

## Original Research Article

# Assessment of the functional results of hemiarthroplasty in geriatric individuals with unstable intertrochanteric femur fractures

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## ABSTRACT

**Background:** The objective of our study is to measure early weight bearing, mobilization, rapid rehabilitation, complications in unstable intertrochanteric femur after hemiarthroplasty fractures in elderly patients.

**Methods:** Prospective and retrospective, non-randomized study was conducted to assess functional results of hemiarthroplasty in elderly individuals with unstable intertrochanteric femur fractures following surgery in patients who underwent surgery from 2019 to 2021 in department of orthopaedics of Seth Nandlal Dhoot Hospital, Aurangabad. Out of total 44 participants, there were 16 males and 28 females with mean age of 79.54 years of study participants. The patients were evaluated radiologically with routine X-rays i.e. pelvis with both hip joint anteroposterior (AP) view and affected side hip lateral view and clinically early weight bearing, mobilization, rapid rehabilitation and complication with Harris hip score.

**Results:** In our study we observed good result of  $86.53 \pm 5.73$  mean Harris hip score at the end of 1 year was following surgery in 44 study participants who underwent hemiarthroplasty in unstable intertrochanteric femur fractures in elderly patients.

**Conclusions:** Primary hemiarthroplasty offers an essentially pain-free movable joint and is a preferable mode of treatment for older osteoporotic patients who suffers from unstable intertrochanteric femur fractures. Hemiarthroplasty allows for early mobilization and offers rapid stability and mobility, preventing the issues associated with recumbency. Hemiarthroplasty has a lower rate of complications and revision surgery than fixation. According to the Harris hip score, primary bipolar hemiarthroplasty results in a good functional outcome, but long-term monitoring is necessary.

**Keywords:** Hemiarthroplasty, Intertrochanteric fracture

## INTRODUCTION

Intertrochanteric fracture of femur constitutes 45% of all hip fractures and is increasing in older population, these fractures are major cause of morbidity and mortality in elderly population.<sup>1,2</sup> Intertrochanteric fracture is grossly divided into stable and unstable intertrochanteric fracture. Stable fracture is easily treated with osteosynthesis and the results are good. Unstable intertrochanteric fractures are difficult to treat as obtaining anatomical reduction is

laborious. Unstable intertrochanteric fractures take long time to heal so mobilization of the patient is delayed and the related complications are common. To avoid complications of immobilization and to allow early weight bearing hemiarthroplasty has been employed to treat unstable intertrochanteric fracture.<sup>3,4</sup>

Purpose of this study is to know whether hemiarthroplasty decreases morbidity and mortality of elderly patient with unstable intertrochanteric fracture and to study time of

mobilization related complications. To determine whether hemiarthroplasty is treatment of choice for unstable intertrochanteric fracture.

### **Aim**

The aim of the study was to evaluate functional outcome of hemiarthroplasty in unstable intertrochanteric fractures of femur.

### **Objectives**

The objectives of the study were: to facilitate early weight bearing, mobilization and rapid rehabilitation after surgery, and to study the associated complications.

## **METHODS**

### **Study type**

It was a prospective and retrospective, non-randomized study.

### **Study design**

The study is a monocentric observational study.

### **Study place**

The study was conducted from June 2019 to May 2021 in department of orthopaedics, Seth Nandlal Dhoot Hospital, Aurangabad, Maharashtra.

The study was planned to assess the functional outcome of hemiarthroplasty in unstable intertrochanteric fractures of femur in 44 cases. There were 28 males and 16 females. All patients visiting our institution with fracture of the femur during the study period formed the study population.

Patients with age more than 50 years of either gender, patients with comminuted and unstable intertrochanteric fracture of femur (AO 31 A2.2 and A 2.3 AND Evans type 3 and 4) and reverse oblique, patient ambulatory prior to fracture, patients with trochanteric fractures with failed internal fixation, all patients and/or his/her legally acceptable representative willing to provide their voluntary written informed consent for participation in the study were included in our study.

Patients with stable intertrochanteric fracture femur with age below 50 years, patients with compound intertrochanteric fractures of femur, patients who were medically unfit for surgery and anesthesia, pathological fracture, psychiatric patient and polytrauma patient were excluded from our study.

### **Methodology**

All the case records of the patients who underwent hemiarthroplasty in unstable intertrochanteric fractures of femur, from 2019 to 2021 was retrieved from the medical records section 104 case records was screened for eligibility for inclusion in the study. Out of which 44 eligible patients visited the hospital for follow up.

