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A prospective study on clinical outcome of surgically managed acetabulum fractures.

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ABSTRACT
Background: Acetabular fractures are in a rising trend in countries like India due increasing incidence of high-energy trauma like RTA. They play a major role in weight bearing in the lower extremity, so they assume great clinical importance. These fractures have always been a challenge for any orthopaedic surgeon because of the difficulty in achieving anatomical reduction. Conservative treatment of these fractures has been criticized because of its inability to restore joint congruity, thereby causing increased incidence of osteoarthritis. The newer diagnostic tools like the CT-scan have helped us to analyze the normal anatomy and plan the surgical management accordingly. Currently, surgical treatment is the treatment of choice as restoration of joint congruity is of paramount importance to reduce the incidence of early hip osteoarthritis.
Aims and Objectives: We aim to evaluate the outcomes of surgically managed acetabular fractures in this prospective study.
Materials and Methods: :33 patients (30 male & 3 female) admitted to Hi-Tech Medical College & Hospital,Bhubaneswar with acetabular fractures underwent open reduction and internal fixation. All patients were evaluated with Matta et al score with a minimum of follow up of six months.
Results: There were 12(36.4%) patients with bi-columnar fractures, 10(30.3%) had posterior column fractures, 4(12.1%) had posterior wall fractures, 4 (12.1%) had transverse fractures, and one (3.0%) patient had an anterior column fracture. Full weight bearing was attained in 21 (63.6%) patients in 16 weeks and in 12 (36.4%) patients after 16 weeks. 28 (84.9%) patients were free of complications. According to Matta et al score 20 (60.7%) had excellent, 07(21.2%) had good, 5 (15.1%) had fair, and 1 (3.0%) had poor results
Conclusions: Open reduction and internal fixation of acetabular fractures is a optimal technique, minimizes recovery time and provides congruent joint reduction. Operative treatment of acetabular fractures results in predictable union and good clinical results with a low rate of complications.

Keywords: Acetabulum fracture , clinical outcome , operative managed

I.INTRODUCTION

Incidence of acetabulum fractures are growing in countries like India because increased incidence of high-energy trauma like road traffic accidents or falls from a significant height . Unfortunately, these patients along with pelvic fracture also always experience serious injury to surrounding skin and muscles and neurovascular structures. According to epidemiology data of UK, the incidence of acetabular fractures is approximately 3 per 100 000 per year. They play a major role in weight bearing in the lower extremity, so they assume great clinical importance. These fractures have always been a challenge for any orthopaedic surgeon because of the difficulty in achieving anatomical reduction.
Conservative management of acetabulum fractures has always been criticized in displaced fractures because of its inability to restore joint congruity, thereby causing increased incidence of early hip osteoarthritis.
There are several studies on the outcome of operative management of acetabular fractures in different parts of the world, however limited data are available in our country about this mater. Need of present study is to review the effectiveness and complications of the surgical management of acetabular fractures in our institution.

II.METHODOLOGY

Materials and Methods
PLACE OF STUDY: Hi-Tech Medical College And Hospital, Bhubaneswar
PERIOD OF STUDY: November 2019- October 2021
CONSENT: Written informed consent of the patients was obtained
INCLUSION CRITERIA: The patients included in the present study met with the following criteria:
1. Age : 18 & above
2. Gender : Both
3. All closed fractures

4. All displaced fractures confirmed by X ray, CT scan
5. All fracture types based on Letournel and Judet classification involving the anterior column, anterior wall, posterior column, posterior wall except the ones mentioned in the exclusion criteria
6. Patients who give informed consent and willing for follow up

EXCLUSION CRITERIA:

1. Age:<18yrs
2. Acetabular fracture with femoral head fracture
3. Stable non-displaccd and minimally displaced fractures
4. The intact acetabulum maintains stability and congruity

a. Low anterior column fractures
b. Low transverse fractures
c. Low T-shaped fractures

5. Both-column fracture with secondary congruence

Wall fracture not compromising hip stability

6. Compound fracture
7. Pregnancy.
8. Associated lower limb fractures of long bones.
9. Associated comorbid conditions history of suffering from Myocardial Infarction(MI) less than lyear, psychiatric illness, uncontrolled Diabetes mellitus (DM), Hypertension.
10. Pathological fracture.
11. Peri prosthetic fractures.
12. Associated major visceral injury.
13. Patients who did not give informed consent

STUDY DESIGN: Prospective study.

