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Prospective study of functional outcome in surgical management of posterior column or posterior wall of acetabular fracture by open reduction and internal fixation

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Abstract

Background: Acetabular fractures remain one of the most difficult Orthopaedic injuries to treat successfully. 80% of the acetabular fractures result from high-energy trauma like motor vehicle accidents and 10% falls from a significant height. Posterior wall fracture with or without dislocation are the most common type acetabular fracture accounting for a quarter to a third of all acetabular fractures. Unsatisfactory clinical results occur in more than 80% of patients treated non-surgically. Recently it has become obvious that accurate reduction of fracture is an important factor in achieving satisfactory outcome and open reduction is better than closed reduction. Operative management usually offers the best chance of preserving long-term joint function and early mobilization but only if an anatomically reconstructed acetabulum is achieved.

Material and Methods: This is a Prospective Study of 20 Patients with posterior wall or posterior column acetabular fracture treated surgically with open reduction and internal fixation with plates and screws by Kocher Langhenbeck approach. The present study was conducted in the department of Orthopaedics at Sanjay Gandhi Institute of Trauma and Orthopaedic and followed up for a period of 18 months.

Results: The mean follow up period ranged from 6 weeks to 18 months. All the fractures were united at an average of 16 weeks and mean Harris hip score at the end of 1 year was 85.8. There was 1 superficial wound infections which was treated with intravenous antibiotic and wound healed with secondary intention and 1 case had foot drop post-operatively treated with foot drop splint recovery occurred after 6 month postoperatively.

Conclusion: Good to excellent results were achieved in 75% of total cases. Hence we conclude that management of posterior wall or posterior column of Acetabular fracture is best achieved by means surgical approach by open reduction internal fixation with plates and screws.

Keywords: Recon plate, ORIF, posterior wall, posterior column

Introduction

Acetabular fractures remain one of the most difficult orthopaedic injuries to treat successfully [1]. One of the major advances in orthopaedic traumatology is the treatment of acetabular fracture. Until recently all acetabular fracture were treated primarily by closed method. Acetabular fracture are complex fractures and to achieve optimum results require experience. Fracture of acetabulum are very difficult to treat because

- Difficult to understand fracture pattern
- Difficult surgical approach
- Difficult in achieving anatomical reduction

Conservative treatment of acetabular fractures has been criticized because of inability to restore joint congruity, thereby causing increased incidence of osteoarthritis [8]. As the medical science has advanced and the diagnostic tools like the CT scan have helped to analyze 3D dimension disturbance in normal anatomy and to plan the surgical management accordingly

Hence, the outcome of surgically managed acetabular fracture has been found to be excellent 80% of the acetabular fractures result from high-energy trauma like motor vehicle accidents and 10% falls from a significant height [2]. Injuries most frequently occur in young and active subjects and are usually caused by high impact trauma, particularly road traffic accidents [3].

Posterior wall fracture with or without dislocation are the most common type acetabular fracture accounting for a quarter to a third of all acetabular fractures [7].

Recently it has become obvious that accurate reduction of fracture is an important factor in achieving satisfactory outcome and open reduction is better than closed reduction [3, 7]. Joint stability and early mobilization are the main goals of the surgery and achieved by anatomic reduction and rigid internal fixation using reconstruction plates, spring plates, cannulated cancellous screws alone, Cable wire fixation, percutaneous fixation techniques are combination of various implant with plates and screws.

Most commonly used implant for treatment of posterior acetabulum fractures are reconstruction plate which can be contoured and bend along contour of acetabulum with combination of cannulated cancellous screws [3, 4]. Operative management usually offers the best chance of preserving long-term joint function and early mobilization.

Aim and objectives of the study

To evaluate the functional outcome of management of posterior column or posterior wall fracture of acetabulum by open reduction and internal fixation.

Methodology

Source of data

Patients admitted with posterior columnar or posterior wall of acetabulum fracture to Sanjay Gandhi Institute of Trauma and Orthopaedic, Bengaluru during the course of study.

