

The immediate future clinical effects of a transformation to total hip replacement in patients with traumatic rheumatism.

Rashin Jaeidinia

Department of Orthopedics Surgery, Tehran Medical Sciences Branch, Islamic Azad University, Tehran, Iran.

*Corresponding Author :

Rashin Jaeidinia, Department of Orthopedics Surgery, Tehran Medical Sciences Branch, Islamic Azad University, Tehran, Iran.

Received : November 20, 2023

Accepted: November 21, 2023

Published : December 20, 2023

Abstract

Background : Acetabulum fractures can cause posttraumatic arthritis even after they have been fixed, making them a complex and challenging condition to manage. In this patient group, total hip arthroplasty (THA) has been the most often done operation for posttraumatic arthritis problems. The purpose of this research is to evaluate the complications and functional outcomes of converting to total hip arthroscopy (THA) for posttraumatic arthritis following acetabular fracture.

Patients and techniques : A mean follow-up period of 3.7 years (range: 2–5 years) was observed for 49 patients. Four occurrences of sciatic nerve palsy were among the complications; all of them had suffered trauma during the first procedure. Two instances had two stages of surgery due to infection, which was indicated by elevated C-reactive protein and erythrocyte sedimentation rate. Following THA infection with methicillin-resistant *Staphylococcus aureus*, one case was treated using a one-stage infection strategy based on protein and frozen section samples that were supplied intraoperatively with a 10 neutrophil/high-power field. We employed cages in two cases, the Girdlestone surgery for severe infections and uncontrolled diabetes, and uncemented cups in 47 cases.

Findings : At the last follow-up, the modified Hip Harris Score mean improved from 47 (31–66) before to the revision to 89 (79–95). At the final follow-up, the average pain component for both Western Ontario and McMaster Universities increased from 7–20 to 0–11. Absence of

dislocation, pulmonary thromboembolism or deep vein thrombosis, fresh nerve damage, and heterotopic ossification. In conclusion, reasonable pain reduction and functional improvement can result from the conversion to THA following posttraumatic arthritis in acetabular fracture patients.

Keywords : *acetabular fracture, conversion total hip arthroplasty, post-traumatic arthritis, internal fixation.*

INTRODUCTION

Complex acetabular fracture has not been clearly explored in the literature. Its utility was limited to associated fracture patterns based on the Letournel classification by some authors. However, others have used it for various types of fractures, including processions of the acetabulum. Patterns like this are more demanding in management and utilization.¹ Acetabular fractures are challenging and difficult to manage. They can result in posttraumatic arthritis, avascular necrosis of femoral head, or both. Despite the fact that open reduction and internal fixation (ORIF) reduces the risk of posttraumatic arthritis, the risk cannot be completely eliminated.² Furthermore, ORIF failure in fracture of acetabulum ranges between 12% and 57% in different investigations.

In case of posttraumatic arthritis and its adverse effects, total hip arthroplasty (THA) might be a feasible resolving procedure.⁷ The conversion of acetabular fracture to arthroplasty leads to different survival rates. Regarding the frequency of acetabular fracture in the elderly, it can be predicted that number of patients in this age group undergoing THA will increase.^{1,3,4,8–10} Post-acetabular fracture THA poses different challenges for orthopedic surgeons, including residual pelvis deformities, bone loss in the acetabulum, infections, osteonecrosis, heterotopic ossification, maintained metalwork, sciatic nerve palsy, and other problems encountered in acetabular element fixations in the long term.⁸ Indication for performing an acute THA in young people with concurrent femoral head and acetabular difficulties is severe nonreconstructable commin-

tion, and in geriatric patients, the indication is severe bony comminution. Outcomes of THA for posttraumatic acetabular fracture consist of good pain relief and functional developments.^{10,11} In a large-scale population meta-analysis, 3,670 acetabular fractures were included and the most common long-term postsurgical ORIF complication was posttraumatic arthritis (20%). The rate of osteonecrosis of femoral head was 5.6%.¹² In other investigations, the incidence of post-traumatic arthritis was between 10% and 60% in some series. The incidence of femoral head osteonecrosis was between 3% and 53%.¹³ In one study, the incidence of conversion of ORIF to THA during and after 5 years of first treatment was 11%.¹⁴ Fractures of acetabulum might grow the risk of post-traumatic degenerative arthritis and THA. Previous investigations revealed that adverse events related to conversion of ORIF to THA are higher in comparison with primary THA.¹⁵ Predisposing factors in conversion arthroplasty failure are comminution and initial displacement, femoral head defect, fracture of femoral head or neck, and crush in anterolateral or posterior portion of acetabulum. It is suggested to perform THA immediately when patients encounter these situations after ORIF.^{16,17} The problems associated with performing converted THA such patients are poor bone supply, damaged tissue, higher risk of infection, and presence of previous implant.⁸ In the current study, the researchers assessed short-term functional outcomes and the associated complications in posttraumatic arthritis patients who had undergone THA after ORIF.

