

COMPARATIVE STUDY OF FUNCTIONAL OUTCOME OF HEMIARTHOPLASTY VS TOTAL HIP ARTHROPLASTY FOR THE TREATMENT OF DISPLACED INTRACAPSULAR NECK OF FEMUR FRACTURES IN ACTIVE ELDERLY PATIENTS

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Abstract

Introduction- Hemiarthroplasty and total hip arthroplasty are commonly used to treat displaced intracapsular fractures of the femoral neck and the optimal treatment of these fractures remains controversial. Our aim was to analyse the functional outcome of these two different forms of treatment for the active patients aged > 60 years with displaced intracapsular fracture of the femoral neck.

Materials & Methods: A cohort study was conducted among the patients who had undergone either total hip replacement surgery or hemiarthroplasty for displaced intracapsular fracture neck of femur. The patient who were admitted at a tertiary care centre in Bangalore from January 2021 to January 2023 were recruited in the study. A total of 60 patients undergoing either unilateral total hip replacement/ hemiarthroplasty satisfying the inclusion criteria were included, 30 in each group. Pre operative diagnosis of intracapsular neck of femur fracture was confirmed with X-ray; Intraoperatively - surgical time, stability, offset and limb length were assessed using standard clinical methods; Assessment of Patient Reported Outcome Measures (PROM) was done using oxford hip score(OHS), 12 months post-surgery in both groups. The above mentioned parameters were compared to see if they have been restored and how these parameters alter the outcomes.

Conclusion: The study concluded that total hip replacement was a better option for the treatment of the displaced intracapsular fracture neck of the femur in active elderly patients aged >60 years, considering the improved functional outcomes in total hip replacement.

Keywords: Total hip arthroplasty, hemiarthroplasty, Oxford hip score

Introduction

The neck of femur fracture is one of the common fractures in elderly. It has been always a challenge to the orthopaedic surgeons to manage these fractures. The prevalence of neck of femur fractures has been increasing with increased incidence of osteoporosis, poor vision in elderly, poor neuromuscular coordination, life style changes, sedentary habits, improvement in life expectancy and improved medical facilities. The trend of rise in incidence with increasing age is alarming and it is expected that the total number of patients suffering femoral fracture would rise to 6.26 million per year by 2050 worldwide [1]. The treatment goal is to return the patient to his or her pre-morbid status of function. Currently the orthopaedic surgeons choose between unipolar, bipolar and total hip replacement for the treatment of intracapsular fractures in elderly. Important factors to consider in choosing any treatment modality can be classified as intrinsic and extrinsic. The intrinsic factors include patient age, general medical conditions, type of fracture, etc and the extrinsic factors include availability of healthcare facilities, socio- economic status, etc.[2] Acetabular erosion and need of revision surgery are complications often noticed with unipolar prosthesis. For displaced fractures of the femoral neck, reduction, compression, and rigid internal fixation are required if union is to be predictable. Because nonunion and osteonecrosis develop frequently after internal fixation of displaced femoral neck fractures, many surgeons recommend primary prosthetic replacement as an alternative in elderly ambulatory patients [3].

Materials And Methods

A cohort study was conducted among patients who had undergone surgery for intracapsular neck of femur fracture at a tertiary care centre in Bangalore from January 2021 to January 2023. A total of 60 patients were recruited for

the study. These patients were divided into 2 groups, 30 patients each in group. In group-1 patients who underwent Total Hip Replacement (THR) were included and in group-2 patients who underwent hemiarthroplasty of hip were included. The functional questionnaire was circulated to all these patients either via telephonic or e-mail based or in-person format methods. These patients were followed up at regular intervals for 1 year (at 3 months, 6 months and 12 months) post-operatively.

Oxford Hip Score (OHS) is a 12 item base postoperative scoring system was utilized to assess the functional outcome of Patient Reported Outcome Measures (PROM). All these patients were operated by single orthopedic surgeon using Modified Posterolateral approach and postoperative treatment was prescribed as per standard total hip replacement protocol.

Patients aged 60 years and above who were physically active and who had displaced intracapsular fracture neck of femur were included in the study. Patients with bilateral hip pathology, Revision total hip arthroplasty, Psychiatric disorders, Severe cardiac and neurologic co-morbidities which are Contra Indications to surgery, Malignancy around hip or proximal femur were excluded from the study. Patient's outcome was measured using OHS.

The answer to each of the 12 items was rated on a scale ranging between 0 and 4, the scores for each question are added to generate an overall score of between 0 and 48 as shown in table 1.