After obtaining clearance and approval from the institutional ethical committee and patients fulfilling the predetermined inclusion & exclusion criteria, was included in the study after obtaining informed consent. Minimum of 30 cases suffering from various patterns of acetabular fracture including the anterior or posterior column and anterior or posterior wall and various fracture combinations will be included in the study

Collection of data and evaluation of patients presenting with various patterns of acetabular fractures will be done on following basis.

History- detailed – mode of injury, duration, previous treatment received

- Clinical examination both systemic and local with detailed neurovascular examination
- Radiological examination using X ray, CT-Scan and other imaging modalities if necessary.
- Classification of acetabular fractures-Letournel and Judet classification
- Investigations –Baseline and others.
- Diagnosis- Clinical and radiological.
- Surgery-Ilioinguinal approach was used for anterior wall and column fractures. Kocher Langenbeck approach was used for posterior wall and column fractures. Stable fixation of fractures was attained with reconstruction plates, while where possible, compression was achieved with cancellous screws
- Routine antibiotics and analgesics/anti-inflammatory drugs.
- Post-Operative evaluation by clinical examination and X-ray.
- Assessment of complications. Preoperative ,immediatepost operative, late post operative.

FOLLOW UP

Clinical follow-up will be done at 4 weeks, 8 weeks, 4months, 6months, 12months intervals regarding healing of fracture, pain, and functional evaluation will be done by clinical grading system by Matta et al.

Radiological follow up by X ray will be done at 2weeks, 4 weeks, 8 weeks, 4months, 6months, 12months intervals in accordance with symptoms.

STATISTICAL ANALYSIS: Descriptive and inferential statistical analysis has been carried out in the presentstudy. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance. The following assumptions on data is made, Assumptions: 1. Dependent variables should be normally distributed, 2.Samples drawn from the population should be random, Cases of the samples should be independent.

Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups.

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III.RESULTS

Age wise analysis of Matta et al clinical score

Age inyears	No. of patients	Matta et al clinical score			
		Excellent Excellent	Good	Fair	Poor
<20	2	2(100%)	0(0%)	0(0%)	0(0%)
21-30	8	6(75%)	0(0%)	2(25%)	0(0%)
31-40	13	9(69.2%)	2(15.4%)	2(15.4%)	0(0%)
41-50	5	1(20%)	3(60%)	0(0%)	1(20%)
>50	5	2(40%)	2(40%)	1(20%)	0(00%)
Total	33	20(60.7%)	7(21.2%)	5(15.1%)	1(3.0%)

P=0.315, not significant, Fisher Exact test

Majority of the patients were in the 21–40 age group, and most of them had Excellent to Good functional outcome.

Analysis of Matta et al score based on Type of Acetabular fracture

Fracture Classification	No. of Patients	Matta Clinical Score			
		Excellent	Good	Fair	Poor
Bicolumnar	12	8(66.7%)	3(25%)	1(8.3%)	0
Post Columnar	10	8(80%)	2(20%)	0	0
Post Wall	04	4(100%)	0	0	0
Transverse	04	0	1(25%)	2(50%)	1(25%)
Bicolumnar +Transverse	01	0	0	1(100%)	0
Ant. Column	01	0	0	1(100%)	0
Post Wall+Ant. Column	01	0	1(100%)	0	0

P=0.021*, significant, Fisher Exact test

Out of 33 cases of acetabular fractures operated in this study,12 patients had bicolumnarfracture.In these, 8 paticnts (66.7%) had EXCELLENT score 3 patients (25%) had GOOD score 1 patients (8.3%) had FAIR score.14 patients had Posterior column and posterior wall fracture. In these, 14 patients (85.7%) had an EXCELLENT score 2 patients (14.3%) had GOOD score.4 patients had a transverse fracture, in these, all 4 patients (100%) had EXCELLENT score. 1 patient had an Isolated Anterior column fracture. This patient had a FAIR score.

