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ORIGINAL RESEARCH

Evaluation of functional outcome in acetabular fractures: A clinical study

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ABSTRACT
Due to consequences acetabular fractures leave, they occupy an important place in modern traumatology. Their treatment is a major challenge and dilemma for orthopedic surgeons. After diagnosis, the greatest controversy in the treatment of fractures is inthetreatment choice: operational or non-operational. Common indication for operative treatment is displacement of fragments more than 0.5 cm, incongruence between the femoral head and acetabular roof-arc. Non-operative treatment of fractures is conditioned by general health, age, occupation, low anterior column fractures and intra-articular step of less than 2mm.
This prospective study includes acetabular fracture patients who were admitted in Hospital. Patients with Head or Neck of Femur Fractures, patients with prior Osteoarthritis, patients with prior Proximal Femur Pathology or abnormality were excluded from the study. Patients with acetabular fracture treated operatively or conservatively were evaluated using Harris Hip Score at regular follow-ups for every 1 month till 6 months and at the end of 1year.
Out of these 35 patients, 13 of them were treated operatively, in which Kocher-Langenbeck approach was used in 8, Posterior approach in 4 and Anterior approach in 1 of the patients and the rest 22 patients were treated conservatively. Out of these 35 patients only 30 patients have completed their 1 year follow-up and 5 patients were lost to follow-up.
The mean HHS, at the end of 1 year was 84.89. According to HHS, 14 patients showed excellent results, 4 patients showed good results, 9 patients showed fair results and 3 patients showed poor results.
Excellent to good outcome can be expected in both operatively or conservatively treated fractures if the intra-articular step is less than 2mm and fracture not involving the dome. The reduction achieved, postoperative rehabilitation, infection or any other complications like secondary osteoarthritis, heterotopic ossification may determine the functional outcome in long term.

Key words: Functional outcome, acetabular fractures, a clinical study

INTRODUCTION

Fractures of acetabular occur at all ages. Low energy fractures occur in the elderly people with Osteopenia, while high energy acetabular fractures occur in young and middle aged groups[1, 2].The incidents of acetabular fractures is about 3 in 1 Lakh population per year[1].
The type of acetabular fractures mainly depends on the position of the femoral head at the time of injury, quality of bone and the impact of injury. These fractures may be associated with Anterior, Posterior or Central dislocation[3, 4].
Thesetypeoffracturesaredifficulttobetreatedbecauseoftheircomplexanatomy[5].
Patients with this kind of fracture have significant functional deficits compared to other fractures when treated conservatively or operatively. In many cases, anatomical reduction alone has shown surgical

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outcome, however, it is unable to achieve good functional outcome.

There have been a number of cases with poor functional outcome despite near anatomical reduction which is likely to be due to chondral damage at the time of injury[6].Almost 30% of these injuries are associated with neurological involvement.

Studies by Letournel and Judet and by Matta have shown that to attain the best results, hip joint congruity and stability must be accompanied by an anatomic (defined as less than 2 mm of residual displacement) reduction of the displaced articular surface.

The need for this study is to evaluate the functional outcome of these fractures with Harris

Hip Score. The Harris Hip Score was developed in 1969 to assess the resultsof hip surgeryand is intended to evaluate various hip disabilities in an adult population. This score assess a variety of parameters, like pain, function, range of motion and deformity.

METHODOLOGY: All the patients admitted to JSS hospital in the department of orthopedics with acetabular fractures treated conservatively or operatively.

Patients are assessed for the function of the hip joint using HHS.

Patients admitted with acetabular fractures are assessed as soon as the patient is mobilized and then regular follow ups are done at an interval of 1 month for 6 months and at the end of one year.

The study includes patients with acetabular fractures admitted to hospital Orthopedics department and examined and the associated injuries are noted.

Clinical and radiological investigations like X-Rays of pelvis with bilateral hips (AP view, Judet view) and CT 2D and 3D reconstruction of the pelvis with bilateral hips are done. The acetabular fractures are classified according to Judet–Letournel classification. These fractures are treated operatively or conservatively (Skeletal or skin traction).

After the treatment the patients are examined for the functional outcome using Harris hip score monthly for 6 months and at the end of 1 year.

