

Outcomes of total hip arthroplasty in trauma patients

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ABSTRACT

Introduction and Purpose: Hip arthroplasty is one of the most useful non-emergency orthopedic surgeries, which is effective in improving pain and function in patients with joint disabilities, and due to its serious complications, as well as the significant and increasing need for research in this field, it seems necessary. This study was conducted with the aim of investigating the type of surgery and the results of joint replacement treatment in patients with orthopedic trauma referred to Baqiyatalla Hospital from 1391 to 1401.

Materials and Methods: This study was conducted cross-sectional. All patients with orthopedic trauma who underwent hip arthroplasty and who visited Baghiy a Hospital between 1391 and 1401 were included in the study. The outcomes investigated in this study are demographic information, treatment complications (infection, loosening, and per prosthetic fracture), patients' final performance, Harris hip score and Womac index. All the information of these patients was extracted from the files in Baqiyat Hospital and finally entered into STATA version 15 software for analysis and comparison. collecting quantitative data, it was analyzed with the help of spss software version 19.

Result: Age of patients in patients who underwent total hip arthroplasty and hip arthroplasty were 67.71 years \pm 7.19 years and 79.37 years \pm 7.14 years respectively, 67 (49.3%) men and 69 (50.7%) women were studied, the average body mass index in total hip arthroplasty and knee hemi arthroplasty patients respectively It was 24.88 \pm 1.56 and 23.85 \pm 1.34 in hip arthroplasty patients in 1 case (0.7 percent) and in hip hemi arthroplasty patients it was not observed in any case. The average Harris Hip Score (HHS) in total hip arthroplasty and knee hemi arthroplasty groups was 76.5 \pm 4.8 and respectively. It was 73.7 \pm 5.1. Six people died in total hip arthroplasty during one year, but this number was recorded in ten people in hip hemi arthroplasty. Most of the patients in both groups were in grade two American Society of Anesthesiologists (ASA) Score, so that in this grade, there were 66 people (48.5%) in total hip arthroplasty and 42 people (30.9%) in hip hemi arthroplasty. Between gender ($p=0.574$), infection ($p=0.98$), loosening ($p=0.15$), displacement ($p=0.42$) and fracture ($p=1$), smoking ($p=0.51$), reoperation ($p=0.09$), falling from a height ($p=0.52$). ASA Score (0.05) did not find any statistically significant difference between the two groups. However, patients' age ($p=0.00$), Body Mass Index (BMI) ($p=0.00$), underlying disease ($p=0.03$), Harris Hip Score (HHS) ($p=0.002$), deaths ($p=0.04$), there was a statistically significant difference.

Conclusion: The result of our study showed that in the group that underwent total hip arthroplasty, they were younger and had a lower body mass index. They had a higher HHS score and a lower number of deaths than the group that underwent hip hemi arthroplasty.

Keywords: hip hemi arthroplasty, arthroplasty, trauma

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Word count: 4062 **Tables:** 03 **Figures:** 03 **References:** 28

Received: 07 April, 2024, Manuscript No. OAR-24-131702

Editor Assigned: 15 April, 2024, Pre-QC No. OAR-24-131702(PQ)

Reviewed: 08 May, 2024, QC No. OAR-24-131702(Q)

Revised: 19 May, 2024, Manuscript No. OAR-24-131702(R)

Published: 26 May, 2024, Invoice No. J-131702

INTRODUCTION

Hip fractures are common injuries, with an incidence of more than 250,000 cases each year in the United States [1]. It is estimated that this number will significantly increase by 2050 [2, 3]. The majority of cases are either intertrochanteric or femoral neck fractures [4]. Hip fractures are three times more common in women [5]. Low-energy trauma is responsible for the majority of elderly patients with hip fractures, whereas the incidence in young patients is mostly related to high-energy trauma [6]. Most femoral neck fractures are treated operatively, which allows early patient mobilization [6]. Arthroplasty is a well-known method for treating such injuries under special circumstances [7].

