

## A Prospective Study to Evaluate Functional Outcome of Cemented Bipolar Hemiarthroplasty for the Treatment of Osteoporotic Unstable Intertrochanteric Fractures in Elderly People

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Conflict of interest: Nil

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### Abstract

**Background and Objectives:** One of the most significant health issues affecting the older age group, particularly those with osteoporotic bones and unstable intertrochanteric fractures. Due to longer life expectancies and a sedentary lifestyle. When compared to younger populations, unstable intertrochanteric fractures in elderly populations are more frequently caused by low-velocity trauma. The preferred therapy for older patients who are ambulatory and have an unstable intertrochanteric fracture is cemented bipolar hemiarthroplasty, which provides a robust and adaptable option for the elderly population.

**Methods:** The participants in this prospective study, who have been admitted to the SSMC Tumkur, between November 2020 and August 2022 with an unstable intertrochanteric fracture and osteoporosis, were taken into consideration based on inclusion and exclusion criteria. Follow-up is done at 8, 12, and 24 weeks.

**Results:** In present study, the Mean Harris Hip Score in post-operative period  $79.06 \pm 5.24$  at 8 weeks, which improved to  $89.12 \pm 4.71$  at 24 weeks. Out of 33 participants, 19 participants (60%) showed excellent, 12 participants (37%) showed good, 2 participants (3%) showed fair score. Mean score was 89.12. In our study 29 (88%) participants not having any complications. 2 participants (6%) had knee stiffness and 2 participants (6%) superficial infection.

**Conclusion:** In a 24-week short-term follow-up, cemented bipolar hemiarthroplasty in older patients results in a better functional outcome for unstable intertrochanteric fractures. Because it allows for early full weight-bearing after surgery, a shorter hospital stay, excellent functional stability, and the absence of postoperative complications related to non-weight bearing after internal fixation in hemiarthroplasty with cemented bipolar prosthesis, this method of treating unstable intertrochanteric fractures in elderly patients is effective and promising.

**Keywords:** Unstable Intertrochanteric Fracture, Cemented Bipolar Hemiarthroplasty, Mean Harris Hip Score, Osteoporosis.

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## Introduction

One of the most significant health issues affecting the older age group, particularly those with osteoporotic bones and unstable intertrochanteric fractures.

Due to longer life expectancies and a sedentary lifestyle. When compared to younger populations, unstable intertrochanteric fractures in elderly populations are more frequently caused by low-velocity trauma.

In India, the prevalence of osteoporosis is 42.5% in women over 50 and as high as 24.6% in men. As a result, unstable intertrochanteric fractures are more common in female than in male.

Most proximal femoral fractures are intertrochanteric and neck of femur fractures. About 35 to 40 percent of all proximal femoral fractures are unstable and cannot be internally fixed due to the high likelihood of implant failure.

The three most often employed techniques for treating unstable intertrochanteric fractures are proximal femoral nailing (PFN), cannulated cancellous screws, dynamic hip screws (DHS) and CC screws.

According to a failure rate of approximately 6-32% and complications like implant loosening, head perforation, plate pull out, plate breakage, avascular necrosis of the femoral head, nonunion, leg shortening, rotational deformities, delayed weight bearing, and problems from prolonged bed rest following internal fixation are not always appropriate for osteoporotic bones and unstable intertrochanteric fractures.

Early ambulation is necessary for these fractures in order to reduce the risks of deep vein thrombosis, bed sores, pneumonia, etc.

Since it offers quick and early rehabilitation and superior functional outcomes, prosthetic replacement, including hemiarthroplasty and complete hip arthroplasty, looks to offer excellent results in unstable intertrochanteric fractures. The preferred therapy for older patients who are ambulatory and have an unstable intertrochanteric fracture is cemented bipolar hemiarthroplasty, which provides a robust and adaptable option for the elderly population.

## Materials and Methods

A prospective study conducted between November 2020 and August 2022 in SSMC Tumkur orthopedics department. According to the specified inclusion criteria, 33 patients were included in the study. Patients who voluntarily agreed in the study were chosen after being counselled in relation to fractures and the inclusion criteria. Informed and written consent given by patients and form was approved by the institutional ethical committee.

