10.6% poor clinical outcomes in posterior wall fracture of acetabulum[16].

Letournel showed 81.82% outstanding outcomes in its cohort of 492 sufferers with posterior column fractures [14]. Matta showed 100% of twenty years of survival in a cohort of 14 treated operatively in acetabular fractures [15]. while a posterior column fracture is associated with a posterior wall fracture, a 20 years survival rate decreases to 85% (26/816 fracture). Radiological evidence of union was seen in 16 cases at 3month follow-up and in the remaining 4 cases at 6-month follow-up in which one was malunion due to loss of reduction but the functional outcome was fair

The main concern regarding the use of this plate is its strength and ability to maintain the reduction in an area of high demand. In contouring the plate we believe that it has sufficient flexibility to provide a 'tension buttress' effect when secured to the posterior wall. The plate is bent to approximate the shape, and then secured to the ischial tuberosity and the ilium superior to the acetabulum; it then lies against the posterior wall with a gap under the plate at the sub-cotyloid fossa. A screw placed through the plate into this fossa will pull the plate

down, forcing it to conform to the posterior wall providing an even pressure fit or ‘tension buttress’ effect, locking the fracture wall fragments into place.

### **VII. Conclusion**

The reconstruction plate is quick and easy to apply to acetabular fractures. It can be secured, providing a strong tension buttress that maintains reduction. We recommend this plate as the implant of choice for the internal fixation of acetabular fractures. In cases involving the posterior wall, it is recommended that a separate reconstruction plate (thin /low profile) be used for the posterior wall which can be easily contoured according to the intraoperative requirement.

### **References**

- [1]. Letournel E. Acetabulum fractures: classification and management. *Clin Orthop Relat Res.* 1980;151:81–106.
- [2]. Mardian S, Rau D, Hinz P, et al. Acetabular fractures in advanced age - current knowledge and treatment options. *Acta Chir Orthop Traumatol Cech.* 2017;84(4):241–6
- [3]. Judet R, Judet J, Letournel E. Fractures of the acetabulum: Classification and surgical approaches for open reduction: a preliminary report. *J Bone Joint Surg Am.* 1964;46:1615-75.
- [4]. Tile M, Pennal G. Pelvic disruption: Principles of management. *Clin Orth and Related Research* 1980 Sept;151: 56-64.
- [5]. Richter H, et al. The use of spring plates in the internal fixation of acetabular fractures. *J Orthop Trauma* 2004;18:179-181.
- [6]. Letournel E. The treatment of acetabular fractures through the ilioinguinal approach. *Clin Orth Related Research* 1993 July;292:62-76.
- [7]. McMaster J, Powell J. Acetabular fractures. *Current Orthopaedics* 2005;19:140-54.
- [8]. Keela M, Trentz O. Acute management of pelvic ring fractures. *Current Orthopaedics* 2005;19:334-44.
- [9]. Petsatodis G, et al. Surgically treated acetabular fractures via a single posterior approach with a follow-up of 2-10 years. *Injury, Int. J. Care Injured* 2006.
- [10]. Schopfer A, DiAngelo D, Hearn T, et al. Biomechanical comparison of methods of fixation of isolated osteotomies of the posterior acetabular column. *Int Orthop* 1994;18:96-10
- [11]. Matta JM. Fractures of the acetabulum: accuracy of reduction and clinical results in patients managed operatively within three weeks after the injury. *J Bone Joint Surg Am.* 1996;78(11):1632–45.
- [12]. Epstein HC. Posterior fracture-dislocations of the hip: comparison of open and closed methods of treatment in certain types. *J Bone Joint Surg.* 1961; 43(8):1079–98.
- [13]. Epstein HC. Posterior fracture-dislocations of the hip – long-term follow-up. *J Bone Joint Surg Am.* 1974;56-A:1103–27.
- [14]. Letournel E, Judet R. *Fracture of the acetabulum.* 2nd edition. Berlin: Springer-Verlag; 1993.
- [15]. Tannast MM, Najibi SS, Matta JM. Two to twenty-year survivorship of the hip in 810 patients with operatively treated acetabular fractures. *J Bone Joint Surg Am.* 2012;94(17):1559–67.
- [16]. Moed BR, Carr SE, Watson JT. Open reduction and internal fixation of posterior wall fractures of the acetabulum. *Clin Orthop Relat Res.* 2000;377:57–67.