All those patients who attended the hospital for the follow up visit an informed written consent was obtained for participation in the study. The basic demographic details like age at the time of surgery, gender, and type of surgery was documented in a structured proforma. Each participant was evaluated at the time of presentation and diagnosis was made on the basis of routine X-rays i.e. pelvis with both hip joint AP view and affected side hip lateral view after careful clinical examination as mentioned in the proforma.

Computed tomography (CT) scan was kept as an option for complex fracture pattern where X-rays were found inappropriate according to complex fracture pattern.

Then by radiological evaluation we have classified fracture according to Evans classification.

Software used is statistical package for social sciences (SPSS) for windows (SSPS Inc.) for analysis.

### **Operative protocol**

#### *Anesthesia*

Spinal anaesthesia was used.

#### *Antibiotics*

1 dose of injection (inj.) cefuroxime axetil 1.5 gm + inj. amikacin 500 mg half hour before starting of surgery, followed by inj. cefuroxime axetil 1.5 gm IV 12 hourly + inj. amikacin 500 mg IV 12 hourly for 2 days.

#### *Position*

Lateral supported with braces at pelvis and thorax and bony prominences are protected with cotton pads with operated limb on upper side.

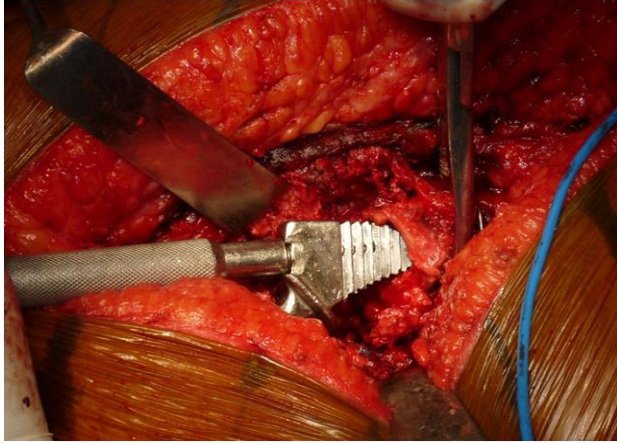
#### *Preparation*

With betadine scrub, saline and povidone iodine and then spirit and again with povidone iodine entire limb with gluteal region prepared and covered with stockinet and rest part covered with sterile disposable drapes.

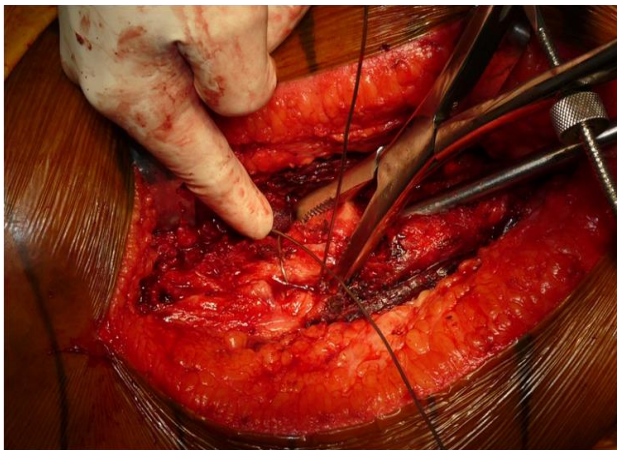
**Surgical procedure**

**Approach**

Most commonly used approach was posterior Moors approach also called as Southern approach.



**Figure 1: Broaching of femoral canal.**



**Figure 2: Trochanteric wiring.**

**Post-operative protocol**

Leg was placed in 30-degree abduction over a pillow and in between thighs with foot end elevation for one day.

DVT prophylaxis was given in high risk patients.

Post-operative pelvis with both hip AP X-ray was taken.

Post-operative inj. cefuroxime axetil 1.5 gm iv over 12 hours given for 48 hours + inj. amikacin iv 500 mg over 12 hours for 48 hours.

Static exercises in bed for glutei, hamstrings and quadriceps were started on next day.

Breathing exercises started from next day.

Ambulation with weight bearing as tolerated on affected lower limb with walker started from 1<sup>st</sup> post-operative day.

Drain removal was done after 48 hours after surgery.

Post-operative dressing was done on 2<sup>nd</sup>, 5<sup>th</sup> post-operative day.

Suture removal was done after 12 days of surgery.

Follow up of patient was done at 6 weeks, 3 months, 6 months, 9 months and 1 year after surgery.



