



FUNCTIONAL OUTCOME OF USING CEMENTED BIPOLAR PROSTHESIS FOR HEMIARTHROPLASTY IN NECK OF FEMUR FRACTURE - A PROSPECTIVE STUDY

Orthopaedics

Dr Kamalesh T	Department of Orthopaedics, Aarupadai Veedu Medical College and Hospital.
Dr Boblee James	Department of Orthopaedics, Aarupadai Veedu Medical College and Hospital.
Dr Abraham M Antony	Department of Orthopaedics, Aarupadai Veedu Medical College and Hospital.
Dr Gokul Anand M*	Department of Orthopaedics, Aarupadai Veedu Medical College and Hospital. *Corresponding Author

ABSTRACT

Background: One of the most frequent injuries in the elderly is a fracture of the femoral neck, which presents a significant challenge to orthopaedic surgeons. The best choice nowadays is a bipolar prosthesis with cement, which allows them to become more active earlier. The current study aimed to prove that cemented bipolar prosthesis in hemiarthroplasty is the preferred modality of choice for treating neck of femur fractures in elderly. **Methodology:** In this prospective observational study, cemented bipolar hemiarthroplasty was used to treat elderly patients who had intracapsular fractures of the neck of femur and was followed up at six weeks, three months, six months, nine months, and one year. This study was conducted at the Aarupadai Veedu Medical College and Hospital, Dept. Of Orthopaedics. Results and follow-up were assessed, and functional outcomes were assessed using a modified Sir Harris Hip Scoring system. **Results:** In our study 57.6% of the cases had excellent outcome, 25.8% had good outcome and 10.6% had fair outcome and we also observed 6% of the cases had poor outcome and regarding patients final satisfaction 50% of the cases had very satisfied and 30% of the cases had fairly satisfied meanwhile 20% of them were not satisfied. In this study 3 cases had superficial skin infection and 1 case had dislocation and remaining 94% of the cases did not have any postoperative complications. **Conclusion:** Neck of femur fracture treated with cemented bipolar hemiarthroplasty provides adequate stability for early return to unassisted near normal activity. It also provides relief from pain with a very minimal complication rate in an elderly patient with less active needs. However, the end result of the patients depends on the time of presentation to the time of surgery, adequate post-operative rehabilitation, pre fracture level of activity, compliance of the patient and associated systemic diseases.

KEYWORDS

Hemiarthroplasty, Femur neck fracture, Cemented bipolar, Harris hip score, Prospective study.

INTRODUCTION

Femoral neck fractures are more prevalent in older women and less common in people under the age of 60 (1). A low-energy fall is typically cited by patients as the injury's primary cause. (2). The injury may be pathological or a stress fracture in the 2-3% of cases where there is no prior history of trauma. (3).

With an increase in life expectancy, the prevalence of these fractures has grown even more (4). Its consequences leave older people with significant lasting disabilities and are a major contributor to mortality in the elderly (5). Restoration of pre-fracture function without accompanying morbidity is the aim of treatment for these fractures, although there is much debate around treatment for geriatric individuals (6). In elderly people, open reduction and internal fixation of these fractures has poor outcome because of high rate of mechanical failure associated with osteoporosis, nonunion and avascular necrosis (7).

In comparison to internal fixation, hemiarthroplasty for femoral neck fractures is the most popular intervention in older patients and is associated with a superior functional result and lesser incidences of re-operations (8). Presently, total hip arthroplasty, unipolar hemiarthroplasty and bipolar hemiarthroplasty are the options available to orthopaedic surgeons for managing these fractures in geriatric individuals (8).

The ideal procedure of choice now for them to be more active is a hemiarthroplasty with bipolar prosthesis with cement (9). By using an uncemented implant, few indicators point to poorer short-term results, along with less mobility and increased discomfort, and concerns have been raised regarding fixation issues with uncemented stems in osteoporotic bone (10). This might be a result of the prosthesis's poor design or poorer anchoring technique (11).

