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RESEARCH ARTICLE

“STUDY OF FUNCTIONAL OUTCOME OF TOTAL HIP REPLACEMENT VERSUS HEMIARTHROPLASTY IN FRACTURE NECK OF FEMUR”

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Abstract

Introduction: In elderly with displaced femoral neck fractures (FNFs), choice between hemiarthroplasty and THR has always been a difficult one, both the treatment modalities having their own proponents. Hemiarthroplasty is a less complex surgery and has been associated with reduced complications and lower initial costs while THR on the other hand has been associated with better postoperative function.

Material and Methods: This study was conducted on patients with displaced FNFs with age more than 65 years, operated either with THR or hemiarthroplasty on 40 patients (20 in each group). Southern Moore approach was used for exposure of the hip joint. The followup was done at 1, 3 and 6 months during which functional assessment was done using Harris Hip Score (HHS) and associated complications were also analyzed. **Results:** The mean HHS was higher in THR group throughout the study period but it was not statistically significant. The complications in hemiarthroplasty group were Infection in 10%, Pulmonary Embolism in 5% of patients. The complications in THR group were Infection in 5%, LLD in 15%, Dislocation in 5% of patients.

Conclusion: THR proved to be superior in terms of higher increase in HHS. Dislocation rates and Limb length discrepancies were higher in the THR group but can be prevented with adequate measures while the other complications were comparable in both the groups. THR should be preferred method of management of displaced FNFs in active elderly patients with acceptable rates of complications.

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Introduction:-

The worldwide frequency of hip fractures was 1.6 million in the year 2000, and this number is estimated to reach 6 million in the year 2050.^[1] Among proximal femoral fractures, displaced femoral neck fractures (FNFs) are the most common (37% frequency), while two-

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thirds of total FNFs are displaced fractures.^[2] FNFs are commonly seen in the geriatric population resulting in significant morbidity and mortality.^[3] The treatment of such fractures must aim at surgical correction while achieving early mobilization. Factors like lifestyle, bone quality and potential complications like non-union, AVN dictate the type of treatment in a particular age group. Hence, while in younger population Closed Reduction and Internal Fixation (CRIF) is the method of choice, arthroplasty (hemiarthroplasty or total hip replacement (THR)) is a preferred treatment modality in the elderly population (>65 years).^[4] In the elderly with displaced FNFs, choice between hemiarthroplasty and THR has always been a difficult one, both the treatment modalities having their own proponents.^[5]

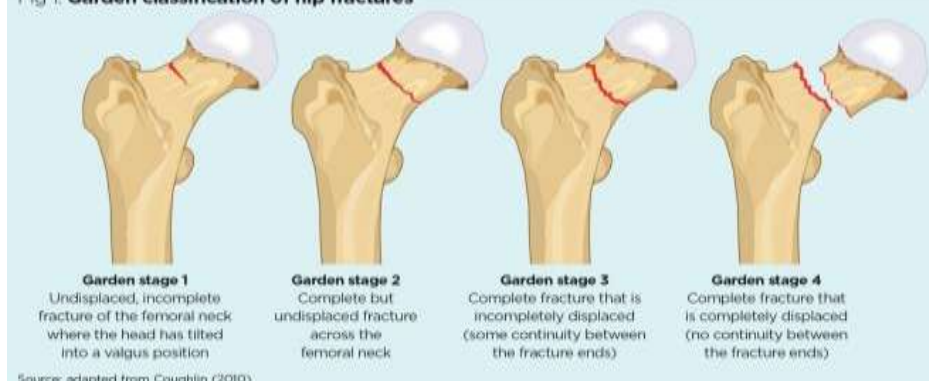
Both hemiarthroplasty and THR are widely used methods of hip arthroplasty after displaced FNFs. Hemiarthroplasty is a less complex surgery and has been associated with reduced dislocation rates, reduced blood loss, and lower initial costs.^[6] However, some patients treated with hemiarthroplasty require conversion to THR due to complications such as acetabular erosion.^[7] THR on the other hand has been associated with superior patient satisfaction and better postoperative function and has been increasingly used in recent years to manage displaced FNFs, especially in younger and more active ambulant patients.^[8-11] This study is on the cross-

sectional analysis of a series of 40 cases of femoral neck fractures in the elderly population (age > 65 years) who were managed either by hemiarthroplasty or THR and evaluated in terms of functional outcome and complications.