**Figure 3: Post op clinical pictures.**

**RESULTS**

Observation and analysis of results was done in relationship to sex, age, mode of trauma, side affected, type of fracture, associated comorbidities, implant used, day of weight bearing, gait, complications, functional outcome based on Harris hip scoring.

**Sex distribution**

The distribution of patients according to gender is given in Table 1.

**Table 1: Distribution of patients according to gender (n=44).**

Gender	Number	Percentage (%)
Female	28	63.6
Male	16	36.4
<b>Total</b>	<b>44</b>	<b>100.0</b>

**Age distribution**

The distribution of patients according to age is given in Table 2.

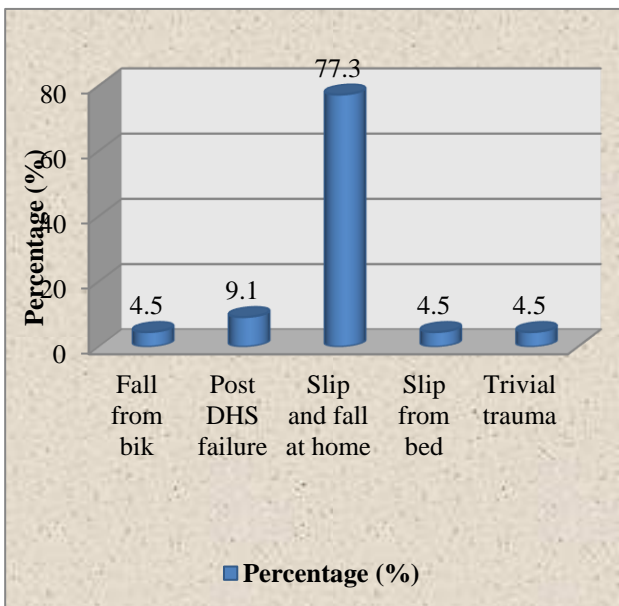
The mean age was found to be 79.54 years, ranging from 57-100 years.

**Table 2: Distribution of patients according to age group (n=44).**

Age group (years)	Number	Percentage (%)
50-60	6	13.6
61-70	4	9.1
71-80	14	31.8
81-90	14	31.8
>90	6	13.6
<b>Total</b>	<b>44</b>	<b>100.0</b>

**Mode of trauma (mechanism of injury)**

The distribution of patients according to mechanism of injury is given in Figure 4.



**Figure 4: Distribution of patients according to mechanism of injury (n=44).**

**Laterality of fractures**

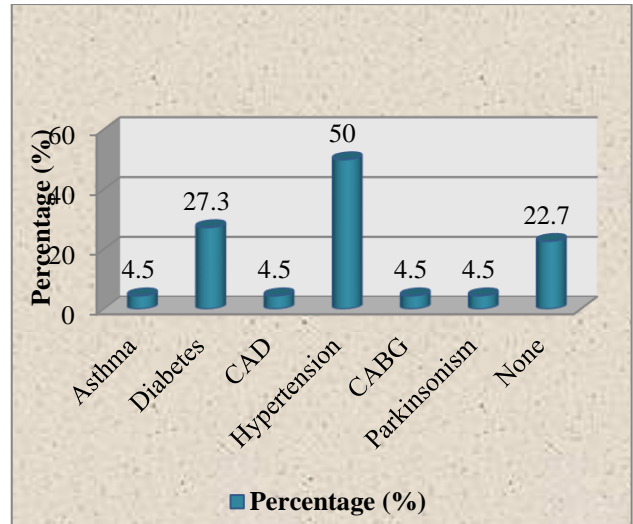
The left hip was most commonly affected as observed in 26 patients out of 44 cases and right hip in 18 cases, in our study bilateral cases were excluded. Left hip was more commonly affected (59.1%) in our study.

**Locality of patients**

Majority of cases were from urban population in our study i.e. 32 cases (72.7%) out of 44 cases and remaining 12 cases were from rural population.

**Comorbidities associated with patients**

The distribution of patients according to co-morbidities is given in Figure 5.



**Figure 5: Distribution according to co-morbidities.**

**Type of prosthesis used**

Most commonly cemented bipolar prosthesis was used in our study, 40 cases out of 44 cases were treated with cemented bipolar prosthesis rest 4 cases was treated with modular bipolar prosthesis.

**Type of fracture and percentage of cases**

We also classified intertrochanteric fractures according to Evans classification, 22 patients out of 44 cases were of Evans type 3 of fracture, 20 cases were that of type 4 and 2 case of reverse oblique (type II) in our study.