Hip arthroplasty is among the best and most successful surgeries for different hip conditions, including trauma, especially displaced Femoral Neck Fractures (FNF) [8]. Hemi Arthroplasty (HA) and Total Hip Arthroplasty (THA) are two well-known procedures used for the treatment of displaced femoral neck fractures in selected patients [9].

Peri-articular fractures of the knee are mostly treated by internal fixation or rarely non-operatively in the elderly [10, 11]. Few articles have proposed Total Knee Arthroplasty (TKA) as the initial treatment for complex knee fractures, particularly in the elderly [12-17]. Achieving stable fixation in elderly patients with acute complex knee fractures is a major problem which total knee arthroplasty can overcome [18]. Moreover, first-line TKA can prevent decubitus-related complications in these patients [18].

Per prosthetic fracture, infection, aseptic loosening, osteolysis and dislocation are among the various complications occur following arthroplasty [19].

Surgeons use various techniques to reduce the risk of complications following total hip arthroplasty for displaced femoral neck fractures [20]. Despite these techniques, a high incidence of complications and reoperations has been reported in several articles [21, 22]. In complete hip joint replacement, clinical and radiological follow-up is necessary so that the complications can be recognized in time and the necessary intervention can be performed, and on the other hand, the patient's abilities and the achievement of the treatment goal, which is the return of the patient to normal life and activity, can be evaluated.

In our country in recent years, the amount of hip surgery has increased dramatically and due to the aging of the general population of the country, the amount is increasing day by

day. Considering that the hip joint is a weight-bearing joint and the movements of this joint play an important role in the overall functioning of the skeletal system, it is very important to perform this surgery accurately and without complications. This operation is accompanied by many complications, and knowing the type and rate of their occurrence can be very helpful in more accurate surgery and making appropriate decisions to prevent complications [23-28].

Based on the growing number of hip replacement surgeries following fractures in the elderly each year, it is reasonable to conduct a study on postoperative complications. This study aimed to describe common complications following hip replacement surgery (THA or HA) for hip fractures and the causes of failure and reoperation at a referral trauma center.

MATERIALS AND METHODS

This retrospective cross-sectional study was conducted at a referral trauma center at Baghiatallah Hospital. All patients who underwent first-line hip or knee arthroplasty for acute trauma were included in this study. The data registry was reviewed for a period of 10 years from 2012 to 2021. Patients who underwent THA or TKA for secondary traumatic osteoarthritis, primary osteoarthritis, avascular necrosis or pathologic fracture were excluded. Patients with previous ipsilateral or contralateral hip or knee fractures or surgery and patients with multiple fractures were excluded. Only patients with isolated displaced femoral neck fractures were included in the review. Records with missing or incomplete data were also excluded. All individual registered information for patients who underwent THA for acute trauma between January 2012 and December 2021 was reviewed. This study was approved by the Ethical Committee of Baghiatallah University of Medical Sciences.

Patient demographic data, including age, sex, and Body Mass Index (BMI) were extracted from registered documents. The patients were divided into two groups according to the type of procedure: Hemi arthroplasty, Total Hip Arthroplasty. No cases of primary TKA for trauma were included in the registry. The complications recorded at 180 days post-surgery were infection, aseptic loosening and dislocation. In addition, the reoperation rate of patients within the first year was recorded. The ASA score was determined for each patient based on the recorded data. Surgeries were performed by four surgeons. All hip replacement procedures were performed using anterolateral or lateral approaches. None of the patients was treated using the posterolateral approach. The mechanism of trauma was extracted from each patient's profile. Harris hip score as an indicator of quality of life for individual patients was recorded postoperatively at various time intervals. Collecting quantitative data, it was analyzed with the help of spss software version 19.

RESULT

Demographic characteristics

A total of 408 patients with displaced femoral neck fractures underwent hip arthroplasty surgery between January 2012 and December 2021. A total of 246 patients underwent total hip arthroplasty and 162 underwent hemi arthroplasty. The demographic information of the patients is shown in table 1. The number of hemi arthroplasty procedures has risen in the last two years and the information is provided in table 2. A total of 207 patients (50.7%) were female and 201 patients (49.3%) were male. Total hip arthroplasty patients were, on average younger (67.7 year *vs.* 79.3 year). Smoking was more common in the THA group (29.3% *vs.* 24.1%); however, the difference was not statistically significant.

