Section: Orthopaedic

Original Research Article

TO ASSESS THE EFFECTIVENESS OF BIPOLAR HEMIARTHROPLASTY IN TREATING HIP JOINT ARTHRITIS

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Abstract

Background: Despite its contentious nature, the replacement of the femoral head is still widely acknowledged as the most effective approach for older individuals with displaced femoral neck fractures. Cemented bipolar hemiarthroplasty is a favourable choice for treating fractures of the neck of the femur in the senior population. Given the scarcity of data supporting the use of cemented hemiarthroplasty for better functional outcomes, and one meta-analysis indicating a higher risk of post-operative death. The aim is to assess the effectiveness of bipolar hemiarthroplasty in treating hip joint arthritis. **Materials and Methods:** A hospital-based prospective clinical research was conducted on 60 patients with intracapsular fractures of the neck of the femur who were admitted to the Department of Orthopaedic. The patients had bipolar cemented hemiarthroplasty surgery with either general or spinal anaesthesia. This research covered patients with certain types of fractures of the neck of the femur, including displaced intracapsular fractures, subcapital fractures, transcervical fractures, as well as fractures caused by road traffic accidents and pathological fractures. The study specifically focused on patients who were 50 years of age or older. **Result:** The average age of the patients was 66.87±9.85 years. Out of the 60 patients, 39 (65%) had surgery on the right side, while 19 (31.67%) underwent surgery on the left side. Only 2 (3.33%) patients underwent surgery on both sides. The mean hospitalisation duration was 5.01±0.94 days. The findings of our research indicate that 11.67% of patients had exceptional outcomes, 58.33% of patients had a good Harris hip score, 25% of patients had a fair Harris hip score, and only 5% of patients fell into the category of bad Harris hip score. Within this research, 55% of the patients exhibited an exceptional radiological grade, 41.67% of the patients shown a good radiological grade, and 3.33% of the patients displayed a bad radiological grade. **Conclusion:** We concluded that the cemented bipolar hemiarthroplasty is a very effective technique for achieving favourable clinical outcomes in older patients with femoral neck fractures.

INTRODUCTION

A hip fracture is a significant and possibly alarming event in a person's medical history.[1] Intertrochanteric fracture is a prevalent health issue among the elderly, with a significant one-year death rate of up to 20%.[2,3] The prevalence of these fractures rose from 1.66 million in 1990 to an anticipated 6.26 million by 2050 due to a combination of longer life expectancy and a sedentary way of living. These fractures often arise in older individuals due to minor injuries, most frequently resulting from sideways falls from a standing position.[4,5] Osteoporosis is a significant risk factor for these fractures, with females being more susceptible than men.[4,5]

Among the elderly, a fracture of the femoral neck is a prevalent type of fracture that leads to both illness and death. Due to the global increase in life expectancy, the population of senior adults is growing. Consequently, there is a projected rise in the occurrence of hip fractures, which is expected to become a widespread issue. The most frequent cause of a fracture in the neck of the femur in older adults is either a slight fall or a twisting injury.[6,7] Fractures are more likely to occur in elderly adults because of factors such as osteoporosis, malnutrition, reduced physical ability, and the presence of several comorbid conditions.[8-10] The choice of the most effective prosthesis for treating displaced femoral neck

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fractures in older individuals is a subject of ongoing debate.

