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Original Research Article

Evaluation of Results of Open Reduction and Internal Fixation of Acetabular Fractures

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Abstract

Background: Acetabular fractures are a rather infrequent injury. Early accounts of acetabular fractures are based on postmortem results of individuals who had experienced substantial trauma, indicating the severity of these injuries. The current study aimed to evaluate the results and functional outcome of open reduction and internal fixation in patients with complex acetabular fractures.

Methods: This cross-sectional interventional study was conducted in a tertiary care hospital. The study comprised a total of n=25 individuals with the diagnosis of an acetabular fracture. The main cause of acetabular fractures was a motor vehicle accident. Surgery was used to treat every case, using plates and screws. Radiologically and functionally, the outcome was evaluated using the Modified Merle D'Aubigne Score. Patients were followed up on an average for 18 months after surgery.

Results: In the cases of transverse fractures n=8 total we found excellent results in n=4(50%) cases and n=3(37.5%) cases and n=1(12.5%) cases. In the cases of transverse with the posterior wall, we found no case in the excellent category and n=3(60%) cases with good results and n=1(20%) cases with fair results, and n=1(20%) cases. An anterior column with posterior hemitransverse in n=3 out of which n=1(33.33%) with excellent results and n=1(33.33%) cases each in fair and poor results.

Conclusion: We found favourable functional results can be achieved in complex acetabular fractures treated with open reduction and internal fixation. Utilizing non-extensible methods alone is sufficient to result in a satisfactory fracture reduction with fewer problems. The fractured fragments must be reduced anatomically wherever feasible, fixed tightly, and mobilized as soon as possible for improved function, which are not attainable using conservative methods.

Keywords: Acetabular fractures, Arthroplasty, replacement, hip, Hip joint fractures, Functional outcome

Introduction

The survival rate following severe pelvic injuries has increased over the past few decades because of advancements in prehospital care, resuscitation, and transfer as well as standardized treatment methods. The acetabulum is only involved in 10% of

pelvic disturbances. [1] The majority of acetabular fractures, or 24% of them, are posterior wall fractures. High-energy trauma is the main culprit in younger people. In most cases, acetabular fractures occur in addition to other fractures. Acetabular fractures were a major orthopedic issue for which the available treatments were woefully insufficient, leaving many patients in excruciating pain. Because many patients are treated non-operatively, these fractures were frequently feared due to poor outcomes. [2] However, a lot of other people continued to report having success with conservative therapy, and it was thought that operational treatment would have problems like heterotrophic ossification and insufficient reduction. Recently, it has become clear that accurate fracture reduction is crucial to achieving a positive outcome. Open reduction is preferable to closed reduction, which caused the articular surface of the hip joint to become misaligned and left patients in excruciating pain with a stiff and painful hip joint as a result. [3] Acetabular fractures have become increasingly common quickly, and this combined with patients' high expectations has encouraged orthopedic surgeons all around the world to do more research and analyze them. The best method for treating unstable and irregular acetabular fractures is surgery. The major objectives of surgery for an acetabular fracture are joint stability and early mobilization, which can be accomplished by anatomic reduction and stiff internal fixation. [4] One intriguing area of orthopedics that is always being improved is the treatment of acetabular fractures. There is a noticeable learning curve. Acetabular fractures frequently co-occur with injuries to the pelvis and lower limbs, which may have an impact on clinical outcomes, surgical choices, and therapeutic options. Treatment choices are also influenced by factors such as patient age, fracture stability, the presence of co-morbidities and osteoporosis, as well as surgeon expertise. [5] Anatomic rebuilding of the articular surface and early mobilization should be the treatment's objectives. Only when the acetabulum is sufficiently exposed and rigorous internal fixation is performed can this objective be accomplished. Treatment for displaced pelvic fractures involving the acetabulum is challenging. With closed techniques, it is challenging, if not impossible, to entirely repair the articular surfaces and achieve enough stability for early hip mobility. Simple acetabular fracture therapy is well-recognized and extensively researched. Treatment for complicated acetabular fractures is challenging because it necessitates the manipulation of both acetabulum columns for reduction and fixation. This study aims to analyze the results and functional outcomes of open reduction and internal fixation in patients with complex acetabular fractures.

Material and Methods

This cross-sectional study was conducted in the Department of Orthopedics, Prathima Institute of Medical Sciences, Naganoor, Karimnagar. Institutional Ethical approval was taken for the study. Written permission was obtained from all the participants of the study.

