

A prospective study of outcome of simple and associated anterior wall and column acetabular fractures at SMS hospital Jaipur (Rajasthan), India

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Abstract

In the present study, we sought to determine outcome of conservative and operative treatment of simple and associated fractures of anterior wall and anterior column acetabular fractures. This prospective study was carried out on patients admitted in SMS Medical College Jaipur between July 2012 to December 2014. Total of 36 patients were included in this study, out of which 25 cases were treated by conservative method and 11 cases were treated by operative method. We assessed many criteria but concluded that anatomical reduction is associated with good, very good and excellent result irrespective of method of treatment (conservative/operative).

Keywords: Acetabular fractures, Anterior column, Anterior wall.

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Received Date: 12/12/2015 Revised Date: 14/01/2016 Accepted Date: 10/02/2016

Access this article online

Quick Response Code:



Website:

www.medpulse.in

DOI: 12 February
2016

INTRODUCTION

Acetabular fractures are serious injuries and overall annual incidence of acetabular fractures in the local population is 3 patients/100000/year¹. These are high velocity injuries caused by high speed motor vehicle crashes and are seen in young patients². Until of middle of the 20th century acetabular fractures were managed conservatively. Surgical treatment is nonexistent but it was understood that a poor result was imminent if the hip was not congruent. Judet and Letournel³ in 1964 analyzed innominate bone anatomy and using protocol of interpreting the x rays, identifying and understanding the fracture pattern, choosing the appropriate surgical approach and striving for an anatomical reduction they published the largest series which includes 173 patients of which 129 were surgically treated. Their results are still

considered as gold standard of what can be obtained in treatment of these difficult injuries. After that, the standard management of displaced acetabular fractures has changed from conservative to operative. The anatomical reduction is a crucial factor, influencing the functional outcome⁴. As there is only few studies in literature on acetabular fractures and considering significant number of patients of anterior wall and anterior column acetabular fractures are treated operatively in our institute, this study was done to evaluate result of anterior wall and column acetabular fractures treated by conservative and operative methods.

MATERIAL AND METHODS

This study was done in the biggest government tertiary care centre of Rajasthan catering largest number of orthopedics cases. Patients of anterior wall and/ anterior column of acetabular fractures admitted in SMS Medical College and associated Hospitals Jaipur between July 2012 to December 2014 were included in this study. Radiological evolution was done by anteroposterior view of pelvis, Judet 45degree oblique view (iliac and obturator), two dimensional and three dimensional computerized tomography scan.

Roof arc measurement

Roof arc is measured by drawing a vertical line through the roof of acetabulum to its geometric centre and second

line through the point where the fracture line intersects the roof of the acetabulum to the geometric centre. Medial roof arc is measured on anteroposterior view. Anterior roof arc is measured on obturator oblique view.

Posterior roof arc is measured on iliac oblique view. : The goal of treatment is anatomical restoration of the articular surface to prevent posttraumatic arthritis.

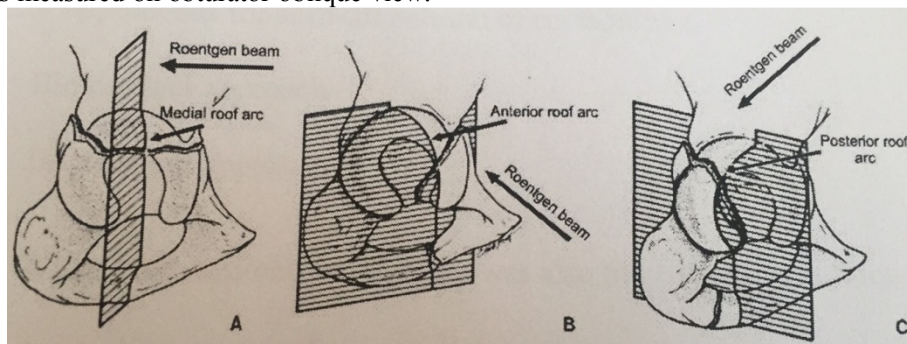


Figure 1

Initial management: Skeletal traction was applied to all 36 cases to minimize soft tissue damage, to allow associated injury to be addressed, maintain limb length and maintain reduction of femoral head in acetabulum.

