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A PROSPECTIVE RANDOMISED STUDY OF CEMENTED THOMPSON HEMIARTHROPLASTY VERSUS DYNAMIC HIP SCREW FIXATION FOR UNSTABLE OSTEOPOROTIC INTERTROCHANTERIC FRACTURE IN ELDERLY

Orthopaedic

KEYWORDS: Unstable Intertrochanteric fractures, Cemented Thompson Hemiarthroplasty, Dynamic Hip Screw, Harris Hip Score

DR. JEEJESHKUMAR T. K. — ASISSTANT PROFESSOR, DEPT. OF ORTHOPAEDICS, GOVT. MEDICAL COLLEGE, KOZHIKODE, KERALA.

DR. ANEEN N. KUTTY — ASSOCIATE PROFESSOR, DEPT. OF ORTHOPAEDICS, GOVT. MEDICAL COLLEGE, KOZHIKODE, KERALA.

ABSTRACT

INTRODUCTION : Unstable intertrochanteric fractures in elderly patients are associated with high rate of morbidity and mortality. In patients over the age of 65 years the management of fractures requires consideration of several aspects of aging which limit the choice of treatment.

AIM : To compare the functional outcome following fixation of unstable Osteoporotic intertrochanteric fracture of hip in elderly of more than 65 years by cemented Thompson hemiarthroplasty and dynamic hip screw fixation.

MATERIALS AND METHODS: Between March 2011 and July 2014, 60 patients with an unstable comminuted inter trochanteric femoral fracture were studied at Govt. Medical College, Kozhikode.

Group A: consisted of 30 patients treated with dynamic Hip Screw fixation

Group B: consisted of 30 patients treated with cemented Thompson arthroplasty

RESULTS : The functional assessment were done at 6 weeks ,3 months,6 months and 1 year interval whereas in the dynamic hip screw group it was not possible to asses at 6 weeks as patient cannot walk with full weight bearing. At the third month follow up 60.9 % of hemiarthroplasty group fall in to the excellent group while only 30.1% belong to the internal fixation group. Functional outcome assessed at one year was 84% in case of hemiarthroplasty group and 74% in case of internal fixation group.

Conclusion : Considering the fact that early weight bearing is possible in cemented Thompson hemiarthroplasty, it is a good option, in elderly patients with unstable intertrochanteric fracture with osteoporosis as morbidities are less compared to the dynamic hip screw group.

INTRODUCTION

Unstable intertrochanteric fractures in elderly patients are associated with high rate of morbidity and mortality[1], although the results have improved with the use of internal fixations. In these patients however, osteoporosis, comminuation and instability of fracture often preclude the early resumption of full weight bearing[2].

In patients over the age of 65 the management of fractures requires consideration of several aspects of aging which limit the choice of treatment[3]. The prime consideration is to select a treatment programme consistent with each patient's mental and physical ability to cooperate in the programme of treatment. Another consideration is the need to avoid any therapeutic procedures which will cause more stress than patient's limited cardiovascular, genitourinary and gastro intestinal systems can tolerate. Still another consideration is the requirement to maintain the patient's activities during treatment as near normal as possible; if immobilization is unavoidable, it should be reduced to the minimum. Finally, any plan of treatment must consider the peculiarities of bone and soft tissue in patients of this age, such as osteoporosis, impaired blood supply, poor hearing potential, and susceptibility to pressure sore. A careful evaluation of all these considerations is a prerequisite to the effective treatment of the elderly injured patient.

The ideal implant for the treatment of an unstable intertrochanteric femoral fracture is still a matter of discussion. Elderly patients with osteopenia have a high prevalence of unsatisfactory functional results in unstable intertrochanteric fracture with unacceptable shortening and external rotation deformity of the limb; following treatment with sliding hip screw[4,5]. Nonetheless; the DHS may result in cut out, risk of instability and delayed weight bearing[6]. Different types of arthroplasty were then used[7].

Several prospective, randomized studies have been performed to compare the results of treatment of intertrochanteric femoral fracture with a compression hip screw with the result of intramedullary hip screws and a plate[8] and hemiarthroplasty with various prosthesis[9]. Since it is a study of osteoporotic fractures cemented calcar replacement hemiarthroplasty will be a better choice. However, studies comparing the results of primary cemented Thompson hemiarthroplasty with a dynamic hip screw fixation are very few in numbers.