**Table 3: Distribution of patients according to Evans type (n=44).**

Evans type	Number	%
Type-3	22	50
Type-4	20	45.46
Type-II (reverse oblique)	2	4.54
<b>Total</b>	<b>44</b>	<b>100.0</b>

**Day of weight bearing (mobilisation day)**

The distribution of patients according to day of weight bearing is given in Table 4.

**Table 4: Distribution of patients according to day of weight bearing (n=44).**

Day of weight bearing	Number	%
Post-op day 1	2	4.5
Post-op day 2	10	22.7
Post-op day 3	24	54.5
Post-op day 4	2	4.5
Post-op day more than 4	6	13.6
<b>Total</b>	<b>44</b>	<b>100.0</b>

### Gait pattern

38 patients of 44 cases had normal gait at the end of 1 year, i.e. 86.4 %, 6 patients out of 44 cases had limp at the end of 1 year in our study.

### Functional outcome

The functional outcome of hemiarthroplasty in intertrochanteric fractures was carried out by using Harris hip score, we evaluated Harris hip score at the end of 6 weeks, 3 months, 6 months, 9 months, and at the end of 1 year.

Mean Harris hip score value at the end of 6 weeks was  $80.41 \pm 4.26$  i.e. Harris hip score gave good result according to scoring

Mean Harris hip score value at the end of 3 months was  $82.52 \pm 4.75$ , good result according to Harris hip score.

Mean Harris hip score value at the end of 6 months was  $83.50 \pm 5.02$ , good result according to Harris hip score.

Mean Harris hip score value at the end of 9 months was  $84.90 \pm 5.17$ , good result according to Harris hip score.

Mean Harris hip score at the end of 1 year was  $86.53 \pm 5.73$ , good result according to Harris hip score.

Paired t test was applied in statistical analysis; p value came out to be 0.000 at the end of 1 year which proves that study carried out is statistically significant.

**Table 5: Distribution of patients according to mean Harris hip score at 6 weeks, 3 months, 6 months, 9 months and 12 months (n=44).**

Time interval	No.	Harris hip score (mean±SD)	't' Value	P value
6 weeks	44	$80.41 \pm 4.26$	-10.247, df=41	0.000*
3 months	42	$82.52 \pm 4.75$		
3 months	42	$82.52 \pm 4.75$	-4.056, df=39	0.001*
6 months	40	$83.50 \pm 5.02$		
6 months	40	$83.50 \pm 5.02$	-5.480, df=39	0.000*
9 months	40	$84.90 \pm 5.17$		
9 months	40	$84.90 \pm 5.17$	-6.096, df=37	0.000*
12 months	38	$86.53 \pm 5.73$		

Paired 't' test applied, p value <0.05 was taken as statistically significant

### Final outcome

The distribution of patients according to final outcome is given in Table 6.

**Table 6: Distribution of patients according to final outcome (n=40).**

Final outcome	Number	Percentage
Fair	8	20.0
Good	18	45.0
Excellent	14	35.0
Total	40	100.0

### Complications

40 patients out of 44 cases had no complication in our study, 2 patient had complication in form of periprosthetic fracture femur, 2 patient had superficial infection. 90.9% in our study had no complication.

### DISCUSSION

Intertrochanteric fractures in elderly is generally comminuted with extensive osteoporosis. There are problems of correct and accurate placement of implant, hold of implant hence prolonged immobilization for achieving bony union is required. Then there is a need of rapid full weight bearing mobilization for this group of patients as they are generally medically compromised due to age and associated diseases. In addition, these patients may not have adequate psychomotor skills required for graded and protected weight bearing,

Hence, there are two conflicting requirement that need to be addressed in a balanced way.

We believe that in geriatric patients there are inherent problems of mobility due to compromised locomotor skills and associated medical problems. Unfortunately, these are the patients who also have osteoporosis and severe comminution which precludes an absolutely rigid fixation which may permit them unrestricted mobilization in the initial post-operative period with any modality of fixation. Even guarded or limited mobilization is fraught with dangers of implant failure due to precarious fixation till fracture unites. Hence there is need for long term protection of hip which is associated with problems of recumbency.

We believe that by treating unstable intertrochanteric fractures in a selected group of physiologically elderly group of patients with compromised general health and comminuted fractures in an osteoporotic bone stock by primary hemiarthroplasty, the phase of fracture healing is essentially bypassed and a stable, mobile and relatively pain free joint is immediately provided. This eliminates the need for prolonged immobilization and permits early ambulation. This gives an edge over internal fixation/osteosynthesis in which there is a dilemma between the need for early mobilization verses protection of hip for bony union and also fears of implant failures and cutouts are eliminated.

