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Original research article

A radiographic and functional analysis of femoral neck fractures treated with unipolar and bipolar hemiarthroplasty

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Abstract

Background and Objectives: The occurrence of fracture neck of the femur and its associated consequences contribute to substantial morbidity and death rates. Unipolar and bipolar hemiarthroplasty procedures have been found to facilitate early patient mobilization and extend their productive lifespan.

Materials and methods: This study comprised 10 individuals who had intracapsular fractures in the neck of the femur. The functional outcome of the patients was assessed using the Harris Hip score. Patients had radiological evaluation as well. The present study was carried out in the Department of Orthopedics, Kakatiya Medical College/ MGM hospital, located in Warangal, Telangana, India, over the period from February 2022 to January 2023.

Results: The preoperative Harris hip scores for unipolar hemiarthroplasty and bipolar hemiarthroplasty were 36.2 and 39.1, respectively. These scores climbed to 81.8 and 85.05 for unipolar and bipolar hemiarthroplasty, respectively. The p-value for these differences was 0.561. The findings of our study indicate that the bipolar group achieved an exceptional result of 35%, whereas the unipolar Hemiarthroplasty group achieved an excellent result of 15%.

Conclusion: Our study findings indicate that uncemented bipolar hemiarthroplasty yielded superior outcomes in comparison to uncemented unipolar hemiarthroplasty. In general, bipolar hemiarthroplasty demonstrated superior performance in comparison to unipolar hemiarthroplasty.

Keywords: Radiographic result, femur fracture, neck fracture, bipolar hemiarthroplasty

Introduction

A person's lower extremities and pelvic girdle are joined at the hip joint. Both stability and a large range of motion are built into the hip joint. In addition to absorbing impact for the rest of the body, this multiaxial ball and socket joint lets the lower limb move in all three directions. When people experience hip pain, it might hinder their ability to move around. This debilitating hip pain can be alleviated in a variety of ways [1-3].

When the muscles, ligaments, and other connective tissues that regulate a joint are injured or damaged, hemiarthroplasty can repair them so the joint can move freely and stay stable. The societal significance and early success of implanting an artificial femoral stem to replace the broken one were enormous. A significant portion of fractures in the elderly are caused by intracapsular cracks in the neck of the femur. The major objective of treatment is to help the patient regain the level of function they had before the fracture. If you want to be sure that a displaced femoral neck fracture will heal, you need to do reduction, compression, and use rigid internal fixation [4-6].

Many surgeons advise against internal fixing displaced femoral neck fractures in older ambulatory patients due to the high risk of complications such as osteonecrosis and nonunion. Instead, these patients should consider primary prosthetic replacement. Immediate weight bearing is possible with prosthetic replacement, allowing older individuals to get back to their active lives and assist prevent problems associated with recumbency and inactivity. This may have been the most significant benefit when the idea of replacing a missing limb was initially proposed. Osteonecrosis and nonunion are consequences of femoral neck fractures that are eliminated as a result of prosthetic replacement, which is the main surgery. Due to the risks associated with protrusioacetabuli and chronic pain, many surgeons opt for bipolar systems when doing unipolar hemiarthroplasties [7-9].

According to research, protrusioacetabuli are less common in the latest generation of bipolar hemiarthroplasties compared to previous designs. On the other hand, some researchers have discovered that the inner bearing surface's motion might not be permanent, and that all bipolar hips eventually become unipolar surgical implants. Whether hemiarthroplasty should be done with a unipolar or bipolar

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prosthesis is still a matter of debate, with advocates for both approaches. Unipolar prostheses have fewer drawbacks, such as a cheaper price and the elimination of polyethylene wear debris. Among the purported benefits of the bipolar prosthesis are reduced acetabular wear and, maybe, hip and groin discomfort [8-10].

We aim to assess the performance of unipolar and bipolar prostheses in managing intracapsular fractures of the neck of the femur in elderly patients in light of these differing perspectives. Our clinic has performed both cemented and uncemented bipolar and unipolar hemiarthroplasty procedures. We have chosen to assess the radiological and functional outcomes of these procedures in the short term, with a mean follow-up of 44.85 months for unipolar and 44.1 months for biopolar hemiarthroplasty. Research objectives included comparing the functional and radiological outcomes of unipolar and bipolar hemiarthroplasty for intracapsular neck of femur fractures in the short term [9-11].

Materials and Methods

This study comprised a cohort of 10 individuals who presented with intracapsular fracture neck of the femur. The patients underwent functional outcome assessment utilizing the Harris Hip score. Radiological evaluation was also conducted on the patients. The study was carried out in the Department of Orthopedics, Kakatiya Medical College/ MGM hospital, Warangal, Telangana, India, from February 2022 to January 2023.

