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Delayed total hip arthroplasty in patients developing osteoarthritis following acetabular fractures

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ABSTRACT

Objectives: The aim of this study is to review the short-term results of total hip arthroplasty (THA) for the management of delayed arthritis after acetabular fractures.

Methods: This is a retrospective study of operated cases of THA post-acetabular fracture arthritis. Data were collected from computerized hospital records from January 2010 to December 2019. We analyzed post-operative outcomes, which included revision surgery due to any reason, post-operative infection, hip dislocation, sciatic nerve injury, and deep venous thrombosis. In addition, radiographs were evaluated for restoration of the center of rotation (COR), horizontal offset (HO), and vertical offset (VO) by an independent observer.

Results: A total of 36 cases (30 males and six females) were included in the study. The average age was 55 years. Road traffic accidents were the most common cause of fractures followed by falls from height. The mean time between the fracture and the development of symptoms of arthritis was 48 months. One THA was complicated by post-operative dislocation. Infection was reported in three cases and sciatic nerve injury occurred in one patient. Heterotopic ossification was seen in four cases and thromboembolism developed in one patient. The COR, HO, and VO showed a normal pattern.

Conclusion: THA after acetabular fractures is a complex surgical procedure with relatively high short-term complications. Restoring the hip biomechanics can help in achieving results that are comparable to primary total hip replacement.

Keywords: Acetabulum, Arthritis, Arthroplasty, Fracture, Replacement, Total hip

INTRODUCTION

The incidence of acetabular fractures is declining in developed countries and is more commonly seen in the older population.[1,2] However, these fractures in the Asian and Middle Eastern populations are still common in the younger age group due to the high prevalence of road traffic accidents (RTAs).[1,3] Despite advances in managing these injuries, the incidence of post-traumatic arthritis is very high and accounts for 13–40% of all hip osteoarthritis cases. The treatment options for post-traumatic hip osteoarthritis include non-operative and operative treatment. Conservative management is usually considered first, and options include physical therapy, nonsteroidal anti-inflammatory medication, intra-articular injections, and life

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modifications. Total hip arthroplasty (THA) is the standard surgical treatment in patients with failure of conservative modalities.

THA to treat these painful joints is challenging and has a reduced survival rate compared to THA for primary arthritis.[2,4-6] This is due to joint deformity, bone defect, presence of implants, reduced bone density, and soft-tissue scarring. In this retrospective study, we reviewed the short-term results of post-acetabular fracture delayed arthritis management in our cohort of the population. This is the first reported study from a Middle East population sample, which has unique and different social and cultural aspects compared with the Western population.

MATERIALS AND METHODS

This is a single-center retrospective study of patients admitted between January 2010 and December 2019 at Oman's Level 1 trauma center. The hospital records were screened and we included all patients with failed acetabular fracture requiring a hip replacement. We included conservatively managed as well as cases that had open reduction and internal fixation, irrespective of the complexity of initial injury, and time to failure. Patients who had the initial treatment done elsewhere but came to our hospital for replacement were also included in the study. We excluded cases with a follow-up period of <1 year.

The initial injury was graded as per the Letournel classification for acetabular fractures [Table 1]. The primary outcome was revision surgery due to any cause. Secondary outcomes were post-operative infection, dislocation, sciatic nerve injury, and deep venous thrombosis (DVT). Radiographs were evaluated for restoration of the center of rotation (COR), horizontal offset (HO), and vertical offset (VO) by an independent observer.

Statistical analysis was done using the Statistical Package for the Social Sciences version 22. For descriptive purposes, categorized variables were described as a percentage. Numeral variables were presented as mean with standard deviation.

RESULTS

A total of 36 patients fulfilled the inclusion criteria. The mean age of the patients was 55 years (44–70). There were 30 males and six females. RTA was the most common cause of these injuries followed by falls from height [Table 2].

One patient had a dislocation postoperatively and it was managed by revision of acetabular shell in a better orientation [Figure 1]. There was a superficial infection in two cases which settled with oral antibiotics. Deep infection developed in one case and was controlled by early debridement and

Table 1: The Letournel classification of the initial injury.