AIM OF STUDY

To compare the functional outcome following fixation of unstable (AO/OTA Type 31 A2) Osteoporotic (Singh's index < grade IV) intertrochanteric fracture of hip in elderly of more than 65 year of age by cemented Thompson hemiarthroplasty and dynamic hip screw fixation.

MATERIALS AND METHODS

Between March 2011 and July 2014, 60 patients with an unstable comminuted inter trochanteric femoral fracture (AO/OTA type 31-A2) with age more than 65 with osteoporotic Singh's index < grade 4 were included in the study done at Govt. Medical College, Kozhikode. All types 31-A2 fractures that had been carried by a low energy injury. All patients fell at home.

We excluded patients with fracture over 2 weeks duration, patients not willing for surgery and medical or surgical contraindication.

Divisions of patients into two treatment groups, Group A and Group B were done using a random number generator.

Group A: consisted of 30 patients treated with dynamic Hip Screw fixation which consisted of 9 males and 21 females.

Group B: consisted of 30 patients treated with cemented Thompson arthroplasty which consisted of 20 females and 10 males.

The two groups were comparable with regard to age, gender, and osteoporosis index described by Singh et al.

Preoperative management

X –rays was taken and assessed the Singh Index and graded and only those patients were included with Singh index less than or with grade IV.

Table 1 : SINGH INDEX in both groups

SINGH INDEX	VI	V	IV
GROUP A	0	8	22
GROUP B	0	11	19

All patients were done under spinal anaesthesia.

Operation technique

1. DHS fixation

The usual time taken was 45min to 60min and the average blood loss was 200 ml. Patient was allowed to mobilization from the bed on second day and was allowed to weight bear only after union is achieved be after 8-12 week after surgery.



Figure 1 - DHS fixation

2. Cemented Thompson Hemiarthroplasty

A lateral Hardinge approach was used. The fractured greater trochanter was attached to the proximal femur with additional stainless steel wire in some cases. The usual time period was 30min to 45 min. The patient was mobilized from bed on second day, allowed to weight bear on 3rd day, suture removal on tenth post operative day.



Figure 2 - Cemented Thompson Hemiarthroplasty

Follow up

Follow up evaluation were performed at 6 weeks, at three, six and twelve months. Totally there were 27 patients in group A and 25 in group B came till the end of first year. The radiographic evaluation was done; antero posterior and lateral radiographic of the affected hip were made post operatively while the patient was in the hospital and at each follow up visits. We classified quality of the reduction of fracture as anatomical (< 5 varus or valgus/or anterior/retro) Acceptable (5° to 10°) or poor (> 10°). Vertical migration and horizontal migration was assessed in the case of Thompson hemiarthroplasty. The functional outcome was assessed during each visit according to the Harris Hip Score in case of hemiarthroplasty group. In case of dynamic hip screw fixation group the functional outcome was done at third month visits onwards because weight bearing is allowed only after union is achieved.

We recorded any intra operative and post operative complication related to the implant, the estimated blood loss the number of unit of blood that were transfused the duration of operation, and length of the hospital stay of each patient. Harris Hip score were determined post operatively for the assessment of the functional outcome.

Statistical analysis was performed with the use of pearson chi square test. Difference were consideration to be significant at the P < 0.05 level.

DYNAMIC HIP SCREW FIXATION GROUP

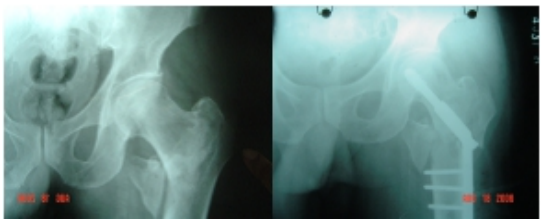


Figure 3 - Case 1 Devadas, 68, male



Figure 4 - Case 2 Karthyani, 70, female

CEMENTED THOMPSON HEMIARTHROPLASTY GROUP

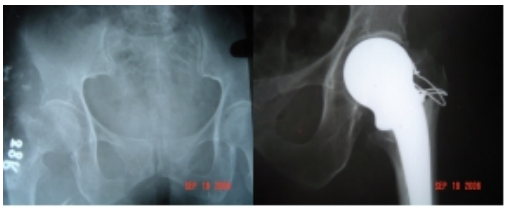


Figure 5 - Case 1. Elikutty, 75, female



Figure 6 - Case 2 Padmavathy, 82, female

The treatment groups were comparable with regard to all measured prefracture variables, including age, gender Singh osteoporosis index, and scores.

