



ORIGINAL ARTICLE

Total Hip Arthroplasty Following Acetabular Fracture Fixation: A Functional Outcome Study

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ABSTRACT

BACKGROUND

Total hip arthroplasty (THA) is the endpoint of failed acetabular fracture surgery. Failure may be attributed to causes related injury causing avascular necrosis (AVN) of the femoral head, inadequate articular restoration leading to post-traumatic arthritis, or rarely massive osteolysis of the femoral head. We present a case series of patients who underwent a THA following acetabular fracture or surgery for the same and report their short-term functional outcomes.

METHODS

Between November 2013 and June 2023, 12 patients underwent a THA for acetabular fracture, all of whom had undergone surgery. There were 11 males and 1 female with an average age of 43 years. The average follow-up was 26 months. Retrospective data on patient and fracture demography, and details of THA prosthesis used, were retrieved from chart and radiograph review, and prospective functional outcome score was measured using the Harris Hip Score (HHS).

RESULTS

There were 11 males and 1 female, 7 right hip cases, and 5 left hip cases. THAs averaged 12 months after acetabular fracture surgery. The most common index fractures requiring THA were the posterior wall (4) and posterior wall-column (3). The most common bearing couple was ceramic-on-polyethylene. THA was indicated for painful avascular necrosis of the femoral head in 5 cases, massive osteolysis in 2 cases, and poor reduction leading to secondary arthritis in 4 cases. Post-THA Harris Hip Score (HHS) averaged 86, up from 26 pre-op.

CONCLUSION

THA following acetabular fracture surgery results in significant improvement in functional score for the patient.

KEYWORDS

Acetabular fractures, Total Hip Arthroplasty, Function

INTRODUCTION

THA is a well-accepted treatment for established hip arthritis following acetabular fractures, conservatively managed or operated cases that progress to non-union/mal-union, and in situations where there is a failure to restore the hip joint integrity. Acute total hip arthroplasty following acetabular fractures is gaining importance in fractures presenting with pre-existing hip arthritis, fractures not amenable to salvage by open reduction and internal fixation, or when a poor prognosis is anticipated following fixation.¹

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Tannast et al. studied negative outcome predictors after acetabular fracture fixation and found factors related to injury or those related to surgery. Six factors related to injury included age over 40 years, anterior dislocation, femur head cartilage loss, posterior wall involvement, marginal impaction (40 acetabular cartilage), and initial displacement of more than 20 mm. Three factors related to surgery included a non-anatomic reduction, postoperative acetabular roof incongruence, and the use of an extended ilio-femoral approach.²

The objective of the present study was to study the functional outcome of total hip arthroplasty following acetabular fracture fixation.

METHODS

All surgically treated acetabular fractures that underwent a total

hip arthroplasty (THA) between November 2013 and June 2023 were included. Of 13 patients, 12 were available for follow-up. This study has retrospective and prospective components. The retrospective component included data on demography, fracture type, fixation, causes leading to THA, and types of THA used. The prospective component included an evaluation of the Harris Hip Score at the latest follow-up. There were 11 males and 1 female with an average age of 43.5 years (min 24 years max 63 years). The right side was involved in 7 and the left in 5. The average follow-up was 29 months (6-120 months).

The most common index acetabular fracture was a posterior wall, and combined posterior wall and column (Table 1). The mean time from fracture fixation to THA was 12 months (5 – 25 months). The most common etiology leading to a THA was avascular necrosis of the femoral head (AVN) in 4 cases, followed by massive osteolysis of the femoral head (MOFH) in 3 cases (Table 2). All 12 femoral stems were uncemented, 11 cups were uncemented, and in one case of pelvic discontinuity, a cage was used with a cemented polyethylene cup. The average pre-THA HHS was 26.75 (SD 8.97) which improved to 87.08 (SD 7.20) post-THA, an average increase of 62 points, indicating significant functional improvement. The detailed breakdown of individual patient demography, fracture types, associated injuries, and HHS is shown in Table 1.

