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Functional outcome of primary total HIP arthroplasty in elderly patients with fracture neck of femur: A prospective study

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Abstract

Background and Objective: Hip fractures caused by osteoporosis have become a leading source of morbidity and mortality in the adult and elderly populations worldwide. Normal locomotion necessitates a stable, pain-free, and mobile hip. Displaced subcapital and intracapsular femoral neck fractures are usually treated with surgery. The study aims to assess the functional outcome of primary total hip arthroplasty in elderly patients with fracture neck of the femur.

Materials and Methods: Twenty-five patients with acute neck of femur fracture were treated with primary total hip arthroplasty between November 2019 to May 2021. All the patients were followed up for six months.

Results: There were 11 male and 14 female patients in our study. The most common mode of injury was trivial trauma. The primary total hip arthroplasty in fracture neck of femur in elderly population provided a mean Harris Hip Score of 81.1 at the end of 1 month, 83.9 at the end of 3 months, and 85.7 at the end of 6 months. The functional outcomes obtained were excellent results in 32%, good results in 52%, fair results in 12%, and poor results in 4% of the study population, with a 'p value' of 0.045. The poor outcome was recorded in 1 patient due to lack of mobilization secondary to recovery from covid pneumonia.

Conclusion: The key to success lies in selecting patients who are active, independent, mobile before the injury, motivated, and in a good mental state. We recommend the total hip arthroplasty as a primary procedure in elderly patients with fracture neck of femur for better function of the hip and to avoid further revisions in patients with long life expectancy.

Keywords: Total hip arthroplasty, Total hip replacement, neck of femur fracture, Modified Harris hip score

Introduction

Hip fractures caused by osteoporosis have become a leading source of morbidity and mortality in the adult and elderly populations worldwide. Hip fractures are becoming a major concern in Asia, owing to a 2–3 fold increase in their occurrence in nearly every country on the continent [1]. Hip fractures are expected to increase from 1.66 million in 1990 to 6.26 million in 2050. Apart from increased urbanisation in Asia, there has also been an increase in the share of the elderly population as the average life span has increased [1].

By the year 2050, it is expected that more than half of these fractures will be centred in Asia due to changing global population dynamics. Widespread Vitamin D and calcium deficiency, disregard for osteoporosis, alcohol intake, smoking, reduced physical activity levels, obesity, and migration status are all risk factors for hip fracture.

According to the 2001 census, there are around 163 million Indians over the age of 50, with that figure anticipated to rise to 230 million by 2015. Even the most conservative estimates show that 20 percent of women and 10-15 percent of males are osteoporotic. As a result, the total population affected would be roughly 25 million people. If reduced bone density is found to be associated with a higher risk of fracture, as projected, the number might rise to 50 million [2].

Hip fractures can be intracapsular (involving the femur neck) or intertrochanteric. Both have a similar incidence. Intracapsular fractures, on the other hand, are three times more prevalent in

women than in men [3]. Normal locomotion necessitates a stable, pain-free, mobile hip. Unsuitable for reduction and primary fixation, displaced subcapital and intracapsular femoral neck fractures are usually treated with an arthroplasty procedure.

Hip hemiarthroplasty, either cemented or uncemented, or total hip replacement may be performed. In competent, medically fitter (ASA [American Society of Anaesthesiologists] grades 1-2), high demand, active individuals, the results of hip hemiarthroplasty have been proven to be inferior to total hip replacement [4].

Total hip replacement has several advantages, including an extended implant life and a lower risk of revision surgery, making it ideal for patients with a longer life expectancy. Primary total hip replacement (THR) has greatly improved the quality of life by significantly improving both immediate and long-term pain and function.

We have conducted the study to evaluate the functional outcome of primary Total Hip Arthroplasty in elderly patients with fracture neck of femur.

