Section: Orthopaedics

Original Research Article

A CLINICAL STUDY ON POSTOPERATIVE MOBILIZATION AND OUTCOMES OF CEMENTED BIPOLAR HEMIARTHROPLASTY IN FRACTURE NECK OF FEMUR

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ABSTRACT

Background: In this clinical study twenty cases of intracapsular fracture neck of femur in elderly patients of age, 60 years and above irrespective of sex treated by hemiarthroplasty using cemented bipolar endoprosthesis, in the Department of Orthopedics were followed up and functional results were analysed with the objectives like quality of life after hemiarthroplasty, recovery of physical, social and vocational independence, number of days of stay in hospital and associated complications. **Materials and Methods:** Twenty cases of fracture neck of femur in elderly patients of age 60 years and above treated by hemiarthroplasty using cemented bipolar prosthesis in the Department of Orthopaedics at Government Medical College / Hospital, Wanaparthy were selected and the cases were followed up for 6 months and the short-term functional results were analysed by using modified Harris hip scoring system. **Result:** At the end of 6 months after surgery, the functional results are analysed in 20 cases. All patients were in the age group of 60 to 82 years with mean average age of 75 years. 35% of the patients had a Garden type III fracture radiologically, while 60% had a Garden type IV and 1 patient was diagnosed with a non-union fracture neck of femur. In 75% percent cases the mode of injury was trivial trauma. Associated medical conditions like hypertension, diabetes mellitus and heart disease or a combination of these were seen in 11 patients. Some of the complications observed were superficial infection of the wound or a limb length discrepancy, following the procedure. There were 50% excellent results and 30% good results. A significant correlation was found between the presence of systemic diseases in patients and their final functional outcomes. **Conclusion:** The success of hemiarthroplasty no doubt depends on preoperative planning and proper attention to surgical details to achieve the optimum biomechanical stability. This study showed that the final functional outcomes were dependent on the presence of associated co-morbidities and the optimum post operative rehabilitation of the patient following surgery. The poor result (5%) in 1 patient was probably due to the late presentation following trauma. We conclude that hemiarthroplasty using cemented bipolar prosthesis for fracture neck of femur is a good option in elderly patients rendering satisfactory results.

INTRODUCTION

Intracapsular fractures of the proximal femur are common in the elderly and represent a significant cause of morbidity and mortality. These injuries have a profound impact on patients' quality of life and place a considerable burden on healthcare systems. Despite advances in surgical techniques, the optimal management of fracture neck of femur remains debated, particularly in elderly patients with osteoporotic bone.[1]

Open reduction and internal fixation (ORIF) has been widely practiced, but it carries high rates of complications such as non-union, avascular necrosis of the femoral head, and the need for revision surgery. Although ORIF can yield satisfactory results in selected cases, these limitations have encouraged the exploration of prosthetic replacement options for more predictable outcomes.[2]

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Unipolar hemiarthroplasty, using prostheses such as the Austin Moore or Thompson, allows for early mobilization and full weight-bearing but is associated with long-term problems including acetabular erosion and reduced functional outcomes, especially in active elderly patients. These shortcomings have driven the development and adoption of bipolar prostheses.[3]

Cemented bipolar hemiarthroplasty has emerged as a superior alternative because it provides greater stability, improved pain relief, increased range of motion, and reduced acetabular wear compared to unipolar implants. Modern modular designs allow for neck-length adjustment and simplify future conversion to total hip replacement, making this option particularly attractive for active elderly patients who need reliable fixation and a rapid return to independent ambulation.[4]

Cemented implants also offer enhanced fixation in osteoporotic bone, lower post-operative pain scores, and allow immediate full weight-bearing compared with uncemented prostheses. Given these advantages, cemented bipolar hemiarthroplasty is increasingly recommended as the treatment of choice for intracapsular femoral neck fractures in the elderly population.[5]

Aim and Objectives

Aim: To evaluate post-operative recovery and outcomes of cemented bipolar hemiarthroplasty in fracture neck of femur.

