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Original research article

A study of clinical outcome of cemented bipolar hemiarthroplasty in type II, type III peritrochanteric fractures of femur in elderly osteoporotic patients

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Abstract

Background: The purpose of this clinical study was to clinically evaluate the advantage of use of cemented bipolar arthroplasty in AO Type II and Type III peritrochanteric fractures of the femur.

Methods: Study was initiated after obtaining approval from the Institutional Scientific Committee and the Institutional Ethics Committee of JSS medical college, Mysuru. The duration of the study was 18 months from November 2019 to May 2021 involving 30 patients?

Results: Though in proportions, more were having good and excellent outcomes in type II fractures (68.0% vs 32.0%), there was no statistically significant association of functional outcomes with type of fractures (p>0.05).

Conclusion: Good clinical postoperative outcome was observed for cemented bipolar hemiarthroplasty for the treatment of AO Type II and Type III peritrochanteric fractures of femur in elderly osteoporotic patients.

Keywords: Age, trauma, elderly patients, cemented bipolar hemiarthroplasty, AO type II and type III peri trochanteric fractures of femur, comorbidities

Introduction

Femoral neck fractures are a most common injury in the elderly are associated with high postoperative morbidity and mortality [1]. Trauma is the most common cause of femoral neck fractures. Being over the age of 50 or having a medical condition that weakens your bones, such as osteoporosis, increases your risk of a fracture in the femoral neck. Having bone cancer is also a risk factor Trochanteric fracture involves the proximal femur between the cervical region and the shaft. Subtrochanteric fracture, with a fracture line running from an area within 5 cm distal to the lesser trochanter. Peritrochanteric femoral fractures are a type of trochanteric fractures involving the femur and are one of the most common fractures in elderly patients. They can involve both the greater and lesser trochanter and are a type of extracapsular fracture [2]. The mortality rates after occurrence of these fractures are as high as 20 percent in the first post- operative year. These fractures are caused generally by trivial trauma like fall in bathroom or on floor, slipping while walking etc. Stable Inter-trochanteric fractures have been treated successfully with open reduction and internal fixation using Dynamic hip screw, Cephalomedullary nail or Jewett blade plate etc. [3]. But it has been a challenge, treating unstable comminuted inter-trochanteric femur fractures (Evan type III and IV, AO/OTA type 31- A2.2 and 2.3) as in elderly osteoporotic patients, anatomical reduction and early rehabilitation both are essential [3]. Cut-out, Excessive head collapse, Plate breakage, plate pull out, Z-effect, reverse Z effects are few of the implant related complications especially with unstable type of fractures [4]. Intramedullary device has shown better results with less cut-out rates in osteoporotic comminuted inter- trochanteric femur fractures but on the other hand Endoprosthetic replacements have proved good mid-long term survivorship and early rehabilitation. The most common treatment for pertrochanteric fractures is surgery. In most cases, surgery is recommended because this fracture can take a long time to heal on its own. Hemiarthroplasty using modular head partial prostheses is a common surgical procedure used to treat elderly patients with femoral neck fractures. Hemiarthroplasty is the most common treatment for displaced fractures of the femoral and is associated with better functional outcome and fewer reoperations than internal fixation [5]. A large number of prostheses have been used, and no definite conclusions have been made regarding

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which type of arthroplasty is preferred [6]. These prostheses can be inserted with or without bone cement [7]. Hemiarthroplasty as an effective treatment contributes to early ambulation and good functional recovery [8]. Unipolar prostheses has a one- piece design where the hip movement occurs between the prosthesis and the acetabulum (hip socket). A bipolar prosthesis has an additional artificial joint between the two components of the prosthesis.

The treatment of osteoporotic peritrochanteric femur fracture in elderly patients has still been a controversial debate. It is therefore this clinal study was planned to evaluate the clinical outcome of cemented bipolar hemiarthroplasty in Type II and Type III peritrochanteric fractures of femur in elderly osteoporotic patients over the age of 65 years and to assess resurgery rates, mortality within one year from the time of fracture and to measure the limb length discrepancies. This in-depth evaluation will provide valuable information and more accurate evidences for surgeons in making a clinical decision.

Aims and Objectives

To evaluate clinical outcome of cemented bipolar hemiarthroplasty in Type II, Type III peritrochanteric fractures of femur in elderly osteoporotic patients.

Materials and Methods

Study Place

The study was conducted at Department of Orthopaedics, JSS Academy of higher Education and Research, Mysuru, Karnataka.

Study Period

18 Months (Nov 2019 to May 2021).

Study Design

Prospective longitudinal study.

Sample Size

A total of 30 cases of peri-trochanteric fractures were considered for the study.

Sampling

Convenient sampling.

