

Prospective Study in Surgical Management of Fracture Neck of Femur with Hemiarthroplasty Using Modular Bipolar Prosthesis**Sagar Mengaji¹, Anand Kumar², Manjunath Japatti³**¹Assistant Professor, Department of Orthopaedics, Yadgiri Institute of Medical Sciences (YIMS), Yadgiri, Karnataka, India²Associate Professor, Department of Orthopaedics, Gulbarga Institute of Medical Sciences (GIMS), Kalaburagi, Karnataka, India³Associate Professor, Department of Orthopaedics, Yadgiri Institute of Medical Sciences (YIMS), Yadgiri, Karnataka, India

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Abstract**Background:** Displaced intracapsular fracture neck of femur is a common injury among the elderly and is associated with significant morbidity and loss of mobility. Bipolar hemiarthroplasty has emerged as a preferred treatment option owing to its ability to facilitate early mobilization and provide satisfactory functional outcomes.**Methods:** This prospective observational study included 20 elderly patients with displaced intracapsular fracture neck of femur who underwent modular bipolar hemiarthroplasty at a tertiary care hospital. Demographic details, fracture characteristics, perioperative variables, postoperative complications, and functional outcomes were recorded. Patients were followed up at 6 weeks, 3 months, 6 months, 9 months, and 1 year. Functional outcome was assessed using the Harris Hip Score (HHS).**Results:** The mean age of the patients was 65 years, with females constituting 60% of the study population. Most fractures resulted from low-energy falls (70%) and were transcervical (80%). The mean Harris Hip Score improved progressively from 58.09 at 6 weeks to 85.68 at one year. At final follow-up, 35% of patients had excellent, 45% good, 10% fair, and 10% poor outcomes, with an overall good-to-excellent outcome in 80% of patients. No cases of prosthetic loosening, dislocation, acetabular erosion, or periprosthetic fracture were observed.**Conclusion:** Modular bipolar hemiarthroplasty provides excellent pain relief, early mobilization, and good functional recovery with a low complication rate, making it an effective treatment option for displaced intracapsular fracture neck of femur in elderly patients.**Keywords:** Bipolar Hemiarthroplasty, Femoral Neck Fracture, Intracapsular Fracture, Harris Hip Score, Elderly, Hip Arthroplasty, Functional Outcome.**DOI:** 10.25258/ijcpr.18.6.353

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Introduction

Femoral neck fractures are among the most common fragility fractures in the elderly and represent a major public health challenge because of their high incidence, morbidity, mortality, and socioeconomic burden. Increasing life expectancy, osteoporosis, reduced muscle strength, impaired balance, and low-energy falls have contributed to a steady rise in these fractures worldwide.

Epidemiological studies predict that the global incidence of hip fractures will continue to increase substantially over the coming decades, with the risk approximately doubling with each decade after the age of 50 years [1,2]. Intracapsular fractures of the

femoral neck are particularly common in older adults due to osteoporotic bone and are associated with prolonged hospitalization, loss of independence, functional disability, and increased mortality. The principal goals of treatment are to relieve pain, facilitate early mobilization, restore pre-fracture functional status, and reduce complications associated with prolonged immobilization [3,4].

The optimal management of displaced intracapsular femoral neck fractures in elderly patients remains an important clinical issue. Although internal fixation is preferred in younger patients, its

outcomes in the elderly are often unsatisfactory because of poor bone quality, impaired fracture healing, and compromised blood supply to the femoral head. Consequently, complications such as non-union, fixation failure, and avascular necrosis frequently necessitate revision surgery, making prosthetic replacement the preferred treatment in this age group [4,5].

Hemiarthroplasty has become the standard treatment for displaced femoral neck fractures in many elderly patients. The introduction of unipolar prostheses by Thompson and Austin Moore significantly improved patient outcomes by enabling early mobilization and reliable pain relief [5]. However, long-term use of unipolar implants has been associated with acetabular cartilage erosion, stem loosening, groin pain, and progressive functional decline, particularly in active elderly individuals [6,7].

