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Intertrochanteric fracture of femur in elderly – A comparative analysis between hemiarthroplasty and osteosynthesis

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Abstract

Background: Fixation of Intertrochanteric fractures Boyd and Griffin type 3 & 4 in elderly is a challenge due to its fracture pattern & the need to protect the fixation from stresses of weight bearing, to prevent implant failure secondary to osteoporosis is common. As elderly patients have existing high risk of morbidity delay in ambulation and prolonged bed rest adds to the morbidity.

Objective: The study was to compare the effectiveness of Bipolar Hemiarthroplasty and Osteosynthesis for Inter-trochanteric fracture of femur in elderly and to evaluate and compare functional & anatomical outcome based on clinical & radiological follow up.

Method: A total of 50 patients diagnosed with Intertrochanteric fractures Boyd and Griffin type 3 and 4 admitted in our hospital and satisfying the eligibility criteria were taken in the study. A Hospital Based comparative study was conducted at Department of Orthopedics, D Y Patil University School of Medicine & Hospital, Navi Mumbai for a duration of 2 years from September 2014 to September 2016.

Result: An excellent result with regards to final range of motion and pain as assessed by the Harris Hip Score was achieved in Bipolar Hemiarthroplasty group.

Conclusion: The greatest advantage of hemiarthroplasty is being able to walk with full weight bearing post-surgery and also the complications of non-ambulation are negated, which also reflects on the functional outcome. Hemiarthroplasty in these cases is a surgically demanding technique and should be performed by experienced operators.

Keywords: Primary hemiarthroplasty, Harris hip score, intertrochanteric fractures, proximal femoral Nail (PFN)

1. Introduction

More than 16.6 lakhs hip fractures are noted worldwide [1] and with increasing life expectancy these numbers are on the rise [2, 3] estimated incidence of 62.6 lakhs by 2050 [2, 4]. Bergström *et al.* [5] noted that 53% of these fractures had low velocity injury in people aged 50 years and above. More than 80% of these fractures occurred in people above 75 years. Osteoporosis and fracture geometry are considered important factors leading to poor results [6-8]. Since internal fixation has high complication rates, replacement surgery has shown promising results and is recommended by authors as a primary treatment. Prosthetic replacements have shown to achieve early rehabilitation of the patient and good long-term results [9-11]. Thus, comparing the functional outcome of Bipolar Hemiarthroplasty and Osteosynthesis and its efficacy in intertrochanteric fractures is the mainstay of the study.

1.1 Objective

The intent of this study is to compare the efficacy of hemiarthroplasty vs osteosynthesis based on clinical and radiological follow up.

2. Materials & methods

Type of study – Prospective
Sample Technique - Consecutive type of non-probability,
Sample size - 50

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Group 1(Arthroplasty): 25 patients have undergone Cemented Bipolar Hemi Arthroplasty.

Group 2(IF): 25 patients have undergone proximal femoral nailing.

Study period - 2 years - 2014 to 2016.

2.1 Inclusion criteria

Patients age 60 yrs and above.

Unstable Intertrochanteric fracture pattern include type 3 and type 4 (Boyd and Griffin)

Informed written consent taken.

2.2 Exclusion criteria

Compound fracture.

Fracture Pattern-Type 1 and Type 2 (Boyd and Griffin)

Patient age less than 60 yrs.

Patients with neuromuscular disease.

Patients not fit for Surgery.

2.3 Our Postoperative Rehabilitation Protocol

Internal Fixation Group: On Day 1 bedside sitting with quadriceps exercises and breathing exercises. On day 5 patients were made to walk with axillary support non-weight bearing. At Day 7 toe touching was started for those patients with good reduction and fixation. While delayed weight bearing for grossly osteoporotic, comminuted fractures and fractures that had inadequate fixation.

Arthroplasty Group: On Day 1 bedside sitting with quadriceps exercises and breathing exercises. On Day 2 patients were made to walking full weight bearing with walker support.