Materials and Methods

The initial study consisted of 31 patients. Patients who were lost to follow-up or lost their lives due to the COVID 19 pandemic were excluded from the study. The final study included 25 cases with fracture neck of femur in elderly patients above the age of 60 irrespective of sex treated by Total Hip Arthroplasty in the Department of Orthopaedics at Shri B. M. Patil Medical College Hospital and Research Centre, Vijayapura, between November 2019 to March 2021. The clearance had been obtained from the ethical committee.

After admission, good medical history and thorough general physical examination were made. A cardiopulmonary evaluation was done by a physician, and an anesthetist did a pre-anesthetic evaluation. Patients received clearance from the ENT and Dental departments to rule out potential foci of infection. The patients were taken up for surgery after obtaining written and informed risk consent of the nature and complications of surgery.

Xylocaine test dose and tetanus toxoid injections were given preoperatively. The operative site was shaved and prepared with betadine scrub a few hours before the surgery. IV antibiotics [II/III generation cephalosporin] were given a day prophylactically before surgery and before induction of anesthesia. Patients were given spinal or epidural anesthesia and then put in the lateral position [operative limb on top]. All the patients were operated through a modified posterolateral

approach. The use of cemented components varied from patient to patient, depending on the quality of their bone stock.

The prosthesis used in our study were VerSys Heritage primary hip prosthesis system manufactured by Zimmer Biomet India Pvt Ltd., and Latitud hip replacement system manufactured by Meril life sciences Pvt Ltd. The implants were chosen based on availability and affordability. Most of the patients were operated with the VerSys Heritage system.

The patient's lower limbs were kept in abduction by using a pillow in between both the legs post-surgery. Drain removal was done after 48 hours. Check radiograph was taken after 48 hours. Patients were made to sit on the second day, stand up with support (walker) on the third day, and were allowed to weight bear and walk with the help of a walker on the fourth postoperative day depending on their pain tolerance and were encouraged to walk after that. Sitting cross-legged and squatting was not allowed.

Suture removal was done on the twelfth postoperative day. The patients were assessed for shortening or deformities and discharged from the hospital. Patients who had infections and bedsores were treated accordingly before discharge from the hospital. The patients were asked to come for follow-up after one month and further follow-up at 3 months and 6 months.

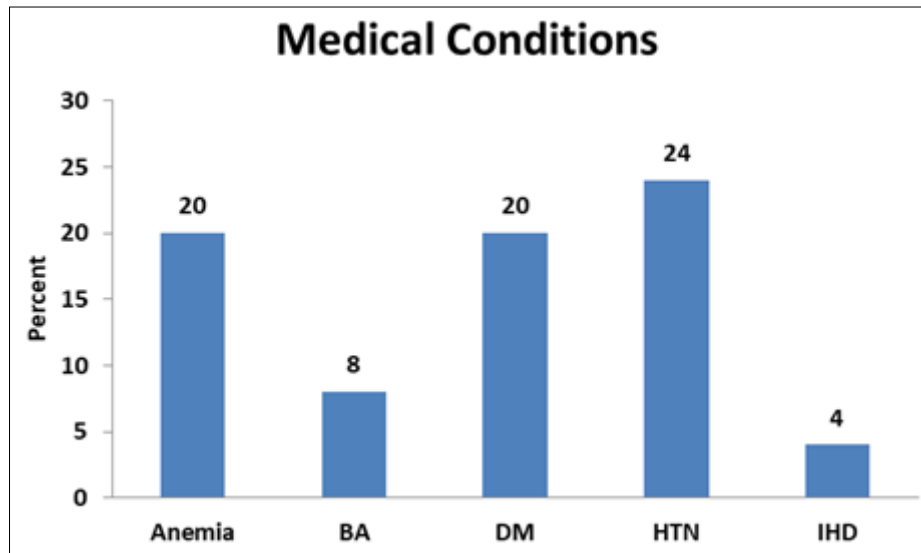
The patients who could not come for follow-up due to Covid 19 restrictions and lockdown were contacted through phone, and details were collected to assess functional results. Such results were then re-confirmed on subsequent follow-ups after the patient came to the hospital following the relaxation of lockdown. The functional outcome was analyzed by using a modified Harris hip scoring system.