Nonoperative Treatment

Nonoperative management in the form of skeletal traction was continued for 25 patients fulfilling following criteria:-

1. Fracture having displacement of 2mm or less of dome, with maintain of femoral head congruency with traction.
2. Absence of intraarticular osseous fragments.
3. Maintenance of anterior, posterior and medial roof arc >45 degrees.
4. Wall fracture not compromising hip stability.
5. Both column fractures with secondary head congruence.
6. Distal anterior column or transverse (infratectal) fractures in which femoral head congruity is maintained by remaining medial buttress.
7. Patients having any medical reason for which surgery becomes contraindicated.

Nonoperative treatment was done by applying longitudinal skeletal traction by upper tibial pin and trochanter hook for applying traction in direction of neck of femur. Immediate check x ray was done after applying traction. After that weekly x rays were done for 4 weeks. Again x ray was done at 6 weeks. Partial weight bearing was allowed between 6-12 weeks. Again x ray was done at 12 weeks. Full weight bearing was allowed after 12 weeks. Pelvic lifting exercises and passive motion modalities continued throughout treatment. Final assessment was done at 24 weeks by modified Merle d' Aubigne' scoring.

Operative management

11 Patients who did not fulfill the criteria for nonoperative treatment were treated by operative treatment. Preoperative assessment and planning is done.

Fractures were approached by ilioinguinal or iliofemoral approach. Fractures were open reduced and fixed by acetabular plates and screws. Patients allowed static quadriceps exercises as soon as possible after surgery. Sutures were removed after 2 weeks. At 6 weeks x ray was done. After 6 weeks partial weight bearing was allowed with support. At 12 weeks x ray was taken. After 12 weeks full weight bearing was allowed on affected limb. Final assessment was done at 24 weeks by modified Merle d' Aubigne' scoring.

Period of non weight bearing, partial weight bearing and ability to sit and squat were recorded. Any problem and complications encountered during surgery, post surgery period and their management were recorded.

Evaluation at the final follow up for primary outcome

1. Clinical evaluation was done for any pain, hip deformity, tenderness of hip joint, range of motion, lower limb muscle group strength, gait and trendelenburg test. Final assessment was done by Merle d' Aubigne' score for acetabular fractures⁷ and Harris Hip score⁸.
2. Radiological evaluation was done by Matta's radiological grading system⁴. Anteroposterior and lateral view of x rays of hip at follow up were used to assess osteoarthritis using Tonnis classification⁹, heterotopic ossification were assessed by Brooker classification¹⁰, avascular necrosis of femur head using Ficat classification¹¹. The CT scan (2D/3D) was done if required to confirm any malunion, nonunion or osteonecrosis in suspected cases. MRI was done in cases to diagnosis necrotic changes of femoral head if deemed necessary.

Statistical Analysis

Continuous data were summarized in form of mean and S.D. Continuous data were expressed in form of proportions. Difference in proportions were analyzed

using chi square test. Agreement between two score system to assess clinical outcome was find out by Kappa

statistic. The level of significance was kept 95% for all statistical analysis.

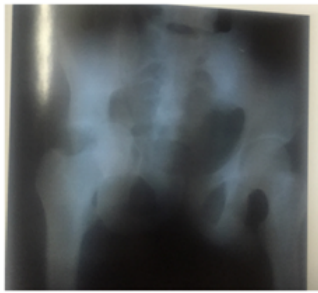


Figure 2

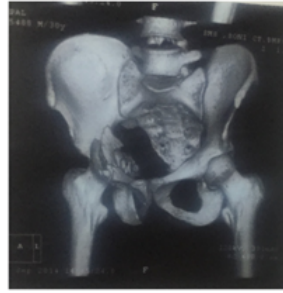


Figure 3

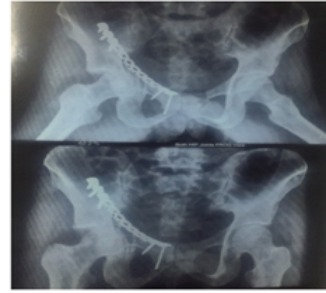


Figure 4

Legend

- Figure 2: Preoperative x ray
- Figure 3: Preoperative CT Scan
- Figure 4: Postoperative X ray

OBSERVATIONS AND RESULTS

In the present study mean age of patients was 41.77 years (range 17 years to 65 years). Most common cause of these fractures in our study was road traffic accident 24 out of 36 (66.67%) of cases. Second most common cause of these fractures is fall from height 10 out of 36 (27.78%) of cases. Mean follow up of patients was 1.305 years. Outcome analysis of various factors on clinical and functional outcome was studied. Only criteria associated which was significantly associated with clinical and functional outcome is quality of reduction. Age, sex, type of management has no significant association on clinical and functional outcome.