Distribution of cases based on Surgical Approach used

Approach	No. ofpatients	%
Ilio-inguinal	5	15.2
Ilio-inguinal + Kocherlangenbeck	3	9.1
Kocher Langenbeck	25	75.7
Total	33	100.0

In this study of the 33 cases which were operated, in 25 cases (75.7%) Kocher Langenbeckapproach , in 5 cases (15.2%) Ilio-inguinal approach and in 3 cases (9.1%), both approaches was used.

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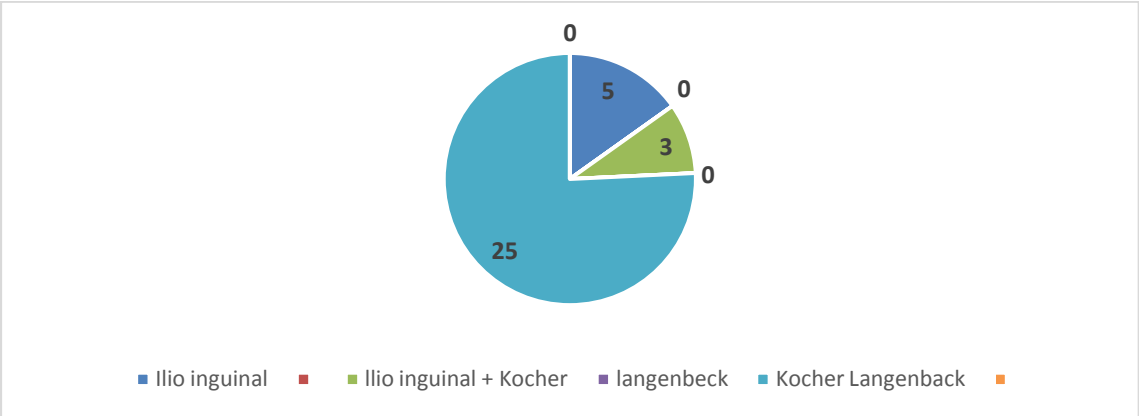

Fig. 1: Distribution of cases based on Surgical Approach used

Distribution of Cases based on Complications

Complications	No. ofpatients	%
Nil	28	84.9
Sciatic nerve palsy	1	3.0
Urethral injury	1	3.0
Wound infection	3	9.1
Total	33	100.0

In 28 of the total 33 cases, 84.9% of the cases were free ofcomplications. Wound infection occurred in 3 cases (9.1%). Sciatic nerve palsy was seen in 1 cases (3.0%). Urethral injury was seen in 1 case (3.0%)

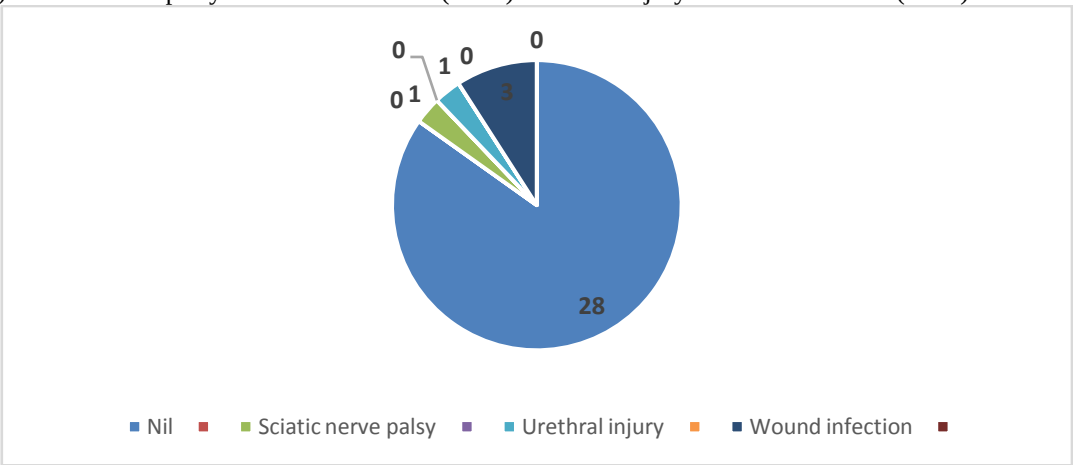

Fig. 2: Distribution of Cases based on Complication

Distribution of Cases based on clinical grading system by Matta et al.