Objectives:

- To determine time to post-operative mobilization.
- To assess procedure-related complications.
- To evaluate quality of life after surgery.
- To assess functional outcomes following bipolar hemiarthroplasty.

MATERIALS AND METHODS

This prospective study was conducted in the Department of Orthopaedics, Government Medical College / Hospital, Wanaparthy, from November 2021 to March 2023. Twenty patients with intracapsular fracture neck of femur who fulfilled the inclusion criteria and provided informed consent were enrolled. All patients underwent cemented bipolar hemiarthroplasty. Data were collected on post-operative mobilization time, procedure-related complications, quality of life, and functional outcomes.

Inclusion criteria were patients aged 60 years and above with intracapsular fracture neck of femur, ununited fracture neck of femur, or fracture neck of femur associated with avascular necrosis of the femoral head.

Exclusion criteria were patients below 60 years of age, patients with avascular necrosis of the femoral head with acetabular changes, pathological fractures of the femoral neck, and those who were medically unfit for surgery.

Data Collection: Patients admitted with intracapsular femoral neck fractures to Government Medical College / Hospital, Wanaparthy, and meeting the inclusion criteria were enrolled after obtaining informed consent. Clinical evaluation and radiological investigations were performed for all patients, and relevant demographic and clinical data were recorded in a structured proforma. Associated injuries, if any, were noted, and all patients underwent preoperative evaluation to assess fitness for anesthesia and surgery.

Preoperative Protocol: All patients were placed on skin traction with 3–5 kg of weight to maintain limb length and facilitate surgery. Co-morbid conditions such as diabetes mellitus, hypertension, and cardiac disease were optimized prior to surgery. Written informed consent was obtained for both the procedure and inclusion in the study. The operative limb, from nipple to ankle, was prepared the day before surgery. Perioperative antibiotic prophylaxis included intravenous cefoperazone–sulbactam administered every 8 hours starting 20 minutes before surgery and continued for 5–7 days. Deep vein thrombosis (DVT) prophylaxis with low molecular weight heparin (enoxaparin 1 mg/kg twice daily) was initiated on admission and stopped 12 hours prior to surgery.

Surgical Procedure: All procedures were performed under regional anesthesia (spinal or epidural) according to the anesthetist's discretion. A Moore's posterior approach to the hip was used. The patient was placed in lateral decubitus with the affected side up. A curved incision was made from 8 cm distal to the posterior superior iliac spine to the posterior margin of the greater trochanter, continuing distally along the femoral shaft. Gluteus maximus fibers were separated bluntly, short external rotators were tenotomized and retracted to protect the sciatic nerve, and the posterior capsule was incised in a T-shaped manner. The femoral head was dislocated, extracted, and measured for prosthesis selection.

Proximal Femur Preparation and Cemented Prosthesis Insertion: The femoral neck was trimmed, leaving 1.5 cm of medial calcar. The canal was prepared using a rasp to accommodate bone cement. Bone cement was mixed to a homogenous dough-like consistency and manually packed into the canal. The appropriately sized bipolar prosthesis was inserted at 10–15° anteversion, seated gently with a mallet, and allowed to set for 8–10 minutes. The hip was reduced, and joint stability and range of motion were confirmed. The posterior capsule and short external rotators were anatomically repaired, and the wound closed in layers over a suction drain.

Postoperative Protocol: Postoperatively, patients were maintained in supine position with 20–30° abduction using an abduction pillow. Vital signs were monitored regularly, and drains were removed within 24–48 hours. Intravenous antibiotics were continued for 5–7 days, followed by oral therapy. DVT prophylaxis was continued for 5 days postoperatively. Patients were encouraged to sit with

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back support from the 2nd day and perform deep-breathing exercises. Mobilization with a walker began between the 3rd and 5th postoperative day, progressing from toe-touch to full weight-bearing as tolerated. Sutures were removed between 10–14 days, and patients were discharged on average at 21 days (range: 10–32 days). Hip and quadriceps exercises were advised for 6 weeks.