Fracture type	No. of cases (percentage)
Posterior wall	3 (8.3)
Posterior column	5 (13.8)
Transverse	14 (38.8)
Anterior column	2 (5.5)
Both columns	10 (27.7)
T shaped	2 (5.5)
Total	36

Table 2: Demographic details of the patients.

Variable	No. (percentage)
Mean age	55 years (range from 44 to 70)
Gender	
Male	30 (83)
Female	6 (17)
Initial management	
Conservative	10 (28)
ORIF	26 (72)

ORIF: Open reduction and internal fixation

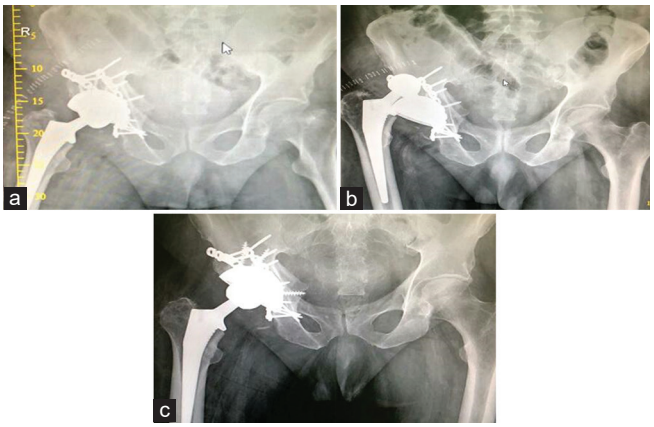

Figure 1: (a) Immediate post-operative total hip arthroplasty for hip osteoarthritis secondary to a posterior wall and posterior column fractures. It shows a retroverted cup with decreased inclination. (b) Post-operative radiograph showing dislocated total hip arthroplasty. (c) Post-revision radiograph showing the acetabular shell in a better orientation.

change of linear followed by intravenous antibiotics for 6 weeks. Transient sciatic nerve palsy occurred in 1 patient (2.8%) who recovered in 3 weeks. Two patients had foot drop due to their initial injury before hip replacement. Post-operative heterotopic bone formation was seen in 4 cases (11%) and they were Brooker Grade 1–2. DVT developed in one patient and was treated by warfarin. Radiolucent lines were seen in three cemented acetabula in De Lee zone 1 and 2, but they did not show progression and patients remained asymptomatic.

Out of these 36 patients, 26 (72%) had an open reduction and internal fixation done as initial management and the remaining 10 patients were managed conservatively. Single-stage surgery was done in 20 patients, whereas six patients required staged initial reconstruction for their initial acetabular fracture. Kocher-Langenbeck approach was used in 20 patients, iliofemoral approach in two patients, and Stoppa approach in four patients. The mean duration to the development of symptomatic arthritis was 48 months.

The patients presenting in follow-up with severe arthritis pain interfering with activities of daily living were considered for THA. The posterior approach was used in 33 patients and the lateral approach was used in three patients. All the cases were operated on by two surgeons. Hardware was removed only if it came in the way of acetabular shell implantation. The sciatic nerve was felt by finger and kept away. Four patients had fully cemented fixation, three had hybrid fixation, and the remaining 29 were uncemented reconstructions [Table 3].

The acetabular defect was reconstructed in three patients using a femoral head bone graft and a trabecular metal (TM) augment (Zimmer Biomet Inc.) was used in five patients. TM cup (continuum shell) (Zimmer Biomet Inc., USA) was used in three cases and revision TM shell (Zimmer Biomet Inc., USA) was used in five patients. A dual mobility cup (Indiana, Warsaw, USA) was cemented in the shell in three patients [Table 4]. Postoperatively, these patients received 2 g of cefazoline sodium for the first 24 h and DVT prophylaxis for 6 weeks. These patients were mobilized initially as partial weight-bearing for 6 weeks and progressing to full weight-bearing at 12 weeks. Patients were instructed to avoid crossing their legs and avoid hip flexion beyond 90°. Post-THA patients were evaluated at days 0, 30, 90, and at 1 year. The radiographs were retrieved from the PACS system for evaluation.

The incidence of dislocation was 0.36%, with a 95% confidence interval. The COR, HO, and VO evaluated in post-operative radiographs showed normal distribution.