In the present study we have studied 44 patients with unstable intertrochanteric fracture with comminution and osteoporosis primarily treated with hemiarthroplasty.

### **Age group**

In the present study maximum numbers of patients were between 71-90 years of age group with mean age being 79.55 years. In the series of Haentjen et al, the mean age was 82 years.<sup>5</sup> In the series of Maru et al, the mean age was 75.6 years, most of the studies age group involved was between the range of 71-90 years.<sup>6</sup>

### **Sex**

In the present series incidence of fracture was more in females 28 out of 44 cases i.e. 63.6% of total number of cases. In the series of Roodoop et al there were 34 females and 20 males in the study.<sup>7</sup> In the series of Sinno et al there were 34 females and 14 males in the series of 48 patients, in most of the other studies there was equal distribution of fracture between both males and females.<sup>8</sup>

### **Mode of injury**

In the present series most common mode of injury was slip and fall at home, accounting for 77% of cases probably osteoporotic bones resulted in fracture with trivial trauma. In the series of Singh et al, 18 patients of 25 cases had fracture due to fall on level surface and less commonly due to road traffic accidents, same as our study.<sup>9</sup> In series of Kumar et al, 15 patients out of 20 cases sustained fracture due to fall from standing height.<sup>10</sup>

### **Laterality**

In the present series most common site affected was left side i.e. 59.1% of total fractures as compared to right side which is 40.9%, most of the patient were from urban population.

### **Comorbidities**

In our series 50% of patients had hypertension as a comorbid condition followed by diabetes in 27% of cases. In series of Roodoop et al, observed on admission most of cases had hypertension, diabetes, heart disease, neurological disease, hematological disease.<sup>7</sup> In the series of Vahal et al, 10% patients suffered from cardiovascular disease, 10% suffered from neurological disorder.<sup>11</sup> Most studies in literature had one of above mentioned complication.

### **Fracture classification**

In our series we classified fractures according to AO/OTA classification and Evans classification, according to AO classification we had 22 patients with 31 A2.2 and 20 patients with 31 A2.3 types and 2 case of 31 A 3.1, Sino et al, in their article studied 48 patients treated with bipolar

hemiarthroplasty and classified them according to AO/OTA classification, they had 22 patients with A21 fracture type, 14 patients had A22 fracture type, 7 patients had A 23 fracture type, 3 patients had A31 fracture type, and 2 patients had A33 fracture type.<sup>8</sup> Maru et al in their study included only AO/OTA type 31 A2.2 and A 2.3 only.<sup>6</sup> Sancheti et al in their series included only AO/OTA type 31 A2.2 and A2.3 types only, AO/OTA classification is most commonly used according to literature we reviewed.<sup>12</sup>

In our study 22 cases were of Evans type 3 and 20 cases of Evans type 4 and 2 case of reverse oblique pattern. Sancheti et al, in their study included only Evans type 3 and type 4 fractures.<sup>12</sup> Maru et al and Patil et al also included in their study Evans Type 3 and Type 4 fractures only.<sup>6,13</sup>

### **Post-operative mobilization**

In our series average time of full weight bearing walking is on 3<sup>rd</sup> day of surgery, 54% of our patients walked on 3<sup>rd</sup> post-operative day with full weight bearing with walker support 98% of patients achieved mobilization by the time of discharge from hospital. In the series of Roodoop et al, 62% of patient were able to walk full weight bearing with walker in first week of surgery, 98% of patients were ambulatory at time of discharge.<sup>7</sup> In the series of Vahal et al, 77% of patients achieved full weight bearing mobilization.<sup>11</sup> In the series of Kayali et al, concluded that in a comparative study between fixation and hemiarthroplasty there was only one difference in favor of hemiarthroplasty was early mobilization as compared to internal fixation.<sup>14</sup> In series of Kumar et al, average day of mobilization was 5<sup>th</sup> day.<sup>10</sup> In the series of Sino et al, time (weeks) to independent full weight bearing and return to the prefracture level of daily activity was significantly earlier in patients who underwent bipolar arthroplasty compared to those in the internal fixation group.<sup>8</sup>

### **Gait pattern**

In our study 38 out of 44 cases walked with normal gait at the end of 1-year follow-up while 6 patients walked with limp, results of our study are comparable to most of other studies in literature.