Garden classification^[12]

Type	Description	Nondisplaced or displaced
I	Valgus impacted incomplete fracture, disruption of the lateral cortex while the medial cortex is preserved	Nondisplaced
II	Complete fracture	Nondisplaced
III	Complete fracture, partial displacement indicated by change in angle of the trabeculae	Displaced
IV	Complete fracture, complete displacement leading to parallel orientation of the trabeculae	Displaced

Fig 1. Garden classification of hip fractures



Material & Methods:-

This study was approved by the local Institutional Ethics Committee (IEC) of Sri Aurobindo Medical College & PG Institute (21 June 2021; IEC no. SAIMS/RC/IEC/2021/71). Information was collected from all participants after obtaining written informed consent in accordance with the Declaration of Helsinki and ethical board approval.

We conducted a cross-sectional observational study at Sri Aurobindo Medical College & P.G. Institute, Indore (M.P.) on patients of displaced FNFs with age more than 65 years, operated either with THR or hemiarthroplasty in Department of Orthopedics. The duration of study was 18 months (12 months for data collection and 6 months for analysis and writing) from 1st April 2021 to 30th September 2022. Sample size was 40 (20 in hemiarthroplasty group and 20 in THR group). Subjects fulfilling the inclusion criteria were included in the study. Allocation of patients to hemiarthroplasty and THR group was done on an alternate basis.

Inclusion Criteria

Patients with displaced fracture neck of femur coming in orthopaedics OPD with age more than 65 years during study period.

Exclusion Criteria

1. Patients with rheumatoid arthritis in fractured hip.
2. Neck of femur fracture associated with other fractures of lower limb.
3. Patients not giving consent.

Study Procedure

1. 50% of patients were treated with uncemented total hip replacement and 50% of patients were treated with hemiarthroplasty by a standard posterior (Southern Moore) approach.
2. Patient was taken in lateral position on OT table under combined spinal and epidural Anaesthesia.
3. A 15 to 20 cm long curvilinear incision was used from the posterior superior iliac spine curving across the greater trochanter and extending along the shaft of femur.
4. Fascial lata was incised along the skin incision to uncover the gluteus maximus proximally and vastus lateralis distally.
5. Fibres of gluteus maximus were split in its proximal extent.
6. Short external rotators were stripped off from their insertion on the greater trochanter and tagged with sutures for later repair.
7. Capsulotomy was done in T-shaped manner and fracture hematoma was washed with normal saline.
8. Fractured head was removed. Femoral neck cut taken 1 cm proximal from the base of the lesser trochanter parallel to the intertrochanteric crest.
9. Box cut was taken keeping 15° of anteversion, thereafter femoral canal was opened and lateralization was done. Sequential rasping of the canal was done maintaining the 15° of anteversion.
10. In cases of hemiarthroplasty, the femoral head was sized and an appropriate trial prosthesis was inserted for confirmation of the size of prosthesis, stability of reduction and limb length. Femoral canal preparation was done and either cemented non-modular bipolar prosthesis or Austin Moore prosthesis was implanted. Reduction was done.
11. In cases of THR, acetabulum was prepared clearing by off the articular cartilage and the labrum. Sequential reaming of the acetabulum was done keeping 15° of anteversion and 45° of inclination till the appearance of punctate bleeding. Trial shell was inserted and size confirmed. Same size shell was inserted and locked with 2 cancellous screws in posterolateral quadrant. Polyethylene liner was inserted. Trial stem and trial head was inserted in the femoral canal and reduction done to confirm the size, stability of the prosthesis and limb length. Uncemented stem and head were implanted and reduction done.
12. Normal saline wash was given. Capsulorrhaphy done and short external rotators were reattached to their insertion on the greater trochanter using the Ranawat technique.
13. Suction drain placement was done. Sequential closure of muscular layer, fascial lata, subcutaneous tissue and skin were done. Sterile dressings applied.