Table 3: Method of fixation used for surgery.

Fixation method	No. (percentage)
Fully cemented	4 (11)
Hybrid fixation	3 (8)
Fully uncemented	29 (81)

Table 4: Details of implants used for surgery.

	No. of cases (percentage)
Cemented dual mobility cup	3 (8.3)
Trabecular metal cup	3 (8.3)
Revision shell	5 (13.8)
Augments	5 (13.8)
Bone grafting	3 (8.3)
Uncemented dual mobility cup	17 (47.2)
Total	36

DISCUSSION

Our study shows that satisfactory outcomes can be achieved with THA following painful arthritis after acetabular fractures. This is shown by the primary and secondary outcomes of the current study, which are comparable to published literature for primary THA.[5,7-9] There was one dislocation, and one patient underwent revision surgery. There was no other failure of implants in our cohort. Cemented cups were used in patients with osteoporotic bones. Three out of seven patients with cemented cups showed radiolucent lines, but they were non-progressive and asymptomatic. Most of the literature mentions poor cement interdigitation in sclerotic bone with distorted anatomy and early cementing techniques have shown consistently poor results.[10,11] Although Scott *et al.* have shown 90% survival with cemented THA after acetabular fracture.[12] Lack of experience and training with cementation techniques might be the reason for inferior results in most of the studies with cemented THA for such complex conversions. Uncemented cups are considered the treatment of choice with reported survival of >90 % at 10 years as these are complex revision cases.[5,13-16] The porous acetabular components with multiple holes are expected to reduce mechanical failure further and improve longevity.[17,18] We have used TM cups in three patients in our study in patients with massive defects where enough bone contact was not there with the acetabular cup. A screw in the pubis and ischium gives enhanced primary fixation till the bone in growth. More studies are expected with these implants with a larger number of patients and follow-up.

The defect in all the patients is posterosuperior (Paprosky 3A) and it was reconstructed using bone grafts in three patients. Porous augments were used for reconstruction in five patients. Excellent primary stability was achieved and with time, autogenous bone graft and artificial grafts got incorporated into the host bone. This helped to bring the COR of the hip down to the original. The restoration of the COR, horizontal and VOs were achieved in the post-operative radiographs. The use of TM cup is also supported in literature with reported long-term revision rates of as low as 2–5%.[7,19]

Heterotopic ossification is a known complication after surgery for these fractures with a reported incidence of up to 53% and a mean incidence of 38.3%, and therefore, routine prophylaxis in the form of indomethacin or low-dose radiation is recommended.[7,9,13] We encountered it in only four patients, which did not affect daily activity living and we did not use any prophylaxis.

We reported infection in three patients (two superficial and one deep) in our series. These are complex conversion cases in which the duration of surgery is increased and there is retained previous hardware resulting in a higher incidence of infection than primary THA.[20] Studies are suggesting removing implants and performing staged surgery to reduce the risk of infection. However, these methods have their own complication with reduced patient satisfaction and, hence, can be universally applied for these injuries.[21,22]

The limitations of our study are the fact it is a retrospective series, small sample size, and short-term follow-up. However, as there are not enough studies from this region as people have different expectations and requirements after surgery, these case series help evaluate results and plan larger controlled studies.

CONCLUSION

THA after acetabular fractures is a complex surgical procedure with relatively high short-term complications. Restoring the hip biomechanics can help in achieving results that are comparable to primary total hip replacement.

RECOMMENDATIONS

THA after acetabular fractures delayed arthritis should involve thorough pre-operative workup and planning. These cases should be handled at tertiary level centers by experienced surgeons with revision acetabular highly porous implants back-up. We also recommend future studies to compare clinical and radiological outcomes with a control group of total hip replacement for primary osteoarthritis.

AUTHORS' CONTRIBUTIONS

JL conceived and designed the article's outlines, data collection, and prepared the initial draft. SSA prepared the final draft. Both authors have critically reviewed and approved the final draft and are responsible for the manuscript's content and similarity index.S

ETHICAL APPROVAL

Ethical approval was obtained from the Khoula Hospital research ethical committee (PRO032021079) on March 18, 2021.

Declaration of patient consent

The authors certify that they have obtained all appropriate patients consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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