Table 1: Effect of quality of reduction in operative group on clinical and functional outcome by Merle d'Aubigné (MDA) score

Type of reduction	Merle d'Aubigné (MDA) score			Total
	Poor+ Fair	Good+ V	Good+ Excellent	
Anatomical	1(16.67%)	5(83.33%)		6
Imperfect+ Poor	5(100%)	0		5
Total	6	5		11

Chi -square= 4.68 with 1degree of freedom; P=0.31 (Significant)

We assessed the association between type of reduction (according to Matta's criteria) and MDA. We found significant results. There was a statistically significant difference in clinical outcome in different type of reduction. That means anatomical reduction is associated with good, very good and excellent results.

Table 2: Effect of quality of reduction in operative group on clinical and functional outcome by Harris Hip Score

Type of reduction	Harris Hip Score		Total
	<=80(Poor)	>80(Good)	
Anatomical	0	6(100%)	6
Imperfect +Poor	4(80%)	1(20%)	5
Total	4	7	11

Chi -square=4.482 with 1degree of freedom; P=0.034(Significant)

We assessed the association between type of reduction (according to Matta's criteria) and Harris Hip Score. We found significant results. That means anatomical reduction is associated with high hip score. Cases having the anatomical type of reduction were all having good score while only 20% of cases having imperfect + poor type of reduction were having good score.

Table 3: Agreement between MDA score and HHS for clinical outcome

Modified MDA score groups	HHS				Total	
	<=80(Poor)		>80(Good)		No	%
	No	%	No	%		
Poor+ fair	7	58.33	6	25	13	36.11
Good+ Very good+ Excellent	5	41.67	18	75	23	63.89
Total	12	100	24	100	36	100

There is a fair agreement between MDA score and HHS score to assess clinical outcome.(Kappa statistic=0.327, SE of Kappa=0.164,95% CI=0.006to 0.647).

Table 4: Outcomes of patients on conservative treatment

Type of score	Mean	SD	Minimum	Maximum
MDA Score	15.2	1.658	11	18
HHS	85.96	9.766	55	100

Table 5: Outcomes of patients on operative treatment

Type of score	Mean	SD	Minimum	Maximum
MDA Score	14.18	2.040	11	18
HHS	78.91	12.357	53	98

We assessed the outcomes in patients managed operatively and conservatively using Merle d' Aubigné score and Harris Hip Scoring system. We found no statistical difference among them. Neither type of management is associated with better results. This means depending on indications optimum management should be carried out.

DISCUSSION

The management of displaced acetabular fractures is a challenging task for trauma surgeon. Although anatomic reduction of the articular surface and internal fixation one established factor but clinical and functional results depends on several other factors also. In the series by Matta *et al*⁴ the mean age of patients was 37 years and the most common mechanism of injury was motor vehicle accident(83%) while fall from height accounted for 14% cases. In the present study mean age of patients was 41.77 years. In present study most common mechanism of injury was motor vehicle accident (66.67%) while fall from height accounted for 27.78 % cases. Reduction quality in our study in immediately postoperative x ray was good in 54.55%, fair in 27.27% and poor in 18.18% patients.

Table 6: Summary of comparison of reduction quality

Reduction quality	Matta <i>et al</i> ⁴	Present study
Good	71%	54.55%
Fair	19%	27.27%
Poor	10%	18.18%

Table 7: Summary of Comparison of Complications among acetabular fracture patients

Complication	Matta <i>et al</i> ⁴	Giannoudis meta analysis ⁵	Present study
Pain/osteoarthritis	23.9%	26.6%	36.11%
Heterotopic ossification	9%(grade 3or 4)	5.7%(grade3 or 4)	0%
AVN or wear of femoral Head	8%	5.6%	0%
Sciatic nerve injury	Traumatic-15.4% Iatrogenic-3.1%	Traumatic-16.4% Iatrogenic-8%	Traumatic-none Iatrogenic-2.8%
Infection	5.01%	4.4%	None
DVT	Not mentioned	4.3%	None
Chondrolysis	Not mentioned	Not mentioned	None
Hardware failure	3%	Not mentioned	None

Outcome analysis

Assessment of clinical outcome was done with the use of HHS and modified MDA score. Both indicated good to excellent clinical outcomes similar to previous studies^{3,4,5}, favoring operative treatment as gold standard for

