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## Study of unstable intertrochanteric fractures treated by cemented bipolar hemiarthroplasty in elderly patients

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### 1. Abstract

**1.1 Aims and Objectives:** To study the functional outcome of unstable intertrochanteric fracture treated with bipolar cemented prosthesis and complications associated with it. Also to facilitate early mobilization, early weight bearing with rapid rehabilitation in elderly patient with unstable intertrochanteric fractures

**1.2 Material and methods:** Prospective study of 20 cases presenting with unstable intertrochanteric fractures which satisfy inclusion and exclusion criteria admitted in Vijayanagar Institute of Medical Sciences, Ballari from year 2013- 2016 who are treated with Cemented Bipolar Prosthesis.

**1.3 Results:** In our study of 20 cases, there were 9 male and 11 female patients with mean age of 77.3 years. 75% of the cases admitted were due to trivial trauma, 25% due to RTA with left side being more common side affected. Boyd & Griffin's Type II fractures accounted for 75% of cases. Mean duration of hospital stay was 12.6 days and mean time of full weight bearing was 3.9 days in our patients. 1 patient died on Postoperative day 5. 25% excellent, 30% good, 30% fair results obtained in our study according to Harris Hip Score.

**1.4 Conclusion:** Our study concludes that Cemented Bipolar Hemiarthroplasty in elderly patient with unstable intertrochanteric fracture reduces complications of prolonged immobilization, prolonged rehabilitation which are associated with internal fixation. Also reduces need for secondary surgery which required in cases of malunited fractures, non-union and implant failure. The procedure offered rapid mobilization, rapid return to pre injury level and improved quality of life.

**2. Keywords:** Unstable Intertrochanteric fractures, Hemiarthroplasty, Boyd and Griffin, Harris Hip Score

### 3. Introduction

Intertrochanteric femur fracture is one of the most important health problems amongst the elder population. Incidence of these fractures has increased primarily due to increasing life span and more sedentary life style brought by urbanization. In younger population, IT fracture occurs due to high velocity trauma, where as in elderly population, it is most often due to trivial trauma. Incidence of intertrochanteric fractures is more in females compared to males due to osteoporosis. A lifetime risk of hip fracture for individuals at 50 years of age of 5.6% for men and 20% for women. Mortality ranges between 15%-20 % [1].

The spectra of treatment modalities starting from conservative to surgical intervention such as, advanced internal fixation have been employed since ages. But the problems remains an enigma unsolved till today. IT fractures can be managed by conservative or operative methods. Conservative methods were the treatment of choice until 1960 before the introduction of new fixation devices. As conservative methods resulted in higher mortality rates and complications like decubitus ulcer, urinary tract infections, pneumonia, thromboembolic complications. Intertrochanteric fractures with severe displacement and comminution are common in elderly patients. These patients have a poor bone quality and the fractures are often associated with complications such as nonunion, metal failure and femoral head perforation [2, 3]. The primary treatment goal is a stable fixation, early mobilization and immediate full-weight-bearing [4]. Stable intertrochanteric fractures can easily be treated by osteosynthesis, with predictable good results, whereas the management of unstable intertrochanteric fractures is challenging, because of a poor bone quality, osteoporosis and other underlying diseases.

Bipolar hemiarthroplasty offers a durable and versatile solution for unstable intertrochanteric fractures in the elderly.

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It can be done as a primary procedure or secondary to failure of conservative or internal fixation, offering an advantage of rapid return of function with a pain-free hip.

Arthroplasty for intertrochanteric fractures has been described as early as 1973. Rosenfeld *et al.* [5] devised a prosthesis for head and neck replacement in trochanteric fracture, detailed the method of surgery and reported a good functional outcome. Later in 1987 Stern and Angerman [6] described similar procedure with Leinbach prosthesis for management of comminuted intertrochanteric fractures Bipolar prosthesis first advocated by Dr. James E Bateman [7] and Giliberty in 1974. Since it had an outer head of metal, which articulates with the high density polyethylene (HDPE), lining the inner surface of the outer head. This prosthesis proved to be very useful and results were encouraging.