Method of collection of data

- A. Study design: Prospective study
- B. Study period: November 2018 to September 2020
- C. Place of Study: Sanjay Gandhi Institute of Trauma and Orthopedics, Bengaluru.
- D. Sample size: Sample size of 20
- E. Inclusion criteria:
 1. Willingness and written informed consent of the patient to participate in the study
 2. Patient more than 18 years of age of either sex
 3. Willingness for surgery of patient with posterior column or posterior wall fracture of acetabulum with open reduction and internal fixation
- F. Exclusion criteria
 1. Patient with pathological fracture
 2. Previous history of hip surgery
 3. Patient medically unfit for surgery
 4. Patient with congenital anomaly and abnormal pelvis
 5. Patient with poliomyelitis and neurological disorders
 6. Patient is not willing to give written informed consent for surgery

Patients admitted with posterior columnar or posterior wall of acetabulum fracture after meeting the inclusion and exclusion criteria were selected for the study. After prior informed consent, a pre-operative anesthetic evaluation was done. Pre-op planning of fixation was made. Under anesthesia, subjects were put in lateral position on a standard operating table.

Open reduction with internal fixation with recon plate and screws was done under c arm guidance, Kocher Langhenbeck approached was used. Suture removal was done on 14th day. Weight bearing was started depending on the fracture configuration, callus response and associated injuries. Assessment was done at OPD following postoperative visits at 3 months, 6 months and at 1 year. At follow-up visit, patient was evaluated clinically for pain score and soft tissue status and radiologically (alignment, fracture reduction and union) Complications were noted. Based on these data the final outcome was assessed according to Harris hip score and short form 36 questionnaire.



Fig 1: Patient positioning and draping



Fig 2: Kocher Langhenbeck approach

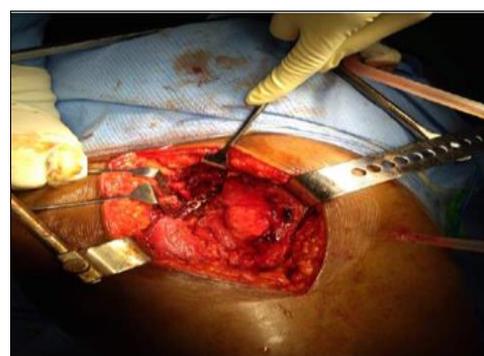


Fig 3: Fracture fixation of posterior wall of acetabulum by recon plate and screws



Fig 4: Fluoroscopic images

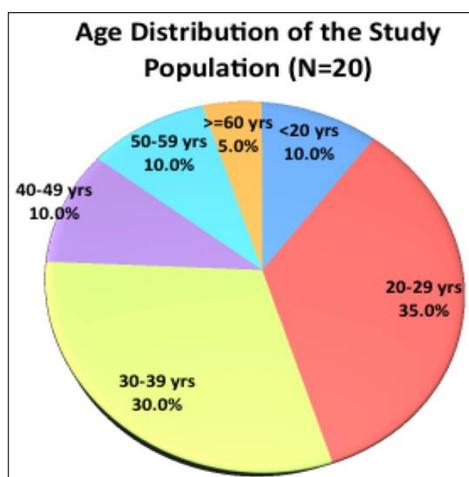
Observation and Results

Prospective study of 20 patients with posterior wall or posterior column of acetabular fractures were treated with open reduction and internal fixation with Kocher-Langenbeck approach. Results were analyzed in terms of functional outcome with Hariss hip score and short form 36 questionnaire with early and post-operative complications.

Table 1: Showing age wide distribution

| Age | No. of patients | Percent |
|------------|-----------------|---------|
| <20 yrs. | 2 | 10 |
| 20-29 yrs. | 7 | 35 |
| 30-39 yrs. | 6 | 30 |
| 40-49 yrs. | 2 | 10 |
| 50-59 yrs. | 2 | 10 |
| >=60 yrs. | 1 | 5 |
| Total | 20 | 100 |

| N | Mean | SD | Median | Min. | Max. |
|----|------|-------|--------|------|------|
| 20 | 33.6 | 12.87 | 31 | 19 | 65 |



Mean Age ± SD, 33.6 ± 12.87

Fig 5: Graph showing age wise distribution of study population

Table 2: Gender distribution

| Gender | No. of patients | Percent |
|--------|-----------------|---------|
| Male | 18 | 90 |
| Female | 2 | 10 |
| Total | 20 | 100 |