To address these limitations, Bateman introduced the bipolar hemiarthroplasty prosthesis in 1974. Bipolar implants incorporate two articulating surfaces that distribute movement between the prosthetic head and the acetabulum, thereby reducing acetabular wear, postoperative pain, and the risk of protrusion [7]. Modern modular bipolar systems further improve outcomes by allowing restoration of limb length, femoral offset, and soft-tissue tension while facilitating easier conversion to total hip arthroplasty when required [8].

Although unipolar hemiarthroplasty remains in use in some developing countries because of its lower cost, evidence indicates that bipolar hemiarthroplasty provides better functional outcomes, less postoperative pain, greater range of motion, earlier return to ambulation, and reduced acetabular erosion, especially in active elderly patients [3,7,10,11].

Total hip arthroplasty offers excellent functional results in selected active patients but is associated with longer operative time, greater blood loss, higher cost, and an increased risk of dislocation. Therefore, bipolar hemiarthroplasty continues to be the preferred option for many elderly patients, particularly in resource-limited settings such as India [8,13].

Despite its widespread acceptance, concerns remain regarding long-term implant performance, including polyethylene wear, reduced inner-bearing motion, acetabular degeneration, and implant-related complications. Furthermore, long-term evidence from the Indian population is limited [14].

Therefore, the present study was undertaken to evaluate the clinical and functional outcomes of bipolar hemiarthroplasty in elderly patients with intracapsular fracture neck of femur and to assess the associated postoperative complications.

Materials and Methods

Study Design: This was a prospective observational study conducted to evaluate the clinical and functional outcomes of modular bipolar hemiarthroplasty in elderly patients with displaced intracapsular fracture neck of femur.

Study Setting: The study was conducted in the Department of Orthopaedics, Gulbarga Institute of Medical Sciences (GIMS), Kalaburagi, Karnataka, India.

Study Population: A total of 20 consecutive patients diagnosed with intracapsular fracture neck of femur and fulfilling the eligibility criteria were included in the study after obtaining written informed consent.

Inclusion Criteria

The study included patients who met any of the following criteria:

- Patients aged 55–65 years with displaced intracapsular fracture neck of femur in whom osteosynthesis was expected to yield poor results because of delayed presentation or non-union.
- Patients with failed internal fixation of fracture neck of femur.
- Patients aged more than 65 years with a radiologically normal acetabulum who were not suitable candidates for primary total hip arthroplasty because of financial constraints.

Exclusion Criteria

Patients were excluded if they:

- Were younger than 55 years.
- Had arthritic changes involving the acetabulum.
- Had pathological fractures.
- Were unwilling to undergo surgery.
- Were medically unfit for anaesthesia or surgery.

Preoperative Evaluation: All eligible patients underwent detailed clinical assessment, including history taking, general physical examination, systemic examination, and local examination of the affected hip. Associated injuries and medical comorbidities were documented. Baseline laboratory investigations and radiographic evaluation of the pelvis with both hips and the affected femur were performed to confirm the diagnosis and assess surgical fitness. Medical conditions such as diabetes mellitus, hypertension, chronic obstructive pulmonary disease, and cardiac disorders were optimized before surgery. Written informed consent for both surgery and participation in the study was obtained from every patient.

Preoperative Protocol: All patients were managed with high tibial skeletal traction using 4–7 kg of weight until surgery. The operative limb was prepared from the nipple line to the ankle on the day before surgery. Intravenous cefuroxime (750 mg) was administered approximately 20 minutes before skin incision and was continued postoperatively for 5–7 days. Cemented femoral stems were used selectively in patients with osteoporosis or poor bone quality who did not have significant medical contraindications.