RESULTS

Table 1: Relation between fracture pattern, dislocation and foot drop

Fracture type	No of Patients	% of patients in total	PD	AD	CD	PS	% of dislocation	Foot Drop	% of foot drops
PCW	4	11.4	2	1	1	-	100	3	75
PW	13	37.1	2	-	-	1	23.1	2	15.4
PC	2	5.7	-	-	-	-	-	1	50
BC	5	14.3	-	-	1	-	20	-	-
AC	4	11.4	-	-	-	-	-	-	-
APW	2	5.7	-	-	-	-	-	-	-
AW	2	5.7	-	-	-	-	-	-	-
PWT	1	2.9	-	-	-	-	-	-	-
T	1	2.9	-	-	-	-	-	-	-
D	1	2.9	-	-	-	-	-	-	-
Total	35	100	4	1	2	1	22.85	6	17.14

Table 2: Foot drop dislocation-Crosstab

			Dislocation					Total
			PD	PS	CD	A	D	
Foot drop	Absent	Count	0	1	1	26	1	29
		% within Dislocation	0.0%	100.0%	50.0%	96.3%	100.0%	82.9%
	Present	Count	4	0	1	1	0	6
		% within Dislocation	100.0%	0.0%	50.0%	3.7%	0.0%	17.1%
Total		Count	4	1	2	27	1	35
		% within Dislocation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

The total number of patients who had dislocations was 8 in number, in which 4 patients were associated with PCW fracture, 3 patients with PW fracture and 1 patient with BC fractures. Out of the 6 patients who had foot drops, 3 patients had PCW fracture, 2 had PW fracture and 1 had PC fracture. Of these 6 patients with foot drop 4 were associated with PD and 1 with CD.

Table 3: Treatment

	Frequency	Percent
Conservative	22	62.9
Operative	13	37.1
Total	35	100.0

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Table 4: Approach frequency and percentage

	Frequency	Percent	Valid Percent	Cumulative Percent
Kocher-Langenbeck	8	61.5	61.5	-
Anterior	1	7.7	7.7	69.2
Posterior	4	30.8	30.8	100.0
Total	13	100.0	100.0	

Table 5: Relative tab for fracture type and approach

Fracture type	Anterior	Posterior	Kocher Langenbeck
PCW	-	2	2
PC	1	1	-
BC	-	-	1
PW	-	-	4
AC	-	1	-
APW	-	-	1

The patients were treated with both operative and conservative management, in which 13 patients were operated. 8(61.5%) of patients were operated with Kocher-Langenbeck approach, 1(7.7%) patient was operated with Anterior approach and 4(30.8%) patients were operated with Posterior approach.

Table 6: Chi-Square test

	Age	Sex	MOI	Side	Fracture pattern	Dislocation	Foot drop	Treatment	Approach
Chi Square	3.657	20.829	35.371	2.314	39.571	72.286	15.114	2.314	29.571
DF	2	1	2	1	9	4	1	1	3
Asymo sig.	0.161	0.000	0.000	0.128	0.000	0.000	0.000	0.128	0.000

Table 7: Mean HHS at 2 months, 4months, 6months and 1year

	Mean	Std. Deviation	N
HHS_2	38.44	12.59	30
HHS_4	58.24	14.10	30
HHS_6	75.66	10.72	30
HHS_12	84.89	10.18	30

Table 8: HHS comparing operative and conservative management

		N	Mean	Std. Deviation	Std. Erro Mean
HHS_2	Operative	12	32.77	10.55	3.04
	Conservative	18	42.22	12.68	2.98
HHS_4	Operative	12	52.15	13.77	3.97
	Conservative	18	62.30	13.14	3.09
HHS_6	Operative	12	72.02	8.97	2.59
	Conservative	18	78.10	11.33	2.67
HHS_12	Operative	12	80.74	8.07	2.33
	Conservative	18	87.65	10.70	2.52

Table 9: T-test for comparison of operative and conservative management

	T-Test for Equality of Means				
	t	df	P value	Mean Difference	Std. Error Difference
HHS_2	-2.133	28	0.042	-9.45	4.43
HHS_4	-2.032	28	0.052	-10.14	4.99
HHS_6	-1.557	28	0.131	-6.07	3.90
HHS_12	-1.902	28	0.068	-6.91	3.63

The mean HHS at 1 year follow-up was 84.89 and the comparative HHS between operative and conservative management at 1 year follow-up was 80.74 and 87.65 respectively with a P value of 0.068 which is not significant. HHS was excellent in 14 patients, good in 4 patients, fair in 9 patients and poor in 3 patients at 1 year follow-up. We found that all 3 patients with poor HHS belonged to BC fractures, patient had excellent to fair results if only acetabular walls were involved.

DISCUSSION

Acetabular fractures are complex injuries caused by

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high energy trauma. In our study we found out that 80% of these fracture are due to RTA (high energy trauma) and 57.14% of these fractures had associated injuries.