### **Final outcome**

We evaluated functional outcome by using Harris hip score, Harris hip scoring is most commonly used scoring system in literature to evaluate functional outcome in patients treated with hemiarthroplasty.

The Harris hip score is a validated fifteen item patient questionnaire on which scores range from 0 to 100 (<70 poor; 70–79 fair; 80–89 good; 90–100 excellent).

At the end of 1 year follow up we had 80 % of patients with good to excellent outcome according to Harris hip

score. 20% of our patients had fair result, in our study there was no patient with poor outcome.

Rodoop et al in a study of primary bipolar hemiprosthesis for unstable intertrochanteric fractures in 37 elderly patients obtained 17 excellent (45%) and 14 good (37%) results after 12 months according to the Harris hip scoring system.<sup>7</sup>

Sancheti et al, in study of primary bipolar hemiarthroplasty for unstable intertrochanteric fractures.<sup>12</sup> A total of 32 out of 35 patients (91%) had excellent to fair functional results and 2 had poor result with respect to the Harris hip score (mean 84.8±9.72, range 58-97).

Patil et al, in their study, operated 126 elderly patients with comminuted intertrochanteric fractures femur, with cemented bipolar prosthesis and encirclage wiring for greater trochanter, through transtrochanteric approach, mean Harris hip score at the end of 2.9 years was 80.5, which showed significant improvement as compared to preoperative status.<sup>13</sup>

Puttakemparaju et al, in their study at African Journal of Trauma they studied 20 patients of more than 65 years of age with unstable intertrochanteric fracture femur treated with bipolar hemiarthroplasty, they evaluated functional outcome in these patients using Harris hip score, mean Harris hip score was 78.2 at the end of 6 months and 83.25 at the end of 24 months, at the end of 2 years functional outcome was good according to Harris hip score.<sup>15</sup>

Chaudhari et al, in their study, studied 25 patients with unstable intertrochanteric fracture femur with comminution treated with cemented bipolar hemiarthroplasty using transtrochanteric approach all patients evaluated using Harris hip score.<sup>16</sup> In their study 25 cases were taken. The mean Harris hip score at one year was 80.54±19.74. Excellent to good results were obtained at one year in 17 (68%) cases and fair in 4 (16%) cases, poor in 2 (8%) of patients.

Our results were comparable with most of the studies in the literature we have gone through.

### **Complications**

We had 4 complications in our study, 2 patients suffered from periprosthetic fracture at the end of 6 weeks after surgery. Patients were operated with open reduction and internal fixation with locking compression plate, and was kept non-weight bearing for 6 weeks on subsequent evaluation fracture united and at the end of 1-year patient had fair outcome on Harris hip score.

Other patient suffered from superficial infection, patient had serous discharge from wound which started at 7<sup>th</sup> post-operative day, patient was treated with alternate day dressings and antibiotics coverage for 2 weeks, wound healed well on follow up and recovery was satisfactory. 4

patients in our study died as all 4 cases was not related to operative procedure.

In our study, no patient suffered from complications like implant loosening, dislocation, bed sores and pneumonia which are complications related to prolonged immobilization.

Patil et al, in their study 1 patient suffered from implant loosening, 1 patient suffered from dislocation and 1 patient had infection which were managed accordingly.<sup>13</sup>

In Sancheti et al, 1 patient suffered from infection which was treated with antibiotics for 2 weeks, 1 patient could not walk due to Alzheimer's.<sup>12</sup>

Our study was comparable with most of the studies in the points discussed as mentioned above.

### **Limitations**

This study has several limitations. First this is monocentric study; secondly our follow up period is short and also the sample size of 44 patients is less to form a definitive conclusion. A randomized controlled trial of sufficient sample size with longer follow up is needed for further evaluation.

### **CONCLUSION**

Elderly patients with osteoporosis presents with unstable intertrochanteric fracture of femur and other problems associated with them is comminution and age-related medical illness.

Primary hemiarthroplasty offers an essentially pain-free movable joint and is a preferable mode of treatment for older osteoporotic patients who suffers from unstable intertrochanteric femur fractures. Hemiarthroplasty allows for early mobilisation since it skips the period of fracture healing and offers rapid stability and mobility, preventing the issues associated with recumbency.

Hemiarthroplasty has a lower rate of complications and revision surgery than fixation. According to the Harris hip score, primary bipolar hemiarthroplasty results in a good functional outcome, but long-term monitoring is necessary.

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*Ethical approval: The study was approved by the Institutional Ethics Committee*

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