Surgical Technique: All procedures were performed under regional anaesthesia (spinal or epidural). A standard Moore's posterior approach to the hip was used in all patients. Following dislocation of the hip, the femoral head was excised, and the acetabulum was cleared of debris. The femoral canal was sequentially reamed and broached, and trial components were inserted to determine the appropriate stem size, neck length, limb length, offset, and stability. The definitive modular bipolar prosthesis was then implanted with approximately 10–15° of femoral anteversion. Stability and range of motion were assessed before closure. The posterior capsule and short external rotators were meticulously repaired, and the wound was closed in layers over a suction drain with meticulous haemostasis.

Postoperative Management: Patients were maintained in the supine position with the operated limb in 20–30° of abduction. Vital signs were monitored regularly during the immediate postoperative period. Suction drains were removed after 24–48 hours depending on drainage volume. Intravenous cefuroxime was continued for 5–7 days. Patients were encouraged to sit with back support from the second postoperative day, and deep breathing exercises were initiated. Ambulation with a walker was started between the third and seventh postoperative day, initially with toe-touch weight bearing, followed by gradual progression to full weight bearing as tolerated. Sutures were removed between 10 and 12 days, and patients were advised to continue quadriceps strengthening and hip abductor exercises for six weeks.

Follow-up Evaluation: Patients were reviewed at 6 weeks, 3 months, 6 months, 9 months, and 1 year after surgery. At each follow-up visit, clinical and radiographic evaluations were performed. Functional outcome was assessed using the Harris Hip Score (HHS), while pain was evaluated using the Visual Analogue Scale (VAS). Mobility was assessed according to the criteria described by Bezwada et al. Standard anteroposterior pelvic and lateral hip radiographs were obtained to evaluate implant position, femoral stem stability, acetabular erosion, prosthetic subsidence, loosening, heterotopic ossification, and protrusio acetabuli.

Femoral stem fixation was assessed according to the criteria proposed by Engh et al., whereas acetabular changes were evaluated using the method described by LaBelle et al. The final Harris Hip Score recorded at one year was considered the primary functional outcome measure.

Outcome Measures

Primary Outcome

- Functional outcome at one year assessed using the Harris Hip Score (HHS).

Secondary Outcomes

- Pain assessed using the Visual Analogue Scale (VAS).
- Ambulatory status and functional mobility.
- Limb length discrepancy.
- Prosthesis-related complications including dislocation, loosening, stem subsidence, heterotopic ossification, acetabular erosion, protrusio acetabuli, infection, and need for revision surgery.
- Radiographic evidence of implant stability and fixation.

Results

A total of 20 patients with displaced intracapsular fracture neck of femur underwent modular bipolar hemiarthroplasty and completed the one-year follow-up. The baseline demographic and clinical characteristics of the study population are summarized in Table 1. The mean age of the patients was 65 years (range: 58–85 years). Most patients belonged to the 66–75 years age group (55%), were female (60%), had left-sided fractures (65%), and sustained injury due to tripping or slipping (70%) (Table 1). The fracture characteristics and associated systemic comorbidities are presented in Table 2 and illustrated in Figure 1. Most patients presented within 24–72 hours of injury (30%), while 80% sustained transcervical fractures. The most common comorbidities were diabetes mellitus (25%) and hypertension (25%), followed by COPD (20%), knee osteoarthritis (20%), and heart disease (10%) (Table 2, Figure 1). The operative characteristics are shown in Table 3 and Figure 2. The most frequently used prosthetic head size was 45 mm (40%), followed by 43 mm and 47 mm (20% each). A 0 mm (medium) neck size was used in 55% of patients, while the medium stem was implanted in 65% of cases. Most patients (60%) experienced an intraoperative blood loss of less than 500 mL (Table 3, Figure 2).