Prosthesis Used for Hemiarthroplasty

AUSTIN MOORE PROSTHESIS



NON-MODULAR BIPOLAR PROSTHESIS



Prosthesis used for total hip replacement

PostOperative Protocol

Postoperatively the hip is kept in 15° of abduction. Patients were given IV antibiotics for 5 days followed by 7 days of oral antibiotics. Pain was managed with IV analgesics and epidural analgesia. S/CClexanewas given as a prophylaxis for DVT. Postoperative X-

ray of hip in anteroposterior and cross table lateral views were taken. Physiotherapy was started from 1st postoperative day. Static quadriceps, ankle foot pump exercises were performed. Patients were taught to walk with walker from 2nd post-operative day. Drain was removed after 36-48 hours post-surgery. Patient was allowed to sit on the edge of bed and dynamic quadriceps exercises are restarted. The sutures were removed on 14th postoperative day.

Follow Up Protocol

The follow up was done at 1 month, 3 months and 6 months during which clinical assessment and functional examination were done using Harris Hip Score. Radiological evaluation was done by taking X-ray of hip in anteroposterior and cross table lateral views.

Results:-

Group	Number	Percentage
Hemiarthroplasty (Group 1)	20	50%
Cruciate Retaining (Group 2)	20	50%
Total	40	100.0%

Table 1:- Distribution of patients according to study groups (N=40)

There were 20 (50%) patients in Group 1 (Hemiarthroplasty) and 20 (50%) patients in Group 2 (Total Hip Replacement).

Age Characteristic (years)	Hemiarthroplasty	THR
Maximum	86	82
Minimum	65	65
Mean	71.96	70.23
SD	6.09	5.18
t test	1.00623	
p value	.320669	

Table 2:- Distribution of patients according to age.

In Hemiarthroplasty, minimum age of the patient was 65 years and maximum age was 86 years. In THR, minimum age of the patient was 65 years and maximum age was 82 years.

	Hemiarthroplasty		THR	
	Frequency	Percentage	Frequency	Percentage
Male	6	30%	9	45%
Female	14	70%	11	55%
Total	20	100%	20	100%
Chi Squared test	0.96			
p value	.327187			

Table3:- Distribution of patients according to sex (N=40)

In Hemiarthroplasty Group, there were 14 (70%) females and 6 (30%) males. In THR Group, there were 11 (55%) females and 9 (45%) males. In both the groups, there was a female predominance.

	Hemiarthroplasty		THR	
	Frequency	Percentage	Frequency	Percentage
Fall on ground	17	85%	9	45%
RTA	3	15%	8	40%
Fall from Height	0	0%	3	15%
Total	20	100%	20	100%
t-value	0			
p value	1			

Table4:- Mode of injury between the Hemiarthroplasty group and THR group.

The most common mode of injury in both the groups was fall on ground followed by RTA.

	Hemiarthroplasty		THR	
	Frequency	Percentage	Frequency	Percentage
T2DM	4	20%	3	15%
HTN	6	30%	4	20%
CAD	1	5%	1	5%
CVA	1	5%	0	0%
PAD	1	5%	0	0%
Hypothyroidism	1	5%	0	0%
Schizophrenia	0	0%	1	5%
Bronchial Asthma	0	0%	1	5%
t-value	0.20751			
p value	.838403			

Table5:- Comorbidities between the Hemiarthroplasty group and THR group.

The most common comorbidity in Hemiarthroplasty group was hypertension followed by type 2 diabetes mellitus. The most common comorbidity in THR group was hypertension followed by type 2 diabetes mellitus.

	Hemiarthroplasty		THR	
KL grade	Frequency	Percentage	Frequency	Percentage
1	2	10%	1	5%
2	2	10%	4	20%
3	5	25%	5	25%
4	11	55%	10	50%
total	20	100%	20	100%
Unpaired t test	0			
p value	1			

Table6:- Distribution of patients according to garden classification.

There was no statistically difference present in both the groups in terms of garden classification as revealed by insignificant p value 1

	Hemiarthroplasty		THR	
	Frequency	Percentage	Frequency	Percentage
Right	13	65%	11	55%
Left	7	35%	9	45%
Total	20	100%	20	100%
Pearsonchisquaredtest	0.4167			
pvalue	.518605			

Table7:- Comparing sidedistributionbetweengroups.