Results:

The study included the patients aged > 60 years and were divided into 2 groups, 30 each in THR (group 1) and Hemiarthroplasty of hip (group 2). Distribution of study population according to age and gender in 2 groups is depicted in table 2. Mean age of patients in group 1 and 2 was 69.23 ± 5.32 years and 71.77 ± 6.55 years respectively. In group 1, 46.70% were males and 53.30% were females. In group 2, 60.00% were female and 40.00% were males. There was no significant difference between the 2 groups based on age (p-value = 0.07) and gender (p-value = 0.30)

The mean intra-operative time in group 1 was 94 ± 6.62 min and mean intraoperative time in group 2 was 88 ± 9.15 min. The difference between the 2 groups was found to be statistically significant (p value < 0.01).

Table 4 depicts the post-operative complication in 2 groups and the comparison between 2 groups. No post operative complications were observed in group 1. However, in group 2, patients who underwent hemiarthroplasty of hip had complications like, 1(3.30%) had superficial infection, 1(3.30%) had cement implantation syndrome, 1(3.30%) had deep venous thrombosis. Remaining 27(90.01%) did not have complications. There was no significant difference between 2 groups with respect to post-operative complications (p-value < 0.37).

Figure 1 depicts the comparison of Oxford Hip Score (OHS) between 2 groups at different time intervals at 3 months, 6 months and 12 months. Independent sample t-test was applied between the 2 groups to compare the mean OHS. The mean OHS at 3 months was 40.33 ± 1.47 in group 1 and 38.10 ± 1.88 in group 2. The mean OHS at 6 months was 41.63 ± 1.03 in group 1 and 39.40 ± 1.45 in group 2. The mean OHS at 12 months was 43.47 ± 0.94 in group 1 and 40.47 ± 1.50 in group 2. The OHS scores were consistently better in the group 1 which was statistically significant. The mean OHS was higher in group 1 when compared with group 2 when followed up at regular intervals and this difference was statistically significant (p-value < 0.001).

OHS in both the groups is depicted in table 5. In Group 1, 27 (90.00%) had excellent scores and 3 (10.00%) had good. In group 2, 4 (13.00%) had excellent, 26 (87.00%) had good scores. None of the patients had fair or poor scores

Table 6 depicts the comparison of the functional outcome between time intervals in each group. In present study the mean OHS at 3 months was 40.33 ± 1.47 in group 1 and 38.10 ± 1.88 in group 2. The mean OHS at 6 months was 41.63 ± 1.03 in group 1 and 39.40 ± 1.45 in group 2. The mean OHS at 12 months was 43.47 ± 0.94 in group 1 and 40.47 ± 1.50 in group 2. The mean HIP score is increasing consistently and separately in both the groups and this is statistically significant (p < 0.001).

Post-hoc analysis is performed to compare the intragroup variation at different time intervals namely, 3 months, 6 months and 12 months. This difference was found to be statistically significant (p < 0.001).

Table 7 depicts the age wise mean OHS scores in different age groups in different time intervals in each group. In the duration of the follow up at 3, 6 and 12 months, OHS scores showed consistent improvement as the age progressed in both the groups. There was better score in 60-80 years of age at 12 months follow-up in group 1 (mean score was 43.00 ± 1.41). However, this difference was not statistically significant. Similarly, in the duration of the follow up OHS scores showed consistency in improvement with marginally better score in >80 years of age in group 2. There was no statistically significant difference observed.

Discussion:

The aim of replacement surgery in fracture neck femur is early return to daily activities. This is particularly applicable to the elderly age group where complications need to be prevented. In our Study we included the patients 60 years and above attending tertiary care centre in Bangalore. The mean age of patients was 69.23 ± 5.32 years in group 1 (THR) and 71.77 ± 6.55 years in group 2 (hemiarthroplasty of hip). In Group 1 (THR) 46.70% were males and 53.30% were females and in group 2, 60.00% were males and 40.00% were females. In our study the age groups in both the groups were comparable involving similar age group range hence the reducing the discrepancy in the outcome.

The anatomical type of fracture and the displacement did not have any bearing on the final function outcome. Fracture neck cases were classified based on the Garden's classification of the femoral neck fractures. Patient Reported Outcome Measures (PROMs) are designed for the objective assessments of patient satisfaction after the treatment. We decided to evaluate and compare patient reported outcome measures between primary THA and hemiarthroplasty for the fracture neck of femur using Oxford Hip score (OHS). The OHS consists of 12 questions specific to the hip, and each question is answered by the patient and is scored with a number from zero to four. The OHS is simple to use and is validated for the purpose of the current study [5,6,7]. In addition, the OHS is a patient report, which eliminates the difficulty in trying to categorize or rate a patient's function and pain by a surgeon. Kalairajah et al [4], Murray et al. [5] further separated the OHS into four categories: 42 to 48 (excellent), 34 to 41 (good), 27 to 33 (fair) and 0 to 26 (poor). In our study we found that in group 1, 27 (90.00%) patients had OHS grade excellent and 3 (10.00%) patients had good score. Group 2 had OHS grade excellent among 4 (13.00%) patients and good among 26 (87.00 %) patients.