Results

The study group consisted of only the elderly population above 60 years. The mean age at the time of surgery was found to be 65.36 years. There were 11 male and 14 female patients. The most common mode of injury was trivial trauma such as domestic falls, which accounted for 88%, and the rest to road traffic accidents. There were 10 patients with left-sided involvement and 15 patients with right hip involvement. Only one patient sustained a distal end radius fracture apart from the fracture of the neck of femur. The patient was treated conservatively with closed reduction and cast. In the study, 2 patients developed bed sores of grade 1. 2 patients had urinary tract infection, and one patient had a superficial infection around the surgical site.

Chart 1: Distribution of Cases according to Comorbid Conditions

Medical Conditions	No. of cases	Percent
Nil	9	36
Anemia	5	20
BA	2	8
DM	5	20
HTN	6	24
IHD	1	4



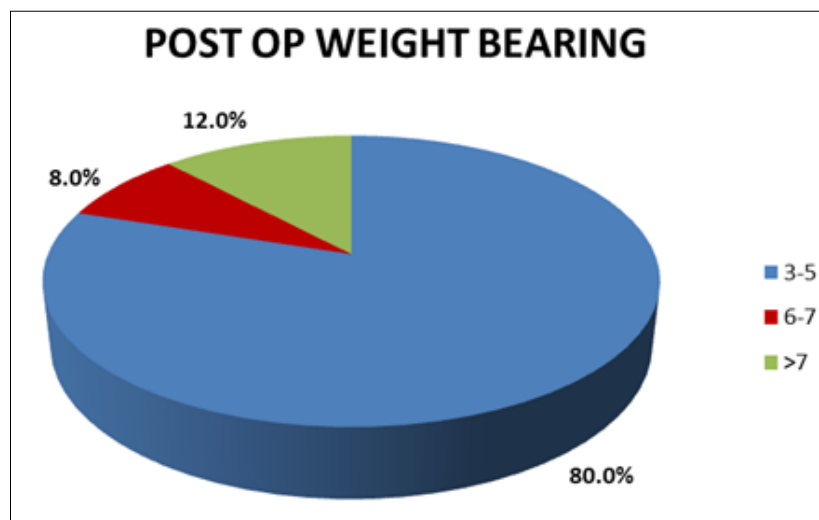
Graph 1: Distribution of Cases according to Medical Conditions

Post-OP Weight Bearing

Chart 2: Distribution of Cases according to Post Op Weight Bearing

Post Op Weight Bearing	No. of cases	Percent
3-5	20	80
6-7	2	8
>7	3	12
Total	25	100

Descriptive Statistics	Min	Max	Mean	SD
Post OP Weight Bearing	3	21	5.5	4.0



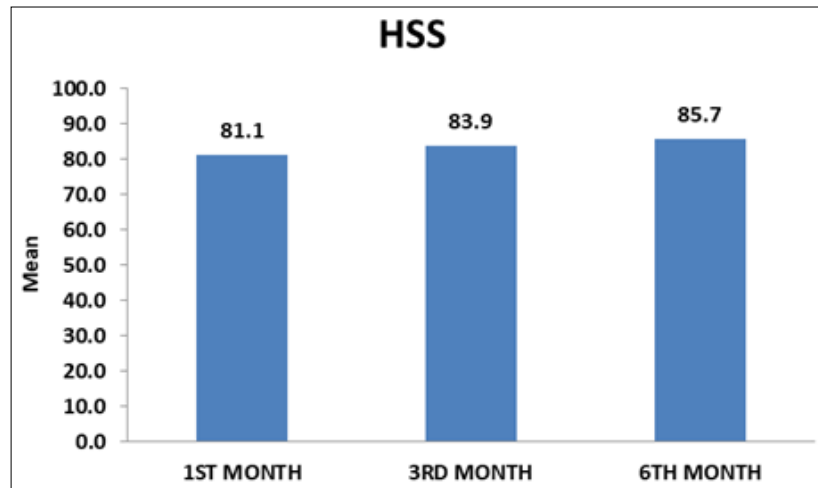
Graph 2: Distribution of Cases according to Post Op Weight Bearing