### Inclusion criteria

1. Age above 60 yrs.
2. Boyd & Griffin type II, III and IV intertrochanteric fractures of femur.
3. Closed fractures.
4. Unilateral fractures.
5. Independently ambulatory before sustaining the fracture.

### Exclusion criteria

1. Related head, spine, and neurovascular injuries.
2. Patient who are unfit for surgery.
3. Patients suffering psychological disorders.
4. Type I Boyd & Griffin Intertrochanteric fracture.

## Surgical procedure

A longitudinal incision starts 5 cm from the greater trochanter's tip and runs down the length of the femur for roughly 8 cm. Sharp dissection is used to separate gluteus medius fibers that are attached to the fascia lata by splitting the fascia lata superficially and retracting anteriorly to expose the gluteus medius tendon. To avoid damaging the superior gluteal nerve, deep dissection splits the gluteus medius fibers longitudinally and extends incision inferiorly into the vastus lateralis fibers.

By using a bone hook to tug on the greater trochanter, the posterior portion of the capsule can be seen. A T-shaped aperture was created by cutting the capsule from distal to proximal along the length of the femur's neck and at an angle to it. A femoral head gauge was used to measure the head's size after it had been pulled out of the acetabulum. In order to prepare the femoral shaft for the installation of the prosthesis, it was rasped

with a broach (rasp). Close to the fracture, the whole femoral head and neck part was removed.

They assessed the anteversion and retroversion. Depending on the degree of comminution, either bone cement or a bone graft obtained from the medial cortex of the neck was used to rebuild the medial cortex. To determine the prosthesis' size and ensure its suction fit in the acetabulum, a trial prosthesis was used.

The prosthesis was fitted into the femur with bone cement using conventional cementing techniques including washing, cleaning, drying, and canal plugging. The prosthesis was positioned 15-20 degrees in anteversion.

The stability of the hip joint was then evaluated before the prosthesis was reduced using mild thigh traction. Absolute hemostasis was obtained. The fascia lata and capsule were stitched together. Suction drain kept and wound closed in layers.