Patients And Methods

This study examined the outcomes of patients at Tehran, Iran's Erfan and Milad hospitals who were eligible for conversion from posttraumatic arthritis to THA by observational prospective analysis. When they were injured, the age range of the participants was 17 to 68 years old, with 43 males and 6 females. Between 1998 and 2015, all patients underwent surgery to convert their posttraumatic arthritis from internal fixation of an acetabular fracture to total hip arthroscopy (THA). It is noteworthy to emphasise that the conversion of THA is frequently required due to the factors associated with the failure of fixation following posttraumatic arthritis. Following a consistent methodology, all patients who met the criteria for conversion surgery underwent an investigation lasting between 3.2 and 17.1 years on average. Posttraumatic arthritis followed acetabular fracture in all patients.

fracture and required THA as a result of excruciating pain, stiffness, and restricted mobility.

Every attempt was made to achieve a safe and specific distance from the prior incision. All procedures were performed utilising a direct lateral (Hardinge) approach with the patient in the lateral position and a standard-length incision. Under general anaesthesia, patients had surgery using a standard protocol with some slight modifications. A plane was created at a distance of 1-2 cm on either side between the subcutaneous tissues and the gluteal fascia, and the skin and subcutaneous tissues were incised in a single line. After dividing the gluteus medius and minimus, a capsulotomy was carried out. The plates were left in place during THA, and the only screws in the joints or were removed or taken out by a milling tool on the reamer path. After the posttraumatic arthritis issues developed, this was not the first operation. Thus, it is indisputable that press-fitting from the cup and reaming the acetabulum require a significant level of accuracy. If there was a possibility of infection or if the acetabular implants were becoming loose or affected, the researchers removed them. Osteotomies were used in certain instances to remove the plates. Throughout the patient evaluation, every other procedure was carried out in compliance with the established guidelines.¹⁸

The Girdlestone surgery was utilised in 1 case by the researchers to treat severe infections and uncontrolled diabetes; cages were used in 2 cases, and uncemented cups were used in 47 cases. The metal bearing surface was extremely cross-linked polyethylene, with the exception of five juvenile cases where the senior author combined highly cross-linked polyethylene with third-generation delta ceramic. It is important to note that X-rays were taken of each patient during the procedure, and that after it was finished, an abduction pillow was placed between the legs. Additionally, prophylactic antibiotics were started in the operating room 30 minutes before to the incision and repeated twice more. Intravenous transfusion of 15 mg/kg tranexamic acid was used to reduce bleeding during the procedure. All patients also received enoxaparin for a month as a prophylactic treatment for deep vein thrombosis (DVT), and indomethacin-SR 75 mg was administered daily for 6 weeks to treat heterotopic ossification.¹⁸

Examining data statistically

Utilising descriptive statistical methods, the mean SD of quantitativeThe variables before and after the procedure were compared using a paired t-test, and the results were assessed

using a linear regression test. The software SPSS (19.0 for Windows; IBM Corporation, Armonk, NY, USA) was used for all analyses. P-values less than 0.05 were regarded as significant.

Declaration of Ethics

The Islamic Azad University of Medical Sciences, Tehran branch's ethical committee oversaw all ethical concerns pertaining to patient information and procedures, and ethical statements were authorised by the committee. In compliance with the Declaration of Helsinki, each patient was required to fill out a written informed consent form before they could take part in the study.

Outcomes

For each participant, a clinical and radiological evaluation was conducted following the conversion process. Prior to the operation, the modified Hip Harris Score (MHHS) was recorded. six months following the procedure and at the two-year follow-up. In the current study, none of the patients experienced dislocation, DVT or pulmonary thromboembolism, heterotopic ossification, new nerve injury (only in 4 cases of preoperative sciatic nerve injury, tendon transfer was performed 6 months postoperatively), or new nerve injury. Two patients required reoperation: one was an acute infection that was managed with a one-stage revision, and the other involved a serious infection and sepsis, uncontrolled diabetes mellitus, and an advanced age of the patient that Girdlestone addressed.

Radiographic Assessment

After internal fixation, all subjects received THA for posttraumatic arthritis, with an average follow-up period of 6.2 years (ranging from 3.2 to 17.1 years).