Perioperative and postoperative complications are summarized in Table 4. The most common perioperative complication was technical difficulty during prosthesis insertion (25%), followed by intraoperative hypotension after cementation (10%)

and postoperative hypotension (5%). Early postoperative complications included limb shortening (10%) and superficial wound infection (10%). No patients developed late complications such as prosthetic loosening, dislocation, acetabular erosion, protrusio acetabuli, secondary osteoarthritis, or periprosthetic fracture during the follow-up period (Table 4). The mean duration of hospital stay was 16 days (range: 14–35 days). The progression of functional recovery assessed using the Harris Hip Score (HHS) is shown in Table 5 and Figure 3. The mean HHS improved progressively from 58.09 at 6 weeks to 70.94 at 3

months, 79.88 at 6 months, 84.65 at 9 months, and 85.68 at the final one-year follow-up, demonstrating continuous functional improvement over time (Table 5, Figure 3). The final functional outcomes according to the Harris Hip Score are presented in Table 6. At one year, 7 patients (35%) achieved an excellent outcome, 9 patients (45%) had a good outcome, while 2 patients (10%) each had fair and poor outcomes. Overall, 80% of the patients achieved good-to-excellent functional results following modular bipolar hemiarthroplasty (Table 6).

Table 1: Baseline Demographic and Clinical Characteristics of the Study Population (n = 20)

Variable	Frequency (n)	Percentage (%)
Age group (years)		
55–65	4	20.0
66–75	11	55.0
76–85	5	25.0
Sex		
Male	8	40.0
Female	12	60.0
Side affected		
Right	7	35.0
Left	13	65.0
Mode of injury		
Tripping/Slipping	14	70.0
Road traffic accident	6	30.0

Mean age: 65 years (Range: 58–85 years)

Table 2: Clinical Characteristics of Fracture and Associated Comorbidities (n = 20)

Variable	Frequency (n)	Percentage (%)
Time to presentation		
<24 hours	5	25.0
24–72 hours	6	30.0
72 hours–1 week	3	15.0
1–3 weeks	3	15.0
>3 weeks	3	15.0
Radiological type		
Transcervical	16	80.0
Basicervical	3	15.0
Subcapital	1	5.0
Comorbidities		
Diabetes mellitus	5	25.0
Hypertension	5	25.0
COPD	4	20.0
Knee osteoarthritis	4	20.0
Heart disease	2	10.0