Specifically, bipolar hemiarthroplasty (BHA) is the favoured method because to its short surgical duration, little risk of dislocation, and ability to provide functional enhancements. Nevertheless, the presence of possible consequences, such as inguinal discomfort accompanied by acetabular erosion, has failed to meet the need for an improved standard of living resulting from increased longevity. Consequently, a small number of orthopaedic surgeons have endeavoured to perform total hip arthroplasty (THA) on patients who have had displaced femoral neck fractures.[11,12] Bipolar hemiarthroplasty is a favourable implant for unstable intertrochanteric fractures due to its ability to circumvent the phases of bone healing and address the associated limitations. It enables prompt mobilisation, reduces hospitalisation duration, and promotes a wide range of motion. It may be performed either as a primary procedure or as a secondary option after the failure of conservative or internal fixation.[13] Bipolar hemiarthroplasty has many benefits over previous procedures, primarily owing to the reduced acetabular wear resulting from its dual bearing system. Hemi arthroplasty was the most often selected treatment for older individuals with a fractured neck of femur. The patient treated with open reduction and internal fixation has a high incidence of non-union and avascular necrosis, which are unfavourable results. Presently, the available options for orthopaedic surgeons to address these fractures in older patients are unipolar hemiarthroplasty, bipolar hemiarthroplasty, and complete hip arthroplasty. The primary issues observed with unipolar prostheses are acetabular erosion and loosening of the stem, resulting in discomfort.[14,15] In 1974, Bateman,[16] created the Bipolar prosthesis with a moveable head element and an extra head surface to enable movement in the acetabulum. The advantages of bipolar prosthesis over unipolar endoprosthesis include a wider range of movements, less post-operative pain, reduced incidence of acetabular erosion, decreased loosening of the stem, a higher percentage of satisfactory results, and a faster return to unassisted activity. Despite its efficacy, total hip arthroplasty remains an unpopular treatment option for these fractures because to the favourable outcomes seen in the majority of patients who have hemiarthroplasty, as well as the significant financial burden associated with total hip arthroplasty. The use of cement saw a surge in popularity with Sir John Charnley's adoption of PMMA, originally designed for denture repair, as a means to secure the femoral head prosthesis in the femur during complete hip arthroplasties.[17] Cemented bipolar hemiarthroplasty is a favourable choice for treating fractured neck of femur in the senior population. Given the scarcity of data supporting the use of cemented hemiarthroplasty for enhanced functional outcomes, and considering that one meta-analysis has shown a higher risk of death after the surgery. The objective of this research is to assess the effectiveness of bipolar hemiarthroplasty in treating hip joint arthritis.

MATERIALS AND METHODS

A hospital-based prospective clinical research was conducted on 60 patients with intracapsular fractures of the neck of the femur who were admitted to the Department of Orthopaedic. The patients had bipolar cemented hemiarthroplasty surgery with either general or spinal anaesthesia. This research covered patients with certain types of fractures of the neck of the femur, including displaced intracapsular fractures, subcapital fractures, transcervical fractures, as well as fractures caused by road traffic accidents and pathological fractures. The study specifically focused on patients who were 50 years of age or older. The research excluded patients with open fractures, aged less than 50 years, and those who were not suitable for general anaesthesia or spinal anaesthesia owing to any medical comorbidity.

The patients diagnosed with an intracapsular fracture of the neck of the femur had a surgical procedure known as cemented bipolar hemiarthroplasty. This procedure was performed after the patients presented with a fracture in the outpatient department or emergency room. The patients admitted to MOW/FOW will undertake the necessary regular investigations for pre-anesthetic check-up. Following the completion of anaesthetic clearance, the patient was transported for elective surgery, and detailed records were meticulously kept according to the study's proforma. The patients who had surgery were monitored for an average of 3 to 5 days and scheduled for frequent follow-up appointments to assess their clinical and radiological progress. Postoperative Follow-up Follow-up: All patients had regular follow-up assessments at 4 weeks, 10 weeks, and every subsequent 6 weeks after their discharge. Subsequently, at intervals of 6 months, 9 months, and 1 year following the date of release.

Statistical Analysis

Data analysis was conducted over a period of 6 months, using criteria such as ratio, rates, and percentages to assess various outcomes based on the HARRIS HIP SCORE. These measurements were calculated and organised. The outcomes were categorised as excellent, good, fair, and bad, based on the points obtained from the HARRIS HIP SCORE. The following functions were taken into account.

RESULTS

[Table 1] indicates that the majority of participants were male, accounting for 41 individuals or 68.33% of the total. The remaining 19 participants, or 31.67%, were female. The ratio of males to females was 2.16 to 1. The majority of participants, 27 (45%), belonged to the age range of 60-70 years, followed by 18 (30%) in the age category of 70-28 years, 11

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(18.33%) in the age group of 50-60 years, and 4 (6.67%) over 80 years of age. The average age of the patients was 66.87±9.85 years. Out of the 60 patients, 39 (65%) had surgery on the right side, while 19 (31.67%) underwent surgery on the left side. Only 2 (3.33%) patients underwent surgery on both sides. The mean hospitalisation duration was 5.01±0.94 days. The findings of our research indicate that 11.67% of patients had exceptional outcomes, 58.33% of patients had a good Harris hip score, 25% of patients had a fair Harris hip score, and only 5% of patients fell into the category of bad Harris hip score [Table 2]. Within this research, 55% of the patients exhibited an exceptional radiological grade, 41.67% of the patients shown a good radiological grade, and 3.33% of the patients displayed a bad radiological grade [Table 3].