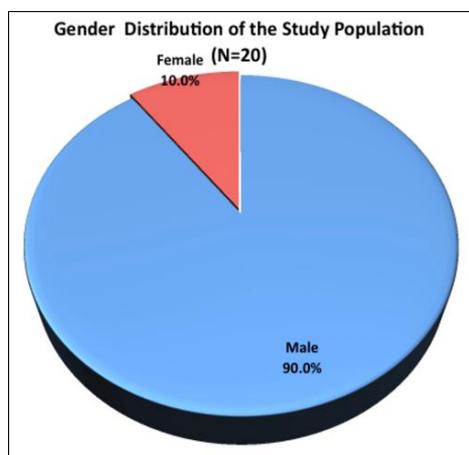


Fig 6: Graph showing gender distribution of study population

Table 3: Distribution of mode of injury

| Mode of injury | No. of patients | Percent |
|------------------|-----------------|---------|
| RTA | 19 | 95.00% |
| Fall from height | 1 | 5.00% |

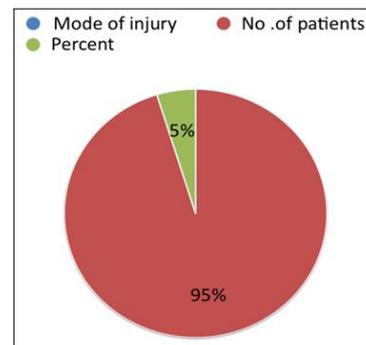


Fig 7: Graph showing mode of injury distribution

Table 4: Type of fracture distribution

| Type of fracture | No. of patients | Percent |
|------------------|-----------------|---------|
| Posterior wall | 15 | 75 |
| Posterior column | 5 | 25 |
| Total | 20 | 100 |

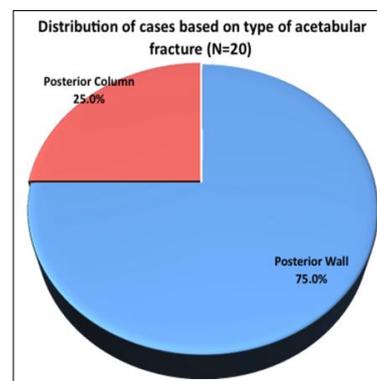


Fig 8: Graph showing type of acetabular fracture

Table 5: Complication distribution

| Complication | No. of patients | Percent |
|-------------------------|-----------------|---------|
| Nil | 18 | 90 |
| Surgical site infection | 1 | 5 |
| Foot drop | 1 | 5 |
| Total | 20 | 100 |

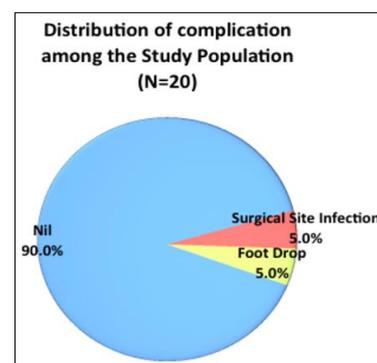


Fig 9: Graph showing complication distribution

Table 6: Harris hip score at final follow up

| Harris hip score at final follow up | No. of patients | Percent |
|-------------------------------------|-----------------|---------|
| Excellent | 8 | 40 |
| Good | 7 | 35 |
| Fair | 4 | 20 |
| Poor | 1 | 5 |
| Total | 20 | 100 |

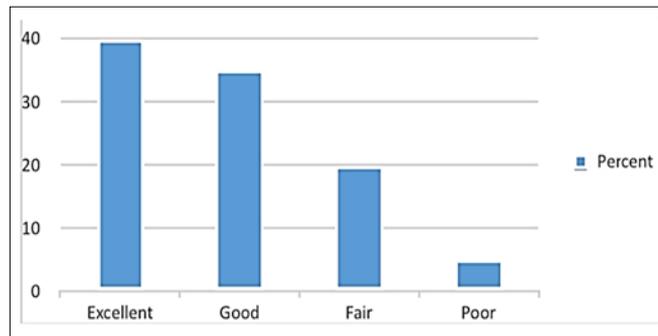


Fig 10: Distribution of cases based on functional outcome with Harris hip score

Table 7: Comparison of mean Harris hip score between different intervals

| | N | Mean | SD | Median | Min. | Max. |
|----------|----|------|-------|--------|------|------|
| 6 Week | 20 | 70 | 7.43 | 69.5 | 58 | 82 |
| 3 Months | 20 | 75.6 | 6.977 | 75.5 | 62 | 86 |
| 6 Months | 20 | 80.9 | 7.718 | 80 | 66 | 92 |
| 1 Year | 20 | 85.8 | 7.172 | 87 | 69 | 96 |