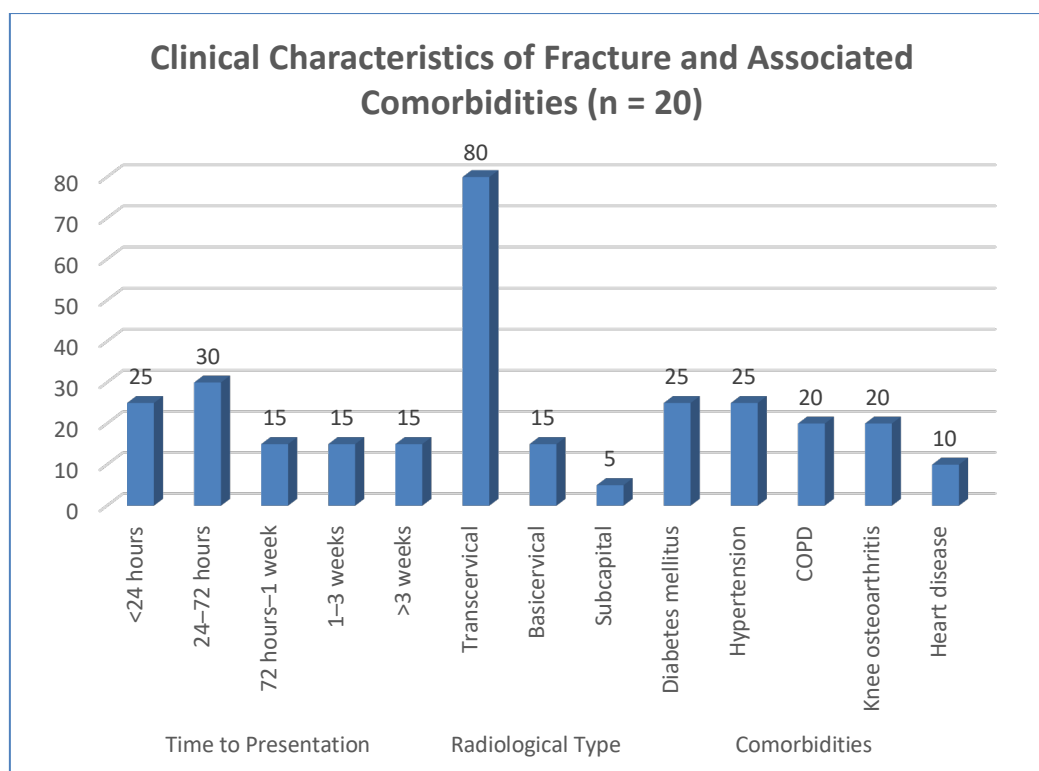


Figure 1: Clinical Characteristics of Fracture and Associated Comorbidities (n = 20)

Table 3: Operative Characteristics (n = 20)

Variable	Frequency (n)	Percentage (%)
Head size		
37 mm	1	5.0
39 mm	1	5.0
41 mm	2	10.0
43 mm	4	20.0
45 mm	8	40.0
47 mm	4	20.0
Neck size		
–5 mm	7	35.0
0 mm	11	55.0
+5 mm	2	10.0
Stem size		
Small	5	25.0
Medium	13	65.0
Large	2	10.0
Average blood loss		
<500 mL	12	60.0
500–750 mL	5	25.0
>750 mL	3	15.0

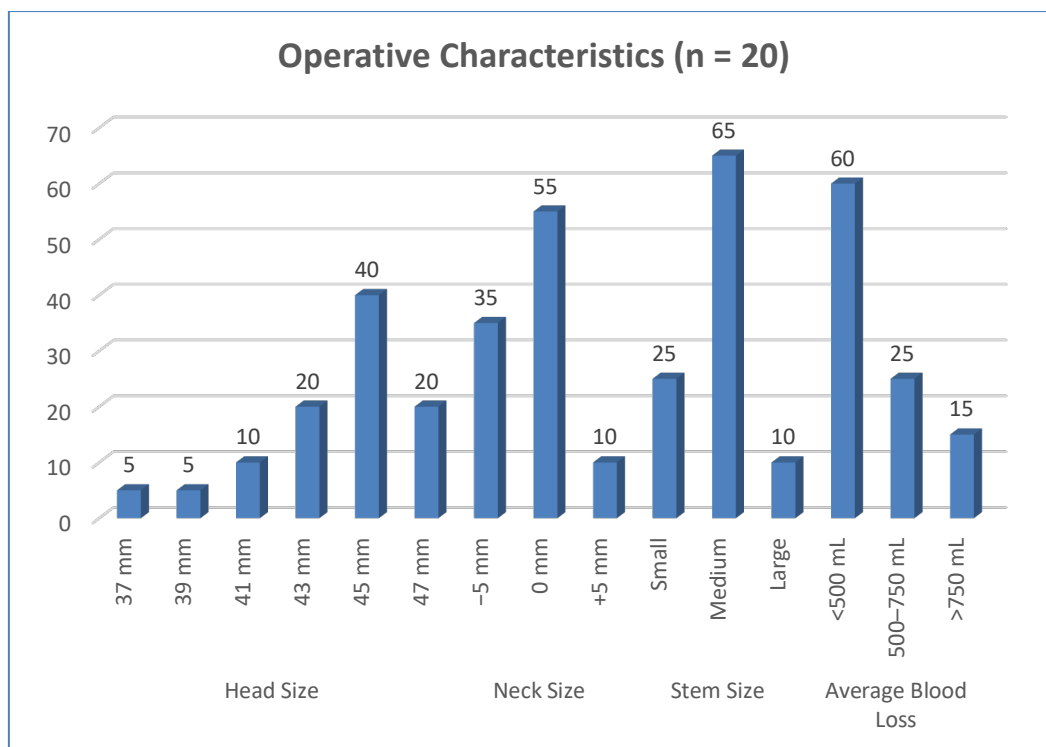


Figure 2: Operative Characteristics (n = 20)