### SKIN MARKING



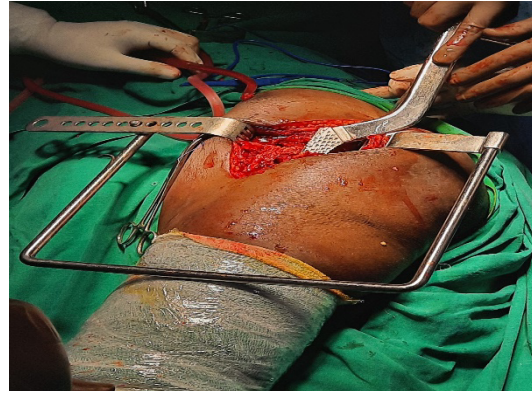
### FASCIA LATA DISSECTION



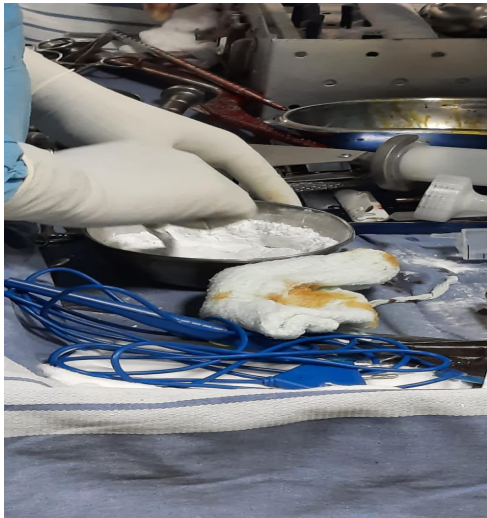
### HEAD EXTRACTION

### RASPING





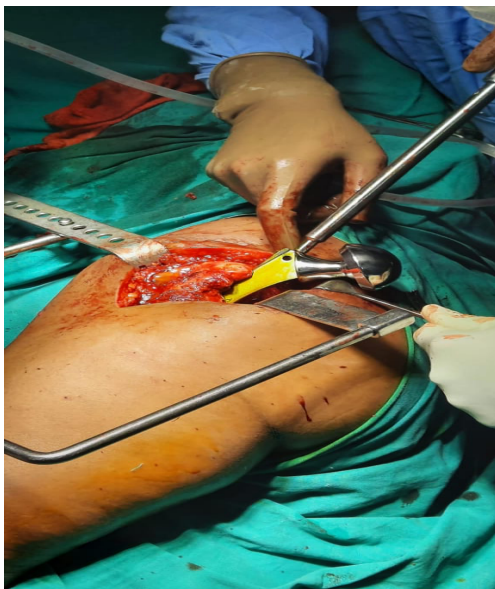
**CEMENT PREPARATION**



**CEMENT INSERTION**



**PROSTHESIS FIXATION**



**WOUND CLOSURE & DRAIN**



**Figure 1: Surgical Steps Of Cemented Bipolar Hemiarthroplasty**



## Results

33 participants who had an unstable intertrochanteric femoral fracture underwent cemented bipolar hemiarthroplasty treatment.

**Table 1: Age Distribution**

Age (years)	Frequency	Percentage
61-70	14	42.4
71-80	11	33.3
81-90	8	24.2
Total	33	100.0
Mean±SD	73±9.92	

In our study,  
 42.4% participants, 14 were between 61- 70yrs of age group  
 33.3% participants, 11 were between 71-80yrs of age group  
 24.2% participants, 8 were between 81-90yrs of age group  
 The Mean age of participants involved in our study were of 73yrs

**Table 2: Sex Distribution**

Sex	Frequency	Percentage
Male	15	45.5
Female	18	54.5
Total	33	100.0

Out of 33 participants, who sustained fracture  
 54.5% participants, that is 18 were females  
 45.5% participants, that is 15 were male  
 Female:Male = 6:5

**Table 3: Singh's Index (Osteoporosis)**

Singh's Index	Frequency	Percentage
Grade 3	10	30.3
Grade 2	23	69.7
Total	33	100.0

Out of 33 participants,  
 70% participants that is 23 shows Grade 2 Singh's Index  
 30% participants that is 10 shows Grade 3 Singh's Index

**Table 4: Hip Harris Score Comparison**

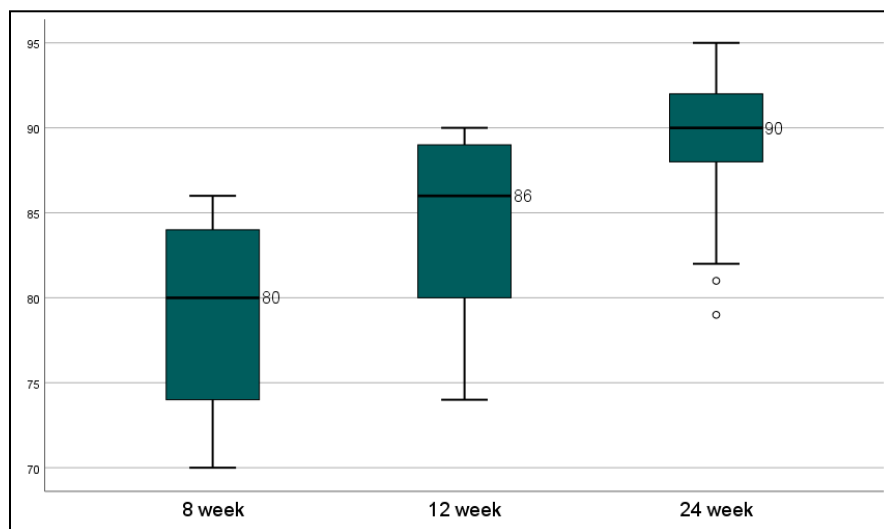
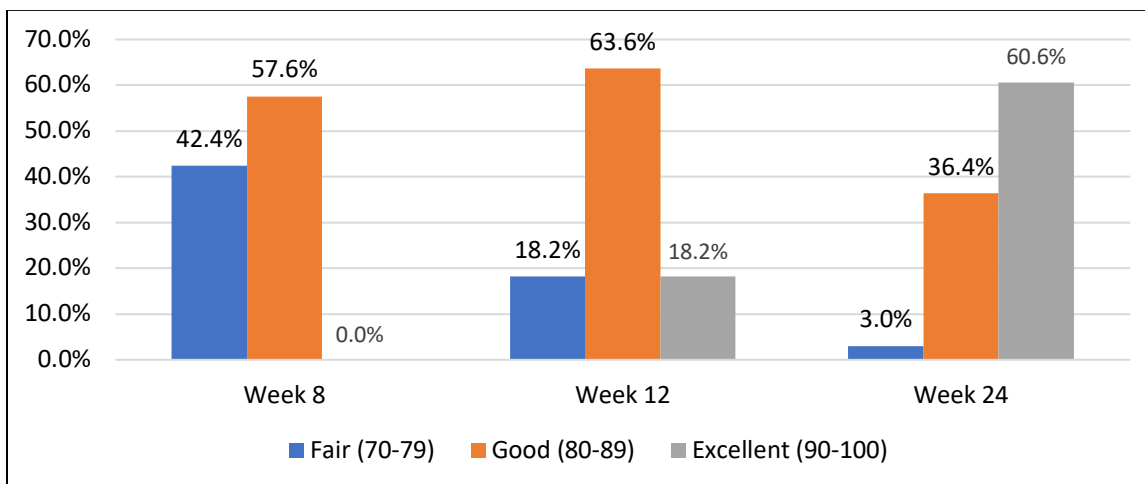
Week	Week	Mean	Std. Deviation	Mean Difference	t-value	P-value*
Hip Harris Score	8week	79.06	5.24	-5.758	-20.910	<0.001
	12week	84.82	4.87			
Hip Harris Score	12week	84.82	4.87	-4.303	-13.916	<0.001
	24week	89.12	4.71			