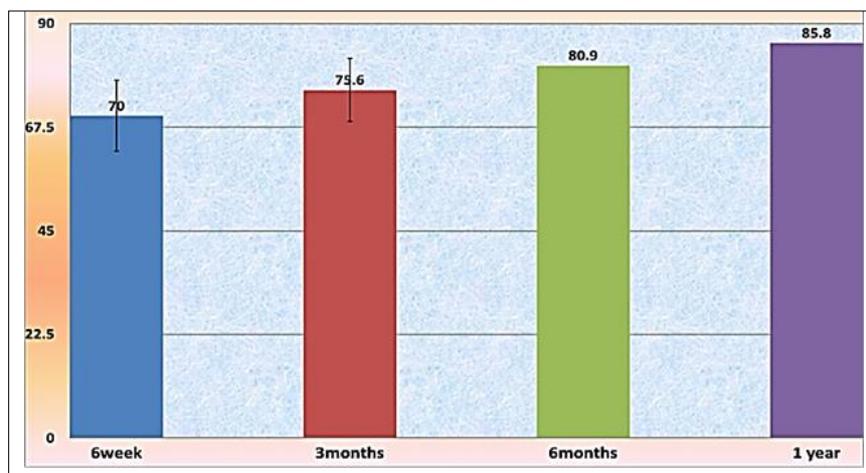


Fig 11: Comparison of mean Harris hip score between different intervals

Table 8: Comparison of mean short form 36 questionnaire scores between different intervals

| | N | Mean | SD | Median | Min. | Max. |
|----------|----|------|-------|--------|------|------|
| 6 Week | 20 | 39.1 | 2.901 | 39 | 34 | 44 |
| 3 Months | 20 | 42.1 | 2.771 | 42.2 | 37 | 46 |
| 6 Months | 20 | 45.8 | 2.542 | 46.1 | 41 | 49 |
| 1 Year | 20 | 47.3 | 1.991 | 48.1 | 44 | 50 |

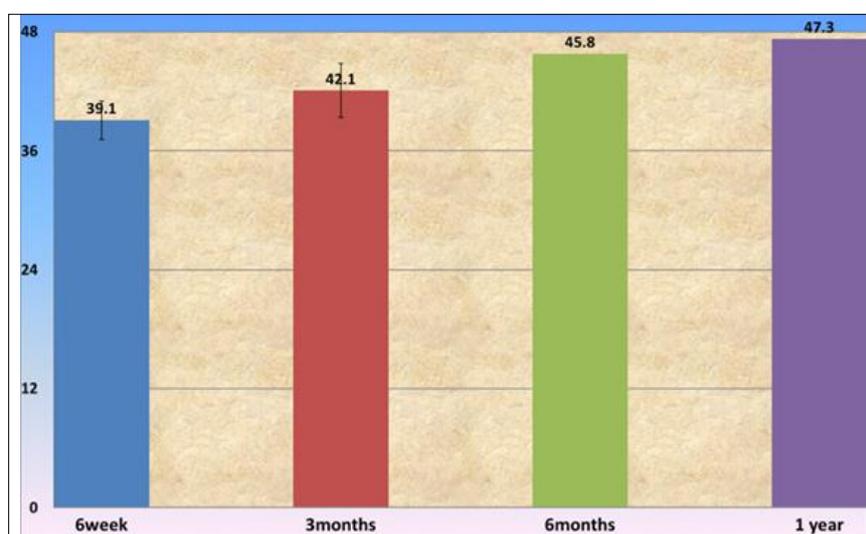


Fig 12: Comparison of mean short form 36 questionnaire scores between different intervals



Fig 13: Pre-op X-ray



Fig 14: Final follow up X-ray

Discussion

Our study was a prospective observational study consists of 20 cases of posterior wall or posterior column acetabular fracture was selected after satisfying inclusion and exclusion criteria. These were surgically fixed with open reduction and internal fixation with plate and screws by Kocher Langhenbeck approach at Sanjay Gandhi institute of trauma and orthopaedics from November 2018 to September 2020 the functional outcome was assessed using Harris hip score and short form 36 questionnaire.

Age

Mean age of the patients was Mean Age \pm SD 33.6 ± 12.87 ranging from 19 years to 65 years. Results were comparable to below standard studies P.V. Giannoudis *et al.* (21) mean age 38.6 Vincenzo Giordano *et al.* (20) mean age 35 Mode *et al.* (22) patient's ages ranged from 16 to 74 years with an average of 38 years thus show the Acetabular fracture are more common in active working young, middle aged population.