Follow-Up: Patients were followed at 6 weeks, 3 months, and 6 months. At each follow-up, clinical evaluation was performed using the Harris Hip Score, and radiological assessment was done using appropriate X-rays to monitor prosthesis positioning, union, and any complications.

Image 1: The Bipolar Prosthesis Instrumentation

Image 2: exposure of the fracture site

Image 3: osteotomy of the femoral neck

Image 4: cement in medullary cavity

Image 5: inserting the prosthesis in the right version

Image 6: after reduction

Image 7: closure over a suction drain

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CASE - 1

Image 8: Pre-Operative

Image 9: Post-Operative

CASE- 2

Image 10: Three months – straight leg raising

Image 11: Three months – mobilisation without walker

RESULTS

Table 1: Laterality

Side affected	No. of patients	Percentage
Right	10	50
Left	10	50

Table 2: Mode of injury

Mode of Injury	No. of patients	Percentage
Tripping/slipping	15	75
RTA	3	15
Fall from a height	2	10

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Table 3: time to presentation after injury

Time to presentation	No. of patients	Percentage
< 24 hrs	11	55
24 hrs - 72 hrs	6	30
72 hrs – 1 wk	2	10
>1 week	1	5

Table 4: radiological type of fracture

Radiological Type	Number of Patients	Percentage
Garden type I	0	0
Garden type II	0	0
Garden type III	7	35
Garden type IV	12	60
Non-union	1	5

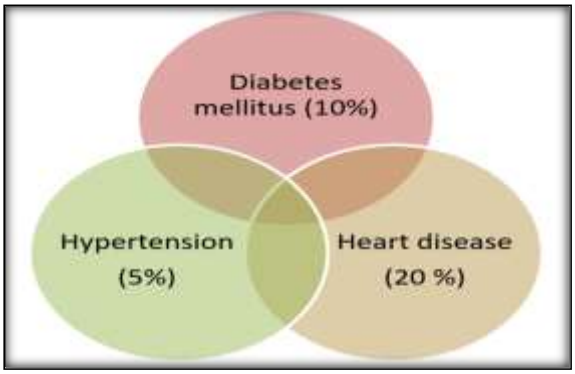

Figure 1: Systemic co-morbidities

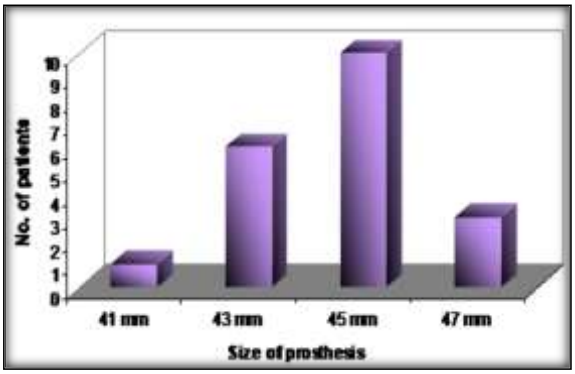

Figure 2: Size of Prosthesis.

Table 5: Average blood loss

Average Blood Loss	No. of patients	Percentage
< 500ml	8	45.45
500-750ml	9	40.90
>750ml	3	13.63

Table 6: Peri-Operative Complications

Peri-operative Complication	No. of patients	Percentage
Technical difficulty	6	30
Intra-op hypotension	5	25

Table 7: early post operative complications

Complication	No. of patients	Percentage
Limb Length Discrepancy	5	25
Superficial Infection	2	10

Table 8: distribution of samples by the criteria of pain

Criteria	Scores	Frequency	Percentage
None	44	7	35
Slight	40	5	25
Mild	30	7	35
Moderate	20	1	5
Marked	10	0	0
Pain in bed	0	0	0
TOTAL		20	100

$\chi 2$= 17.83; P= 0.003(S)

