

## Clinico-Radiological and Functional Outcome Assessment of Hip Hemiarthroplasty in Elderly with Fracture Neck of the Femur: An Observational Study

Arnab Sinha<sup>1</sup>, Santosh Kumar<sup>2</sup>

<sup>1</sup>Senior Resident, Department of Orthopaedics, IGIMS, Patna, Bihar, India

<sup>2</sup>Professor and HOD, Department of Orthopaedics, IGIMS, Patna, Bihar, India

Received: 03-02-2023 Revised: 27-02-2023 / Accepted: 20-03-2023

Corresponding author: Dr. Arnab Sinha

Conflict of interest: Nil

### Abstract

**Aim:** The study evaluated the clinical, radiological, and functional outcomes of hip hemiarthroplasty in elderly with fracture neck of the femur.

**Methods:** The study was conducted in the Department of Orthopedics at IGIMS, Patna, Bihar, India from March 2015 to February 2016. Data of patients above 60 years who were operated on for fracture neck of the femur by bipolar hemiarthroplasty for 1 year were retrieved from the Department of Orthopedics. The sample size was 100.

**Results:** The predominant mechanism of injury was trivial falls in 68 (68%) patients followed by motorcycle accident in 27 (27%) patients and vehicular accident in 5 (5%) patients. 60 patients were female, and 40 patients were male. All the patients were ambulatory with or without support before the fracture. 94 patients received cemented femoral stems; the remaining 6 received press-fit ones. Majority of the patients had hypertension followed by diabetes. 18 patients had excellent Harris Hip scores, and 10 had fair scores. The remaining 72 patients had good Harris hip scores.

**Conclusion:** The present study modular bipolar hemiarthroplasty provides better pain relief with early mobilization and a good level of return to daily routine activities with minimal complications. The overall complications following hemiarthroplasty were acceptable. Targeted medical intervention that focuses upon susceptible patient groups may reduce morbidity, mortality, and improve survival.

**Keywords:** Elderly, Femoral neck fracture, Hemiarthroplasty.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

### Introduction

The geriatric population, defined as those aged 65 and older, is the fastest growing demographic in the world. Hip fracture, including femoral neck fracture (FNF), is a cause for concern in this group, as they are one of the most common traumatic injuries in elderly patients and are associated with high rates of mortality and functional loss. [1] The incidence of these fractures has increased with improvement in life expectancy and is expected to double in

the next 20 years and triple by 2050.2 Mortality rate of 20- 30% in the year following the fracture has been reported. [2] In general, hip fractures most commonly occur in elderly female patients. The demographic studies on these fractures have shown that the incidence of fractured neck of the femur is two-three times more in females than males. [3] Well-established nonmodifiable risk factors for sustaining hip fractures include

female sex, increasing age, ethnic origin, and family history of osteoporotic fragility fractures. Modifiable or lifestyle risk factors include low body mass index (<18.5), smoking, alcohol abuse, poor nutritional status, and low levels of baseline physical activity. [4] Other risk factors are often related to aging, which, in turn, are usually associated with increased risk of falls—these include muscle weakness, deficits in balance or coordination, deteriorating eyesight, and medication side effects. These fractures have been classified according to their anatomical location into fracture neck of the femur, intertrochanteric and subtrochanteric fracture. [5] During the aging process, minor trauma can also cause intracapsular neck femur fracture due to osteoporosis which makes this fracture the 2nd leading cause of hospitalization in people in the age group above 50 years. [6] It has been seen that these fractures consist of around 60% of all hip fractures, out of which 80% of these fractures are displaced. The major consequence of this fracture displacement is it increases the risk of avascular necrosis (AVN) of the head of the femur by affecting the blood supply to the head, nonunion, delayed union, and failure of fracture fixation procedures. [7] The neck of femur fractures is associated with high mortality in the elderly compared to young adults. [8] Management poses a challenge to the orthopaedic surgeon especially in the elderly patient with medical comorbidities. The goal of surgically managing intracapsular neck femur fractures is to operate these fractures timely, helping the patients bear weight easily and, indeed, helping them return to their old functional status with fewer morbidity and morbidity and further surgery. [9] There are various modes of treatment for displaced femoral neck fractures with regard to the patient's age, functional status, and cognitive function. [10] Studies have suggested that hip replacement arthroplasty has opted above