Parameter	THA	HA	p-value
No. of patients (total=409)	247	162	
Male (%)	126 (51.01%)	75 (46.3%)	0.57
Female (%)	121 (48.99%)	87 (53.7%)	
Mean age (range)	68 years (53 years-86 years)	79 years (60 years-95 years)	0.37
BMI (range)	24.9 (21.6-28.2)	23.9 (21.2-26.2)	0.34

Comorbidity	THA	HA	p-value
Diabetes mellitus (%)	66 (26.8)	66 (40.7)	0.09
Hypertension (%)	132 (53.7)	84 (51.9)	0.83
Hyperlipidemia (%)	67 (27.2)	21 (13)	0.53
Ischemic heart disease (%)	18 (7.3)	45 (27.8)	0.001
Smoking (%)	72 (29.3)	39 (24.1)	0.05
ASA score 1 (%)	27 (11)	4 (2.4)	0.028
ASA score 2 (%)	198 (80.1)	125 (77.2)	
ASA score 3, 4 (%)	22 (8.9)	33 (20.4)	

Comorbidities

The American Society of Anesthesiologists (ASA) physical status classification system was developed to assess preoperative general health condition of patients. Based on ASA score total hip arthroplasty patients were generally healthier than hemi arthro-

plasty patients (p-value<0.05). Diabetes was more common in hemi arthroplasty patients (40.7% *vs.* 26.8%) but hyperlipidemia was more common in total hip arthroplasty patients (26.8% *vs.* 12.9%). When comparing ischemic heart disease, it was statistically more common in hemi arthroplasty group (27.7% *vs.* 7.3%,

p-value<0.05). The detailed information about underlying medical diseases are shown in table 2.

Postoperative outcomes

Postoperative outcome parameters are shown in table 3. When comparing THA to HA patients, death within one year after the surgery is statistically more common in HA group (7.3% vs. 18.5%

respectively, p-value<0.05). Infection within 6 months following surgery, dislocation, aseptic loosening and per prosthetic fracture were main complications observed during study and the results are shown in table 3.

Harris hip score were collected at various postoperative visits and were included in the study (Table 3).

Complication/outcome	THA	HA	p-value
Infection (%)	10 (4.04)	6 (3.7)	0.98
Dislocation (%)	7 (2.83)	5 (3.08)	0.65
Fracture (%)	3 (1.21)	5 (3.08)	0.92
Aseptic loosening (%)	8 (3.23)	2 (1.23)	0.27
Reoperation within 1 st year (%)	13 (5.26)	4 (2.46)	0.15
Death within 1 st year (%)	17 (6.88)	29 (17.9)	0.047
Harris hip score (mean)	76.5	73.74	0.002

Surprisingly during data collection there were 3 patients with gunshot trauma to hip. The first one is a 40-years old male with right femoral neck fracture (Figure 1). He underwent a total hip

arthroplasty through direct lateral approach (Figure 1). His recovery period was unremarkable. He came back to his work with mild limping.



Fig. 1. Total hip arthroplasty after gunshot injury and femoral neck fracture

The second patient was a 28-years old male with acetabular fracture and bullet fragments inside the left hip joint following gunshot injury (Figure 2). The fact that intra-articular bullet fragments are harmful both locally and systematically are represented in several articles. Intra-articular bullet fragments are in close contact with

joint cartilage and synovial fluid and can cause significant degenerative processes inside the joint, in addition to decreased range of motion mechanically. Surgical dislocation approach was the preferred approach in this case and 3 months after the surgery the patient has returned to his job without any complaint.