Mean Harris Hip Score (HHS) in the post-operative period was 79.06±5.24 at 8 weeks, which improved to 89.12± 4.71 at 24 weeks.

**Table 5: Functional Outcome**

Outcome	Week 8		Week 12		Week 24		Chi-Square, P-value*
	Frequency	%	Frequency	%	Frequency	%	
Fair (70-79)	14	42.4	6	18.2	1	3.0	47.895, <0.001
Good (80-89)	19	57.6	21	63.6	12	36.4	
Excellent (90-100)	0	0.0	6	18.2	20	60.6	
Total	33	100.0	33	100.0	33	100.0	

Out of 33 participants, 19 participants (60%) showed excellent, 12 participants (37%) showed good, 2 participants (3%) showed fair score. Mean score was 89.12.

**Figure 2: Median Hip Harris Score Comparison****Figure 3: Functional Outcome****Table 6: Complications**

Complications	Frequency	Percentage
Yes	4	12.1
No	29	87.9
Total	33	100.0

Out of 33 participants,  
4 participants in this study had complications including  
2 participants – knee stiffness  
2 participants – superficial infection

## Discussion

To assess the functional outcome of cemented bipolar hemiarthroplasty for the treatment of osteoporotic unstable intertrochanteric fractures in older patients, a prospective study was conducted. 33 senior participants with intertrochanteric fractures of Boyd & Griffin types II, III, and IV participated in the study.

Numerous studies were conducted to demonstrate the superiority of cemented bipolar hemiarthroplasty over alternative techniques. In this study who underwent cemented bipolar hemiarthroplasty treatment experienced successful outcomes.

## Surgery in elderly participants

The average age of the participants in the current study was 60 years (42%). On average, they were 74 years old. In 2006, 47 in China reported 89 cases of comminuted intertrochanteric fractures treated with bipolar prosthesis, with an average age group of 82.6 years, according to a study by Yin Q, Jiang Y, *et al.* (2008). With an average age of 82.2 years and 20 elderly individuals who had an unstable intertrochanteric fracture, Green, Stuard M.D. *et al.* (1984) 48 reported excellent surgical outcomes.