Table 4: Perioperative and Postoperative Complications (n = 20)

Complication	Frequency (n)	Percentage (%)
Perioperative		
Technical difficulty	5	25.0
Intraoperative hypotension after cementation	2	10.0
Postoperative hypotension	1	5.0
Early postoperative		
Limb shortening	2	10.0
Superficial wound infection	2	10.0
Late postoperative complications		
Prosthetic loosening	0	0
Dislocation	0	0
Acetabular erosion	0	0
Secondary osteoarthritis	0	0
Protrusio acetabuli	0	0
Periprosthetic fracture	0	0

Table 5: Progression of Harris Hip Score during Follow-up

Follow-up	Mean Harris Hip Score	Minimum	Maximum
6 weeks	58.09	43.83	66.65
3 months	70.94	58.05	83.88
6 months	79.88	57.45	88.80
9 months	84.65	65.80	93.00
12 months	85.68	65.80	93.00

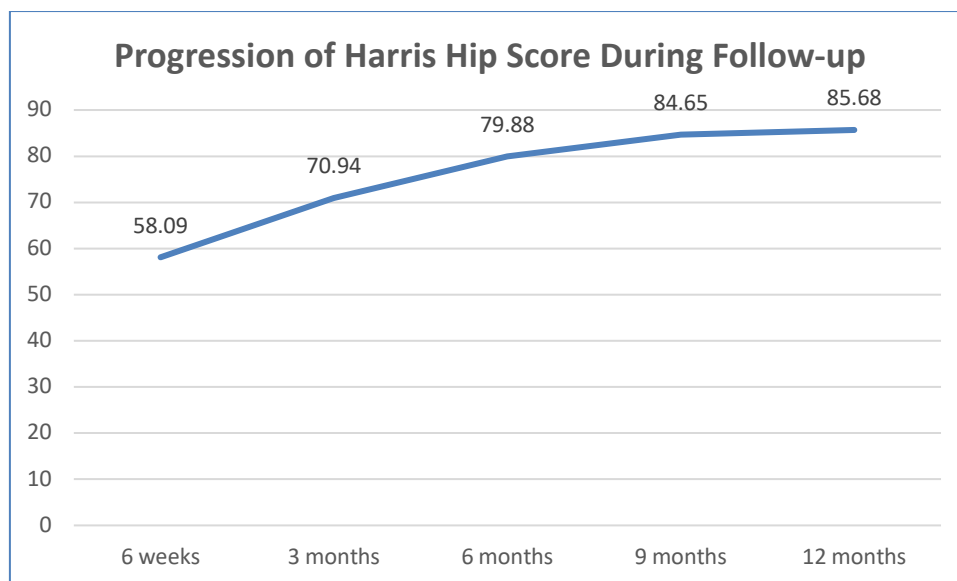


Figure 3: Progression of Harris Hip Score during Follow-up

Table 6: Final Functional Outcome According to Harris Hip Score (n = 20)

Outcome Grade	Harris Hip Score	Frequency (n)	Percentage (%)
Excellent	90–100	7	35.0
Good	80–89	9	45.0
Fair	70–79	2	10.0
Poor	<70	2	10.0

Discussion

The primary objective in the management of displaced intracapsular fracture neck of femur in elderly patients is early mobilization, restoration of pre-fracture function, and prevention of complications associated with prolonged immobilization. Bipolar hemiarthroplasty is widely accepted for this purpose as it provides immediate stability, allows early weight bearing, and avoids complications such as non-union and avascular necrosis associated with internal fixation. The present prospective study evaluated the functional outcome of modular bipolar hemiarthroplasty in 20 elderly patients.