Matta clinical grading at Final Follow up	No. of patients	%
Excellent	20	60.7

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Good	07	21.2
Fair	05	15.1
Poor	01	3.0
Total	33	100.0

All the cases under study were evaluated with clinical grading system by Matta et al at their final follow up. **SCORE** was found to be Excellent in 20 patients (60.7%), Good in 07 patients (21.2%), Fair in 5 patients (15.1%) and Poor in 1 patients (3.0%).

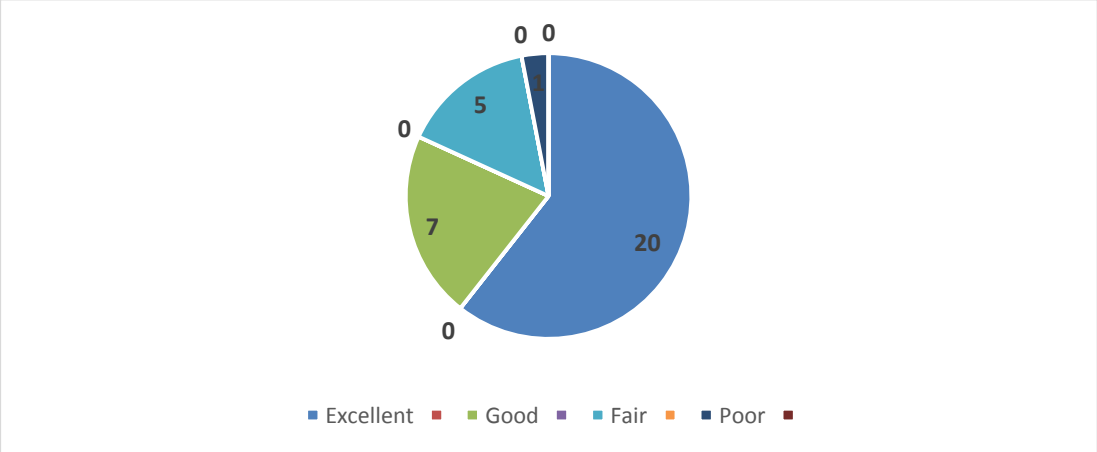

Fig 3: Distribution of cases based on Matta et al. clinical grading system

IV.DISCUSSION

The management of acetabular fractures is a challenging task for the trauma surgeon. Although anatomical reduction of the articular surface and stable internal fixation has been established as an ideal treatment with good to excellent results, many aspects of the management of these injuries are still controversial [33],because of the choice of the surgical approach. Many others have stated that the quality of the clinical results depends directly on the quality of reduction that was achieved by internal fixation. Letournal[41] stated that anatomical reduction of acetabular fractures depends upon the selection of the proper operative exposure even if no approach is ideal. The goal of surgical treatment is to provide the means for good function and excellent painless motion in the injured hip for the rest of the patient's life[42]

This study included 33 skeletally matured patients. They were followed up for 6 months and results were analyzed with respect to the age, sex, mode of injury, type of fracture, time taken for full weight bearing and finally the Clinical outcome of the study was assessed through the clinical grading system by Matta et al.

Our Study included patients in the age groups ranging from 20 to 60 years and the Mean age was 34.25 yrs. Out of 33patients majority of patients in were in the age group of 20-40 years. This may be due to high physical activity. Age wise distribution of acetabulum fractures in different Studies is in the table below with comparison to our study.

STUDY	AGE OF PATIENTS(in yrs)	MEAN AGE(inyrs)
S.D.Deo et al[32]	16-81	36
Vincenzo Giordano et al	18-79	35

M.L.Chip Routt et al [43]	14-79	30
Albuquerque et al [43]	23-68	40
A.Kumar et al [34]	15-76	39.5
George Petsatodis	18-71	37.8
Chuan-Mu Chen [44]	19-72	43
Joel M Malta [19]	11-90	37
A.Moroni et al [45]	18-63	32
Present Study	20-60	34.25

Majority of the fractures in our study were Bicolumnar i.e.,24 patients (43.6%), followed by posterior column fractures in 15 patients (27.3%), posterior wall fractures in 10 patients (18.1%), transverse fractures in 5 patients (9.1%) and anterior column fracture in one patient (1.8%). The comparison with other studies with regard to the type of fracture is shown in the table below.