Macaulay[6] Giannini observed longer mean surgical time in THR group, while Cadossi found a decrease of 5.6 minutes in THR group. An important possible factor explaining this difference was that with the development of technique and prosthesis, the surgery of THR tended to be more convenient and time saving. In our study mean intra-operative time in group 1 was 94 minutes and in group 2 it was 88 minutes with a mean difference of 6 minutes.

In group 2 (Hemiarthroplasty), 1 (3.30%) had superficial infection, 1 (3.3%) had cement implantation syndrome, 1 (3.30%) had DVT. No complications were seen in Group 1 (THR). Post operative dislocation did not differ between both the groups, patients were well instructed about the importance of abduction pillow after THR/hemiarthroplasty appropriate rehabilitation instruction were given to the patient and their attendants and training was provided during their stay in the hospital and the same continue at home. Strict high sitting and avoiding squatting were instructed after surgery in both groups. Surgical site infection was managed with antibiotics and wound care, DVT was managed conservatively by anticoagulant therapy for 6 months.

The study conducted by Chen-Chiang Lin et al [7] in 2019 comparing the mid-term survivorship and Clinical Outcomes between Bipolar Hemiarthroplasty and Total Hip Arthroplasty a multicentric retrospective study showed the mean OHS with THR is 44.6 ± 4.6 and the mean OHS with hemiarthroplasty is 37.5 ± 9.6 . In our study the mean OHS at 3 months was 40.33 ± 1.47 in group 1 and 38.10 ± 1.88 in group 2. The mean OHS at 6 months was 41.63 ± 1.03 in group 1 and 39.40 ± 1.45 in group 2. The mean OHS at 12 months was 43.47 ± 0.94 in group 1 and 40.47 ± 1.50 in group 2. The OHS scores were consistently better in the group 1 when compared with group 2 which was statistically significant ($p < 0.001$). In our study in the duration of the follow up of 1 year OHS scores showed consistency in improvement with better score in 60-80 years age group in group 1 whereas in Group 2 OHS scores showed consistency in improvement with marginally better score in > 80 years age.

Conclusion

Total hip replacement is a better option for the treatment of the displaced intracapsular fracture neck of the femur in active elderly patients in view of improved radiological and the functional outcomes in total hip replacement. We recommend total hip replacement to be considered as the choice of the treatment for the fracture neck of femur in active elderly patients. Smaller sample size of the study limits our study and the main strength of our study is that the patients were followed up regularly at 3months, 6 months and 12 months.

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Tables and figures:

Table 1: Grading of OHS

Grading of OHS	Indication
0 to 19	May indicate severe hip arthritis. It is highly likely that you may well require some form of surgical intervention.
20 to 29	May indicate moderate to severe hip arthritis. Consider a consult with an Orthopaedic Surgeon for an assessment and x-ray.
30 to 39	May indicate mild to moderate hip arthritis. You may benefit from non- surgical treatment, such as exercise, weight loss, and/or anti-inflammatory medication.
40 to 48	May indicate satisfactory joint function. May not require any formal treatment.

Excellent 42-48, Good 34-41, Fair 27-33, Poor 0-26 [4].

Table 2: Distribution of study population according to age and gender in 2 groups

Variable	Category	Group 1		Group 2		P-Value
		Mean	SD	Mean	SD	
Age	Mean & SD	69.23	5.32	71.77	6.55	0.07 ^a
	Range	60 - 84		60 - 84		
		n	%	n	%	
Sex	Males	14	46.70	18	60.00	0.30 ^b
	Females	16	53.30	12	40.00	

Note: a. Mann Whitney Test, b. Chi Square Test

Table 3: Comparison of mean Intra Operative Time (in mins) between 2 groups

Parameters	Groups	N	Mean	SD	Mean Diff	P-value
Operative Time	Group 1	30	94.00	6.62	6.00	0.01*
	Group 2	30	88.00	9.15		

* p-value <0.05 – Mann-Whitney U test

Table 4: Comparison of Post - surgical complications occurred between 2 groups

Variables	Category	Group 1		Group 2		P-Value*
		n	%	n	%	
Post-op Complications	Superficial Infection	0	0.00	1	3.30	0.37
	Cement Implantation Syndrome	0	0.00	1	3.30	
	Deep venous thrombosis	0	0.00	1	3.30	
	Nil	30	100.00	27	90.10	