osteosynthesis as fixation treatment has high complication rates followed by secondary surgeries. Hemiarthroplasty is one of the chosen treatments for the geriatric age group and helps patients in early weight bearing and return to their functional status, eliminating complications of nonunion, and osteonecrosis. [11] The present study intends to address the functional, clinical, and radiological follow-up outcomes of patients receiving bipolar hemiarthroplasty for a fractured neck of the femur. [12]

Hence the aim of study was to evaluate the clinical, radiological, and functional outcomes of hip hemiarthroplasty in elderly with fracture neck of the femur.

### Materials and Methods

The study was conducted in the Department of Orthopedics at IGIMS, Patna, Bihar, India from March 2015 to February 2016. Data of patients above 60 years who were operated on for fracture neck of the femur by bipolar hemiarthroplasty for 1 year were retrieved from the Department of Orthopedics. The sample size was 100.

### Inclusion criteria

- Patients aged 60 years and above with displaced intracapsular neck of femur fractures, with no associated injuries, a minimum of 6 months of follow-up, medically fit patients willing for surgery.
- Ambulatory patients who can walk minimum 500 m independently or with minimal support preinjury.

### Exclusion criteria

- Patient under 60 years old; other associated fractures were present.
- Pathological fractures, bilateral neck of femur fractures,
- Patients unable to walk before sustaining the injury,

- Patients who had previous surgery to the affected hip or the opposite hip, and
- Patients who lost to follow-up.

Data were collected from the inpatient files, and then patients were asked to complete the questionnaire form during the final follow-up. Elderly patients with multiple medical comorbidities, physiological compromise, cognitive impairment, and decreased functional demands are largely treated with hemiarthroplasty. In the healthy and active elderly with long life expectancy, total hip arthroplasty is used. Patients were clinically and radiologically evaluated during follow-up, and the functional outcome was assessed by Harris Hip Score. It is a clinician-based outcome measure that is reliable and a validated scale to measure the functional outcome for the hip joint. Results are rated as excellent: 90–100, good: 80–89, fair: 70–79, and poor: <70.

All the patients were examined and operated on by the treating physician after achieving their consent and medical fitness for the surgery. Patients were initially stabilized and evaluated for an elective procedure. The positioning of the patient and approach were based on the surgeon's preference. Preoperative antibiotic prophylaxis (ceftriaxone 2 g IV given after test dose) was used as a single dose 30 minutes before surgery. The selection of the type of implant and bone cementing

were based on the surgeon's preference and bone quality. The posterior Southern Moore surgical approach was used in all the patients. Most patients received cemented femoral components. Hemiarthroplasty operations were performed with second-generation techniques, including intramedullary lavage followed by radio-opaque cement restrictor insertion, hand mixing of the cement, and cement injection using the gun. Only a few patients received uncemented press-fit femoral components.

All the patients received 3 days of intravenous antibiotics and low molecular weight heparin. And all of them were allowed full weight bearing with support on the first postoperative day, along with bedside physiotherapy. Mobilization with support was started after the removal of the negative suction drains. Radiographs were taken to assess the size and fit of the prosthesis along with the cement-bone interface. Patients were followed up at the end of the first, third, and sixth months and the end of the first year of their surgical intervention. Patients were assessed for clinical, radiological and functional outcomes at the end of 1 year.

### Statistical analysis

Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) version 16.0 (IBM SPSS Inc., New York, NY).

### Results

**Table 1: Gender versus Mechanism of Injury of fracture neck of femur in elderly patients**

Gender	Male (N=40)	Female (N=60)
<b>Mechanism of Injury</b>		
Trivial Falls	23	45
Motorcycle accident	15	12
Vehicular accident	2	3

The predominant mechanism of injury was trivial falls in 68 (68%) patients followed by motorcycle accident in 27 (27%) patients and vehicular accident in 5 (5%) patients.