Table 9: distribution of samples by the criteria of use of support

Criteria	Scores	Frequency	Percentage
None	11	13	65
Cane for long walks	7	6	30
Cane most of the time	5	1	5
One crutch	3	0	0
Two canes	2	0	0
Two crutches	0	0	0
Unable to walk	0	0	0
TOTAL		20	100

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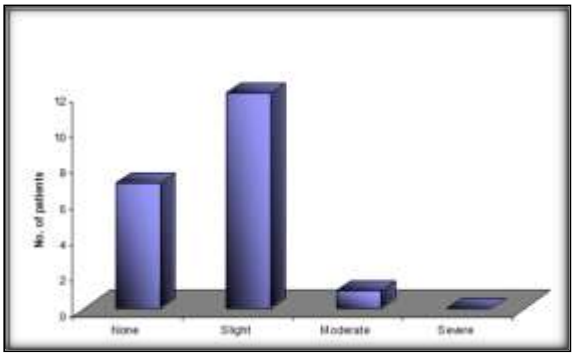

Figure 3: Distribution of samples based on criteria of Limp

DISCUSSION

The primary aim of replacement surgery for fracture neck of femur is the early return to activities of daily living. This is particularly relevant in the elderly population, in whom complications associated with prolonged immobilisation must be prevented.

In the present study, the mean age of the patients was 75 years (range 60–82 years). Age distribution is an important factor in the management of hip fractures; however, our results showed that patient age had minimal influence on the final functional outcome.

Consistent with previous reports, a higher proportion of females sustained fracture neck of femur compared with males, reflecting the increased susceptibility of elderly women to osteoporosis (Choudhari & Mohite, 1987 et al).[6] The majority of injuries (75%) resulted from low-energy mechanisms such as tripping or slipping common among the elderly due to impaired vision and reduced neuromuscular coordination. Ten percent of patients sustained injuries following a fall from height, and 15% following road traffic accidents.

More than half of the study population presented to hospital within three days of injury. Fifty-five percent arrived within 24 hours, 30% between 24–72 hours, 10% between 72 hours and one week, and 5% after one week. Postoperative rehabilitation was particularly difficult in patients presenting after 90 days of injury, likely due to soft-tissue and bony changes leading to poorer outcomes.

All patients had displaced fractures of the femoral neck. Most (60%) had Garden type IV fractures, 35% had Garden type III fractures, and one patient (5%) had a non-union fracture. Similar findings were reported by Krishnan et al,[7] in their comparative study of cemented and un-cemented bipolar prostheses, with 29 patients of Garden type IV and five of type III. In our series, fracture type and displacement did not influence final functional outcomes.

Cardiovascular disease was the most common comorbidity (20%). Two patients had type II diabetes mellitus and were transitioned to insulin preoperatively. Hypertension was present in 5% of patients, and combined comorbidities (heart disease with diabetes or hypertension) were observed in 20%. Postoperative rehabilitation was significantly influenced by these comorbidities, which also affected final functional results (Koval et al Bath).[8]

All patients underwent surgery between the second and fourth day following injury (average 4 days), with delays primarily due to medical optimisation. Deep vein thrombosis prophylaxis with low molecular weight heparin was initiated on admission and withheld 12 hours before surgery. All cases were performed electively as first cases of the day.

Spinal or epidural anaesthesia was administered following thorough pre-anaesthetic evaluation. All patients were positioned in the lateral decubitus position, and the Moore posterior approach was used owing to surgeon familiarity. Although dislocation rates are generally higher with the posterior approach, none of our patients experienced postoperative dislocation. Meticulous closure of the posterior capsule and short external rotators, use of an abduction pillow, and patient education about avoiding excessive hip flexion or adduction likely contributed to this outcome.

Prosthesis sizes used were: 45 mm in 50% of cases, 43 mm in 30%, 47 mm in 15%, and 41 mm in 5%. After calcar preparation and over-reaming of the medullary cavity, cement was manually packed and the prosthesis inserted. Intraoperatively, difficulties were encountered in determining the optimal neck osteotomy angle and calcar retention, as well as in manual cement packing. Hypotension during cement insertion occurred in five patients but was promptly managed intra operatively.