3. Result

We enrolled a total number of 50 patients with unilateral intertrochanteric femur fracture with most common age of presentation was between 60-80 years of age. Female predominance was observed in the study 64% to 36% males. Most common mode of injury was history of trivial fall (48%) or road traffic accident (46%). 6% subjects gave history of fall from height. Most common medical co-morbidity among study subjects was diabetes (70%) followed by hypertension (62%). As per Boyd & griffin classification, 66% fractures were of type III and 34% were type IV. In Arthroplasty group at the end of reconstruction, the greater trochanter was wired together using steel wires in 11 cases while only ethibond sutures were used in two cases that were severely comminuted. The mean intraoperative blood loss (ml) was higher in Arthroplasty group (253.4± 99.1) than in the internal fixation group (192.3± 80.9) ($P<0.05$) while the arthroplasty group had early discharge from the hospital (6.2± 1.7 vs 7.8± 2.2) ($p<0.001$). Patients who underwent internal fixation had more pulmonary complications (32% vs 12%; $p<0.05$). Two case of loosening of implant was seen in Internal Fixation group while one was seen in arthroplasty group. Patients who underwent internal fixation had more incidence of pressure sore (24% vs 8.0%; $p<0.05$). One case of mal-union and one case of implant failure was seen in Internal Fixation group. Superficial wound infection was seen in 2 patients (8%) of Arthroplasty group as compared to none in IF group. The time (weeks) to independent full weight bearing (1.25± 0.67 vs 7.02± 2.21 weeks; $p<0.01$) and return with good function (34.22 ± 4.40 vs 52± 8.7 days) was significantly earlier in patients who underwent bipolar hemiarthroplasty compared to internal fixation. Bipolar hemiarthroplasty patients had significant higher Harris Hip Score at the end of 1 month (67.77± 5.76) (range 56 – 76) compared to those in the internal fixation

group (60.23± 4.90) (range 45 – 68) ($p<0.01$). At the end of 3 and 12 months the Harris hip score was also higher (76.32 ± 6.23 and 80.35 ± 8.76) compared to the internal fixation group (66.89 ± 5.22 and 69.78 ± 3.73) ($p<0.01$). Good to excellent results were seen in 92% patients of arthroplasty group as compared to 64% patients of Internal fixation group ($p<0.05$). Fair to poor results were seen in 32% and 4% patients of internal fixation group while it was seen in 8% and 0% patients of arthroplasty group.

Table 1: Comparison of study groups based on Age distribution

Age Group	Group		Total
	Arthroplasty	IF	
60-70	13	12	25
	52.0%	48.0%	50.0%
71-80	7	9	16
	28.0%	36.0%	32.0%
81-90	4	3	7
	16.0%	12.0%	14.0%
> 90	1	1	2
	4.0%	4.0%	4.0%
Total	25	25	50
	100.0%	100.0%	100.0%

p- Value - 1.0

Table 2: Comparison of study groups based on Intra-operative parameters

Variables	Group	Mean	SD	p-value
Operative Time (mins.)	Arthroplasty	139.1	41.1	0.11
	IF	112.2	38.8	
Amount of Blood Loss (ml)	Arthroplasty	253.4	99.1	< 0.01
	IF	192.3	80.9	
Duration of Hospital Stay (days)	Arthroplasty	6.2	2.2	< 0.05
	IF	7.8	1.7	

Table 3: Comparison of study groups based on early complications

Early Complications	Group		Total	p- value
	Arthroplasty	IF		
Dislocation	0	0	0	NA
	0.0%	0.0%	0.0%	
Loosening of Implant	1	2	3	1.0
	4.0%	8.0%	6.0%	
Intra-op Complication	0	0	0	NA
	0.0%	0.0%	0.0%	
Pulmonary	3	8	11	<0.05
	12.0%	32.0%	22.0%	
UTI	3	3	3	1.0
	12.0%	12.0%	6.0%	

Table 4: Comparison of study groups based on late complications

Late Complications	Group		Total	p- value
	Arthroplasty	IF		
Mal union	0	1	1	1.0
	0.0%	4.0%	2.0%	
Non union	0	0	0	NA
	0.0%	0.0%	0.0%	
Implant Failure	0	1	1	1.0
	0.0%	4.0%	2.0%	
DVT	1	1	2	1.0
	4.0%	4.0%	4.0%	
Pressure Sores	2	6	8	<0.05
	8.0%	24.0%	16.0%	