**Table 2: Demographics, characteristics of the patients, and details of the procedures performed**

<b>Gender</b>	<b>N%</b>
Male	40 (40)
Female	60 (60)
Age	72.48 ± 8.32
<b>Preinjury mobility</b>	
Unaided	77 (77)
Aided	23 (23)
<b>Past medical history</b>	
Hypertension	43 (43)
Diabetes	32 (32)
Bronchial asthma	2 (2)
<b>Duration from trauma to surgery (days) Anaesthesia</b>	
GA	6 (6)
SA	94 (94)
<b>Femoral stem</b>	
Cemented	94 (94)
Uncemented	6 (6)

60 patients were female, and 40 patients were male. All the patients were ambulatory with or without support before the fracture. 94 patients received cemented femoral stems; the remaining 6 received press-fit ones. Majority of the patients had hypertension followed by diabetes.

**Table 3: Harris Hip Scores**

<b>Harris hip scores</b>	<b>N%</b>
Excellent	18 (18)
Good	72 (72)
Fair	10 (10)

18 patients had excellent Harris Hip scores, and 10 had fair scores. The remaining 72 patients had good Harris hip scores.

### Discussion

Hip fractures in the elderly have represented a major public health concern. [13] The maximum percentage of hospitalization among trauma cases has been accounted for by proximal femur fractures; these fractures have a high incidence in the general population. [14] Studies have shown that over 90% of the patients having these fractures are people of more than 50 years. These fractures have been classified according to their anatomical location into fracture neck of the femur, intertrochanteric and

subtrochanteric fracture. [15] During the aging process, minor trauma can also cause intracapsular neck femur fracture due to osteoporosis which makes this fracture the 2nd leading cause of hospitalization in people in the age group above 50 years. [16] It has been seen that these fractures consist of around 60% of all hip fractures, out of which 80% of these fractures are displaced. The major consequence of this fracture displacement is it increases the risk of avascular necrosis (AVN) of the head of the femur by affecting the blood supply to the head, nonunion, delayed union, and failure of fracture fixation procedures. [17,18]

The predominant mechanism of injury was trivial falls in 68 (68%) patients followed by motorcycle accident in 28 (28%)

patients and vehicular accident in 4 (4%) patients. Eight (29.6%) patients were involved in motorcycle accident reflecting the recklessness of motorcyclist as a common etiology for trauma in developing countries. [19,20] 55 patients were female, and 45 patients were male. All the patients were ambulatory with or without support before the fracture. Displaced fracture of femoral neck fractures imposes a major health burden on the elderly age group. The incidence of these fractures increases with age, and the prevalence of this fracture is two to three times higher in women. [21] Displaced femoral neck fractures can be treated with osteosynthesis or with arthroplasty. Along with total hip arthroplasty, there are options for unipolar and bipolar hemiarthroplasty. As an effective technique, hemiarthroplasty can provide early ambulation and satisfactory function recovery for the displaced fracture neck femur. [22,23]

Keating et al [24] compared reduction and internal fixation to hemiarthroplasty and total hip arthroplasty in the older age group with displaced neck femur fracture and concluded that the reoperation rate in the internal fixation was 39%, whereas 5% in hemiarthroplasty and 9% in total hip arthroplasty. Moreover, the functional and quality of life scores were worst in internal fixation than arthroplasty group. In a randomized control trial, Inngul et al [25] did a study on 120 patients of fracture neck femur managed with hemiarthroplasty? They concluded no difference regarding complication, health-related quality of life questionnaire, and hip function in people managed by unipolar versus bipolar hemiarthroplasty. However, at the end of 1-year frequency of acetabular erosion is more frequent in the patients treated with unipolar hemiarthroplasty than the bipolar hemiarthroplasty, 20% vs. 5%, whereas the present study encountered acetabular erosion in 18.6% of patients.