The mean age of patients was 65 years, with 55% belonging to the 66–75-year age group, which is comparable to the findings of Lestrange et al., Moshein et al., and Koval et al., who reported mean ages ranging from 67 to 69 years and emphasized the increasing incidence of femoral neck fractures after the sixth decade because of osteoporosis and falls.[15–17] Females constituted 60% of patients, reflecting the higher prevalence of postmenopausal osteoporosis, similar to previous reports.[15,17] Low-energy domestic falls accounted for 70% of injuries, consistent with observations by Koval et al. and Bath et al., who identified simple falls as the commonest mechanism in elderly patients.[17,18] More than half of the patients presented within 72 hours, while delayed presentation was common in neglected fractures, resulting in greater surgical

difficulty and slower rehabilitation. Transcervical fractures (80%) were the predominant fracture type, although fracture configuration had no significant influence on final functional outcome after hemiarthroplasty. Comorbidities such as diabetes mellitus, hypertension, COPD, and osteoarthritis were frequently encountered and influenced perioperative optimization and rehabilitation, in agreement with Koval et al., who highlighted systemic illnesses as important determinants of postoperative recovery.[17]

All patients underwent bipolar hemiarthroplasty through the posterior (Moore's) approach under regional anaesthesia. Despite the traditionally reported risk of dislocation with the posterior approach, no postoperative dislocation occurred, probably because of meticulous repair of the posterior capsule and short external rotators, as also reported by Bath et al. and Nottage et al.[18,19] Appropriate prosthesis sizing, most commonly a 45-mm bipolar head and medium-sized stem, helped restore limb length and biomechanics.

Technical difficulty during prosthesis insertion was the commonest intraoperative challenge (25%), particularly in neglected fractures. However, intraoperative blood loss remained below 500 mL in 60% of patients, comparable with previous reports by Haidukewych et al. and Drinker and Murray.[20] Early mobilization was achieved in almost all patients, with bedside mobilization on the first postoperative day and assisted weight

bearing within 72 hours, thereby minimizing complications associated with prolonged recumbency.

Postoperative complications were infrequent. Limb shortening occurred in two patients (10%) and superficial wound infection in one diabetic patient (5%), while no patient developed dislocation, prosthetic loosening, acetabular erosion, periprosthetic fracture, or pressure sores during one-year follow-up. Similar low complication rates have been reported by Nottage et al.[19] The average hospital stay was 16 days, shorter than that reported by Lestrangle et al. and Drinker and Murray.[15]

Functional outcome improved progressively, with the mean Harris Hip Score increasing from 58.09 at six weeks to 85.68 at one year, comparable to the results reported by Lestrangle et al. and Moshein et al., who observed final scores between 82 and 88.[15,16] Overall, 80% of patients achieved excellent-to-good outcomes, while poor results were mainly associated with neglected fractures, multiple comorbidities, and poor pre-fracture functional status. Patient satisfaction was high (85%), although subjective satisfaction did not always correlate with Harris Hip Scores.

The study is limited by its small sample size (n=20) and one-year follow-up, which preclude assessment of long-term implant survival and acetabular wear. Nevertheless, the findings indicate that modular bipolar hemiarthroplasty provides reliable pain relief, facilitates early mobilization, achieves good functional recovery, and has a low complication rate, making it an effective treatment option for displaced intracapsular fracture neck of femur in elderly patients.

Conclusion

Modular bipolar hemiarthroplasty is a safe and effective treatment option for displaced intracapsular fracture neck of femur in elderly patients. It provides reliable pain relief, facilitates early mobilization, and results in good functional recovery with a low incidence of complications.

In the present study, 80% of patients achieved excellent to good functional outcomes at one-year follow-up, with no cases of prosthetic loosening, dislocation, or acetabular erosion. Therefore, modular bipolar hemiarthroplasty remains a valuable and cost-effective surgical option for elderly patients, particularly in the Indian clinical setting.

Limitations

The present study had a relatively small sample size (n = 20) and was conducted at a single tertiary care centre, which may limit the generalizability of the findings. The follow-up period of one year was

insufficient to evaluate long-term prosthesis survival, acetabular erosion, and implant longevity. Additionally, the study lacked a comparison group (such as unipolar hemiarthroplasty or total hip arthroplasty), limiting direct comparison of treatment outcomes.

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