Inclusion criteria

1. Those with a diagnosis of complex acetabular fractures
2. Closed fractures
3. Aged 18 years and above
4. Males and females
5. Operated in our Hospital
6. Those willing to participate in the study and available for follow up

Exclusion criteria

1. Open injuries
2. Simple fractures
3. Fractures greater than 3 weeks old
4. The patient operated on within the last six months

A general evaluation and resuscitation were performed as soon as the patients arrived at the emergency room. The whole skeletal survey and any accompanying injuries, particularly vascular and nerve damage, were evaluated when the vital parameters had stabilized. Anteroposterior, judet views of the acetabulum were used for radiological evaluation, as well as computed tomography with an optional 3-d reconstruction of the acetabulum. Under intravenous anesthesia, closed reduction was performed on dislocated patients, and skeletal traction was used on all patients. According to Damage Control Orthopaedics, patients had surgery for 5 to 10 days. After finishing the clinical and radiographic assessment, preoperative planning was developed based on the nature, displacement, and comorbid injuries of the fracture. Based on fracture displacement, preoperative exposure for surgery was chosen. For posterior fractures, the Kocher Langen-beck technique was employed, and for anterior fractures, the anterior ilioinguinal approach. After lowering and fixing one column, an image intensifier evaluated the reduction of the other column and determined if it was necessary to expose the other column. Schanz pins were inserted into the trochanter, ischial tuberosity, and iliac crest during the posterior approach allowing simultaneous manipulation. To make the reduction and holding easier, a variety of reduction clamps are offered. To manage and reduce, a Schanz pin or a Farabeuf clamp was inserted into the iliac crest during the anterior approach. The Picador ball spike pusher and Matta's quadrangular clamps in various sizes and offsets are crucial tools in acetabular surgery. Lag screws were used to fix reduction whenever practicable. Lagging was accomplished using 3.5 mm cortical screws with washers or 4 mm cancellous screws. As a neutralization plate, 3.5mm reconstruction plates are employed.

Preoperative antibiotics and a 5-day postoperative period were provided to all patients. On the second post-operative day, the drain was removed. Incision sutures were removed between days 12 and 14. The day following surgery, a prescription for oral Aceclofenac 100 mg TDS was given for 6 weeks. When an anterior approach is employed as DVT prevention, low molecular weight heparin was administered for 7 days. The second postoperative day saw the beginning of passive mobilization. Active motions gradually began in response to discomfort. Weight-bearing was permitted since the fracture mainly consolidates in the third or fourth month. For the first six months, a radiological and functional evaluation was performed monthly, and then every three months. At each follow-up, patients in our research were evaluated using Matta's radiographic examination post-operatively as well as the modified Merle d' Aubigné and Postel Hip Score. [6]

Results

A total of n=25 cases were included in the study out of which n=20(80%) were males and n=5(20%) were females. The male-to-female ratio was 4:1. The maximum number of cases in the study was between the age group 31 – 40 years and the least number were in the age group 18 – 20 years and 51 – 60 years. The youngest patient was a male aged 19 years and the oldest was male aged 59 years. The mean age of the group of cases in the study was 34.5 ± 7.5 years the details have been depicted in table 1.

Table 1: Age-wise distribution of cases included in the study

Age in years	Frequency	Percentage
18 - 20	2	8
21 - 30	7	28
31 - 40	10	40

41 - 50	4	16
51 - 60	2	8
Total	25	100

Most of the cases of fractures were due to Road traffic accidents n=21(84%) of cases followed n=4(16%) cases were falls from a height. The transverse fracture was the most common type of fracture in n=8(32%) in this study. An anterior column with posterior hemitransverse was the least common type in n=3(12%) the details have been depicted in figure 1. N=9(36%) patients had associated skeletal injuries. One patient had a sciatic nerve injury have been depicted in table 2.