Modified Harris HIP Score

Chart 3: Distribution of HHS according to time

HHS	Min	Max	Mean	SD	p value
1ST Month	62	89	81.1	6.2	0.045*
3RD Month	65	91	83.9	6.5	
6TH Month	65	93	85.7	6.6	

Note: p value* significant at 5% level of significance ($p < 0.05$)

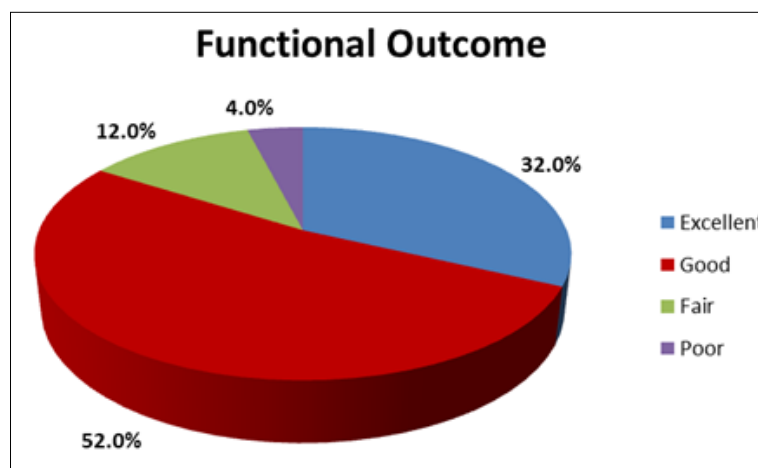


Graph 3: Distribution of HSS according to time

Functional Outcome

Chart 4: Distribution of Cases according to Functional Outcome

Functional Outcome	No. of cases	Percent
Excellent	8	32
Good	13	52
Fair	3	12
Poor	1	4
Total	25	100



Graph 4: Distribution of Cases according to Functional Outcome

Discussion

Internal fixation, unipolar hemiarthroplasty, bipolar arthroplasty, and total hip arthroplasty are the current treatment options for femoral neck fractures, each with its own set of indications, outcomes, and risks. Arthroplasty improves stability and reduces pain following surgery, allowing patients to walk immediately after implantation and lead to more effective mobilisation and rehabilitation [5]. However, hemiarthroplasty presents the potential for development of acetabular cartilage erosion, resulting in pain and may lead to conversion from hemiarthroplasty to total hip arthroplasty [6].

Although there is no statistically significant difference in functional outcomes between bipolar hemiarthroplasty and total hip arthroplasty, THR appeared to be more cost-effective and functional because it seldom requires revision surgery, which is often required with bipolar hemiarthroplasty [5].

In our study, a primary Total hip arthroplasty was performed on 25 patients with a fracture neck of femur. The study group

consisted of only elderly population with age above 60 years. The mean age at the time of surgery was found to be 65.36 years. There were 11 male and 14 female patients. The most common mode of injury was trivial trauma such as domestic falls, which was 88%.

Gregory *et al.* [7] reported a significant rate of postoperative hip dislocation in femur fracture necks treated with total hip arthroplasty. The risk of dislocation is determined by the surgical approach, reconstruction of the hip biomechanics, head size and offset, capsular closure quality, and surgeon expertise. Ricci *et al.* [8] found a very low dislocation rate when performing THA in acute displaced femoral neck fractures using the posterior approach as long as the protocol for patient selection criteria and surgical techniques assuring posterior hip stability was followed.

