



Original Article

Evaluation of Total Hip Replacement for Complications of Post-Operative Acetabular Fracture Dislocation

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Abstract

Introduction: Acetabular fractures, which frequently result in hip dislocation, are complicated intra-articular injuries caused by high-energy trauma. Many patients get post-traumatic osteoarthritis and femoral head avascular necrosis despite surgery. Total hip replacement (THR) is necessary due to the discomfort, limping, decreased mobility, and functional impairment caused by these disorders. There is yet little information on THR results in these situations. In patients with osteoarthritis and/or avascular necrosis following surgical repair of acetabular fracture dislocation, this study assessed the functional result and complications of THR.

Methods: This quasi-experimental study was conducted at the National Institute of Traumatology and Orthopedic Rehabilitation (NITOR), Dhaka, from March 2022 to September 2024. A total of 30 patients were included and followed for a minimum of 24 weeks. Functional outcome was assessed using the Harris Hip Score (HHS), along with evaluation of pain, limping and postoperative complications.

Results: The mean age of participants was 46.9 ± 11.442 years, with male predominance (80%). The mean HHS improved significantly from 25.8 ± 6.386 preoperatively to 91.9 ± 2.998 at 24 weeks ($p < 0.001$). Excellent outcomes were observed in 83.3% of patients and good outcomes in 16.7%. The surgery successfully eliminated the marked preoperative pain reported by 90.0% of patients, resulting in 80.0% experiencing only mild pain and 20.0% achieving complete pain relief postoperatively. Limping improved significantly, with 66.7% achieving normal gait. Complications were minimal (6.7%), including superficial surgical site infection and heterotrophic calcification and no major complications were observed.

Conclusion: Total hip replacement provides excellent short-term functional outcomes, significant pain relief and low complication rates in patients with post-traumatic hip complications following acetabular fractures.

Keywords: Total hip replacement, acetabular fracture, post-traumatic osteoarthritis.

Introduction

Acetabular fractures are complex intra-articular injuries that significantly affect the biomechanics and long-term function of the hip joint. The hip joint, formed by the articulation between the femoral head and acetabulum, plays a critical role in weight bearing and

mobility. Disruption of this joint, particularly through acetabular fractures, may lead to substantial morbidity and long-term disability if not managed appropriately¹.

These fractures account for approximately 10% of all pelvic fractures and commonly occur following high-energy trauma such as road traffic accidents,

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especially among younger individuals. However, in elderly populations, low-energy trauma may also result in acetabular fractures due to decreased bone quality²⁻⁴. Despite advances in surgical techniques, particularly open reduction and internal fixation (ORIF), complications remain frequent and clinically significant.

Among these complications, post-traumatic osteoarthritis and avascular necrosis (AVN) of the femoral head are the most disabling. These conditions arise due to cartilage damage, disruption of vascular supply and residual incongruity of the hip joint following injury or surgical intervention. The incidence of these complications varies widely in the literature, reflecting differences in injury severity, surgical expertise and patient characteristics^{3,5}. Clinically, these conditions manifest as persistent pain, restricted movement, limping and progressive functional impairment.

Total hip replacement (THR) has emerged as the definitive treatment for end-stage hip degeneration resulting from such complications. It aims to relieve pain, restore joint function and improve quality of life. However, THR following acetabular fracture is technically challenging due to altered anatomy, presence of scar tissue, retained implants and bone defects, which may influence surgical outcomes and complication rates^{6,7}.

Previous studies have demonstrated favorable outcomes of THR in this context, particularly in terms of functional improvement measured by Harris Hip Score (HHS). Nevertheless, variability in complication rates and long-term outcomes persists across studies^{8,9}. Furthermore, most available evidence originates from high-income countries, with limited data from resource-constrained settings.

In Bangladesh, where trauma burden is high and orthopedic services are evolving, there is a need to evaluate the outcomes of THR in patients with post-traumatic hip complications.

Therefore, the present study aimed to assess the functional outcome and complication profile of total hip replacement in patients with complications following surgical fixation of acetabular fracture dislocation, using Harris Hip Score, pain and limping as primary outcome measures.

Materials & Methods

This study was a quasi-experimental investigation conducted at the National Institute of Traumatology

and Orthopedic Rehabilitation (NITOR), Sher-e-Bangla Nagar, Dhaka, Bangladesh, over a period from March 2022 to September 2024, involving a total of patients diagnosed with hip osteoarthritis and/or avascular necrosis of the femoral head as complications following surgical fixation of acetabular fracture dislocation. The inclusion criteria were age between 20 and 70 years with traumatic hip osteoarthritis and/or avascular necrosis following surgical management of acetabular fracture dislocation, while the exclusion criteria included non-traumatic AVN, neuromuscular disorders of the hip joint, current or previous hip joint infection, conservatively managed acetabular fractures, and severe osteoporosis of acetabular or femoral bone stock.