## Sex incidence

Females are more likely to experience intertrochanteric fractures due to hormonal changes after menopause. Similar to many other studies, our study included a preponderance of female participants. Only 15 (45.5%) of the 33 participants in the current study were men, whereas 18 (54.5%) were women. In a similar, G.S. Kulkarni *et al.*<sup>42</sup> found that 55% of their study

participants were female and 45% were male. In their study, Hunter and Krajchich *et al.*<sup>29</sup> found that 38% of men and 62% of women who suffered intertrochanteric fractures.

## Mode of injury

60% of the cases in this study's injury mode were due to insignificant injuries, such as falls at home, slips in the bathroom, etc. Another 40% of cases involved injuries from traffic accidents as one of the contributing factors. According to research by Ganz *et al.*<sup>31</sup> and Hornby *et al.*<sup>30</sup>, respectively, the incidence of trauma was 80% and 70%.

## Type of fracture

According to Boyd and Griffin's classification, intertrochanteric fractures were classified in the present study. There were 21 participants (type II), and 9 participants (type III), 3 participants (type IV). Most common fracture in the study were type II fractures. The degree of comminution depends on bone condition and it occurs more frequently in elderly people whose bones are osteoporotic.

## Associated co morbid diseases

Due to the fact that most of the research focused on elderly participants, comorbid conditions were more prevalent in several of them. In the present study, 88% of the older individuals have non-communicable disorders such diabetes, hypertension, HT combined with diabetes etc. This factor affected how long patients stayed in the hospital before surgery and after surgery.



### Duration of surgery

Duration of surgery depends on the type of fracture, condition of the participant and surgical skill of the surgeon. According to the present study, 25% of participants had surgeries that lasted between 60 and 90 minutes, 60% had surgeries that lasted between 90 and 120 minutes, and 15% had surgeries that lasted longer than 120 minutes. After operating on 19 participants for their study, SKS Marya *et al.* (2008) 25 found that the average surgical time for bipolar hemiarthroplasty was 60 minutes. Yin Q, Jiang Y, and others (2008), 89 patients underwent surgery, with a mean surgery time of 62 minutes (50 min-70min) Sanchetti *et al.* 41 found that the typical procedure lasted 71 minutes.

### Total duration of hospital stay

According to the present study, 75% of the individuals spent less than 30 days in the hospital. 5% of individuals stayed longer than 40 days, while 20% stayed for 30 to 40 days. The typical stay in the hospital was 26.65 days. (16-43 days). If there were no post-operative complications, the patients were released two weeks after the operation. In a few cases, the length of the hospital stay exceeded 4 weeks because of complications like HT/DM/IHD/COPD that prevented participants from receiving anaesthesia in a timely manner.

The average hospital stay, according to numerous studies, was approximately 16 days for a total of 18 participants in Zhang Q *et al.*'s study from 2005, and 19 days for a total of 89 participants in Yin Q *et al.*'s study from 2008. An average hospital stay of 11 days was found by Sanchetti *et al.*, in their series of 35 intertrochanteric fractures treated with bipolar hemiarthroplasty

### Pain

The evaluation of the treatment for intertrochanteric fractures includes pain as a

key factor. Hip discomfort after surgery may be brought on by mechanical issues or an infection. Nearly 80% of individuals reported experiencing pain after surgery. Physical therapy and analgesics were used to treat them, and over time, they gradually became better.

At the end of the study, (58%) 19 participants reported having no pain at all, whereas (15%) 5 reported having slight pain and (15%) 5 reported having mild pain. 4 participants (12%) continued to experience moderate pain after the study was over. When compared to alternative approaches, Zhang Q *et al.* 34, (2005) found 10% and Gjersten JE *et al.*, (2008) 24 found 14% in their studies, respectively. On a total of 30 elderly participants who underwent surgery by Gallinaro *et al.*, mild pain was noted in 19 participants (63%) and severe pain in 2 individuals (6%).

### Ambulation and range of movements

After surgery, the pain and inflammation subsided all participants in the present study encouraged to do active hip and knee movements. In the first post-operative week, the majority of the individuals were able to walk. In one subject, full weight bearing was delayed until the fourth week. In their study, Harwin SF *et al.*, (1990) 56 found that 88% of participants could ambulate within the first post-op week and 91% were able to do so before being discharged. Out of 29 intertrochanteric fractures stabilised with a proximal femoral replacement, Stern and Godstein found that 86% of participants were mobile within one week following surgery.