20 patients had excellent Harris Hip scores, and 10 had fair scores. The remaining 70 patients had good Harris hip scores. A study by Yamagata et al [26] did a study in 1001 cases of hip hemiarthroplasty, in which 682 were unipolar, and 319 were treated with bipolar hemiarthroplasty. He concluded that patients who underwent bipolar hemiarthroplasty had higher harris hip scores and fewer erosion rates as compared to those a unipolar hemiarthroplasty. The present study also had higher harris hip scores. 94 patients received cemented femoral stems; the remaining 6 received press-fit ones. Most fractures are often sustained during dislocation of head of femur from acetabulum, impaction of the prosthesis after broaching or during its reduction. Under broaching and relative oversizing of the stem with intent to provide interference fit of the prosthesis in osteoporotic bone may result in fracture during prosthesis insertion. Previous studies by Weinrauch et al [27] and Parker et al [28] have reported a statistically significant increased incidence of periprosthetic fractures in uncemented Austin Moore prosthesis. Options available to minimize intraoperative periprosthetic fractures include; Proper patient positioning, adequate lateralization of the broach, adequate soft tissue release, routine use of narrow stem prosthesis or cementing the Austin Moore prosthesis.

### Conclusion

The present study modular bipolar hemiarthroplasty provides better pain relief with early mobilization and a good level of return to daily routine activities with minimal complications. The overall complications following hemiarthroplasty were acceptable. Targeted medical intervention that focuses upon susceptible patient groups may reduce morbidity, mortality, and improve survival. Moreover, total hip arthroplasty can be done whenever warranted, which can be easier than revision in total hip

arthroplasty. Being a cheaper alternative compared to total hip arthroplasty and providing similar functional outcomes, bipolar hemiarthroplasty is the treatment of choice considering the poor socioeconomic constraint faced on a larger scale in the developing country.

## References

1. Lutnick E, Kang J, Freccero DM. Surgical treatment of femoral neck fractures: a brief review. *Geriatrics*. 2020 Apr 1;5(2):22.
2. Schmidt AH, Swiontkowski MF. Femoral neck fractures. *Orthopedic Clinics*. 2002 Jan 1;33(1):97-111.
3. Kannus P, Niemi S, Parkkari J, Palvanen M, Vuori I, Järvinen M. Nationwide decline in incidence of hip fracture. *Journal of Bone and Mineral Research*. 2006 Dec;21(12):1836-8.
4. Hippisley-Cox J, Coupland C. Derivation and validation of updated QFracture algorithm to predict risk of osteoporotic fracture in primary care in the United Kingdom: prospective open cohort study. *Bmj*. 2012 May 22;344.
5. Mittal R, Banerjee S. Proximal femoral fractures: principles of management and review of literature. *Journal of clinical orthopaedics and trauma*. 2012 Jun 1;3(1):15-23.
6. Hoskins W, Webb D, Bingham R, Pirpiris M, Griffin XL. Evidence based management of intracapsular neck of femur fractures. *Hip International*. 2017 Sep;27(5):415-24.
7. Thorngren KG, Hommel A, Norrman PO, Thorngren J, Wingstrand H. Epidemiology of femoral neck fractures. *Injury*. 2002 Dec 1; 33:1-7.
8. James LG. Fractures of hip, acetabulum, and pelvis. *Campbell's operative orthopaedics*. Maryland: Mosby; 1998. 2181-2279
9. Bhandari M, Devereaux PJ, Tornetta III P, Swiontkowski MF, Berry DJ, Haidukewych G, Schemitsch EH, Hanson BP, Koval K, Dirschl D, Leece P. Operative management of displaced femoral neck fractures in elderly patients: an international survey. *JBJS*. 2005 Sep 1;87(9):2122-30.
10. Saberi S, Arabzadeh A, Khomeisi B, Berehnegard E, Mortazavi SJ. Early complications following bipolar hemiarthroplasty for femoral neck fracture in elderly patients. *Academic Journal of Surgery*. 2014;1(3-4):45-8.
11. Parker MJ. The management of intracapsular fractures of the proximal femur. *The Journal of Bone and Joint Surgery. British volume*. 2000 Sep; 82(7):937-41.
12. Prashanth YS, Niranjana M. Comparative study of surgical management of fracture neck of femur with cemented versus uncemented bipolar hemiarthroplasty. *Journal of Clinical and Diagnostic Research: JCDR*. 2017 Feb;11(2):RC17.
13. Robertson GA, Wood AM. Hip hemiarthroplasty for neck of femur fracture: What is the current evidence? *World journal of orthopedics*. 2018 Nov 11; 9(11):235.
14. Ossendorf C, Scheyerer MJ, Wanner GA, Simmen HP, Werner CM. Treatment of femoral neck fractures in elderly patients over 60 years of age-which is the ideal modality of primary joint replacement? *Patient safety in surgery*. 2010 Dec;4(1):1-8.
15. Mittal R, Banerjee S. Proximal femoral fractures: principles of management and review of literature. *Journal of clinical orthopaedics and trauma*. 2012 Jun 1;3(1):15-23.
16. Hoskins W, Webb D, Bingham R, Pirpiris M, Griffin XL. Evidence based management of intracapsular neck of femur fractures. *Hip International*. 2017 Sep;27(5):415-24.
17. Royal College of Physicians. National Hip Fracture Database (NHFD) annual report 2017. London: Royal College of Physicians; 2017.
18. Thorngren KG, Hommel A, Norrman PO, Thorngren J, Wingstrand H.