48.6of the patients involved in this study were between the ages of 25 and 46 yr. 88.6% of the total population were males and the mean age of the patients involved was 37.37 yr.

Studies done by Predrag Grubor *etal*.and André Gaudêncio Ignácio de Almeida*et al*. showed a mean age of 40.5 yr and 38.4 yr and with a male population of 85.42% and 84.2% respectively. In another study, done by N. Briffa *et al*.the mean age of the patients was 36 yrwith a male population of 76%. In a meta-analysis done by P. V. Giannoudis *et al*. the mean age of the patients was 38.6 yr± 46yr with a male population of 69.4%[4].

Judet and Letournel revolutionized the treatment of acetabular fractures after their work on acetabular fracture classification. 35 patients in this study were classified according to Judet and Letournel classification, 13(37.1%) patients were involved with PW fractures in which 4(23.1%) patients were associated with dislocations. 5(14.3%) patients were involved with BC fractures in which 1(20%) patients was associated with a dislocation, while 4(11.4%) patients were involved with PCW fractures in which 100% dislocation rate was observed.

To decide the best way to treat an acetabular fracture, the injury and the prognosis have to be assessed and the possible benefits of surgery measured against the risks.

In this study, acetabular fractures were assessed and treated accordingly, in which 13 patients were treated operatively according to the indications of surgery.

In the total operative cases, 61.54% of patients were treated with Kocher-Langenbeck approach which included 4 PCW fractures, 2 PC fractures and 1 each of BC and APW. Posterior approach was used in 30.77% of the patients which included 2 PCW and 1 each of PC and AC. 1 of the patients with PC fracture was operated with anterior approach. There was no postoperative complication in this study as such but one patient had developed sepsis with ARDS after 4 months of surgery, but fracture site/surgical site infection could not be ruled out. No patient in our study had a postoperative sciatic nerve injury and as we did not have a long term follow-up we did not find any patients with heterotopic ossification or secondary osteoarthritis.

JM Matta has stated that surgical treatment of acetabulum fracture through specific approach provides excellent results obtained with surgical treatment in 119 (33%) out of the 373 acetabular fractures,ilioinguinal approach was used to treat anterior wall orcolumn, the anteriorcolumnassociatedwithtransversefracturesaswel lascolumnswithtransversefractures[7].

Briffa *et al*. reported on results in 71 patients with different acetabular fractures treated via the Kocher-Langenbeck approach. The rate of exact anatomical reconstructions (0-1 mm) was 70.4%, 14.1% were reconstructed almost anatomically (2-3 mm) and 15.5% had a non-anatomical reconstruction[8].

In this study, 6 patients had foot drop after injury and 5 of the foot drops were associated with dislocations and 3 of these patients recovered. One of the patients had a complication of femoral vein injury on table, repair done and the patient later developed deep vein thrombosis. No patient had complication of heterotopic ossification or secondary osteoarthritis.

The mean Harris Hip Score of the 30 patients, who have completed 1 yr follow-up, at the end of 1 year, was 84.89. 14 patients had excellent HHS, 4 patients had good HHS, 9 had fair HHS and 3 had poor HHS.In operative cases the mean HHS at 1 year is 80.7, and conservative cases it is 87.6 with 2 tailed t test significance of 0.68.The functional outcome was excellent to good in 60% of the patients in this study.

Excellent or good functional outcome can be expected in between 75%-80% of patients with an anatomical reduction[4].A study done by P. Tornetta mean follow-up of 2.7 years, the results were good or excellent in 91% of the cases[9].

Starr *et al*. stated that an excellent functional outcome can be achieved even in patients with a poor reduction providing that the step-off is outside the weight-bearing area. Factors which influence functional outcome includes increased age, delay in operative treatment, the presence of damage to the femoral head, associated injuries and local complications[10].

Our study has limitations in aspects such as less sample size,comparative groups were not formed, follow up was only for 1 year, whereas other studies have a larger sample size and specific fracture patterns were addressed and a longer period of follow up. As this was a short term study we could not assess the long term complications like secondary osteoarthritis.

CONCLUSION

- Excellent to good functional outcome can be expected in minimally displaced fracture, treated conservatively.
- Intra-articular step of more than 2mm may lead to increase in rate of secondary osteoarthritis and poor clinical outcome.
- In surgically managed patients, the postoperative rehabilitation must be aggressive for the patients to achieve excellent to good functional outcome.
- Patients with BC fractures are most likely to have poor clinical outcome and are at higher risk of joint degeneration.

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