Compared to an arthroplasty using an uncemented implant, an arthroplasty using a cemented implant may be more likely to increase mortality (12). The underlying processes are unclear, however they include methyl methacrylate particles and venous and pulmonary embolization of bone marrow components (8). There may be design-specific issues with an uncemented implant, such as stress shielding, thigh pain, and an increased probability of peri-prosthetic fracture (13).

MATERIALS AND METHODS

This is a prospective study to analyse the functional outcome of using cemented bipolar prosthesis for hemiarthroplasty in neck of femur fracture. This study was conducted in Aarupadai Veedu Medical College and Hospitals, Pondicherry from November 2020 to November 2022. The study includes 66 patients who sustained neck of femur fractures.

In our study most of the patients were in the age group of 60 – 70 years ranging from 68-91 years and the female gender were observed more in number (74.2%) than male (25.8%). Most of the cases was injured by RTA (57.6%) followed by slip and fall (42.4%). The results showed that right side (57.6%) was affected more than the left (42.4%). The results shows that most of the injury was due to RTA (57.6%) than slip and fall (42.4%). In our study, most of the patients were classified into transcervical group (64%) followed basicervical group (24%) and remaining 12% of patients were classified into sub capital group based on anatomical classification.

Surgical Procedure

Following a pre-operative review, all procedures were performed under regional anaesthesia, which might involve spinal or epidural anaesthesia at the anaesthetist's discretion.

Surgical Approach

All cases were done either through Modified Hardinge's lateral approach or Moore's posterior approach and head of the femur is extracted.

Preparation of Proximal Femur

The neck is trimmed leaving 1 cm of medial calcar, eventually on which the shoulder of the prosthesis would be seated. The proximal femur was reamed with rasp and to achieve correct seating of the prosthesis in 10°-15°, the trans-epicondylar axis is used as the guide to direct the insertion of the rasp.

Insertion Of The Bipolar Prosthesis

With care, the correct-sized prosthesis is placed at 10°-15° of anteversion within the reamed canal. With the aid of an insertor and a mallet, the prosthesis is gently tapped into place. Adequate seating of

the prosthesis on the calcar is should be visualized directly. Gentle traction and simultaneous manipulation of the head of the prosthesis is done to reduce the hip joint. The range of movement is assessed by taking the moving the joint in all directions. By flexing and adducting the hip, the prosthesis stability and susceptibility to dislocate are assessed. The limb length is restored. Once the stability is checked the hip is dislocated and the prosthesis is removed. The bone cement is prepared and it is packed inside the medullary canal of the femur and the prosthesis is again inserted and placed in 10°-15° of anteversion. The cement is allowed to set and care is taken to avoid any cement particles getting placed within the joint. The hip is again reduced and all range of movements and stability is checked. Thorough wound wash is given. The wound is closed in layers and a suction drain placed beneath the deep muscle layer. Haemostasis is maintained throughout the procedure. Sterile dressing is applied.

Postoperative Protocol

Post operatively, the affected limb of the patient is kept in 20°-30° of abduction. For the first six hours, a regular chart of the temperature, pulse rate, and blood pressure was kept. Thereafter, it was checked every two hours for the next 24 hours. Ideally, the drain was removed between 24 and 48 hours depending on the quantity of collection. One dose of antibiotic given half an hour before surgery after sensitivity test and two doses of post-operative antibiotics was given. The wound was inspected at the time of drain removal and at regular interval till suture removal. On the first postoperative day, it was instructed to all patients to sit with their backs supported while also performing ankle pumps and deep breathing exercises. Mobilization with a walker was usually started from second post-operative day or when the patient tolerates pain and is able to do active straight leg raising. Patients were advised to weight bear as tolerated. The sutures were removed between 10-14 days. Abduction and quadriceps strengthening exercises were advised for a period of 6 weeks.

