Original Research Paper

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FACTORS INFLUENCING THE OUTCOME OF ACETABULAR FRACTURES TREATED OPERATIVELY BY SINGLE APPROACH.

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ABSTRACT **Introduction:** The treatment of acetabular fractures is a complex area of orthopaedics that is being continually refined. There have been many changes in the recommended treatment modalities over time as the understanding of acetabular anatomy and fracture patterns developed which acts as a first step in decision making for the mode of treatment. Multiple factors influence clinical outcome following an acetabular fracture, including pre-existing conditions, injury-related factors, surgical considerations, and postoperative complications. **Methodology:** This is a prospective longitudinal cohort study, conducted on 30 patients who were admitted in Trauma Centre, BHU under Department of Orthopaedics, Institute of Medical Sciences, BHU from August 2018 to July 2020. It is a Clinical study of patients aged between 18 to 65 years with transverse, T–type and both column acetabular fractures. Outcome parameters that were evaluated were Matta radiographic scoring and Amount of blood loss and duration of surgery. **Results:** In our study mean age of patients was 35±12 years with the age ranging from 20 years to 60 years. We have included three types of acetabular fractures, namely both column fractures (25 cases), transverse (3 cases) and T type (2 cases).All three types of fractures were operated by single approach. Timing of surgery following trauma was 6 -14 days. Maximum number of cases was operated within 10 days with good outcome. Mean timing is 8.47 days. It has significant effect on clinical outcome. There is no significant difference in the mean age of the patients for radiological group i.e. statistically not significant. Road traffic accident was the most common mode of injury (83%). Also we had 86.7% good to excellent results radiologically assessed by Matta radiographic criteria. **Conclusion:** The incidence of Acetabular fractures is increasing, owing to the increased frequency of road traffic accidents and high velocity injuries with younger males being the most affected.

KEYWORDS :

INTRODUCTION

The incidence of acetabular fractures is increasing worldwide at a rapid rate due to increase in rail and road traffic accidents and high velocity injuries. The treatment of acetabular fractures is a complex area of orthopaedics that is being continually refined. There have been many changes in the recommended treatment modalities over time as the understanding of acetabular anatomy and fracture patterns developed which acts as a first step in decision making for the mode of treatment[1,2]

The rise in the high-speed motor vehicles accidents and high velocity injuries like fall from heights had increased the incidence of polytrauma and pelvic injuries over the past decade. About 10% of pelvic injuries involves acetabulum of which more than 80% occurred in road traffic accidents and 10.7% in fall victim injuries.[3]

Acetabular fractures are fractures involving the acetabulum, the socket of the hip joint in which the femoral head articulates. It takes part in one of the most crucial joint of the body and is a site tremendous stress as the weight of the upper body is transmitted to lower limbs via this joint Given the complex anatomy of the acetabulum and pelvic region along with the difficulty to accurately decline and classify the fracture pattern, the orthopaedic surgeon is at a dilemma when it comes to taking decisions regarding treatment of these fractures.

Acetabular fractures are among the most complex injuries treated by Orthopaedic surgeons. The work of Robert Judet and Émile Letournel began our understanding of surgical approaches, reduction techniques, complications, and results.[4,5] Good to excellent functional results have been reported in up to 80% of operatively treated acetabular fractures at 20 years[6].

Multiple factors influence clinical outcome following an acetabular fracture, including pre-existing conditions, injury-related factors, surgical considerations, and postoperative complications. The quality of the articular reduction has been shown to be of utmost importance in determining clinical outcome. This chapter will focus on the factors affecting outcome and the long-term results of operatively treated acetabular fractures. Open anatomic reduction and internal fixation is the treatment of choice for displaced fractures of the aceta bulum[7,8,9,10,11].

MATERIAL & METHODS

This study was conducted on randomly patients who were admitted in Trauma Centre, BHU under Department of Orthopaedics, Institute of Medical Sciences, BHU.

Period of study: August 2018 to July 2020

Design of Study: Prospective longitudinal cohort study.

Source of data

Clinical study of patients aged between 18 to 65 years with transverse, T–type and both column acetabular fractures admitted or visiting the Orthopaedic OPD at Trauma Centre, IMS, BHU.

Inclusion criteria

- Transverse, T-type and both column acetabular fractures.
- All skeletal mature patients (> 18 years, both male and female)
- Less than 3 weeks old (i.e. operated within 21 days of injury) and without any distal neurovascular deficit.
- Those who will give consent and willing to come to regular follow-up

Exclusion criteria

- Patients of age less than 18 years (Skeletal immaturity)
- Open fractures
- Presence of any existing hip pathology/limb deformities.
- Presence of any other bony injury in the ipsilateral limb.
- History of previous injury or ipsilateral hip deformity.
- Patient who have concomitant medical condition making them unfit for surgery.