Age:

The mean age of group A is 72.33 with standard deviation of 6.32 and in group B is 75.56 with standard deviation of 5.98.The p value is .052 whereas the t value is 2.004 and the age of these patients were comparable in both groups.

Table 2 : AGE DISTRIBUTION

Age	65 – 75	76– 85	86 – 95
Group A	17	11	2
Group B	16	12	2

Sex :

There were 21 female patients 9 were male patients in group A and 20 female and 10 females in group B are given in table 4 and fig 20.The Pearson chi square value is0.918 and the p value is .0577 which is also comparable in both groups.

Table 3 : SEX DISTRIBUTION

Total No.	Male	Female
Group A	9	21
Group B	10	20

The mean hospital stay was 17.4 days in group A, and 17.9 days in group B.

Table 4 : Results of reduction & time of union in group A;

Results of reduction & time of union in group A			
	Immediate Post-op	Latest follow up	Mean time to union (wk)
Anatomical	15	10	12-20
Acceptable	11	12	12-22
Poor	4	5	20-28

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RESULTS

All patients were assessed at 6 weeks, 3 months, 6 months and 1year interval with Harris Hip Score. At each visits x- rays was taken in different views.

The functional outcome by Harris Hip Score in group A was 74% at one year follow up whereas in group B was 84%.

Table 5 : Comparison of functional outcome

	A				B			
	6week	3m	6m	12m	6week	3m	6m	12m
Excellent	NA	9	8	8	14	14	13	13
Good	NA	12	12	12	9	7	8	8
Fair	NA	4	5	5	2	3	3	3
Poor	NA	2	2	2	0	1	1	1

COMPARISON OF FUNCTIONAL OUTCOME OF GROUP A & GROUP B

The functional outcome was assessed at 6weeks, 3 months, 6 months and at 1 year in cases of group B whereas in group A, it as assessed at 3 months, 6 months and at 1 year since the weight bearing was delayed in group A, i.e. in dynamic hip screw fixation group. The p value at 3 months, 6 months, and 1 year are 0.422, 0.432 and 0.432 respectively. The study was found to be statistically not significant. This may be due to small numbers of groups period of follow up was shorter.

Table 6 : Comparison of functional outcome at I year

			Excellent	Good	fair	poor	Total
Group	A	Number of patients	8	12	5	2	27
		% within Group	29.6%	44.4%	18.5%	7.4%	100.0%
		% within 1yr	38.1%	60.0%	62.5%	66.7%	51.9%
	B	Number of patients	13	8	3	1	25
		% within Group	52.0%	32.0%	12.0%	4.0%	100.0%
		% within 1yr	61.9%	40.0%	37.5%	33.3%	48.1%

Chi square test value: 2.751, degree of freedom3, p value 0.432



FIGURE 7 : Functional outcome of dynamic hip screw fixation

FIGURE 8 : Functional outcome in cemented Thompson hemiarthroplasty

DISCUSSION

DHS Functional outcome

Despite obvious recent advances in the treatment of these fractures, catastrophic implant failures continue to occur. Simpson et al. studied different modes of failure and found superior cutout, plate pull off, and plate breakage to be the most common[10].

Kim et al. found that most important cause of dynamic hip screw failure was fracture in stability[11]. Baumyaertner et al. found that the tip apex diameter was the strongest predictor of cutout[12]. The average tip apex diameter in successfully treated inter trochanteric hip fracture was 24mm and no construct with tip apex diameter of < 25mm resulted in cut out from the femoral head. The optimal placement of the sliding screw is in the center – center position of the femoral head because the coalescence of tension and compression trabaculae in that location provides the best osseous purchase[12].

Abrengart et al. reported that 70% needed a walking aid at 6 months compared with 36% preoperatively[13].