Sex of the patient

Out of 20 cases there were 18 (90%) male patients and 2 (10%) female patients R. Pascarella *et al.* (1) study shows 81.8% male and 18.2% female Vincenzo Giordano *et al.* (20). study shows 75.80% male and 24.39% female. The results

were found comparable to the previous standard studies. This could be because male are structured to higher physical activity, thereby predisposing them to injury.

Side of the injury

In our present study the injury was predominantly right side seen in 13 cases (65%) and 7 cases (35%) involved left side. In the study conducted by Joel Matta *et al.* (34) there was left side predominance of left side 60% and right side 40% this may attributed to right sided driving in India.

Mode of injury

The most common mode of injury were RTA for 19 (95%) cases, 1 (5%) case had history of fall from height and most of other studies show the same results Vincenzo Giordano *et al.* (20) study shows 96.40% RTA and 2.40% show fall from height R. Pascarella *et al.* (1) study shows 91.7% of RTA and 5.67% of fall of height P. V. Giannoudis, *et al.* (21) study shows 80.5% RTA and 10.7% show fall from height.

Type of fracture

In our study based on classification of Letournel and Judet posterior wall fracture were the most common fracture presentation 15 cases (75%) and posterior column 5 cases (25%) Kachnerkar NI *et al.* 26 out of 30 patient 87% posterior wall fracture and 13% posterior column fracture Kim *et al.* (26) in their findings reported reconstruction of acetabular posterior wall fractures, in the series of 33 patient, according to the Letournel-Judet system there were 21 (63.6%) simple posterior wall fractures 12 (36.4%) were complex fractures associated with other types of fractures our study results match with previous studies.

Complication

1 case (5%) had surgical site infection treated with intravenous antibiotic and wound healed with secondary intention P. V. Giannoudis, *et al.* (21) shows overall incidence of surgical site infection 4.4% and 1 case had foot drop postoperatively treated with foot drop splint recovery occurred after 6 month postoperatively P. V. Giannoudis, *et al.* (21) incidence of iatrogenic nerve palsy of 8% was recorded in 20 studies with 2426 fractures.

Harris hip score

At 12 months, the mean Harris hip score was 85.8% and 8 patient (40%) had score more than 90 (excellent), 7 patient (35%) had score between 81-90 (good), 4 patient (20%) had score between 71-80 (fair) and 1 (5%) had score less than 70 (Poor).

P.V. Giannoudis *et al.* (21) the HHS, 263 patients (43.9%) had an excellent result, 176 (29.3%) were graded as good, 69 (11.5%) as fair, and 92 (15.3%) as Poor Mears (35) *et al.* study shows was excellent in 179 (42%), good in 126 (30%), fair in 54 (13%), and poor in 65 (15%) The results are in par with the previous standard studies.

Mean Harris hip score improved from 70 (at 6 weeks) to 75.6 (at 3 months) to 80.9 (at 6 month) and 85.8 (at 1 year).

R. Pascarella *et al.* (1) study shows Mean HHS was 91.5 8.9 (48-100) at 2 years follow up. The results found are comparable to the previous standard studies.

Mean short form 36 score improved from 39.1 (at 6 weeks) to 42.1 (at 3 months) to 45.8 (at 6 month) and 47.3 (at 1 year).

R. Pascarella *et al.* (1). The SF-36PCS and MCS scores at follow-up were 47.98.2 and 51.25.3. The results found are comparable to the previous standard studies.

Conclusion

In older days because of poor understanding of anatomy, fracture pattern, lack of modern imaging modalities and surgical expertise the stable Acetabular fractures were managed conservatively with poor functional outcome and high morbidity with the advent of CT scan with 3-D reconstruction the fracture pattern is well understood with improvement in surgical techniques and instrumentation. The management of these fractures becomes handy with good reduction of fracture and instrumentation resulting in good outcome with less surgical complication.

Thorough Examination and documentation of preoperative foot drop or sciatic nerve injury and proper intra-operative care should be taken to avoid iatrogenic injuries of Sciatic nerve.

Good to excellent results were achieved in 75% of total cases and fair in 20% of patients which is attributed to poor bone quality and postoperative infections. We conclude that management of posterior wall or posterior column of Acetabular fracture is best achieved by means surgical approach i.e. open reduction internal fixation with plates and screws.

To achieve best results we recommend

- Proper pre-operative analysis of nature of injury
- Good radiological analysis of the fracture pattern with Various X-ray view and CT scan
- Care over the morbidity factors
- Judicious surgical planning
- Proper instruments and implants
- Surgical expertise
- Tailored post-operative protocols

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