Inclusion Criteria

- Patients 60 years of age and older, both male and female.
- Femur neck fracture, unilateral.

Exclusion Criteria

- Patients with neurological problems.
- Pathological fractures of the femur neck.
- Additional capsular fractures.

Results

Clinical and radiological evaluations were conducted on ten hips for the unipolar and bipolar groups, respectively. The outcomes of the clinical evaluation, which utilized the Harris hip score, are as follows. Bipolar hemiarthroplasty is more expensive than unipolar hemiarthroplasty, but it improves hip function, pain, and quality of life just as well, if not better. However, there is no difference between the two in terms of operation time, blood loss, transfusions, hospital stay, mortality, reoperation, dislocation, or complications. Lastly, bipolar hemiarthroplasty does not reduce the rate of acetabular erosion in the long run.

Table 1: One-Sided Knee Replacement

Sr. No.	Results	Number	%
1.	Excellent	2	20
2.	Good	6	60
3.	Fair	1	10
4.	Poor	1	10

Table 1 presents the results of unipolar Hemiarthroplasty, with 20% classified as outstanding, 60% as good, and 10% as fair / poor.

Table 2: Bipolar Knee Replacement

Sr. No.	Results	Number	%
1.	Excellent	3	30
2.	Good	5	50
3.	Fair	1	10
4.	Poor	1	10

Table 2 presents the results of unipolar Hemiarthroplasty, with 30% classified as outstanding, 50% as good, and 10% as fair / poor.

Table 3: The functional outcomes of uncemented unipolar hemiarthroplasty

Sr. No.	Results	Number	%
1.	Excellent	3	30
2.	Good	3	30

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3.	Fair	2	20
4.	Poor	2	20

The results of the unipolar hemiarthroplasty are presented in Table 3, which shows that thirty percent of the patients had outstanding results, thirty percent had good results, and twenty percent had fair or poor results.

Table 4: Functional Outcomes of Uncemented Bipolar Hemiarthroplasty

Sr. No.	Results	Number	%
1.	Excellent	5	50
2.	Good	3	30
3.	Fair	2	20
4.	Poor	0	0.0

The results of the unipolar hemiarthroplasty are presented in Table 4, which shows that fifty percent of the patients had outstanding results, thirty percent had good results, and twenty percent had fair results.

Discussion

The use of hemiarthroplasty is on the rise due to its effectiveness in treating femoral neck fractures. This procedure allows patients to walk more quickly and has a positive impact on their functional recovery. However, the use of bipolar vs unipolar prosthesis has been a topic of dispute for quite some time. Theoretically, bipolar prostheses with an extra inner articulation have less cases of acetabular erosion and dislocation than unipolar hemiarthroplasty. At follow-up, this study shows that acetabular erosion is less common in the bipolar hemiarthroplasty group compared to the unipolar hemiarthroplasty group. Later follow-ups showed an increase in the rate of acetabular erosion, and the only significant difference occurred at the 1-year mark [11-13].

This might be due to the fact that the bipolar articulation becomes immobile and acts as a unipolar hemiarthroplasty over time. When looking at the risk of dislocation, this study found no difference between bipolar and unipolar hemiarthroplasty. When compared to cemented femoral stems, those intended for ingrowth of bone are more likely to cause thigh pain. After the first discomfort subsided, all of our patients reported complete relief by the sixth month following surgery [12-14]. By the sixth month following hip surgery, every single patient in our study reported significant improvement in their pain levels. Even though our study's subjects with poor outcomes saw significant hip pain reduction, doctors identified osteoarthritis in their ipsilateral knees. After the operation, not a single subject in our research experienced limping. The posterior technique was used in all of our examples. When a posterior method is employed, limp is less common, according to Hardinge [13-15].

Except for individuals who had a bad result, all of the patients in our study walked unassisted or with the help of a walker. The patients who did not fare well needed to use walkers because they suffered from ipsilateral osteoarthritis of the knee. All patients were able to walk endless distances before surgery. After surgery, patients who did well were able to walk six blocks, those who did moderately two to four blocks, and those who did poorly could only move indoors with the help of a walker. Although all ten patients had trouble climbing stairs before the procedure, those who had successful outcomes were able to do it even without the aid of a railing. Patients got good results when they used rails to climb stairs. Unfortunately, patients who did not fare well could not use the stairs [16-18].