Complications

The late complication following a fracture of the acetabulum is pain due to osteoarthritis that may necessitate a total hip replacement or an arthrodesis⁴. On evaluation it was found that pain (36.11%) was the primary complication in our series. Our results are not comparable with that of Matta *et al* 23.9%⁴ and with Giannoudis meta-analysis⁵ in which overall incidence of 26.6%. Briffa *et al*⁶ found the incidence of arthritis in 38% patients with more than 10 years of follow up which indicate that on long term follow up arthritis is more likely to develop even in perfectly reduced fractures. Infection rate in our study was zero % while the analysis of Matta *et al*⁴ reported 5.01% and 4.4% infection rate was reported by Giannoudis *et al*⁵. Sciatic nerve injury was present in one patient. While comparing to Giannoudis metaanalysis incidence of both traumatic (16.4%) and iatrogenic nerve injury (8%), in our series it was low and was comparable to Matta's series (3.1%)⁴.

displaced acetabular fractures. In our study modified Merle d'Aubigné score was good, very good or excellent in 63.88% cases and poor or fair in 36.11% cases. HHS was good or excellent in 66.67% cases and poor or fair in 33.33% cases.

Table 8: Summary of comparison of published results from other authors

Authors	Number of cases	Mean follow up (yrs)	Good/excellent
Present study	36	1.3	63.89%
Matta <i>et al</i> ⁴	259	6	76%
Mayo <i>et al</i> ¹²	163	3.7	75%
Briffa <i>et al</i> ⁶	161	11.3	72%

On analysis of factors affecting clinical outcomes, we observed that quality of reduction was the main determinant of clinical outcome. Among operated patients with anatomical reduction had good, very good or excellent (83.33%) clinical outcome with the modified MDA score and all patients with anatomical reduction had good to excellent clinical outcome with the use of HHS. Matta *et al*⁴ also found that the clinical results were

positively affected by anatomical reduction and postoperative congruity between the femoral head and the acetabular roof.

CONCLUSION

This study presents the radiological, clinical and functional outcome of patients who had acetabular fracture, the study data support open reduction and

internal fixation as a gold standard for acetabular fractures in which it is indicated, anatomical reduction was found significant indicator for both clinical and functional outcome. This study has shown that the majority of patients who undergo open reduction and internal fixation of an acetabular fracture do very well but complete return to a pre injury functional level is uncommon despite a good to excellent of clinical scores.

REFERENCES

1. Laird A, Keating JF: Acetabular fractures. A 16 year prospective epidemiological study: *J Bone Joint Surg Am* 2005;87:967-73.
2. Dakin GJ, Eberhardt AW, Alonso JE, et al: Acetabular fracture patterns, associations with motor vehicle crash information: *J Trauma*. 1999; 47:1063-71.
3. Judet R, Judet J, Letournel E: Fracture of acetabulum, classification and surgical approaches for open reduction: *J Bone Joint Surg Am* 1964; 46:1615-38.
4. Matta JM: Fractures of the acetabulum. Accuracy of reduction and clinical results in patients managed operatively within three weeks after the injury: *J Bone Joint Surg Am* 1996; 78:1632-45.
5. Giannoudis PV, Grots MR, Papakostidis C, et al: Operative treatment of displaced fractures of the acetabulum, a metaanalysis: *J Bone Joint Surg Br* 2005; 87:24-29.
6. Briffa N, Pearce R, Hill AM, et al: Outcome of acetabular fracture fixation with ten years follow up: *J Bone Joint Surg Br* 2011; 93:229-36.
7. Merle d' aubigne RM, Postal M: Functional results of hip arthroplasty with acrylic prosthesis: *J Bone Joint Surg Am* 1954;36:451-75.
8. Hoekma HL, Van Den Ende CH, Runday HK, et al: Comparison of the responsiveness of the Harris Hip Score with generic measures for hip function in osteoarthritis of the hip function in osteoarthritis of the hip: *Ann Rheum Dis* 2003;62:935-8.
9. Tonnis D: Congenital dysplasia and dislocation of hip in children and adults: New York; Springer 1987.
10. Brooker AF, Bowermn JW, Robinson RA, et al: Ectopic ossification following total hip replacement, incidence and a method of classification: *J Bone Joint Surg Am* 1973; 55:1629-32.
11. Ficate RP, Arleta J: "Necrosis of the femoral head." In: Hunderford DS, eds. Ischemia and necrosis of bone. Baltimore, Md: Williams andWilkins 1980; 171-82.
12. Mayo KA: Open reduction and internal fixation of fractures of acetabulum: result in 163 fractures. *Clin orthop Relat Res* 1994 Aug; 305:31-7.

Source of Support: None Declared
Conflict of Interest: None Declared