Thompson prosthesis functional outcome

Studies using endoprosthesis for the treatment of unstable intertrochanteric fracture are very less. Shin-Yoon Kim, Young-Gookim and Jun-Kyung Hwang[14] conducted a comparison study between cementless Calcar replacement hemiarthroplasty with intramedullary fixation of unstable intertrochanteric fractures. They got 80% good results and then were one discoloration. They found there was no significant difference between the hemiarthroplasty group and intramedullary fixation group in terms of functional outcomes, hospital stay, time to weight bearing, or general complication in case of unstable intertrochanteric fractures. Rosenfeld et al[15] used arthroplasty and reported 86% satisfactory results in the elderly person. Stern and Angerman[16] reported 94% good and excellent results after a mean follow up period of 8 months. Haentjens et al[17] compared the clinical results of internal fixation and bipolar arthroplasty for unstable trochanteric fractures. They reported the functional results, according to the rating scale of Merle of d' Aubigne, were rated as good or excellent in 75% of the patients and remained almost unchanged with time and he stated that in arthroplasty group, rehabilitation was easier and faster, and the incidence of pressure sores, pulmonary infection and atlectasis were significantly lower. They insisted that early weight bearing was the major factor responsible for decreasing postoperative complications.

Andress et al.[18] showed adequate osseointegration of the implant, supporting the conclusion that an uncemented prosthesis can be used successfully to treat complex, unstable trochanteric fractures. But one of the major complications of the cement less system is stem migration.

Excessive collapse, loss of fixation and cut out of the lag screw resulting in poor function remains a problem associated with internal fixation of unstable inter trochanteric fracture in elderly patients with osteoporotic bone. To allow earlier post operative weight bearing and to avoid excessive collapse at the fracture site, some recommended prosthetic replacement, especially with a calcar replacement or head and neck replacement type of prosthesis, for the treatment of unstable intertrochanteric fractures.

Functional outcome assessed at one year was 84% in case of hemiarthroplasty group and 74% in case of internal fixation group. Various studies support this.

Table 7 : Functional outcome in case of hemiarthroplasty

No	Study	Year	Functional outcome excellent and good
1	Rosenfeld et al.	1973	86%
2	Stern and goldman	1977	88%
3	P.Haentjens et al.	1983	75%
4	Stern and angerman	1987	94%
5	Rodop et al.	1997	80%
6	Shin-yoon kim et al.	1998	80%
7	Present study	2006	84%

There was no stem loosening or dislocation reported in our study as supported by so many studies. We reports rotational malalignment and limb length discrepancies in the case of internal fixation groups as supported by some studies. Another complication reported was implant failure in the case of internal fixation group as it was reported in literature. The above results such as no stem loosening, dislocation etc. were consistent with various studies like Harwin et al., Broos et al. and Rodop et al.

In present study mechanical failure was 3% in the group A with functional outcome of 74 % excellent and good. And in case of hemiarthroplasty functional outcome was 84% excellent and good at one year follow up. The p values at 3 months, 6 months and 1years are 0.422, 0.432, and 0.432 respectively which indicates there is no statistical difference between the functional outcomes of these two procedures. This may be due to study conducted with small samples of short duration study.

The present study had several limitations, first, it did not include a large number of patients, secondly, follow up period was relatively short. Potential long term problems associated with prosthetic replacement, such as loosening acetabular erosion, stem failure, late infection and late dislocation may yet occur.

In another study by A Kiral et al.[19] published in 2002 obtained an excellent and good result in about 80% of cases using the Harris Hip scoring system. He studied about 54 elderly patients with unstable intertrochanteric fracture and in his study he used bipolar prosthesis.

CONCLUSION

Unstable intertrochanteric in elderly patients are associated with high rate of morbidity and mortality But early walking with full Weight bearing significantly reduced the morbidities in hemiarthroplasty group compared to the dynamic hip screw fixation group. The study shows that there was an obvious difference in full weight bearing time between the two groups. This may be due to small study sample of short duration. Considering the fact that early weight bearing is possible in cemented Thompson hemiarthroplasty, it is a good option, in elderly patients with unstable intertrochanteric fracture with osteoporosis as morbidities are less compared to the dynamic hip screw group. But further studies with larger number of patients and long term follow up are necessary to identify long term merits of hemi arthroplasty over dynamic hip screw.

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