Follow Up

All patients had routine follow-up at end of six weeks, three months, six months, nine months, and one year. Patients were assessed clinically using the Harris Hip Score and radiologically using the necessary X-rays at each follow-up visit. At the 3rd month follow up, after patient undergoes adequate rehabilitation to strengthening the muscles, patient is made to stand and mobilise without any assistance. Although the Harris Hip Score is assessed at each visit, the final Harris Hip Score analysed after one year is used in the current study to assess the procedure's effectiveness. Also, radiographic examinations of the patients looked for protrusio acetabuli, heterotopic ossification, loosening of the prosthesis, and sinking/subsidence of the prosthesis.

RESULTS

66 patients were treated with cemented bipolar hemiarthroplasty for neck of femur fracture with patients age ranging from 60 to 91 with mean age of 70 years. In this study 49 patients were female and 17 were male. We observed that Road traffic accidents were the most common cause of the injury (57.6%) followed by self fall (42.4%). 38 patients were affected on the right side whereas the remaining 28 were affected on the left side. Based on anatomical classification most of the patients were classified into transcervical type (64%), 24% were in basicervical type and 12% were in subcapital type. All the cases were followed up for a minimum of 1 year. 6.1% had Iatrogenic Lesser Trochanter Fracture during prosthesis insertion which was managed by doing a cerclage wiring around the fracture with proper compression.

3 patients had complications of superficial skin infection which was treated debridement and secondary suturing with appropriate intravenous antibiotics and 1 patient had dislocation which was reduced under general anaesthesia and managed accordingly with proper care. In this study regarding surgical approach 62% of the cases were used Hardinge approach and 38% were used Moore approach. In this study 62% of the cases were used regular prosthesis type and 38% were used modular type.

The mean and standard deviation of Sir Harris Hip Score at end of 1 year is 88.7±7.578. The objective results shows that 38 patients (57.6%) had Excellent outcome. 17 patients (36.7%) had Good results, 7 patients (10.6%) had Fair results and 4 patients (6.1%) had poor outcome. The subjective results shows that 33 patients (50%) had Excellent outcomes, 20 patients (30%) had Good results and 13 patients (20%) had Fair result.



Fig 1: Distribution of Final Clinical Result assessed by Sir Harris Hip Score

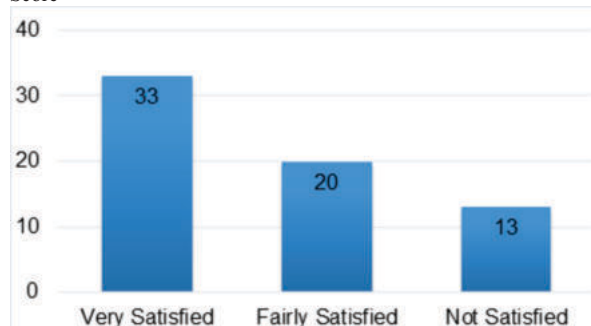


Figure 2: Distribution of Final Patient Satisfaction

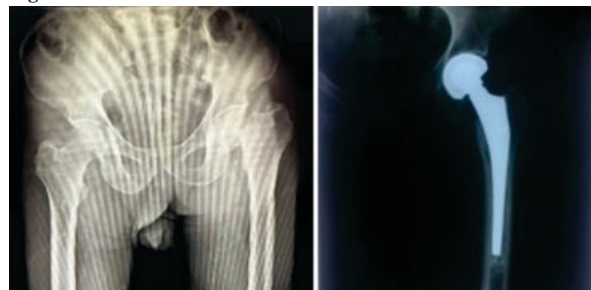


Fig 3: Pre operative and post operative image of fracture neck of femur treated with cemented bipolar hemiarthroplasty



Fig 4: Pre operative and Post operative image of fracture neck of femur with iatrogenic intertrochanter fracture which was managed with cerclage wiring