Simple and complicated fractures are the two types of fractures that are typically seen in acetabular fractures. The majority of patients received plate treatment initially for complicated fractures. Between three and seventeen years following the first treatment, all of them experienced posttraumatic arthritis following ORIF and required total hip arthroplasty (THA) as a result of complications from their previous acetabula fracture procedure.

Difficulties

Four occurrences of sciatic nerve palsy were among the complications; all of them had suffered trauma during the first procedure. Due to infection, which was indicated by

high levels of erythrocyte sedimentation rate and C-reactive protein as well as by frozen section samples (confirmed by >10 polymorphonuclear cells/high-power field), two cases underwent two stages of surgery; one patient developed methicillin-resistant *Staphylococcus aureus* after THA. follow-up after surgery Six months after the conversion surgery, the MHHS was used to assess its effects on pain relief and practical progress, even though it had been recorded for every patient during the 2-year final follow-up. The results showed that, six months after THA, the MHHS had improved from 47 (31–66) prior to the procedure to 89 (79–95). Furthermore, at the last follow-up, the average pain score for McMaster and Western Ontario Universities decreased from 15 (7–20) to 4 (0–11). Four patients from the current study that were treated are shown in Figures 1-4.

Discussion

Fractures of the proximal side of the femur are increasing in frequency as the population ages.¹⁹ Additionally, THA is the most advantageous technique in orthopaedics and one of the greatest practices in modern orthopaedic surgery. The procedures are carried out for various reasons, and the indications for post-traumatic arthritis are the same as those for any patient with a destructured hip disorder. These include unbearable pain, trouble performing daily tasks, confirmed radiological signs of advanced arthritis, articular incongruity, or osteonecrosis.¹⁸ Whether simple or complex, the ORIF approach is used to treat the majority of acetabulum fractures. Orthopaedic doctors use THA when patients have difficulties associated to post-traumatic arthritis in order to get the desired results. A precise preoperation is a crucial component that might enhance the likelihood of surgical success. However, it's also necessary to carry out a surgery in a proper and conventional manner: The primary focus of many investigations was THA of acetabular fractures following unsuccessful internal fixation. 32 patients receiving THA after a failed dynamic hip screw were evaluated by Hammad et al. in 2023. fixation and discovered just one dislocation and one periprosthetic fracture. At the end follow-up, 78% of patients had good–excellent clinical results.²³ The rate of osteoporotic fractures, such as those of the pelvis and acetabulum, will rise as the population ages. Compared to younger cases with similar injuries, management of senior patients with acetabular fractures is more debatable. In these cases, prevention of posttraumatic arthritis and THA is still

the best way to reduce the need for revision arthroplasty. In the elderly population, arthroplasty is frequently used to treat proximal femur fractures and is. However, most surgeons who perform acute total hip arthroplasty (THA) for older acetabular fractures do not permit immediate weight bearing following surgery. As such, the debate over the most effective way to treat these difficult fractures continues. Four therapy options have been identified so far: ORIF, restricted open reduction and percutaneous screw fixation, acute THA, and non-surgical treatment with early mobilisation. However, the precise indications and advantages of any treatment are still unknown. The development of cementless fixation and implant designs has significantly improved clinical outcomes, especially on the acetabular side.^{24, 25} The current investigation had certain shortcomings. The sample size was minimal during the study period and the study did not include a specific age group for analysis.

Conclusion

The current study's findings, taken together with a slightly higher rate of intraoperative complications, indicate that the conversion of posttraumatic arthritis following acetabular internal fixation to total hip arthroplasty (THA) is a safe option that yields good functional results and is clinically successful without increasing the risk of complications. On the other hand, it is imperative to alert patients to the risk of only partial postoperative relief from groin pain. Appropriate preoperative planning is likely to increase patient satisfaction and decrease discomfort, and raising awareness of common complications may enhance results. A large-scale study involving age-diverse subgroups is advised in order to improve the validity and generalizability of the findings.