#### 4. Methodology

##### 4.1. Source of data

Data collected from patients presenting with unstable intertrochanteric fractures satisfying inclusion and exclusion criteria in Vijayanagar Institute of Medical Sciences, Ballari from year 2013-2016 who are treated with Cemented Bipolar Hemiarthroplasty

##### 4.2. Inclusion criteria

1. Patients with age group >70yrs of either sexes.
2. Elderly patients with neglected intertrochanteric fractures for 3- 4wks.
3. Patients with intertrochanteric fractures treated by internal fixation which has gone for failure

##### 4.3 Exclusion criteria

- 1) Polytrauma patients.
- 2) Patients <70yrs of age.
- 3) Compound intertrochanteric fractures.

##### 4.4 Preoperative management

Patients were admitted and detailed history was taken with particular emphasize on mode of injury and associated medical illness. In depth, clinical assessment was carried out in each case. In all patients preoperatively Buck's skin traction with appropriate weight was applied to the fractured lower limb. Oral or parental NSAIDs were given to relieve the pain. The blood investigations were done accordingly for anesthetic clearance.

##### Surgical technique

##### 4.5 Surgical procedure

All surgeries were performed in the elective theater using standard aseptic precautions. Surgery was performed under spinal or general anesthesia. Straight lateral position with the patient lying on the unaffected side. Posterior approach (southern approach) was used for exposing the hip joint. From a point 10 cm distal to posterior superior iliac spine and extended distally and laterally parallel to the fibres of gluteus maximus to the posterior margin of the greater trochanter and then directed about 6cm parallel to the femoral shaft. Deep fascia was exposed and divided in line with the skin incision as also was the fascia over gluteus maximus, which was then split in the direction of its fibres using blunt dissection. By retracting the proximal fibres of the muscle proximally, the greater trochanter is exposed. Distal fibres are retracted distally. The trochanteric Bursa excised. In cases with fractured greater trochanter, the trochanter is reflected anteriorly. The sciatic nerve was usually not exposed, and if it was, it was gently retracted out of the way. The gemelli, obturator internus and the piriformis tendons were divided at their insertions after tagging them for easier identification and reattachment. The posterior part of the capsule thus exposed is incised from distal to proximal along the line of neck of femur and at right angle to it, thus making a 'T' shaped opening. The thigh and knee are flexed to 90° and the limb is rotated internally to expose the neck of the femur, osteotomy was done at the level of the neck, then the hip was dislocated posteriorly. The head of the femur was levered out of the acetabulum and head size measured using template, the size was confirmed using a trial prosthesis. The acetabulum was prepared, the remnant ligamentum teres was completely excised and the remaining soft tissue from the region of pulvinar region was curetted. The femoral shaft was rasped using a broach (rasp) and prepared for the insertion of the prosthesis. Bipolar stem was cemented in place in 10-15° of anteversion using standard cementing techniques – lavage, cleaning, drying and plugging of the canal. Before cementing in some cases calcar reconstruction done using bone taken from the excised head. Fractured lesser trochanter and the greater trochanter was put back in place, in case of comminution they were fixed using a SS wire. Reduction of joint carried out. On table movements of the joint carried out for checking the stability of prosthesis. After suturing the capsule the external rotators were sutured, the wound was closed in layers over a suction drain, which is removed at the first change of dressing after 48 hours.



Positioning of Patient



Incision



Exposure of Femoral Head



Extraction of Head



Reconstruction of calcar



rasping of medullary canal



prosthesis insertion



tbw for gt

**4.6 Postoperative management**

In case of spinal anesthesia, foot end elevation was given. Lower limbs kept in abduction using pillows. Every half an hour blood pressure, pulse rate, temperature, and respiratory rate were monitored for the first 24 hours. Whenever necessary, postoperative blood transfusion was given. Intramuscular analgesics were given as per patient's compliance, IV antibiotics were continued for 5 days. Drain removal was done after 48 hours. Check radiograph was taken after 48 hours. Patients were made to sit up on the second day, standup with support (walker), on the third day and were allowed to full weight bear and walk with the help of a walker on the fourth postoperative day, depending on his/her pain tolerance and were encouraged to walk thereafter. Sitting cross-legged and squatting were not allowed. Suture removal

was done on the 12 to 15 postoperative days. The patients were assessed for any shortening or deformities. Any complications like infections and bed sores are treated before discharging the patients. Patients were followed up at an interval of 6 weeks, 3 months, 6months and 12 months. Clinical follow up was based on Harris Hip Score. Radiological follow up done for signs of loosening, protrusion, dislocation or dissociation of implant.