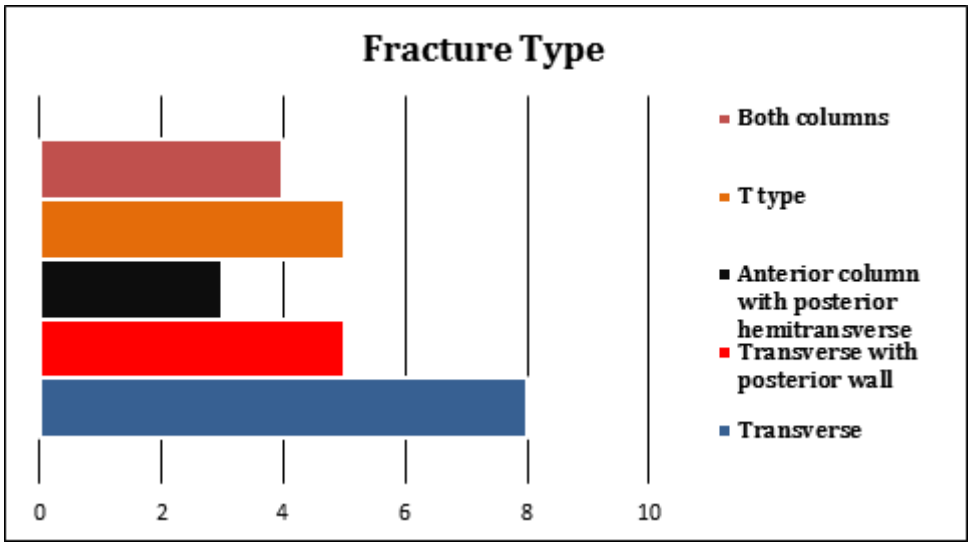

Figure 1: Showing the distribution of cases based on the type of fractures

Table 2: Showing the distribution of cases with associated injuries

Associated injuries	Frequency	Percentage
Fracture of clavicle	1	4.0
Fracture of Distal radius	1	4.0
Fracture of superior pubic rami B/L	2	8.0
Fracture of Neck of Contralateral Femur	1	4.0
Intertrochanteric Fracture of ipsilateral Femur	1	4.0
Fracture shaft of contralateral Femur	1	4.0
Fracture supracondylar femur ipsilateral side	1	4.0
Fracture of both bones contralateral leg	1	4.0
Fracture Medial malleolus contralateral side	1	4.0
Sciatic Nerve palsy	1	4.0

Most of the patients were operated by the Kocher Langenbeck approach N =21(84%) cases and n=4(16%) cases were operated by the ilioinguinal approach. N=4(16%) cases were operated by the combined approach depicted in figure 2. In contrast to pelvic injuries, all patients were hemodynamically stable at the time of admission. In our study, the average surgical time delay was 5 days ranging from 6 to 12 days. The average surgical time was 135 minutes ranging from 90 minutes to 240 minutes.

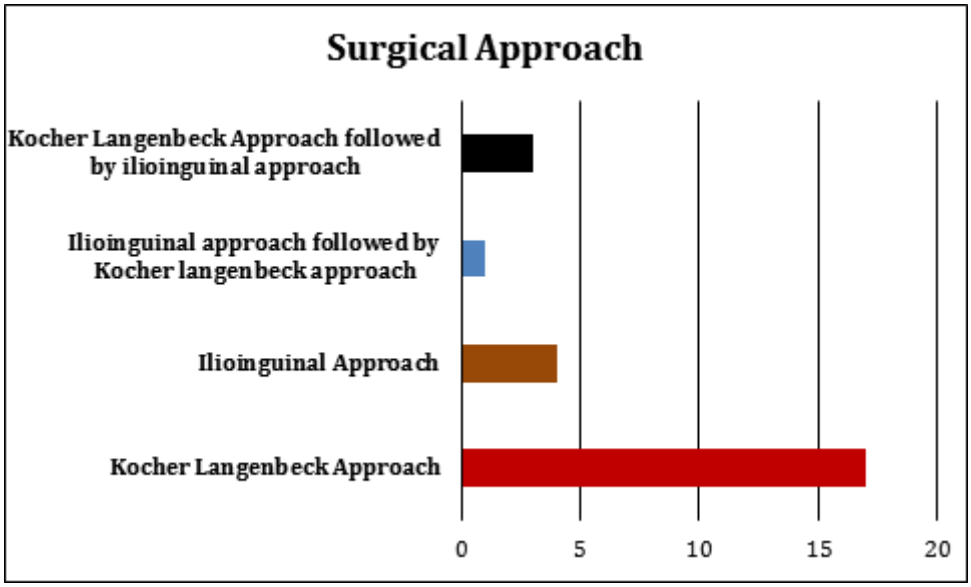

Figure 2: Surgical approach followed in the cases of the study

In the cases of transverse fractures n=8 total, we found excellent results in n=4(50%) cases and n=3(37.5%) cases, and n=1(12.5%) cases. In the cases of transverse with the posterior wall, we found no case in the excellent category and n=3(60%) cases with good results and n=1(20%) cases with fair results,, and n=1(20%) cases. An anterior column with posterior hemitransverse in n=3 out of which n=1(33.33%) with excellent results and n=1(33.33%) cases each in fair and poor results. In T type of fractures out of n=5 cases n=1(20%) cases with excellent results and n=2(40%) cases were with good and fair results. Both column fractures were n=4 cases and n=3(75%) cases with excellent results and n=1(25%) cases were in good category the details have been depicted in table 3.