Study Subjects

Thirty elderly subjects aged more than 65 years with type II or III department OPD were considered for the study.

Inclusion Criteria

- Elderly patients above 65 years with AO Type II or Type III peritrochanteric fractures of femur who were willing to participate.
- Those patients with history of injury timed not more than 3 weeks were included.

Exclusion Criteria

- The patients with history of pre-existing rheumatoid arthritis or any other arthropathies.
- Those who were non ambulatory prior to the current injury.
- Those with history of associated systemic illnesses or injuries which might affect rehabilitation post-surgery.
- The patients who were not fit for anaesthesia.
- The patients with a suspected pathological fractures.
- The patients with cognitive impairment on mini-mental status were excluded.

Procedure of cemented bipolar hemiarthroplasty was performed under spinal anaesthesia

All the surgeries were performed by one of the surgeon of the same unit of the department of Orthopaedics. The patient was positioned in the lateral decubitus position. 10 cm distal to the posterior superior iliac spine, the skin incision was made and extended laterally and distally to the greater trochanter. It was then distally extended 15 cm along the femoral shaft. In line with skin incision, the fascia lata and gluteal fascia were divided and the fibers of the gluteus maximum were bluntly separated. The superior gluteal vessels and nerve branches in the proximal half of the muscle and the inferior gluteal vessels and nerve in the distal half of the muscle were carefully preserved. The sciatic nerve was also then identified and protected. Bluntly dissecting and detaching short external rotators near their femoral insertion, the muscles were medially retracted taking care of the sciatic nerve and the capsule was now exposed. The femoral head and neck were removed and subsequently reaming of the femoral medullary canal was done to appropriate stem size and diameter. Trial reductions were considered to

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determine the exact length and to achieve the equal leg length, desired tension and tissue balancing of the abductor muscles. The definitive femoral stem was cemented into the femoral canal with the third-generation techniques using bone cementing was carried out using Polymethyl methacrylate (PMMA) consisting of a liquid MMA monomer and a powered MMA-styrene co-polymer. Using free-hand technique of application the cement was mixed thoroughly and carefully minimizing the entrapment of air. Forming dough and waiting until it no longer adheres to the glove and the surface becomes dull as opposed to shiny, the cement was kneaded thoroughly in the gloved hands. Great care was taken to totally avoid premature insertion of cement which might lead to a drop in the patient's blood pressure. Considering the adequate time until the cement has developed a sufficient degree of viscosity to resist excessive displacement by the implant and not to delay very much to avoid the risk of cement hardening leading to failure of surgery, cement was applied. After waiting for it to get hardened, a non-fenestrated, non- modular bipolar prosthesis stem was placed in the medullary canal filled with bone cement, with the head of bipolar prosthesis in the acetabulum, the limb externally rotated, reduction achieved and checked for the stability of the hip joint.

The greater trochanter was reduced and stabilized by using the tension band wiring technique after hip reduction or it was just sutured near the prosthesis whenever required. The lesser trochanter was not removed and any protruded cement between reduced bone fragments was cleaned.

Once the stability was assessed, the wound was closed with suction drainage. Operative details and blood loss were recorded.

Mobilization and weight bearing following surgery was started next day as tolerated by the patient.

Dressing was changed and drain was removed after 48 hrs.

The patient remained in the postoperative ward handled by the anesthesia team for 2 to 4 hours following surgery.

Subsequently, patients were shifted to an orthopedic ward after stabilizing. They were visited daily by the orthopaedician. The patients requiring active medical intervention were shifted to a high dependency unit managed by physicians and after stabilization, they were internally transferred to the orthopedic ward.

Whole blood transfusions were repeated based on the requirement in the immediate post-operative period.

The sutures were removed on 12th day of post-operative period and were discharged based on their condition, with printed instruction sheets of dos and don'ts.

Results

Table 1: Comparison of outcome in terms of MHHS scores among type II and III fractures (n=30)

MHHS Scores		*t*-value [95% CI]	*P*-value
Type II [n=19] (Mean ±SD)	Type III [n=10]$^{\bullet}$ (Mean ±SD)		
86.00±3.96	81.36±5.77	2.57[0.94 to 8.33]	0.016*

*Indicates significant statistical difference between the groups

$^{\bullet}$ One patient has been excluded as the patient died on table

Table 2: Comparison of both type II and III fractures with respect to pre and post-surgery requirement of blood transfusion and post-op complications (n=30)

Blood transfusion requirement	Type II [n=19] n (%)	Type III [n=11] n (%)	Fisher's exact (*P*-value)
Pre-surgery			
Yes	08 (42.1)	07 (63.6)	(0.45)
No	11 (57.9)	4 (36.4)	
Post-surgery			
Yes	12 (63.2)	08 (72.7)	(0.70)
No	07 (36.8)	03 (27.3)	
Complications			
Yes	04 (21.1)	04 (36.4)	(0.42)
No	15 (78.9)	07 (63.6)	