Fig. 2. Surgical dislocation for intra articular bullet removal

Gunshot trauma are responsible for a variety of injuries, as in the third patient, femoral neck fracture, femoral head fracture and acetabular fracture are complex injuries requiring appropriate treatment. Total hip arthroplasty through direct lateral approach was

done (Figure 3). Early post-operative days was unremarkable. In follow-up visits signs and symptoms of infection raise concern but after irrigation and debridement and use of antibiotics resolved.



Fig. 3. Total hip arthroplasty after high energy trauma following gunshot injury to hip joint

DISCUSSION

The number of patients with hip fractures are increasing annually. Arthroplasty is a common procedure in the treatment of displaced femoral neck fractures especially in the elderly patients [23-25]. Hemi arthroplasty is the most common procedure in elderly patients with multiple underlying diseases and limited preoperative ambulation. However, better postoperative outcome and more ambulation has been reported by total hip arthroplasty and though this procedure is also rising among patients [26]. In the present study we reported increased number of THA procedures during 2012 to 2018.

As previously described, THA as the treatment for displaced femoral neck fracture in elderly is becoming more popular, but complications such as dislocation and infection, reoperation rate and the cause of reoperation have not been well reported in the articles. We reported any revision procedure within first year after surgery for any reason and the cumulative incidence was 10%. This is obviously higher than the revision rate for nondramatic total hip arthroplasty procedures reported in studies (between 2% and 4%) [22].

Various causes can lead to revision surgery after THA and HA thus per Prosthetic Joint Infection (PJI) and dislocation remains two the most important etiologies [28]. Baker et al (3 sohoo) reported higher rate of dislocation (6%) after THA than our study (2.4%). The fact that patients who underwent THA were younger and had better preoperative physical health may have an important impact on this statistic. In addition, in the current study no procedure was done via posterolateral approach that according to current evidence about complications following THA can lower dislocation rate.

In this study PJI was the leading cause for reoperation. Sassoon et al reported higher incidence for infection after arthroplasty for treatment of FNF than nondramatic patients (about 6 times higher). Gausden et al verified PJI as the second cause of revision surgery. The rate of PJI after THA for FNF was reported twice the rate of PJI after nondramatic total hip arthroplasties according to current literature [25, 26]. According to our study, the rate of PJI between THA and HA groups was not statistically different.

Per prosthetic fractures after arthroplasty are one of common etiologies for revision surgery and can cause serious problems for the patient and the surgeon. In the current study the incidence of postoperative fracture within one year after surgery was 3.6% and there was no difference between two groups. This can vary regarding the follow-up period, as Gausden et al reported 7% after 5 years' observation.

Mortality within first year after surgery was another endpoint that was reported in this study. Although mortality rate is influenced by many factors, Okike et al designed a 9-year study on 12491

patients aged 60 years old and found no difference in mortality rate between patients who underwent cemented hemi arthroplasty and uncemented hemi arthroplasty for hip fractures. Similarly, Bhandari et al found no difference in mortality rate after treatment of hip fracture either by THA or HA. Unlike mentioned articles we found higher mortality rate after hemi arthroplasty in this study. This might be due to patient selection for surgery, as healthier patients with less comorbidities underwent Total hip arthroplasty. In addition, the THA group were more active before surgery and generally younger than the HA group.

In this study we found no significant difference in reoperation rate within first year after surgery between two groups. However, follow-up period may play a significant role in this conclusion. In contrast, it has been reported by meta-analyses that the risk of reoperation with hemi arthroplasty is higher than with total hip arthroplasty [1, 4-6].

Harris hip score was determined at certain various intervals after surgery and as previous studies claimed total hip arthroplasty had better outcome measures. Because all the patients had trauma before surgery, it was not possible to evaluate the patients before surgery. The choice of total hip arthroplasty as the treatment of displaced femoral neck fracture was rising in the past recent years, because THA has better outcome results when comparing to HA and also lower revision rates and more pain relief are its advantages [6-8, 15, 20, 21].