Data Collection Procedure

Data were collected using a semi-structured questionnaire designed specifically for this study, incorporating patient history, clinical examination findings, laboratory investigations, intraoperative details and postoperative follow-up outcomes. Each participant underwent thorough preoperative evaluation and relevant baseline and clinical data were systematically recorded. Follow-up assessments included evaluation of pain, limping, functional status using Harris Hip Score and documentation of complications. A structured data sheet was utilized to ensure consistency and completeness of outcome evaluation.

Study Procedure

Eligible patients were selected through purposive sampling based on predefined inclusion and exclusion criteria. After obtaining informed consent, all patients underwent total hip replacement. Preoperative and postoperative assessments were conducted systematically and patients were followed up for a minimum duration of 24 weeks to assess clinical and functional outcomes.

Statistical Analysis

Data were processed and analyzed using IBM SPSS Statistics version 25.0. Descriptive statistics were used to summarize demographic and clinical variables, expressed as mean, standard deviation, frequency and percentage. Inferential statistical analyses included Chi-square tests for categorical variables, independent sample t-tests for comparison of means and analysis of variance (ANOVA) followed

by Bonferroni correction for repeated measures of Harris Hip Score over time. A p-value of less than 0.05 was considered statistically significant, with a confidence interval of 95%.

Results

In this study the highest proportion of patients (33.3%) belonged to the 41–50-year age group, followed by 30.0% in the 51–60-year group, with a mean age of 46.9 ± 11.442 years (range 20–67 years). The study population showed a marked male predominance (80.0%). Participants were engaged in diverse occupations, most commonly manual workers (30.0%), followed by businessmen (26.7%) and housewives (20.0%). Regarding comorbidities, the majority (80.0%) had no associated medical conditions, while diabetes mellitus (16.7%) and hypertension (3.3%) were observed in a minority of patients.

Table I: Baseline characteristics of study participants (N=30)

Variable	Category	Frequency Percentage	
		(n)	(%)
Age (years)	≤20	1	3.3
	21–30	2	6.7
	31–40	5	16.7
	41–50	10	33.3
	51–60	9	30.0
	61–70	3	10.0
Gender	Male	24	80.0
	Female	6	20.0
Occupation	Manual worker	9	30.0
	Businessman	8	26.7
	Housewife	6	20.0
	Farmer	3	10.0
	Service holder	2	6.7
	Student	2	6.7
Comorbidities	None	24	80.0
	Diabetes mellitus	5	16.7
	Hypertension	1	3.3

Table II demonstrates that right-sided hip involvement was more common, observed in 63.3% of patients, whereas left-sided involvement was observed in 36.7%. This indicates a predominance of right hip pathology among the study participants.

Table II: Distribution of study participants by affected sides (N=30)

Side	Frequency (n)	Percentage (%)
	(n)	(%)
Left	11	36.7
Right	19	63.3
Total	30	100

Table III shows that the majority of patients (80.0%) sustained a posterior wall acetabular fracture associated with hip dislocation. Central fracture dislocation and combined acetabular and femoral head fractures were comparatively less frequent, each accounting for 10.0% of cases.

Table III: Distribution according to initial injury pattern (N=30)

Injury pattern	Frequency	Percentage
	(n)	(%)
Central fracture dislocation of the hip	3	10.0
Acetabular fracture with femoral head fracture	3	10.0
Posterior wall fracture with hip dislocation	24	80.0
Total	30	100.0

Table IV indicates that half of the patients (50.0%) underwent total hip replacement within 2 years of the initial injury. A substantial proportion (43.3%) had surgery within 2–4 years, while only 6.7% underwent delayed procedures beyond 4 years. The mean duration between injury and THR was 2.8 ± 1.669 years.

Table IV: Distribution according to duration from injury to THR (N=30)

Duration (years)	Frequency (n)	Percent (%)
≤2	15	50.0
2–4	13	43.3
≥4	2	6.7
Total	30	100.0
Mean ± SD	2.8 ± 1.669	
Range	1–10	

The figure illustrates the types of prosthetic implants used in total hip replacement. Hybrid implants were used in the majority of cases (70.0%), while reverse hybrid implants were used in 30.0% of patients. This reflects a preference for hybrid fixation techniques in the study setting.