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Table 3: Comparison of both type II and III fractures with respect to prosthesis size (n=30)

Size of the prosthesis in centimeters		*t*-value [95% CI]	*P*-value
Type II [n=19] (Mean ±SD)	Type III [n=11] (Mean ±SD)		
45.00±2.49	44.64±2.50	0.38 [-1.57 to 2.30]	0.70

Table 4: Association of outcomes in terms of length and rotation of limb post-surgery among the type II and III fractures (n=29)

Limb Length and rotation	Type II [n=19] n (%)	Type III [n=10]⁂ n (%)	Chi-square value (*P*-value)
Limb shortening			
Yes	07 (58.3)	05 (41.7)	0.49 (0.49)
No	12 (70.6)	05 (29.4)	
External rotation			
Yes	04 (80.0)	01 (20.0)	(0.63)¥
No	15 (62.5)	09 (37.5)	
Internal rotation			
Yes	01 (100.0)	00 (0.0)	(1.00)¥
No	18 (64.3)	10 (35.7)	

⁂ One patient has been excluded as the patient died on table
¥ Fisher's exact test applied

Table 5: Association of functional outcomes in the follow-up period among both the groups (n=29)

Functional Outcome	Type II [n=19] n (%)	Type III [n=10] ⁂ n (%)	Fisher's exact (*P*-value)
Excellent and Good	17 (68.0)	08 (32.0)	0.49 (0.49)
Fair	02 (50.0)	02 (50.0)	

Table 6: Comparison of mean duration taken for ambulation and duration of hospitalization among both the groups of fractures (n=30)

Variables	Type II [n=19] (Mean ±SD)	Type III [n=11] (Mean ±SD)	*t*-value [95% CI]	*P*-value
Time taken for ambulation in days	4.05±1.51 [2-7]	4.20±1.23 [2-6]	-0.27 [-1.28 to 0.99]	0.79
Duration of hospitalization in days	7.89±3.12 [4-14]	8.10±2.47 [4-13]	-0.18 [-2.55 to 2.14]	0.86

Table 7: Association of functional outcomes with various probable risk factors (n=29)

Variables	Functional Outcome		Fisher's exact (*P*-value)
	Excellent and Good [n=25] n (%)	Fair [n=4] n (%)	
Age-group			
≤75	16 (88.9)	02 (11.1)	(0.62)
>75	09 (81.8)	02 (18.2)	
Gender			
Males	09 (81.8)	02 (18.2)	(0.62)
Females	16 (11.1)	02 (88.9)	
Side of injury			
Left	12 (75.0)	04 (25.0)	(0.11)
Right	13 (100.0)	00 (0.0)	
Mode of Injury			
Trauma	20 (87.0)	03 (13.0)	(1.00)
Fall	05 (83.3)	01 (16.7)	
Type of fracture			
Type II (Type 31.A1)	17 (89.5)	02 (10.5)	(0.59)
Type III (Type 31.A2)	02 (80.0)	08 (20.0)	
Comorbidities			
Yes	13 (81.2)	03 (18.8)	(0.61)
No	12 (92.3)	01 (7.7)	

Note: Total n is not equal to 30 as one patient has been excluded as the patient died on table

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Discussion

Table 8: Comparison of the findings of this study with Gadre *et al*. study

	Present study	**Gadre N *et al*. 2018**
Cases (n)	30	50
Age incidence years	<70	70-80
Predominance	Female-63.2% 63.6%	62%
Location	Left 53.33%	
Mode of injury	Trauma-80%	Domestic fall- 88%)
Associated medical condition		
Hypertension	46.7%	20%
Diabetes mellitus	36.7%	14%
Cerebrovascular accident	3.3%	4%
Obesity	3.3%	6%
Hypothyroidism	3.3%	-
Parkinson	3.3%	-
Complication		
Bed/pressure sore	10%	2%
Deep vein thrombosis	-	2%
Superficial Infection	13.3%	4%
Limb shortening	16.7%	6%
Dislocation	-	2%
Pulmonary Embolism	-	2%
Mortality	1 patient died on table	0
Harris Hip Score		
Excellent	86.2%	2%
Good		42%
Fair	13.8%	52%
Poor		4%
Mean duration of ambulation	1 day	4 days

Conclusion:

Cemented bipolar hemiarthroplasty offers early painless mobility, ease of rehabilitation and early return to function, in peritrochanteric fractures in the elderly and osteoporotic group. Hence cemented bipolar hemiarthroplasty performed on elderly patients with pertrochanteric fractures has promising results in future.

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