Sample size: 30 cases satisfying inclusion criteria were included in the study.

Outcome parameters:

- Matta radiographic scoring
- Amount of blood loss and
- Duration of surgery.

Imaging:

An AP view of the pelvis is required for all patients sustaining significant trauma to the pelvis. If an acetabular fracture is suspected, three additional views are necessary:

Pre-operative skiagrams:

the following Judet view skiagrams were done to assess and classify the fracture

1. AP view of the involved hip.
2. Iliac oblique view:
3. Obturator oblique view

ASSESSMENT

The data was collected from patients after obtaining proper consent as per the proforma.

To assess the radiological outcome, immediate post operative skiagrams were used and assessed using:

Table 1: Matta's radiological criteria

Grade	Osteophyte	Joint Space Narrowing	Sclerosis
Excellent	None	Normal	None
Good	Small	>2mm	Minimal
Fair	Moderate	<50%	Moderate
Poor	Large	>50%	Severe With Femoral Head Collapse

However, for the sake of statistical comparison, the criteria was simplified and described as: [12,13,14]Excellent congruent: less than 1 mm articular step in x-ray with almost normal looking hip joint Good: 1mm to 3 mm articular step in x-ray with almost minimal sclerosis Poor incongruent: > 3 mm articular step in x- ray

OBSERVATION AND RESULTS

This study was a prospective study and conducted in the Department of Orthopaedics, Trauma Centre, Institute of Medical Sciences, in Banaras Hindu University, Varanasi, India. The present study was performed to observe the "Factors influencing the outcome of Acetabular Fractures Treated Operatively by Single Approach". The duration of the study was from August 2018 to July 2020.

Table 2:

Characteristic Feature	STUDY GROUP (n=30)	
	No.	%
AGE (in years)		
18-30	16	53.33%
31-45	7	23.33%
46-65	7	23.33%
GENDER		
male	23	76.66%%
Female	7	23.33%
MODE OF INJURY		
Fall from height	5	16.67%
RTA	25	83.33%
INJURY TO SURGERY TIME(days)Mean	8.47	
ASSOCIATED INJURIES		
Lower extremities injury	12	40%
Upper extremities injury	8	26.66%
Head injury	7	23.33%
Thoracic Injury	1	3.3%
Abdominal injury	1	3.3%
Vertebral injury	1	3.3%
SURGICAL APPROACH		
Anterior(Stoppa)	6	20%
Modified Gibson(Posterior)	1	3.3%
Posterior	23	76.7%
FRACTURE PATTERN		
Bi-columnar	25	83.3
Transverse	3	10
T-type	2	6.67

A total of 30 patients were included in the study, out of which 23 were male and 7 females. The average follow up was 6 months. Patients had an average age of 35±12 years with the age ranging from 20 years to 60 years. Median age of patients is 30 years, mean 35.97 with standard deviation of 12.082. We have included three types of acetabular fractures, namely both column fractures (25 cases), transverse (3 cases) and T type (2 cases).All three types of fractures were operated by single approach. Most commonly cases were operated by Kocher Langenbeck approach.

Table 3: Distribution of time of surgery:

Time of Surgery	No of patients	Percentage
<2.5	5	16.7
2.5-3.0	12	40.0
3.0-3.5	9	30.0
3.5-4.0	4	13.3
Total	30	100.0

Table 4: Descriptive statistics

	Mean	Std. Deviation
Blood Loss (mL)	318.33	66.285
Surgical Time	3.200	.4661

Table 5: Surgical time and blood loss distribution table

Surgery time	Blood Loss (mL)						Total
	200	250	300	350	400	450	
<2.5	2	2	1	0	0	0	5
2.5-3.0	0	3	5	3	1	0	12
3.0-3.5	0	1	2	4	2	0	9
3.5-4.0	0	0	1	0	1	2	4
Total	2	6	9	7	4	2	30

Most of the cases were operated within 2.5 -3hours.Around 300ml blood loss was there in most of the cases. Blood loss was calculated from suction drain and number of surgical mops used.

Time Gap:

After admission and hemodynamic stabilization, imaging studies were performed on all patients and preoperative planning was done. Timing of surgery following trauma was 6 -14 days. Maximum number of cases was operated within 10 days with good outcome. Mean timing is 8.47 days. It has significant effect on clinical outcome. There is no significant difference in the mean age of the patients for radiological group i.e. statistically not significant (p value more than .05).

Table 6: One sample t test between time gap and clinical outcome at 6months

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
Time gap	30	8.47	2.129	.389
Clinical outcome at 6 months	30	15.40	1.404	.256

Mean timing of surgery 8.47 days (range 6-10 days).