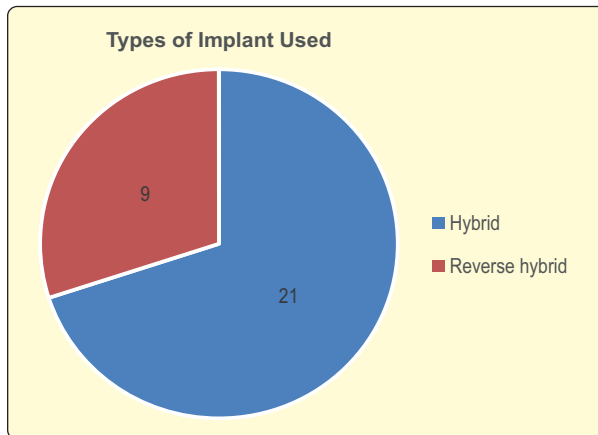
**Figure 1.** Distribution of participants according to types of implant used (N=30)

Table V shows that all patients achieved satisfactory outcomes (100%), with 83.3% categorized as excellent and 16.7% as good. No patient had fair or poor outcomes. The mean Harris Hip Score at final follow-up was 91.9 ± 2.998 , indicating excellent functional recovery.

Table V: Distribution according to HHS at last follow-up (N=30)

HHS Category	Frequency (n)	Percent (%)
Excellent (90–100)	25	83.3
Good (80–89)	5	16.7
Fair (70–79)	0	0.0
Poor (<70)	0	0.0
Total	30	100.0
Mean ± SD	91.9 ± 2.998	
Range	85–96	

Table VI demonstrates a progressive and statistically significant improvement in Harris Hip Score over time. The mean score increased from 25.8 preoperatively to 91.9 at 24 weeks postoperatively. All pairwise comparisons between time points were statistically significant ($p < 0.001$), indicating consistent functional improvement following THR.

Table VI: Distribution of HHS at different follow-ups (N=30)

Time point	Mean ± SD	p-value
Pre-operative	25.8 ± 6.386	<0.001
6 weeks	47.1 ± 2.171	
12 weeks	75.4 ± 5.986	
24 weeks	91.9 ± 2.998	

Table VII shows that before surgery, the majority of patients (90.0%) experienced marked pain, while the remainder had moderate pain. At 24 weeks' follow-up, no patients reported moderate or marked pain. Instead, 80.0% reported slight pain and 20.0% were completely pain-free. The reduction in pain was statistically significant ($p < 0.001$).

Table VII: Pain status before and after surgery (N=30)

Pain level	Pre-operative n (%)	24 weeks n (%)	p-value
None	0	6 (20.0)	<0.001
Slight	0	24 (80.0)	
Moderate	3 (10.0)	0	
Marked	27 (90.0)	0	

Table VIII demonstrates a marked improvement in gait following surgery. Before intervention, 73.3% of patients had moderate limping and 26.7% had severe limping. At 24 weeks' follow-up, no patient had moderate or severe limping; instead, 66.7% had normal gait and 33.3% had slight limping. This improvement was statistically significant ($p < 0.001$).

Table VIII: Limping status before and after surgery (N=30)

Limping	Pre-operative n (%)	24 weeks n (%)	p-value
None	0	20 (66.7)	<0.001
Slight	0	10 (33.3)	
Moderate	22 (73.3)	0	
Severe	8 (26.7)	0	

Table IX shows that postoperative complications were minimal. The majority of patients (93.3%) experienced no complications. Only two patients (6.7%) developed complications: one case of wound infection and one case of heterotopic ossification. No major complications such as implant loosening or prosthetic dislocation were observed.

Table IX: Distribution according to complications (N=30)

Complication	Frequency (n)	Percentage (%)
None	28	93.3
Wound infection	1	3.3
Heterotopic ossification	1	3.3
Total	30	100

Discussion

The present study evaluated the functional outcome and complications of total hip replacement (THR) in patients who developed osteoarthritis and/or avascular necrosis following surgical fixation of acetabular fracture dislocation. The findings demonstrate significant functional improvement, substantial pain relief, restoration of gait and a low complication rate, supporting THR as an effective salvage procedure.

The mean age of the study population was 46.9 ± 11.442 years, which is consistent with several previous studies. Abdelmoneim et al. reported a mean age of 47.8 ± 11.3 years [6], while Flóris et al. documented a mean age of 45 years⁵. Similar findings were observed by Kumar et al. (mean 44.7 years) and Wang et al. (mean 45.1 ± 9.3 years), as well as in a meta-analysis by O'Driscoll et al., where the mean age

was 49 years^{3,10,11}. However, slightly higher mean ages were reported by Luthra and Habsi, whereas Ramanath et al. reported a comparatively younger cohort^{12,13}. These variations likely reflect demographic differences and varying indications for arthroplasty.