**5. Results**

The following results were obtained from the data collected during the study of 20 cases of unstable intertrochanteric fractures treated by Cemented Bipolar Hemiarthroplasty in the Department of Orthopaedics in Vijayanagar Institute of Medical sciences, Ballari from year between 2013 and 2016

**Table 1: Age Distribution**

Age	No. of Cases	Percentage
70-75	10	50
76-80	5	25
81-85	1	5
86-90	2	10
91-95	2	10
<b>Total</b>	<b>20</b>	<b>100</b>

**Table 2: Sex Distribution**

Sex	No. of Cases	Percentage
Male	9	45
Female	11	55
<b>Total</b>	<b>20</b>	<b>100</b>

**Table 3: Classification (Boyd &Griffin's)**

Type of Fracture	No. of Cases	Percentage
Type I	2	10
Type II	15	75
Type III	3	15
Type IV	0	0
<b>Total</b>	<b>20</b>	<b>100</b>

**Table 4: Mode Of Injury**

Mode Of Injury	No. of cases	Percentage
Total Trauma	15	75
RTA	5	25
<b>Total</b>	<b>20</b>	<b>100</b>

**Table 5: Complications**

<b>Complication</b>	<b>No. of Cases</b>	<b>Percentage</b>
<b>Superficial Infection</b>	<b>1</b>	<b>5</b>
<b>Deep Infection</b>	<b>-</b>	<b>-</b>
<b>Bed sore</b>	<b>2</b>	<b>10</b>
<b>Death</b>	<b>1</b>	<b>5</b>
<b>Total</b>	<b>4</b>	<b>20</b>

**Table 6:** Functional results according to harris hip score

<b>Functional Results</b>	<b>No. of Cases</b>	<b>Percentage</b>
<b>Excellent</b>	<b>5</b>	<b>25</b>
<b>Good</b>	<b>6</b>	<b>30</b>
<b>Fair</b>	<b>6</b>	<b>30</b>
<b>Poor</b>	<b>2</b>	<b>10</b>
<b>Death</b>	<b>1</b>	<b>5</b>
<b>Total</b>	<b>20</b>	<b>100</b>

## 6. Discussion

Hip fractures are associated with notable morbidity and mortality in elderly patients. Internal fixation has drastically reduced the mortality associated with intertrochanteric fractures [8] however, early mobilization is still avoided in cases with comminution, osteoporosis, or poor screw fixation [9, 10]. Primary Hemiarthroplasty offers a modality of treatment that provides adequate fixation and early mobilization in these patients thus preventing postoperative complications such as pressure sores, pneumonia, atelectasis, and pseudo arthrosis [11]. Hemiarthroplasty has been used for unstable intertrochanteric fractures since 1971 [8] however less frequently as compared to femoral neck fractures [12]. Its initial use was as a salvage procedure for failed pinning or other complications [13]. Tronzo claimed to be the first to use long, straight-stemmed prosthesis for the primary treatment of intertrochanteric fractures [14]. Rosenfeld, Schwartz, and Alter reported good results with the use of the Leinbach prosthesis [15]. Since then there are multiple studies showing good results using this technique.

In our study, the mean age was 77.3 years. 11 patients were female and 9 patients were male, 9 patients had right-sided fracture and 11 patients had left-sided fracture. 15 patients had trivial trauma, 5 patients had an RTA. Boyd and Griffins [1] classifications for trochanteric fractures was used in the study. 15 patients presented with Type II fractures, 3 patients with Type III fractures, 2 patients presented with Type I fractures. The most common associated medical problem was hypertension in 8 cases(40%), followed by anemia in 7 cases (35%) and diabetes in 3 cases (15%) 1(5%) patient had COPD and 1(5%) with IHD Pre-operatively 7 patients (35%) had blood transfusion and post operatively 5 patients (25%) had blood transfusion, which were uneventful. Cerclage wiring for Greater trochanter was done in 12 cases (60%) to hold the fragments together. Calcar reconstruction done in 5 cases (25%) There was incidence of postoperative superficial infection in 1 patient who had serous discharge. They responded to conservative treatment alone without use of antibiotics. 2 patient had superficial bedsore for which daily dressing done and wound healed before the patient was discharged from the hospital. 1 patient died on 5th post-operative day due to myocardial infraction. Postoperatively, 5