Table 7

One-Sample Test						
	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Time gap	21.780	29	.000	8.467	7.67	9.26
Clinical outcome at 6 months	60.060	29	.000	15.400	14.88	15.92

Time gap has significant effect on clinical outcome (p value is < 0.05 i.e. it is significant)

Complications: Table 8

Complications	No of patients	Percentage
Sciatic nerve palsy	4	13.33
Osteoarthritis	12	40.0
AVN of head of femur	9	30.0
Infections	2	6.66
Heterotopic ossifications	3	10
Total	30	100.0

In present study, we observed 4 cases of iatrogenic sciatic nerve palsy in which 2 of them partially recovered on follow up of 1 year. 12 cases developed post traumatic arthritis at 6 months follow up and 9 developed avascular necrosis. 2 patients experienced soft tissue infections, all of whom treated with superficial wound debridement and antibiotic therapy.

Table 9: Age and radiological outcome (one way ANOVA)

	N	Mean	Std. Deviation	Std. Error	Min	Max
Excellent	8	36.63	14.618	5.168	20	60
Good	18	35.56	11.094	2.615	21	57
Poor	4	36.50	14.572	7.286	21	55
Total	30	35.97	12.082	2.206	20	60

Table 10: ANOVA Test

Age					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.647	2	3.824	.024	.976
Within Groups	4225.319	27	156.493		
Total	4232.967	29			

There is no significant difference in the mean age of the patients for radiological group i.e. statistically not significant. (p value more than .05)

Table 11: Surgical time and radiological outcome (one way ANOVA)

	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Excellent	8	2.813	.3720	.1315	2.5	3.5
Good	18	3.333	.3835	.0904	3.0	4.0
Poor	4	3.375	.6292	.3146	2.5	4.0
Total	30	3.200	.4661	.0851	2.5	4.0

Table 12:

ANOVA					
Surgical Time					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.644	2	.822	4.766	.017
Within Groups	4.656	27	.172		
Total	6.300	29			

The mean surgical time is significantly different for different radiological groups and it is statistically significant.(p value small than .05)

DISCUSSION

The primary aim of the management of the acetabular fracture is to obtain an adequate exposure, anatomical reduction and maintaining the articular surface especially in the weight bearing area. Operative time, minimal soft tissue stripping, blood loss, adequate exposure of fracture fragments, surgeon expertise are important parameters for a surgical approach.

In our study mean age of patients was a 35±12 year with the age ranging from 20 years to 60 years. Median age of patients is 30 years. Timing of surgery was in between 6-14 days. No cases were operated after 3 weeks of injury. We had 76% good to excellent results in patients who were operated within 10 days of injury. As the delay in surgery increased the outcome score decreased. Delayed in surgery occurred because of associated injuries. Timing of surgery has a bearing on the surgeon ability to reduce an accurate reduction and mobility of fracture site decreased with time from injury.

However, in some studies, undue delay in the time of surgery has been shown to be a significant predictor of radiologic and clinical outcome. After 3 weeks callus formation is so extensive that fixation is no more considered as an acute injury. In 1996, Matta JM[11] in his study discussed about accuracy of reduction and clinical results treated operatively within 3 weeks of injury.

Valuer HA et al[15] in their study on 645patients, they opined that early fixation of unstable pelvis and acetabular fractures in multiply injured patients reduces morbidity.

Plaisier et al[16] in their study showed improved outcome after early fixation of acetabular fractures. Early fixation of acetabular fractures was associated with lower MODS (p <0.006) and decreased total length of stay (p <0.026).

Therefore in our study, early fixation was of topmost priority and only those cases were included in the study where fixation was performed within 21 days of injury.

As mentioned by Matta *et al*[17]] the main complication following a fracture of the acetabulum is post-traumatic osteoarthritis. The incidence of osteoarthritis in our series was 40%, which is considerably higher than that reported by Isaacson *et al*.[18]52% and the 21.6% reported by Negrin *et a*[19]. Iatrogenic nerve injury included sciatic nerve, femoral nerve and lateral cutaneous nerve of thigh are possible complication during acetabular surgery. In our series, the overall incidence of sciatic nerve palsy was 13.33%, and other nerve damage wasn't seen. Nerve damage was 6% in a study by Shrestha *et al*[20], and reported 12% in another study [21].

CONCLUSION

The incidence of Acetabular fractures is increasing, owing to the increased frequency of road traffic accidents and high velocity injuries with younger males being the most affected. In conclusion, Outcome results are influenced by age, fracture pattern, complications, delay in surgery, increased surgical time and blood loss with other associated injuries. However, a good to excellent radiological outcome was seen in more than 50%of the patients treated surgically. Moreover, the rate of complication was acceptable in our study. In summary, the operative treatment for acetabular fractures gives universally satisfactory results. Furthermore the limitation of the study is the small sample size and this study needs longer duration of follow up for long terms results.

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