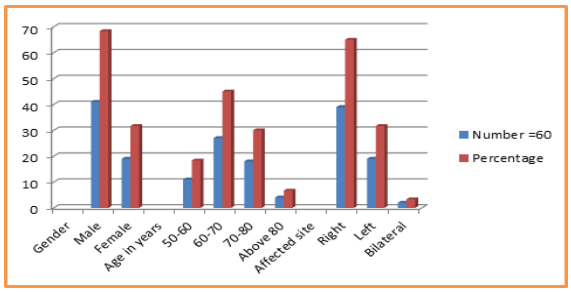

Figure 1: Basic parameter of patients

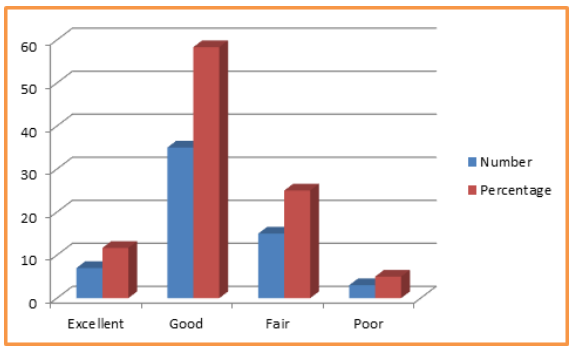

Figure 2: Grading of Harris hip score

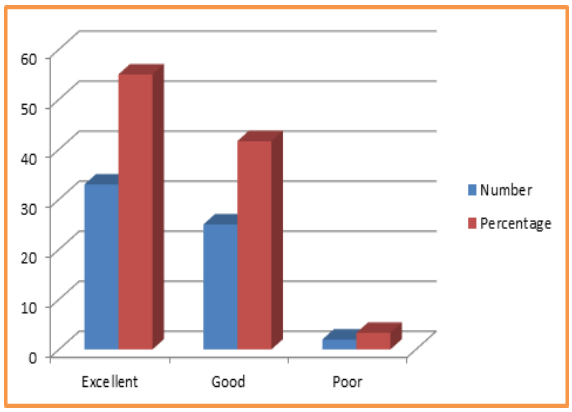

Figure 3: Radiological grade

Table 1: Basic parameter of patients

Parameter	Number =60	Percentage
Gender		
Male	41	68.33
Female	19	31.67
Age in years		
50-60	11	18.33
60-70	27	45
70-80	18	30
Above 80	4	6.67
Mean Age in years	66.87±9.85	
Affected site		
Right	39	65
Left	19	31.67
Bilateral	2	3.33
Hospital stay in days	5.01±0.94	

Table 2: Grading of Harris hip score

Harris hip score	Number	Percentage
Excellent	7	11.67
Good	35	58.33
Fair	15	25
Poor	3	5

Table 3: Radiological grade

Radiological grade	Number	Percentage
Excellent	33	55
Good	25	41.67
Poor	2	3.33

DISCUSSION

The management of displaced fracture of the neck of femur in geriatric individuals remains a topic of debate. Previous research indicate that BHA is mostly conducted on elderly patients who have a reduced life expectancy and minimal functional needs. Femoral neck fracture is prevalent in older patients due to their frailty and the presence of many chronic diseases such as osteoporosis and osteomalacia. Due to medical advancements, life expectancy has been extended.The incidence of