10 of the 33 participants (30%) demonstrated an excellent range of movement (211°-300°), 15 participants (45%) demonstrated a good range of movement (161°-210°), 5 participants (15%) demonstrated a fair range of movement (101° -160°), 3 participants (10%) had a poor range of movement (61s° -

100%). None of the subjects showed signs of severe limitation of movement.

In the present study, 10 (or 30%) of the 33 patients walked normally. Twenty of them (or 60%) displayed a slight limp during the follow-up. At the conclusion of the study, 3 (10%) participants moderate limping present.

10 (about 30%) of them were able to walk without support. 15 of them (45%) took long walks with a cane. 3 of the participants (10%) walked mostly with a cane. 5 (15%) participants used a crutch when walking.

80% of the 33 participants were able to use public transportation without any difficulties. 20% of the participants reported difficulty during the last follow-up. Out of 35 subjects in a research by Sanchetti *et al*, 23 were able to walk without support. One member was wheelchair-bound, and 10 others walked with a limp. At the three-month follow-up, 22 subjects had experienced abductor lurch.

### **Limb length discrepancy**

33 participants total. 21 participants (64%) shown no difference in limb length. 8 participants (24%) had shortening of limb length of between 0.5 and 1 cm. 2 participants (6%) had limbs that had shortening of limb more than 1 cm. 2 (6%) of the individuals had lengthening of between 0.5 and 1 cm.

19 patients who underwent surgery had their leg length restored to within 5 mm after follow-up in a different study by SKS Marya *et al*. (2008) 25 patients. According to Sancheti *et al*'s study, 10 out of 35 patients who had cemented bipolar hemiarthroplasty for unstable intertrochanteric fractures noted an average shortening of 1.1 cm.

### **Complications**

29 (88%) of the 33 participants in the current study did not experience any problems. 2 participants (6%) with knee stiffness and 2 participants (6%) with infection. *Staphylococcus epidermidis* was detected as

the source of a superficial infection in 2 of the participants. Antibiotics were administered intravenously to the participant. In our series, we didn't encounter any further complications such dislocations or periprosthetic fractures. In research conducted by SKS, no complications or pain were seen in 19 subjects who had hemiarthroplasty. In their series, Haentjens *et al*.<sup>38</sup> showed 3% dislocation in groups receiving bipolar hemiarthroplasty as compared to 45% in total hip replacement groups.

### **Harris hip score**

In our study, out of 33 subjects, 19 (60%) had excellent Harris hip scores, 12 (37%) good scores and 2 (3%) fair scores. The average Harris hip score was 89.12. It demonstrates the beneficial functional outcomes of cemented bipolar arthroplasty in the elderly subjects in our study who had intertrochanteric fractures.

In the study of primary bipolar prosthesis for unstable intertrochanteric fractures in 37, elderly people, Rodop *et al*. reported 17 excellent (45%) and 14 good (37%) results according to the Harris Hip Scoring System. In a study by Sancheti *et al* (n = 41), 25 of 35 participants results that were good to excellent (71%).

In the study conducted by Yin Q *et al*, More or less similar findings have been observed. (2008) Harris hip scores for 27 out of the 85 participants overall were 84% (excellent in 16%, good in 56%, fair in 12%, and poor in 16%).

In a study by Haentjen *et al*, 100 patients who were 75 years of age or older underwent either a cemented bipolar hemiarthroplasty (91 participants) or a total hip arthroplasty (9 participants) to fix unstable intertrochanteric or subtrochanteric fractures. Results ranged from good to excellent for 78% of individuals.

## Conclusion

Cemented bipolar hemiarthroplasty significantly reduces the morbidity associated with prolonged bed rest including pressure sores, lung infections, and atelectasis in elderly patients with unstable intertrochanteric fractures. Early mobilization, consistent pain management and a return to ordinary everyday activities. In our study, the majority of older patients with unstable intertrochanteric fractures who underwent cemented bipolar hemiarthroplasty reported excellent outcomes.

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