DISCUSSION

Neck of femur fracture is considered as an unsolved fracture (14). It has a bimodal distribution in incidence (15). A very small group 3%-5% are very young patients subjected to high energy trauma (16). Almost 90% of the remaining injuries in the geriatric population originate from simple falls from a standing height (17). Femoral neck fractures are seldom treated with non-operative care (18). Only non-ambulatory, comfort care, or individuals at extremely high risk may benefit from it (19). Emergent open reduction internal fixation, usually with sliding hip screws or percutaneous cannulated screws, is required for the treatment of young patients with femoral neck fractures (1). However, the rate of avascular necrosis (AVN) with the use of a sliding hip screw (9%) compared to cannulated screws (4%) is comparatively higher (20). The course of treatment for older people with femoral neck fractures is determined by the patient's age and baseline level of activity (4). Hemiarthroplasty is a treatment option for those who are less active, while complete hip arthroplasty is a treatment option for people who are more active (8). As compared to a hemiarthroplasty, total hip arthroplasty is more resilient, but it also entails a higher risk of dislocation (10). In comparison to THA, hemiarthroplasty is a

technically simpler procedure that also has cheaper costs, shorter operating times, less blood loss, and a lesser risk of dislocation (12). The objective of this study was to evaluate the effectiveness of cemented bipolar hemiarthroplasty for treating elderly patients with a fractured neck of the femur. In our study most of the cases were in the age group of 60 – 70 years (68.2%) and the female gender were observed more in number (74.2%) than male (25.8%). **Jung-Yun Choi et al.**, studied Femur Neck Fractures Treated with Cemented versus Cementless Stem, in his study he observed among gender male were more than female in both cemented and uncemented group (31:84 & 19:46) and the mean age was 76 years and 77 years (21). Another study by **SKS Marya et al.**, observed Twenty-nine elderly patients with mean age of 83 years (range:71-102 years) with femoral neck fractures in their study (9). In our study Most of the cases were injured by RTA (57.6%) followed by slip and fall (42.4%).

In our study 57.6% of the cases had excellent outcome, 25.8% had good outcome, 10.6% had fair outcome and we also observed 6% of the cases had poor outcome according to Harris Hip Score and regarding patients final satisfaction 50% of the cases were very satisfied, 30% of the cases were fairly satisfied meanwhile 20% of them were not satisfied. Importantly using correlation co-efficient our study showed significant difference in the hospital stay between the patients who presented earlier than who presented to the hospital late ($p=0.007$) and patients who presented to us early and underwent surgery as early as possible were having better outcomes comparing to ones who presented to us late. We observed that there was no significant difference in the HHS prosthesis type and surgical approach and patients who presented to the hospital < 24hrs had excellent and good final outcome. Different prosthesis type showed no significant difference on patient's final satisfaction and final outcome based on HHS at the end of 1 year.

Limitations Of The Study

Our research has certain limitations of its own. First off, a year is a fairly short time to evaluate the durability and functional endurance of the utilised prosthesis.

Secondly, the degree of intra-prosthetic motion at the inner bearing was not evaluated at each follow-up. Such studies require more resources than our institution has available. These investigations are necessary since it has been suggested that the motion at the inner bearing decreases over time and that most prostheses eventually act as unipolar prostheses.

CONCLUSION

Cemented bipolar hemiarthroplasty for fractures of the neck of femur provides adequate range of movements, early return to unassisted near normal activity, relief from pain with a very minimal complication rate in an elderly patient with less active needs.

However, the end result of the patients depends on the time of presentation to the time of surgery, adequate post-operative rehabilitation, pre fracture level of activity, compliance of the patient and associated systemic diseases.

A study for a longer period with a larger sample size will be required to study further about the long term results of using cemented bipolar hemiarthroplasty in fracture neck of femur in elderly.

Author Contributions

The authors contributed equally for its content, writing, and reviewing and/or editing of the manuscript before submission.

Conflicts Of Interest

The authors declare no conflict of interest.

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