patients had shortening of the operated limb of which 4 had less than 2 cm, they walked with the help of a cane. 1 patient had shortening more than 2 cm, he had slight limp and used support of a quadruple walker while walking. Three patients had lengthening of less than 2cm. The operated limb was fixed in less than 20 degrees of external rotation in 3 cases and less than 20 degree internal rotation in one case. Full weight bearing was allowed on and after the third post-operative day. The mean day of full weight bearing was on 3.9th day. 18 patients were discharged on and before 15th day. One patient died on 5<sup>th</sup> post-operative day. The mean number of days spent by the patient in the hospital was 12.6 days. All patients were advised not to squat and sit crossed legged. The patients were followed up at 6 weeks, 3 month, 6 months, 9 months and 1 year post operatively. There was no incidence of acetabular erosion, loosening or dislocation of the prosthesis in this series, on follow up of 1year. At the end of 6 weeks 5 patients walked without any support, 8 patients walked with the help of a cane, 6 patients used walker.

The functional results were graded according to Harris Hip Scoring System, where in, a score of more than 90 indicates excellent result, a score in between 80 and 90 indicates good results, a score in between 70 and 80 indicates fair results and a score below 70 is rated as poor. In our study, 5 patients had excellent results, 6 patients had good results, 6 patients had fair results, and 2 patients had poor result.

Green *et al.* [16], in a series of 20 cases, performed Bipolar Hemiarthroplasty for elderly patients with unstable trochanteric fractures with a mean time to ambulation of 5.5 days, and a mean follow up of 13.2 months. Amongst the 20 cases, 7 patients had excellent results, 11 patients had good results, 7 patients had fair results, 5 patients had poor results and 3 patients died. They concluded that elderly patients were a suitable alternative to internal fixation because the prosthesis provided for early full weight bearing and rapid rehabilitation.

Haentjens *et al.* [17] in a series of 37 cases, with a mean age of 82 years who sustained unstable intertrochanteric fractures were treated with immediate Bipolar Hemiarthroplasty. Amongst the 37 cases, who were rated according to criteria of Merle d'Aubigne, 7 patients had excellent results, 11 patients had good results, 7 patients had fair results, 5 patients had

poor results and reported death of 3 cases. They concluded that immediate Bipolar Hemiarthroplasty for independently mobile patients older than 70 years having an unstable intertrochanteric fractures, allowed early walking with full weight bearing and helped the patients to return to prefracture level of activity rapidly, preventing complications such as pressure sores, pneumonia, atelectasis and pseudoarthrosis.

Rosenfeld *et al.* [18], in a series of 72 elderly patients with unstable trochanteric fractures treated using head neck replacement prosthesis. The series showed excellent results in 33 patients, good results in 21 patients, fair results in 11 patients, poor results in 2 patients and reported death of 5 patients. They concluded that in elderly, fragile, osteoporotic patients who had intertrochanteric fractures, Hemiarthroplasty helped in faster ambulation and reduced the complications.

Casey C K *et al.* [19], in a series of 55 patients with intertrochanteric fractures, with a mean age of 84.2 years, were treated using Cemented Bipolar Hemiarthroplasty. They reported excellent results in 19 cases good results in 8 cases, and death of 12 cases in the series. They concluded that, Cemented Bipolar hemiarthroplasties for intertrochanteric fractures have the advantage because the patients can bear full weight immediately after the surgery and there was no risk of excessive collapse, compromising walking function and so is a reasonable alternative to a sliding screw device for the treatment of unstable intertrochanteric fractures.

Stern M B *et al.* [13], in a series of 105 cases with type III and type IV comminuted intertrochanteric fractures who were treated using Leinbach Bipolar prosthesis, concluded that functions were restored within a short period of time and allows unrestricted weight bearing almost immediately. The hospital stay was shortened and the incidence of secondary operations, thrombophlebitis, pulmonary embolism, decubitus ulcers and pneumonia were relatively very low.

Broos P L *et al.* [20], in a series of 565 patients, who sustained a fresh per trochanteric fracture, were treated with compression hip screw, angled blade plate, enders pins and Bipolar Hemiarthroplasty. They concluded that fixation with angled blade plate and enders pins should be forsaken, patients treated with compression hip screw had good results but at this treatment had a risk for serious collapse and pain in 80% of the cases, he suggested that complex multifragmentary intertrochanteric fractures can be treated with endoprosthesis as it is no longer considered a severe intervention with less than 1% danger of mechanical complications.