Table 5: Comparison of study groups based on Functional Outcome

Variables	Group	Mean	SD	p-value
Time to full Weight bearing (weeks)	Arthroplasty	1.25	0.67	< 0.01
	IF	7.02	2.21	
Return to Normal activity (days)	Arthroplasty	34.22	4.40	< 0.01
	IF	52.00	8.70	
Complete bony union (weeks)	Arthroplasty	18.97	2.56	0.31
	IF	19.78	2.56	

Table 6: Comparison of study groups based on Harris hip score

Harris Hip Score	Group	Mean	SD	p- value
1 month	Arthroplasty	67.77	5.76	< 0.01
	IF	60.23	4.90	
3 month	Arthroplasty	76.32	6.23	< 0.01
	IF	66.89	5.22	
12 month	Arthroplasty	80.35	8.76	< 0.01
	IF	69.78	3.73	

Table 7: Comparison of study groups based on Functional Outcome

Functional Outcome (12 months)	Group		Total
	Arthroplasty	IF	
Excellent	5	1	6
	20.0%	4.0%	12.0%
Good	18	15	33
	72.0%	60.0%	66.0%
Fair	2	8	10
	8.0%	32.0%	20.0%
Poor	0	1	1
	0.0%	4.0%	2.0%
Total	25	25	50
	100.0%	100.0%	100.0%

P-value < 0.05

**Fig 1:** Pre operative xray**Fig 2:** Postoperative xray

4. Discussion

Early postoperative full weight bearing in the hemiarthroplasty group compared with early partial or non-weight-bearing in the internal fixation group was the main reason for significant reduction in postoperative complications such as pressure sores and pulmonary complications [12-14].

Stern and Anger man [13] reported that all the hips were stable after hemiarthroplasty regardless of whether the greater trochanter was anatomically reduced or just sutured near the prosthesis. The high complication rate of internal fixation in elderly can be attributed to poor bone quality in elderly patients. The poor mechanical properties of the weak and porotic bone in these elderly patients do not usually provide a firm purchase for internal fixation leading to early biomechanical failure [15, 16]. This will lead to collapse with migration of the femoral head into varus and retroversion resulting in limping due to shortening and decreased abductor muscle lever arm [17, 18]. Another complication of internal fixation in porotic weak bone is cutting-out of the implant from the femoral head leading to profound functional disability and pain [19]. Thus, it has become clear that, although the mortality index has reduced; the rate of complication of internal fixation group is 4%-50% [20, 21]. The time (weeks) taken for return to full function was better in patients with bipolar hemiarthroplasty group (1.26± 0.68) than compared to fixation group (9.6± 2.28) (p<0.0001) [3]. Bonneville P *et al.* also observed that general complications mechanical complications were more frequent in the nailing group than arthroplasty (12.5% versus 2.8%) [12]. Report by Harwin *et al.* showed 58 patients with comminuted fracture of femur intertrochanteric region and osteoporosis treated with a bipolar Bateman-Leinbach prosthesis showed no complications like dislocations, acetabular erosions, stem loosening or no deep infections [11]. Total hip replacement would be a better option for elderly patients undergoing surgery but in our scenario these patients were from low socio-economical status and could not afford the expenses of the implant. Therefore in such scenario Bipolar Hemiarthroplasty is a better option than osteosynthesis.

5. Conclusion

Based on our evaluation, we have concluded that in intertrochanteric femoral fractures, bipolar hemiarthroplasty gives the most promising outcome in elderly patients above sixty years of age. We have also observed that the obstacle of non-weight bearing in the internal fixation group are avoided in the Arthroplasty group due to early rehabilitation and this in turn reflects on the final outcome. In view of the distorted anatomical landmarks in the intertrochanteric region, hemiarthroplasty becomes a challenge and requires to be performed by experienced surgeons who avoid the pitfalls associated with this surgical technique.

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