REFERENCES

1. El-Khadrawe TA, Hammad AS, Hassaan AE, El-Khadrawe TA, Hammad AS, Hassaan AE. Indicators of outcome after internal fixation of complex acetabular fractures. *Alexandria Med J*. 2012;48(2):99–107.
2. Yu L, Zhang CH, Guo T, Ding H, Zhao JN. [Middle and long-term results of total hip arthroplasties for secondary post-traumatic arthritis and femoral head necrosis after acetabular fractures]. *Zhongguo Gu Shang*. 2016;29(2):109–113. Chinese.
3. Diwanji SR, Kim SK, Seon JK, Park SJ, Yoon TR. Clinical results of conversion total hip arthroplasty after failed bipolar hemiarthroplasty. *J Arthroplasty*. 2008;23(7):1009–1015.
4. Sierra RJ, Mabry TM, Sems SA, Berry DJ. Acetabular fractures: the role of total hip replacement. *Bone Joint J*. 2013;95-B(11 Suppl A): 11–16.
5. Berry DJ, Halasy M. Uncemented acetabular components for arthritis after acetabular fracture. *Clin Orthop Relat Res*. 2002;405:164–167.
6. Srivastav S, Mittal V, Agarwal S. Total hip arthroplasty following failed fixation of proximal hip fractures. *Indian J Orthop*. 2008;42(3):279.
7. Pang QJ, Yu X, Chen XJ, Yin ZC, He GZ. The management of acetabular malunion with traumatic arthritis by total hip arthroplasty. *Pak J Med Sci*. 2013;29(1):191.
8. Winemaker M, Gamble P, Petruccioli D, Kaspar S, de Beer J. Short-term outcomes of total hip arthroplasty after complications of open reduction internal fixation for hip fracture. *J Arthroplasty*. 2006;21(5):682–688.
9. Taheriazam A, Saeidinia A, Keihanian F. Total hip arthroplasty and cardiovascular complications: a review. *Ther Clin Risk Manag*. 2018;14:685–690.
10. Taheriazam A, Saeidinia A. Cementless one-stage bilateral total hip arthroplasty in osteoarthritis patients: functional outcomes and complications. *Orthop Rev*. 2017;9(2):6897.
11. Taheriazam A, Saeidinia A. Conversion of failed hemiarthroplasty to total hip arthroplasty: a short-term follow-up study. *Medicine*. 2017;96(40):e8235.
12. Giannoudis PV, Grotz MR, Papakostidis C, Dinopoulos H. Operative treatment of displaced fractures of the acetabulum. A meta-analysis. *J Bone Joint Surg Br*. 2005;87(1):2–9.

13. Swanson MA, Huo MH. Total hip arthroplasty for post-traumatic arthritis after previous acetabular fractures. *Semin Arthroplasty*. 2008;19(4):303–306.
14. Mears DC, Velyvis JH, Chang CP. Displaced acetabular fractures managed operatively: indicators of outcome. *Clin Orthop Relat Res*. 2003;407:173–186.
15. Ranawat A, Zelken J, Helfet D, Buly R. Total hip arthroplasty for posttraumatic arthritis after acetabular fracture. *J Arthroplasty*. 2009;24(5):759–767.
16. Amstutz HC, Smith RK. Total hip replacement following failed femoral hemiarthroplasty. *J Bone Joint Surg Am*. 1979;61(8):1161–1166.
17. Schnaser E, Scarcella NR, Vallier HA. Acetabular fractures converted to total hip arthroplasties in the elderly: how does function compare to primary total hip arthroplasty? *J Orthop Trauma*. 2014;28(12):694–699.
18. Krause PC, Braud JL, Whatley JM. Total hip arthroplasty after previous fracture surgery. *Orthop Clin North Am*. 2015;46(2):193–213.
19. Archibeck MJ, Carothers JT, Tripuraneni KR, White RE. Total hip arthroplasty after failed internal fixation of proximal femoral fractures. *J Arthroplasty*. 2013;28(1):168–171.
20. Haidukewych GJ, Berry DJ. Salvage of failed internal fixation of inter-trochanteric hip fractures. *Clin Orthop Relat Res*. 2003;412:184–188.
21. Mortazavi SM, R Greenky M, Bican O, Kane P, Parvizi J, Hozack WJ. Total hip arthroplasty after prior surgical treatment of hip fracture is it always challenging? *J Arthroplasty*. 2012;27(1):31–36.
22. Zhang L, Zhou Y, Li Y, Xu H, Guo X, Zhou Y. Total hip arthroplasty for failed treatment of acetabular fractures: a 5-year follow-up study. *J Arthroplasty*. 2011;26(8):1189–1193.
23. Hammad A, Abdel-Aal A, Said HG, Bakr H. Total hip arthroplasty following failure of dynamic hip screw fixation of fractures of the proximal femur. *Acta Orthop Belg*. 2008;74(6):788.
24. Romness DW, Lewallen DG. Total hip arthroplasty after fracture of the acetabulum. Long-term results. *J Bone Joint Surg Br*. 1990;72(5):761–764.
25. Makridis KG, Obakponovwe O, Bobak P, Giannoudis PV. Total hip arthroplasty after acetabular fracture: incidence of complications, reoperation rates and functional outcomes: evidence today. *J Arthroplasty*. 2014;29(10):1983–1990.