Rodop *et al.* [21], in a series of 54 elderly patients, with a mean age of 75.6 years, who had unstable intertrochanteric fractures were treated primarily with Bipolar hemiarthroplasties. The series showed excellent results in 17 cases, good results in 14 cases, fair results in 3 cases, poor results in 13 cases and reported death of 7 cases. They concluded that Bipolar Hemiarthroplasty for unstable intertrochanteric fractures in the elderly was a good procedure which provides rapid weight bearing and rehabilitation of the patients.

Kesemenli C *et al.* [22], in a series of 27 patients with unstable intertrochanteric fractures, who were at the mean age of 78 years, were treated by Leinbach type Bipolar endoprosthesis. The series showed excellent results in 22 cases, poor results in 3 cases and reported death 2 cases. They concluded that in elderly patients with unstable intertrochanteric fractures due to pathologies related complications and complications due to immobilization are seen frequently. Treatment with Bipolar endoprosthesis is to be helpful in decreasing these complications and early mobilization of the patients.

A C Vahl *et al.* [23] in a series of 22 patients with unstable trochanteric fractures with severe comminution and osteoporosis. Endoprosthesis was inserted in 5 patients with sub trochanteric and 17 with pertrochanteric fractures. Pre and postoperative ambulation levels were classified. Seventeen patients (17%) achieved full weight bearing mobilization. Five patients never walked again (23%). 2 patients died in first month (9%). It is concluded that for elderly and debilitated patients with an unstable intertrochanteric fracture, Hemiarthroplasty is an acceptable alternative to osteosynthesis.

Chris Grimsud *et al.* [24] in a series of 39 patients with unstable three and four part intertrochanteric hip fractures, treated with Cemented Bipolar hip arthroplasty with a novel technique of cerclage fixation of the trochanteric bone fragments allowing retention of the femoral calcar. At one year minimum follow up, there was no loosening or subsidence of the femoral components. All trochanteric fractures healed. One dislocation and one deep infection occurred. They concluded that, this technique allows safe early weight bearing on the injured hip and had a relatively low rate of complications.

Kiran Kumar GN, Sanjay Meena, Vijaya Kumar N, Manjunath S, Vinaya Raj MK [25] studied outcome of Bipolar Hemiarthroplasty in 20 cases of intertrochanteric femur fracture, according to their study the treatment of unstable intertrochanteric fractures in elderly patients with severe osteoporosis differs from the treatment of patients with other proximal femoral fractures. These fractures are better treated with Cemented hemi-arthroplasty than with internal fixation. Besides an early ambulation and less hospital stay, Cemented hemi-arthroplasty provides stable and mobile hips. Weight bearing can be started earlier than in other methods of treatment, which prevents any recumbency related complications.

George *et al.* [26], in a series of 60 patients with a mean age of 78 years amongst which 24 patients were treated by total hip arthroplasty, 27 patients were treated with Bipolar arthroplasty, and 9 patients were treated with unipolar arthroplasty, secondary to failed internal fixation of intertrochanteric fractures. The series showed excellent results in 26 cases, good results in 20 cases, fair results in 10 cases and poor results in 4 cases. None of the patients had a revision arthroplasty for acetabular erosion. They did not observe any association between the quality of pain relief and treatment with Bipolar Hemiarthroplasty as opposed to total hip arthroplasty they concluded that hip arthroplasty is an effective salvage procedure after the failed treatment of an intertrochanteric fracture in older patients. Most of the patients had good pain relief and functional improvement.

## 6. Conclusion

According to our results, we believe that Cemented Bipolar Hemiarthroplasty is of choice in freely mobile elderly patients above seventy years of age with an intertrochanteric femoral fracture. The procedure offered, faster mobilization, rapid return to pre injury level, improved the quality of life and gave a long term solution in elderly patients with intertrochanteric fractures of the femur. Postoperative full weight bearing after Hemiarthroplasty spares the postoperative complications of non-weight bearing after internal fixation like prolonged immobilization, prolonged rehabilitation, marked residual deformities and need for revision surgeries. Hemiarthroplasty in these cases is a surgically demanding technique. Bad surgical technique may

lead to prolonged operative time, high incidence of deep infection, dislocation, and a poor radiological and functional outcome.

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