*Chi- square test

Table 5: Distribution of OHS in group 1 and group 2

OXFORD HIP SCORE	Group 1		Group 2	
	N	Percent	N	Percent
Excellent	27	90.00	4	13.00
Good	3	10.00	26	87.00
Fair	0	0.00	0	0.00
Poor	0	0.00	0	0.00
Total	30	100.00	30	100.00

Note: * Statistically Significant

Table 6: Comparison of mean HIP scores between different time intervals separately in each group

Groups	Time	N	Mean	SD	P-Value ^a	Sig. Diff	P-Value ^b
Group 1	3 Months	30	40.33	1.47	<0.001*	3M vs 6M	<0.001*
	6 Months	30	41.63	1.03		3M vs 12M	<0.001*
	12 Months	30	43.47	0.94		6M vs 12M	<0.001*
Group 2	3 Months	30	38.10	1.88	<0.001*	3M vs 6M	<0.001*
	6 Months	30	39.40	1.45		3M vs 12M	<0.001*
	12 Months	30	40.47	1.50		6M vs 12M	<0.001*

a. P-Value derived by Repeated Measures of ANOVA Test

b. P-Value derived by Bonferroni's post hoc Analysis.

Table 7: Comparison of mean HIP Scores based on the age of the patients in each group

Hip Score	Age group (years)	Group -1				Group -2			
		N	Mean	SD	p-value*	N	Mean	SD	p-value*
3 Months	60-70	19	40.26	1.66	0.77	12	37.83	1.75	0.83
	71-80	9	40.33	1.12		15	38.20	2.04	
	> 80	2	41.00	1.41		3	38.67	2.08	
6 Months	60-70	19	41.74	1.10	0.66	12	39.42	1.17	0.98
	71-80	9	41.33	0.87		15	39.40	1.81	
	> 80	2	42.00	1.41		3	39.33	0.58	
12 Months	60-70	19	43.63	1.01	0.44	12	40.50	1.17	0.99
	71-80	9	43.22	0.67		15	40.40	1.88	
	> 80	2	43.00	1.41		3	40.67	0.58	

Note: * Kruskal Wallis test

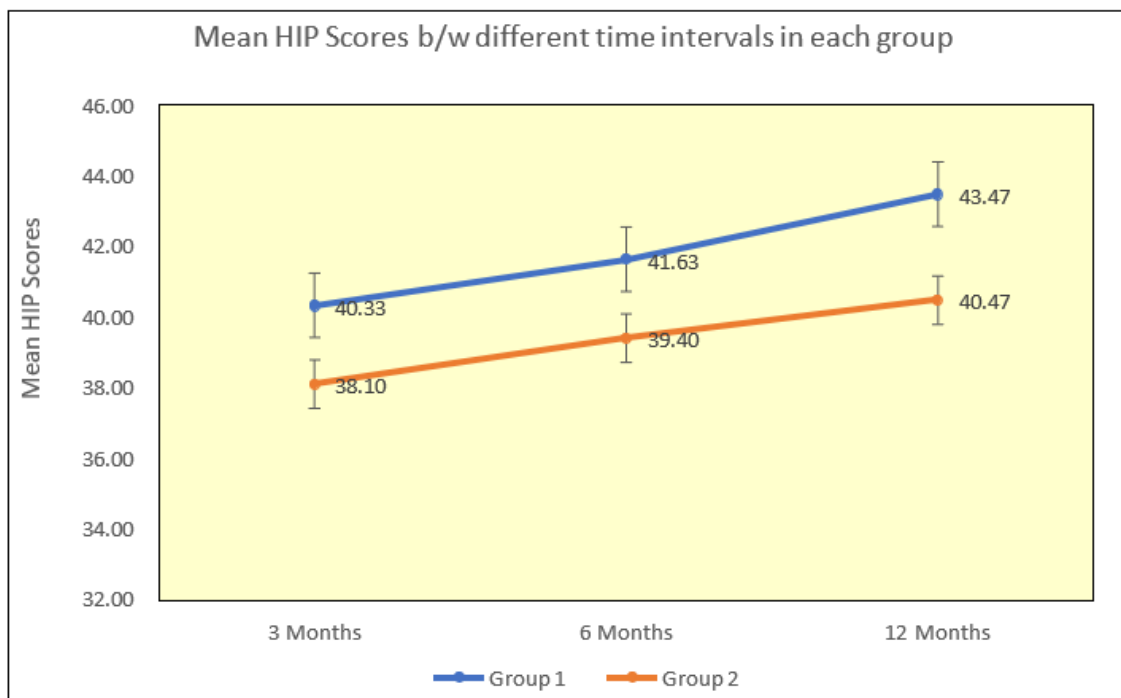


Figure 1 Comparison of OHS in two groups at different time intervals

*P-value < 0.001 - Statistically Significant