Blood loss was <500 ml in 50% of cases, 500–750 ml in most of the remainder, and >750 ml in 13.6%, necessitating transfusion. Reported literature suggests less blood loss with anterior approaches compared to posterior approaches. Operative time ranged from 90–120 minutes, consistent with previous studies (Haidukewych et al, Drinker et al).[9,10] Neither intraoperative blood loss nor operative duration influenced final outcomes. Most patients were mobilised in bed on postoperative day one and progressed to weight-bearing as tolerated within 72 hours, unless delayed by medical issues.

Limb length discrepancy was noted in 25% of patients postoperatively: four patients had lengthening of approximately 1 cm, and one had shortening of 1.5 cm, likely due to variable calcar resection.

Superficial wound infection occurred in two diabetic patients (10%). Both were successfully managed with antibiotics, debridement, secondary suturing, and strict glycaemic control. No deep infections occurred. Reported infection rates following bipolar hemiarthroplasty are approximately 3.9% (Nottage et al).[11] No cases of deep vein thrombosis were observed, likely due to routine prophylaxis.

Hospital stay ranged from 10–32 days (mean 21 days), comparable to published series (Lestrange,[12] Drinker & Murray).[10] No late complications such as loosening, dislocation, acetabular erosion, secondary

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osteoarthritis, protrusio acetabuli, or periprosthetic fracture were noted during the follow-up period.

Upon discharge, patients were instructed in hip and knee rehabilitation exercises, including quadriceps strengthening. Toe-touch weight-bearing with a walker was initiated between days 3–5 postoperatively and continued until the first follow-up visit, depending on pain tolerance. Follow-up assessments were performed at 6 weeks, 3 months, and 6 months, with functional outcomes evaluated using the Harris Hip Score.

Pain following hemiarthroplasty remains a concern. Hinchey,[13] and Day (1964) reported postoperative pain in 22 of 294 patients without definitive causes. Potential aetiologies include infection, improper prosthetic seating, metallic corrosion, contracture, or periarticular ossification (Lanceford). In our series, 13 patients reported pain at final follow-up. These patients were managed conservatively with reassurance, exercises, and intermittent analgesics.

At 6 months, the mean Harris Hip Score was 87.2 (range 55–100). Ten patients (50%) achieved excellent outcomes, six (30%) good, three (15%) fair, and one (5%) poor. Overall, 80% achieved either excellent or good outcomes. Our results are comparable with standard series of bipolar hemiarthroplasty for fracture neck of femur. The single poor outcome likely reflects delayed presentation and associated soft tissue/bony changes. No radiological complications were observed at 6 months. However, our study is limited by its relatively short follow-up period, which precludes conclusions about long-term prosthesis survival, acetabular erosion, or intra-prosthetic motion. Detailed studies assessing motion at the inner bearing are warranted, as some evidence suggests these prostheses may functionally behave as unipolar devices over time.

CONCLUSION

In the present study

- The majority of fracture neck of femur cases resulted from low-energy injuries such as tripping or slipping.
- All patients, except one, underwent definitive surgical intervention within seven days of trauma.
- Garden type IV fractures were the most frequently observed pattern, accounting for 60% of cases.
- Final functional outcomes were influenced, to some extent, by:
    - The presence of systemic comorbidities, including heart disease, diabetes mellitus, and hypertension, which were observed in 11 of 20 patients.
    - Mild to moderate pain reported by most patients during follow-up, possibly attributable to decreased intra-prosthetic motion at the inner bearing or suboptimal cementation of the medullary canal during surgery.
- Overall, 80% of patients achieved good to excellent functional outcomes.

Study Limitations: The study was limited by a small sample size of 20 patients and a relatively short follow-up period of six months (mean follow-up: 12–14 weeks), which restricts assessment of long-term prosthetic function and durability.

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