Male predominance (80%) observed in this study aligns with existing literature. Abdelmoneim et al. reported identical gender distribution, while Luthra and Habsi also demonstrated higher male involvement^{6,12}. This pattern is likely related to increased exposure of males to high-energy trauma such as road traffic accidents.

Regarding injury characteristics, posterior wall acetabular fracture with hip dislocation was the most common pattern (80%), which is consistent with findings from meta-analyses by Morison et al., where posterior wall fractures were the predominant configuration¹⁴. This reflects the typical mechanism of injury involving dashboard impact.

The mean duration from injury to THR in this study was 2.8 ± 1.669 years. Comparable findings were reported by Kumar et al. (average 30 months) and Flóris et al. (mean 27 months)^{3,5}. In contrast, longer intervals were observed in studies by Wang et al. and Do et al.^{7,10}. Meta-analytical data suggest that most conversion THRs are performed within 2–5 years following initial injury, supporting the findings of the present study^{3,4}.

In terms of implant selection, hybrid fixation was predominantly used (70%), which is consistent with observations by Abdelmoneim et al. and partially comparable to findings by Luthra and Habsi, although variations exist depending on surgeon preference and bone quality^{6,12}. Literature suggests that both cemented and uncemented components are acceptable, with selection tailored to patient-specific factors⁴.

Functional outcome, as measured by Harris Hip Score (HHS), showed marked improvement from 25.8 ± 6.386 preoperatively to 91.9 ± 2.998 postoperatively. This improvement is comparable to multiple studies. Abdelmoneim et al. reported improvement from 39.6 to 80.1 and Taheriazam and Saeidinia from 47 to 89^{6,9}. Similarly, Makridis et al. reported a median HHS of 88 in their systematic review⁸. These findings collectively indicate that THR provides substantial functional recovery.

The proportion of excellent outcomes (83.3%) in this study is also comparable to previous reports. Do et al. reported 72% excellent outcomes, while Kumar et al. observed 61.1% excellent and 38.9% good outcomes^{3,7}. Wang et al. also reported predominantly excellent and good results¹⁰. These findings suggest that satisfactory outcomes are consistently achieved across different settings.

Pain relief was a significant outcome, with elimination of moderate and marked pain postoperatively. Similar improvements in pain have been reported by Taheriazam and Saeidinia⁹. Likewise, limping improved markedly in this study, consistent with findings by Ramanath et al., indicating restoration of gait and functional mobility¹³.

The complication rate in this study was low (6.7%), with only minor complications observed. This is lower than rates reported in other studies. Flóris et al. reported dislocation (7.6%) and infection (5.1%)⁵, while Abdelmoneim et al. reported dislocation and heterotopic ossification in 6.7% cases each⁶. Do et al. observed dislocation in 12% of cases and Ramanath et al. reported heterotopic ossification in 13.6%^{6,8}. A systematic review by Yuan et al. reported pooled complication rates of heterotopic ossification (22.53%), dislocation (4.66%), infection (3.44%) and nerve injury (1.07%)¹⁵. In contrast, no major complications such as prosthetic dislocation, implant loosening, or nerve injury were observed in the present study, which may reflect careful surgical technique and shorter follow-up duration.

Although comorbidities were present in a minority of patients, no statistically significant association with complications was found. However, the single case of wound infection occurred in a diabetic patient, suggesting a possible clinical correlation.

Overall, the findings of this study are consistent with existing literature, demonstrating that THR is a reliable and effective treatment for managing complications following acetabular fracture dislocation. The procedure results in excellent functional outcomes, significant symptom relief and relatively low complication rates.

This study was limited by a small sample size, single-center design and a short follow-up duration of 24 weeks. Long-term outcomes, implant survivorship and late complications could not be assessed. Additionally, the absence of a control group limits the ability to

compare treatment effectiveness. Larger multicenter studies with extended follow-up are recommended to evaluate long-term outcomes and implant survival. Comparative studies assessing different implant types and surgical techniques may provide further insights. Early identification and timely intervention for post-traumatic hip complications should be emphasized to optimize outcomes.

Conclusion

Total hip replacement is an effective and reliable surgical option for managing post-operative complications of acetabular fracture dislocation. The procedure results in significant improvement in functional outcome, substantial pain relief and restoration of gait, with a low complication rate. These findings support the role of THR as a definitive treatment modality in appropriately selected patients.

Conflicts of interest

There are no conflicts of interest.

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Ethical Approval

Ethical approval for the study was obtained from the Institutional Review Board (IRB) of NITOR.

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