Table 3: Functional evaluation by Modified Merle'dAubinge and Postel score

Fracture	Frequency	Results			
		Excellent	Good	Fair	Poor
Transverse	8	4	3	1	0
Transverse with posterior wall	5	0	3	1	1
Anterior column with posterior hemitransverse	3	1	1	1	0
T type	5	1	2	2	0
Both column	4	3	1	0	0

N=5(20%) patients have encountered operative complications. One patient operated by ilioinguinal approach had superficial infection which settled with antibiotics. One patient had a deep circumflex vein tear managed by ligation following which he developed DVT that resolved with heparin.

Discussion

There have been many studies on the management of uncomplicated acetabular fractures, but nothing has changed over time. Treatment options for complicated acetabular fractures are many and are becoming improved over time. Treatment for complicated acetabular fractures is challenging because it necessitates reducing both columns using a single or double technique. In this study the mean age of the cases was 34.5 ± 7.5 years, which is similar to findings of Routt ML Jr et al. [7] on complicated acetabular fracture like men dominated in this type of injury. Injury from automobile accidents

is the most common type. Anatomic reduction, stiff fixation, and early mobilisation, which will maintain the joint's functional state as defined by Matta JM et al., [5] are the highlights of open reduction and internal fixation. When open reduction and internal fixation are used, Pennal GF et al., [8] observed that the quality of the clinical outcome is closely correlated with the quality of the reduction that was obtained. A sufficient exposure is needed to treat a dislocated acetabular fracture with the least amount of morbidity. A perfect strategy would make it easy to visualise both the joint surface and the columns. Only the front Ilioinguinal approach and the posterior Kocher Langenbeck technique were employed. Except for four cases, we treated all the patients using a single strategy. This one strategy allows us to achieve a 65% acceptable decrease and a 94% positive result in the near term. Anatomic reduction can be achieved in 80% of instances of acetabular fractures, according to Tile, even with the best hands, depending on the nature and intricacy of the fracture. Only difficult fractures were included in our analysis, and 76% of patients had reductions that were adequate. A study enumerated the elements that affected the results and 6-degree initial displacement, harm to the femoral head or superior weight-bearing dome, level of hip joint instability brought on by posterior wall fracture, suitability of open or closed reduction, and late complications like AVN, heterotrophic ossification, chondrolysis, or nerve injuries are evaluated. [9] In this study, the functional result was lowered by a related posterior wall fracture. 5.6% of AVN in posterior methods were reported by a meta-analysis. [10] An instance of femoral head avascular necrosis leading to a poor result (5%) occurred in our investigation. At the 8-month follow-up, the patient with the AVM underwent complete hip replacement.

High rates of complications have been observed for extensile techniques around the hip joint. The adoption of the Triradiate method resulted in a 53% incidence of heterotopic ossification while the Extended iliofemoral approach resulted in an 86% incidence. In our investigation, no instances of heterotopic ossification were found in the follow up examinations. According to Guo JJ et al., [11] heterotopic ossification has been documented as high as 20% in non-extensive techniques utilised for complicated fractures. Giannoudis et al., [10] observed that 8% of posterior approaches had iatrogenic sciatic nerve palsy. One incidence of sciatic nerve palsy in the posterior approach is reported in our study and there was one instance of DVT in the anterior ilioinguinal approach. We encountered a case of anterior intra-articular screw penetration; however, the patient experienced no symptoms and had a very positive functional result. When compared to other studies the rate of complications is quite low. [5, 7] The operating time and average blood loss of the non-extensile techniques we recommended are comparable to those described by other similar studies. The patient with the lowest score had a posterior hemitransverse fracture that had been treated by the Kocher-langenbeck method and had resulted in avacular necrosis of the femoral head. [12] Despite the fact that our study only included a smaller sample of n=25 patients, we were nevertheless able to achieve 92% good to satisfactory results using modified Merle d'Aubigne and Postel rating systems [6] due to effective preoperative planning, the use of non-extensive methods, and early rehabilitation.

Conclusion

Within the limitations of the current study, we found favourable functionals result can be achieved in complex acetabular fractures treated with open reduction and internal fixation. Utilizing non-extensible

methods alone is sufficient to result in a satisfactory fracture reduction with fewer problems. The fractured fragments must be reduced anatomically wherever feasible, fixed tightly, and mobilized as soon as possible for improved function, which are not attainable using conservative methods. Better results can be achieved with good preoperative planning, non-extensive exposure, correct reduction, firm fixation, and early rehabilitation.

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