RESULTS

Table 1: Baseline characteristics of the patients (N=12) including age and regional distributions, Mechanism of injury, Associated injuries, and HHS

Case No	Age	Sex	Side	Follow-up (months)	Index acetabular fracture	Associated injuries	THR done (months)	Pre HHS	Post HHS
1	41	M	Rt	6	Anterior column posterior wall	None	10	24	79
2	63	M	Rt	54	Posterior wall posterior column	None	10	32	85
3	43	M	Lt	6	Posterior wall posterior column	Right ankle fracture - arthrodesis	5	24	78
4	48	M	Lt	12	Posterior wall	Bilateral Sacroiliac joint disruption+pubis diastasis	13	28	81
5	28	M	Rt	18	Posterior wall	Shaft of Right Tibia and Fibula fracture	7	44	96
6	36	M	Lt	120	Posterior wall	Iliac wing fracture	14	30	91
7	63	M	Lt	6	Posterior wall	Femoral head Fracture with hip dislocation	10	19	77
8	32	M	Rt	6	Posterior wall posterior column	Femur with patella Fracture with split-thickness skin graft	25	19	92
9	48	F	Rt	12	Transverse fracture	None	13	26	84
10	24	M	Rt	24	Anterior column posterior wall	Right Tibia + fibula fracture	13	9	94
11	51	M	Lt	24	Anterior column	Iliac wing fracture	13	36	92
12	45	M	Rt	60	Posterior wall posterior column	None	8	30	96

Table 2: Surgical challenges in performing THA for acetabular fractures (acute or delayed)

Aim of surgery: Restore the columns for cup implantation	Meticulous preoperative planning Labs, Radiographs CT scans	Adequate exposure to delineate the fracture pattern	Availability of all instruments and possible implants as backup
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Eight patients (67%) had associated injuries but this did not seem to influence the HHS (p-value=0.326) at the latest follow-up. Also, there was found to be no significant difference between the index acetabular fracture and the HHS at the latest follow-up (p-value=0.4).

DISCUSSION

An increase in the rate of anatomical reduction and a decrease in the rate of operative complications should be the goals of surgeons who treat acetabular fractures. Matta et al. studied 255 acetabular fractures operated within 21 days and followed for 6 years (2-14). The average age was 29 years old, there were 208 (79%) associated fracture types, and both-column fractures were the most common type (92 hips; 35 %). Anatomical reduction was achieved in 185 hips (71%). The rate of anatomical reduction decreased with increases in the complexity of the fracture, the age of the patient, and the interval between the injury and the reduction.

The clinical result was found to be excellent in 104 hips (40%), good in 95 (36 %), fair in 21 (8%), and poor in 42 (16 %). The clinical results were related closely to the radiographic result. The clinical result was adversely affected by associated injuries of the femoral head, an older age of the patient, and operative complications. It was positively affected by an anatomical reduction and postoperative congruity between the femoral head and the acetabular roof.^{3, 4} Thus, the requirement of a THA is greatly mitigated in acetabular fractures where anatomical reduction has been achieved.

THA after acetabular fracture achieves excellent pain relief and functional improvement in the majority of patients.⁵ The biggest historical problem has been acetabular component fixation. The failure rate of cemented fixation at ten years follow-up was as high as 50%, so is not currently recommended.¹ Early literature of 34 uncemented hips performed between 1984 and 1990 at 10-year follow-up showed that 9 (26%) required acetabular revision, 2 for loosening or wear, and 7 for osteolysis.⁶ Newer generation acetabular components have shown increased durability. Bellabarba et al reported only one revision out of 30 components at five years,⁷ whereas Ranawat et al. reported 2 revisions in 32 acetabular components at a mean of 4.7 years.⁸

Previous implants if any should be removed only if they are in the way of cup implantation or infected.⁵ Press fit uncemented modern porous metal acetabular component with multiple screw options is the preferred implant for the majority of cases. Complex fractures may require major reconstruction with revision THA implants especially when a pelvic discontinuity is present.¹

Our study has some major limitations that include a small sample size, retrospective nature, heterogeneous group of index fractures, and relatively short follow-up. However, even in a heterogeneous fracture cohort, we found significant improvement in functional scores across all fracture types, which is an encouraging observation. Future prospective studies with larger sample sizes across different fracture types are required to show performances across individual parameters explored in our study.

CONCLUSION

Acetabular fractures should be fixed anatomically to mitigate the need for a THA. Damage or division of the gluteus muscles must be avoided to prevent a post-operative lurch, instability, and heterotrophic ossification. Total hip arthroplasty is a viable salvage option for arthritis, avascular necrosis, and femoral head osteolysis following acetabular fractures. THA after acetabular fracture fixation is complex primary THA, is technically demanding, and requires meticulous planning and execution. Availability of appropriate inventory including revision arthroplasty prosthesis is mandatory before embarking on these difficult cases. Excellent improvement in functional scores can be expected after THA in these patients, as was the case in this series.

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