- Epidemiology of femoral neck fractures. *Injury*. 2002 Dec 1; 33:1-7.
19. Icha IO, Yinusa W. Femoral neck fractures: A prospective assessment of the pattern, care and outcome in an orthopaedic centre. *Nigerian Journal of Orthopaedics and Trauma*. 2004 Sep 10;3(1):42-9.
  20. Aristote H, Moevi A, Michel L, Madougou S, Zannou R, Padonou J. Treatment of femoral fracture by moore prothesis in Cotonou. *Niger J Orthop Trauma*. 2010; 9:5-7.
  21. Alffram PA. An epidemiologic study of cervical and trochanteric fractures of the femur in an urban population analysis of 1,664 cases with special reference to etiologic factors. *Acta Orthopaedica Scandinavica*. 1964 Feb 1;35(sup65):1-09.
  22. Iorio R, Schwartz B, Macaulay W, Teeney SM, Healy WL, York S. Surgical treatment of displaced femoral neck fractures in the elderly: a survey of the American Association of Hip and Knee Surgeons. *The Journal of arthroplasty*. 2006 Dec 1;21(8):1124-33.
  23. Crossman PT, Khan RJ, MacDowell A, Gardner AC, Reddy NS, Keene GS. A survey of the treatment of displaced intracapsular femoral neck fractures in the UK. *Injury*. 2002 Jun 1;33(5):383-6.
  24. Keating JF, Grant A, Masson M, Scott NW, Forbes JF. Randomized comparison of reduction and fixation, bipolar hemiarthroplasty, and total hip arthroplasty: treatment of displaced intracapsular hip fractures in healthy older patients. *JBJS*. 2006 Feb 1;88(2):249-60.
  25. Inngul C, Hedbeck CJ, Blomfeldt R, Lapidus G, Ponzer S, Enocson A. Unipolar hemiarthroplasty versus bipolar hemiarthroplasty in patients with displaced femoral neck fractures. A four-year follow-up of a randomised controlled trial. *International orthopaedics*. 2013 Dec; 37:2457-64.
  26. Yamagata M, Chao EY, Ilstrup DM, Melton III LJ, Coventry MB, Stauffer RN. Fixed-head and bipolar hip endoprostheses: a retrospective clinical and roentgenographic study. *The Journal of Arthroplasty*. 1987 Jan 1;2(4):327-41.
  27. Weinrauch P. Intra-operative error during Austin Moore hemiarthroplasty. *Journal of Orthopaedic Surgery*. 2006 Dec;14(3):249-52.
  28. Parker MJ, Khan RJ, Crawford J, Pryor GA. Hemiarthroplasty versus internal fixation for displaced intracapsular hip fractures in the elderly: A randomised trial of 455 Patients M. *The Journal of bone and joint surgery. British Volume*. 2002 Nov;84(8):1150-5.