LIMITATION

This study has several limitations. First, this is a retrospective study. Second, the patient selection for THA or HA was made by surgeon's preference and though the THA group were consist of younger and healthier patients with better preoperative function and more ambulation. Third, the study was conducted in one trauma center and thus the number of patients was not enough to determine risk factors for complications. Fourth, there were four surgeons to perform the procedures and thus different tendencies among surgeons for approach, implant positioning, fixation and closure can lead to confounding results.

CONCLUSION

The reoperation rate between HA and THA groups was not different. Mortality rate was higher with HA. PJI and dislocation were the leading causes of revision surgery after THA and HA. THA has better postoperative outcome in comparison to HA, however the choice of treatment for displaced femoral neck fracture for elderly patients can be confusing and surgeon's preference and skill is one of main parameters.

ACKNOWLEDGEMENT

We greatly appreciate all the participants in the research who kindly shared their views with us.

AUTHORS CONTRIBUTION

Mohamad Kazem Emami Mebodi and Sadra Haji conceptualized and designed the study. Mohamadhosein Mokhtari developed the study methodology in detail. Eman Ghazizadeh, transcribed and analyzed data. Mohamadhosein Mokhtari, Mohamad Kazem Emami Mebodi, and Sadra Haji drafted the initial version of this manuscript. Eman Ghazizadeh and Mohamadhosein Mokhtari reviewed the draft of the manuscript and provided feedback. Mohamad Kazem Emami Mebodi and Sadra Haji made revisions based on intellectual feedback. All authors reviewed and approved the final version of the manuscript.

FUNDING

No funding.

AVAILABILITY OF DATA AND MATERIALS

The datasets used and/or analyzed during the current are available

from the corresponding author on reasonable request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

We obtained ethics approval from the Ethics Committee of the Baghiatallah University of Medical Sciences for this study. All methods were carried out in accordance with relevant guidelines and regulations. An information note on the study, including the collection and recording of oral data, was provided to participants and their signed informed consent was received.

DECLARATIONS

The present work is the outcome of a research proposal from Baghiatallah University of Medical Sciences.

CONSENT FOR PUBLICATION

Not applicable.

COMPETING INTERESTS

All authors declare that they have no competing interests.