Patients had a decent range of motion after surgery, except from bad outcomes. Hemiarthroplasty is still not a panacea for uneven leg length. In many cases, the operation goes off without a hitch, with the exception of an unanticipated disparity in leg length. The patients mentioned above received footwear adjustment. In most cases, a 1 cm gap is well-tolerated, and over time, the noticeable difference becomes less noticeable. In most cases, physical therapy stretching can alleviate the apparent pelvic obliquity and leg length discrepancy that results from persistent soft tissue rigidity. Two patients in our unipolar group experienced a 1 cm and 1.5 cm limb length disparity, or lengthening, respectively; two patients in our bipolar group had a 1 cm and 0.5 cm limb length discrepancy, respectively [17-19].

There was no instance of implant loosening over the 48.2 month and 46.2 month mean follow-up periods, respectively, that we observed in our study for unipolar and bipolar hemiarthroplasty. Despite an 84-month follow-up period, no patients in our study had implant loosening. Still, if needed, follow-up in the long run. Two cases of acetabular erosion were reported in our study of unipolar hemiarthroplasty patients with an average follow-up of 48.2 months, and one incidence was reported in our investigation of bipolar hemiarthroplasty patients with an average follow-up of 46.2 months [18-20].

At its core is the proper placement of the femoral stem. With bipolar hemiarthroplasty, 16 of the 10 stems were in a neutral position, 1 was in valgus, and 3 were in varus. We had 13 stems in neutral position, 2 in valgus, and 5 in varus during the unipolar hemiarthroplasty procedure. Neither unipolar nor bipolar hemiarthroplasty resulted in subsidence nor migration in our research. There was a spike in the dislocation rate just after surgery, and it was high for the first three months after the procedure. Neither

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unilateral nor bilateral hemiarthroplasty has resulted in a dislocation in our cohort of patients [21-23].

A typical complication that might occur following hemiarthroplasty is heterotopic ossification. It typically takes three to four weeks following surgery for radiographs to reveal its presence, and another three to six months for it to fully grow. Depending on the source, heterotopic ossification can occur anywhere from 5% to 90% of the time. We found that 1 out of 10 patients undergoing bipolar hemiarthroplasty and 1 out of 10 patients undergoing unipolar hemiarthroplasty experienced heterotopic ossification. When compared to cemented femoral components, uncemented implants may increase the amount of particle bone debris and the escape of femoral bone marrow elements [22-24].

It is possible that the stimulation is caused by the localized increase in the dispersion of bone debris or marrow components. In our investigation, which included one case of heterotopic ossification in bipolar hemiarthroplasty and one case in unipolar hemiarthroplasty, we did not find any correlation between patient age and new bone development. According to the Brooker classification, the heterotopic ossification was followed up for 83 months. One of two degenerative processes - articular cartilage deterioration in the acetabulam or loosening of the prosthesis - usually causes pain following hemiarthroplasty [23-25].

The reason we achieve a dislocation-free percentage is that, following surgery, patients are carefully transferred from the operating table to the bed and back again for X-rays and an abduction pillow is fastened to their leg for a period of one to two weeks. There is strong evidence that the length of time a surgery lasts increases the likelihood of postoperative infection. Because all of the surgeries were performed by senior surgeons with limited operating time with pre and post antibiotic cover, and because extra attention was made for patients' hygiene and the operating room conditions, we only had a 4% superficial infection. Patients are currently free of infection after those superficial infections resolved [24-26].

Great 80.2% and fair 19.8% of femur neck fractures treated with Austin-Moore were successfully treated. Superb 38%, decent 21%, mediocre 24%, and terrible 17.3%. The findings for the remaining 45 patients in this study were similar: 44.44% had outstanding results, 26.66% had good results, and 20% were pleased. On the other hand, 8.88% of the patients had bad results [25-28].

Conclusion

For intracapsular femur neck fractures, we have performed a brief follow-up study evaluating radiological and functional results after bipolar and unipolar hemiarthroplasty. Our research led us to the following conclusion: hemiarthroplasty is a difficult surgical procedure that requires special attention to the health of the elderly individuals undergoing the procedure as well as specific surgical procedures to ensure their safety. If not, it could cause a number of problems. If you've suffered an intracapsular neck of femur fracture, hemiarthroplasty is a great option for pain relief and getting your mobility and function back to how it was before the injury. We found that functional and radiological outcomes were better with bipolar hemiarthroplasty for intracapsular neck of femur fractures compared to unipolar hemiarthroplasty. Unipolar hemiarthroplasty is associated with a higher risk of acetabular erosion than bipolar hemiarthroplasty, which is less prevalent.

Funding

None.

Conflict of Interest

None.

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