Study	Anterior column	Posterior column	Bicolumnar	Transverse
Vincenzo Giordano et al	11.76%	29.41 %	41.18%	17.65%
KumarA et al.	8.11%	5.41%	72.97%	13.51%
Deo SD et al.	12.5%	5%	50%	32.5%
Lim HH	6.25%	87.5%	0%	6.25%
Present Study	3.0%	30.3%	36.4%	12.1%

In the present study , Kocher-Langenbeck approach was used in 25 cases (75.7%).ilio-inguinal approach was used in 5 cases (15.2%). Both approaches were used to fix 3 patients with Bicolumnar fracture. Comparison of the various studies is shown in the table below.

Distribution of the Acetabular fractures depending on the SurgicaApproach used:

STUDY	ILIO-INGUINAL	KOCHER-LANGENBECK	BOTH	EXTENDED FEMORAL	TRIRADIATE
S.D.Deo et al [32]	24%	38%	15%	3%	20%

Vincenzo Giordano et al [33]	15.85 %	67.1 %	15.85 %	nil	1.2 %
A.Kumar et al [34]	36.11 %	56.94 %	1.39 %	nil	6.94 %
Joel M Malta	33%	43%	2%	23%	nil
Present Study	15.2 %	75.7%	9.1%	nil	nil

In our present study, there were 3 types of complication encountered – Sciatic Nerve palsy was seen in 1 patients (3.0%) patients (3.0%) (existed pre operatively) urethral injury in one patient (3.0%). Would infection in 3 cases 9.1%. We didn't encounter any other complication as compared to other studies shown in the table.

Study	AVN with Sec. Osteoarthritis	SCIATIC NERVE PLASY	HETEROTROPIC OSSIFICATION	STIFFNESS	INFECTION	OTHERS	Morel. lavalle skin lesion
S.D. Deo et al	8%	Nil	9%	3%	Nil	Nil	Nil
Vincenzo Giordano et al	4.8%	12.2%	1.2%	Nil	1.2%	3.6%	Nil
M.L. Chip Routt et al	2.8	8.57	Nil	Nil	Nil	Nil	Nil
Chuan-Mu Chen	Nil	Nil	9.3%	Nil	5.7%	Nil	8.57
Present Study	0	3.0	Nil	Nil	9.1%	3.0%	Nil

As per Matta et al scoring system, we had excellent Outcome in 20 patients (60.7), Good in 07 patients (21.2%), Fair in 5 patients (15.1%) and Poor in 1 patient (3.0%). The results were on par with other studies. The poor outcome was due to Complications we encountered.

Comparison of Matta et al Score in present study with other studies :

STUDY	**MATTA ET AL SCORING SYSTEM**			
	EXCELLENT	GOOD	FAIR	POOR
Joel Matta et al	37%	47%	14%	2%
Paul D Ruesch et al	51%	30%	Nil	19%

V.A. de Ridder et al	42%	33%	25%	Nil
Keith mayo et al	14%	61%	16%	9%
Present Study	60.7%	21.2%	15.1%	3.0%

LIMITATION OF OUR PRESENT STUDY

- Single Centre
- Single Surgeon
- Only 3 approaches were used
- Limited number of cases (sample size of the study was 33)
- Lack of Polytrauma Team

V.CONCLUSION

Study results indicated that mechanism of injury, age and gender of patient, fracture pattern and quality of reduction had significant effect on functional as well as radiological outcome. With the availability of good imaging facilities, surgeon experience, better instrumentation along with good perioperative care, we believe that the surgical fixation of displaced acetabular fractures would yield better results.

We conclude that the management of fractures of Acetabulum is best achieved by means of Surgical approach. To achieve best results we recommend

- Proper pre operative evaluation- thorough analysis of nature of injury

-care over morbidity factors

-good radiological analysis of fracture pattern

- Judicious Surgical Planning
- Need for proper instruments and Implants
- Surgical expertise
- Tailored Post operative protocol

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CASE 1

CT Scan

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POST OP X-RAY

FOLLOW UP AT 6 MONTHS

FLEXION

CROSS LEGGED SITTING

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SQUATTING

CASE 2

PRE-OP X-RAY & CT SCAN

CT SCAN WITH 3D RECONSTRUCTION

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POST OP X-RAY

FLEXION

SITTING CROSS LEGGED

SQUATTING