REFERENCES

1. National Center for Health Statistics (US). National Hospital Discharge Survey (US). National hospital discharge survey. US Dep Health Hum Serv Cent Dis Control Prev Natl Cent Health Stat. 2010.
2. Gullberg B, Johnell O, Kanis JA. World-wide projections for hip fracture. *Osteoporos Int.* 1997;7:407-413.
3. Dhanwal DK, Dennison EM, Harvey NC, Cooper C. Epidemiology of hip fracture: worldwide geographic variation. *Indian J Orthop.* 2011;45:15-22.
4. Australian. ANZHF Bi-National annual report for hip fracture care. *Regist NZHF.* 2017:1-92.
5. Jordan KM, Cooper C. Epidemiology of osteoporosis. *Best Practice & Research. Clin Rheumatol.* 2002;16:795-806.
6. Johnell O, Kanis J. An estimate of the worldwide prevalence and disability associated with osteoporotic fractures. *Osteoporos Int.* 2006;17:1726-1733.
7. Bonneville P, Feron JM. Fractures of the over 80 years old. *J. Orthop Reconstr Surg Mot Syst.* 2003;89:129-182.
8. Ramezani G, Norouzi A, Moradi E, Pourbairamian G, Aalaa M, et al. Comparing peer education with TBL workshop in (EBM) teaching. *Med J Islam Repub Iran.* 2020;34:70.
9. Keating JF, Grant A, Masson M, Scott NW, Forbes JF. Displaced intracapsular hip fractures in fit, older people: a randomised comparison of reduction and fixation, bipolar hemiarthroplasty and total hip arthroplasty. *Health Technol Assess (Winch Engl).* 2005;9:3-5.
10. Bohm ER, Tufescu TV, Marsh JP. The operative management of osteoporotic fractures of the knee: to fix or replace?. *J Bone Jt Surg Br Vol.* 2012;94:1160-1169.
11. Ries MD. Primary arthroplasty for management of osteoporotic fractures about the knee. *Curr Osteoporos Rep.* 2012;10:322-327.
12. Nourissat G, Hoffman E, Hémon C, Rillardon L, Guigui P, et al. Total knee arthroplasty for recent severe fracture of the proximal tibial epiphysis in the elderly subject. *J Orthop Reconstr Surg Mot Syst.* 2006;92:242-247.
13. Parratte S, Bonneville P, Pietu G, Saragaglia D, Cherrier B, et al. Primary total knee arthroplasty in the management of epiphyseal fracture around the knee. *Orthop Traumatol: Surg Res.* 2011;97:87-94.
14. Malviya A, Reed MR, Partington PF. Acute primary total knee arthroplasty for peri-articular knee fractures in patients over 65 years of age. *Injury.* 2011;42:1368-1371.
15. Bell KM, Johnstone AJ, Hughes SP. Primary knee arthroplasty for distal femoral fractures in elderly patients. *J Bone Jt Surg Br Vol.* 1992;74:400-402.
16. Yoshino N, Takai S, Watanabe Y, Fujiwara H, Ohshima Y, et al. Primary total knee arthroplasty for supracondylar/condylar femoral fracture in osteoarthritic knees. *J Arthroplasty.* 2001;16:471-475.
17. Nau T, Pfelegerl E, Erhart J, Vecsei V. Primary total knee arthroplasty for periarticular fractures. *J Arthroplasty.* 2003;18:968-971.
18. Honkonen SE. Indications for surgical treatment of tibial condyle fractures. *Clin Orthop Relat Res.* 1994;302:199-205.
19. Gausden EB, Cross III WW, Mabry TM, Pagnano MW, Berry DJ, et al. Total hip arthroplasty for femoral neck fracture: What are the contemporary reasons for failure?. *J Arthroplasty.* 2021;36:272-276.
20. Fahad S, Khan MZ, Aqueel T, Hashmi P. Comparison of bipolar hemiarthroplasty and total hip arthroplasty with dual mobility cup in the treatment of old active patients with displaced neck of femur fracture: A retrospective cohort study. *Ann Med Surg.* 2019;45:62-65.
21. Schairer WW, Lane JM, Halsey DA, Iorio R, Padgett DE, et al. The Frank Stinchfield Award: total hip arthroplasty for femoral neck fracture is not a typical DRG 470: a propensity-matched cohort study. *Clin Orthop Relat Res.* 2017;475:353-360.
22. Charette RS, Sloan M, Lee GC. Not all hip arthroplasties are created equal: increased complications and re-admissions after total hip arthroplasty for femoral neck fractures compared with osteoarthritis. *Bone JT J.* 2019;101:84-90.
23. Calder SJ, Anderson GH, Jagger C, Harper WM, Gregg PJ. Unipolar or bipolar prosthesis for displaced intracapsular hip fracture in octogenarians: a randomised prospective study. *J Bone Jt Surg Br Vol.* 1996;78:391-394.
24. Søreide O, Skaerven R, Alho A. The risk of acetabular protrusion following prosthetic replacement of the femoral head. *Acta Orthop Scand.* 1982;53:791-794.
25. Squires B, Bannister G. Displaced intracapsular neck of femur fractures in mobile independent patients: total hip replacement or hemiarthroplasty?. *Injury.* 1999;30:345-348.
26. Ravikumar KJ, Marsh G. Internal fixation versus hemiarthroplasty versus total hip arthroplasty for displaced subcapital fractures of femur—13 year results of a prospective randomised study. *Injury.* 2000;31:793-797.
27. SooHoo NF, Farnig E, Lieberman JR, Chambers L, Zingmond DS. Factors that predict short-term complication rates after total hip arthroplasty. *Clin Orthop Relat Res.* 2010;468:2363-2371.
28. Dinmohammadi M. Demographic characteristics of patients with trauma and its related factors in patients referred to emergency departments of Ayatollah Mousavi, teaching hospital affiliated to Zanjan University Of Medical Sciences, 2017. *Iran J Emerg Care.* 2017;1:11-17.