The patients were put in a lateral decubitus position, and a modified posterolateral approach was used in all the patients. All the surgeries were done by experienced surgeons. The rate of dislocation in our study was nil due to the ideal selection of

patients, proper placement of the acetabular cup, good closure of capsule, good attachment of the short external rotators by drilling holes in the bone and reinforcing with strong suture materials.

Complications such as bed sores were seen in 2 patients, urinary tract infections were seen in 2 patients, and superficial infection at the surgical site was seen in one patient. Bedsores were of grade one and healed on mobilisation. Superficial infection developed due to lack of hygiene and was treated promptly with antibiotics. No patients had any signs of deep vein thrombosis, pneumonia, or cement related complications. In our study, early mobilisation and weight-bearing with a walker was encouraged. The average mean for postoperative weight-bearing was around 5.5 days. The mean average day of discharge was about 9 days from surgery. 5 patients had limb length shortening of 1 cm, and 3 patients had lengthening of 1 cm, which was not significant, and patients were comfortable and did not require any shoe modifications.

All patients were followed up from the time of discharge to 6 months from the surgery date. They were evaluated clinically and radiographically, and functional outcomes were recorded using Modified Harris Hip Score. Harris Hip Score (HHS) was dominated by the THR group compared to the HA group up to 9 years following surgery, according to Avery *et al.* [9]

In our study, we found that the mean Harris hip score was 81.1 at the end of 1st month follow-up. At the 3rd month follow-up, the mean Harris hip score was 83.9. At the end of 6 months, the mean Harris hip score was 85.7. Out of the twenty-five patients, 8 patients had excellent outcomes, 13 patients had good outcomes, 3 patients had fair outcomes, and one patient had poor outcomes. The poor outcome was recorded in one patient due to inadequate mobilisation secondary to recovery from COVID pneumonia.

Iorio *et al.* [10] found that total hip arthroplasty for displaced neck of femur fractures is the best cost-effective procedure when considering complications, reoperation rate, mortality, and functional results of the hip during a 2 year period. Even while the cost of surgery with a prosthesis appears to be high at first, it will become more cost-effective over time because revision surgery is rarely required, and the hip's performance

is excellent. THA has been shown in a number of studies to have a place in the treatment of patients with acute femoral neck fractures [11, 12].

In our study, most patients had none to occasional pain with no compromise in daily activities and did not require analgesics. Patients were able to walk a distance of more than six blocks comfortably. The patients with fair and poor outcomes were found to walk with a slight limp. All the patients were found to use a cane while walking; some attributed its use as a precautionary measure to avoid another fall despite good stability.

Twenty-one patients were able to use public transportation. Eight patients could sit comfortably on an ordinary chair, while the rest required a highchair. Twenty-one patients were able to climb stairs normally by using the railing. None of the patients in our study developed any deformity. At the end of the study, the sum of the range of movements of the hip joint was, on an average about 186°.

Limitations of the study

The study's main limitations were attributed to the lack of an adequate sample group and short duration of follow-up. All cases were performed by well-experienced surgeons, so complications like dislocations were not encountered.

Conclusion

When performed as a primary procedure in elderly patients with fracture neck of femur, total hip arthroplasty provided excellent results in 32%, good results in 52%, fair results in 12%, and poor results in 4% of the study population. These results suggest that primary Total hip arthroplasty is an excellent option for treating fracture neck of femur in the elderly population.

The key to success lies in selecting active, independent, mobile before injury, motivated, and in a good mental state. There were no cases of dislocation in our study, as is commonly dreaded. We recommend the total hip arthroplasty as a primary procedure in patients with fracture neck of femur to avoid further reoperations in patients with long life expectancy.

Case Illustrations

Case 1



Postoperative radiograph



Clinical image at 6 months: Flexion



Clinical images at 6 month follow up: Standing, Sitting, Abduction of limb

Case 2



Postoperative radiograph



Clinical images at 6 month follow up: Standing, Sitting, Abduction of limb and Flexion



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