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nonunion fractures was significantly elevated in elderly individuals. Fractures that do not heal properly without surgical intervention are rare in individuals under the age of 50, but the likelihood of nonunion fractures climbs to about 40% for people in their seventies. For patients who are younger (below 60 to 70 years old), it is recommended to preserve the femoral head as it has a greater chance of healing after a fracture and reduces the risk of long-term issues associated with joint replacement surgery.[18] Nevertheless, avascular necrosis of the femoral head is more prevalent among younger individuals. The results of our research indicate that the majority of participants, namely 27 individuals (45%), were in the age category of 60-70 years. This was followed by 18 individuals (30%) in the age group of 70 to 28 years, 11 individuals (18.33%) in the age group of 50-60 years, and 4 individuals (6.67%) above the age of 80. The average age of the patients was 66.87±9.85 years. A research conducted by Yurdakul Eet al,[19] revealed that the average age of the patients was 78.16 years. A research conducted by YS Prashanth and M Niranjan in 2017,[20] revealed that the average age of the patients was 70 years. Lestrange,[21] observed an average hospital stay of 18 days for patients undergoing bipolar hemiarthroplasty. Drinker and Murray, together with their colleagues,[22] have documented a mean hospitalisation duration of 23 days using the same technique. No late postoperative problems such as loosening, dislocation, erosion, secondary osteoarthritis, protrusioacetabuli, or periprosthetic fracture were seen. The findings of our research revealed that the mean duration of hospitalisation was 5.01±0.94 days. The patients were promptly readied for operation. Undue preoperative delay was experienced by some patients necessary to delays in receiving government funding, while in other cases it was because to delays in obtaining physician approval. Yurdakul Eet et al. discovered that the cemented arthroplasty group had superior pain ratings and walking abilities throughout the first follow-up period.[19] In their study, Mohsen Khorami et al,[23] discovered that the average pain score was considerably lower in the cemented group compared to the uncemented group (P=0.001). In their study of 294 patients, Hinchey and Day discovered that 22 individuals had discomfort after undergoing hemiarthroplasty during the early postoperative period.[24] They were unable to identify any conclusive reason inside them. Lunceford identified other potential reasons of discomfort, including inadequate positioning of the prosthesis, infection, tissue inflammation, metal corrosion, contractures, poor sizing of the femur's head, and periarticular ossification.[25]

The findings are promising, as over 90% of patients achieved a satisfactory range of motion and were able to do their daily chores without assistance, maintaining their independence in old age. Several studies have examined the interprosthetic motion during weight-bearing and have consistently shown a protective movement of the inner joint during the stance phase of gait.[26,27] In order to overcome these issues, other approaches are used, including establishing a mechanically secure connection between the bone and implant, promoting rapid bone regeneration, and using Polymethyl Methacrylate (PMMA) cement. Out of these options, using PMMA cement provides clear benefits as it serves as a grouting agent to replace weakened trabecular bone, resulting in instant stability between the implant and bone. This substantially simplifies the rehabilitation process. Bipolar arthroplasty was used to hinder or delay the erosion of the acetabulum. The prostheses are equipped with a 22 to 32 mm head that moves in conjunction with an ultra-high density polyethylene liner of different diameters. The liner is coated with a smooth metallic outer surface that connects with the cartilage in the acetabulum. In theory, the main movement of the hip occurs at the prosthetic joint, with just secondary movement at the metal cartilage interface, which helps to minimise wear on the joint. There is data supporting the use of cemented hemiarthroplasty, which leads to improved anchoring and reduced risk of periprosthetic fracture. Burgers et al. conducted a meta-analysis and review of randomised controlled trials that compared different methods of arthroplasty for femoral neck fractures.[28] The functional result was compared using the Harris hip score. The overall score was shown to be considerably greater in total hip replacement (THR) in comparison to other methods of joint replacement surgery. The Harris hip score has a range of 0 to 100 points. The subdomains included are discomfort, deformity, function, and range of motion. These subdomains have been widely used in several global research to provide a comprehensive understanding of the patient under evaluation.[29]

The findings of our research revealed that 11.67% of patients had exceptional outcomes, 58.33% of patients had a good Harris hip score, 25% of patients had a fair Harris hip score, and only 5% of patients had a bad Harris hip score. The research found that 55% of patients had an outstanding radiological grade, 41.67% had a good radiological grade, and 3.33% had a bad radiological grade. Preliminary radiographic investigations on interprosthetic motion in bipolar hemiarthroplasties revealed little or negligible movement between the stem and the head over a period of time when examining the passive movement of the hip without any weight-bearing. The limitations of our research include the lack of evaluation of the degree of intra-prosthesis motion at the inner-bearing of the prosthesis. Extended duration studies are necessary to enhance the long-term functional result of cemented bipolar hemiarthroplasty for femoral neck fractures in the elderly. The study's main strength is in its demonstration of the enhanced quantity and quality of life resulting from cemented bipolar hemiarthroplasty, leading to improved functional outcomes.

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CONCLUSION

We concluded that the cemented bipolar hemiarthroplasty is a very effective technique for achieving favourable clinical outcomes in older patients with femoral neck fractures.

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