InHemiarthroplastygrouprightsideinvolvementwasseenin13(65%)patientsandleftsideinvolvementwasseenin7(35%).InTHR, rightsideinvolvementwasdetectedin11(55%)patientsandleftsideinvolvementwasseenin9(45%).Inourstudy, there was no statistical difference in terms of side of fractured neck of femur.

HarrisHipScore

	Hemiarthroplasty		THR		t-value	p-value
	Mean	SD	Mean	SD		
1Month	47.63	13.22	51.08	6.55	0.69663	.490272
3Months	65.23	13.55	70.93	7.10	0	1
6Months	81.34	10.84	88.16	5.75	2.27725	.028487

Table8:- ComparingHarrisHipScorebetweenHemiarthroplastyvsTHR.

There was a statistically significant improvement in the mean Harris Hip Score at all successive time intervals of the study duration in both the study groups. The mean Harris Hip Score was higher in THR group throughout the study period but it was not statistically significant as revealed by insignificant p value (>0.05).

As per the Harris Hip Score, patients are categorized into 4 groups according to the final score at 6 month follow up-

HarrisHipScore	GRADE	FREQUENCY	
		Hemiarthroplasty	THR
<60	POOR	2(10%)	0(0%)
60-69	FAIR	1(5%)	0(0%)
70-85	GOOD	8(40%)	6(30%)
>85	EXCELLENT	9(45%)	14(70%)

Table9:- Categorization of patients according to Harris Hip Score.

Complications

There was occurrence of 2 cases of postoperative infection in this study in the Hemiarthroplasty group. Both the patients were managed with single session of debridement and administration of IV antibiotics according to culture sensitivity reports. Infection subsided within a span of 3 weeks and there was no evidence of infection at the end of the study period. In THR group there was only 1 occurrence of superficial wound infection in the immediate postoperative period. This was managed with serial sessions of daily dressing and administration of IV antibiotics according to culture sensitivity reports. The infection subsided within a week and at the end of study duration there was no evidence of infection.

In our study 1 patient in hemiarthroplasty group had an episode of tachycardia, drop in saturation and hypotension at 3rd postoperative day for which patient was given supportive care in ICU and CTPA was done and he was diagnosed with submassive pulmonary embolism. Supportive care was continued and dosage of LMWH were increased. Patient recovered completely after 2 days and is doing good at 6 months follow up period.

In our study 3 patient in THR group developed limb length discrepancy. Patients were given shoe raise accordingly and gait training was also advised.

In our study there was 1 episode of posterior dislocation of hip prosthesis in the THR group at 2 weeks follow up duration due to fall in bathroom. Closed reduction was attempted under general anesthesia and was successful. There were no further recurrences till the end of the study duration.

COMPLICATIONS	HEMIARTHROPLASTY		THR		TOTAL
	COUNTS	%	COUNTS	%	
INFECTION	2	10%	1	5%	3
LLD	0	0%	3	15%	3
PULMONARY EMBOLISM	1	5%	0	0%	1
DISLOCATION	0	0%	1	5%	1
NIL	17	85%	15	75%	32
TOTAL COMPLICATIONS	3	15%	5	25%	8
t-value	0.6324				
p-value	.550415				

Table 10:- Comparing complications between groups.

On comparing complications among both the groups, there was no statistically significant difference obtained in both the groups as revealed by insignificant p-value of .550415.

1. The complications in Hemiarthroplasty Group were Infection in 10% of patients, Pulmonary Embolism in 5%. In present study at the end of 6 months, 85% of the patients of Hemiarthroplasty Group did not have any postoperative complications.
2. The complications in THR Group were Infection in 5% of patients, LLD in 15% of patients, Dislocation in 5% of patients. In present study at the end of 6 months, 75% of the patients of THR Group did not have any postoperative complications.

Discussion:-

Hedbeck et al.^[13] conducted a prospective randomized clinical trial examining the results of hemiarthroplasty (N=41) versus THA (N=42) performed in 83 patients aged more than 65 years (mean age, 80 years). The authors found that while the results of both techniques were similar in the short-term period, the first-year follow-up results in the THA group were significantly better. Macaulay et al.^[14] compared the results of arthroplasty for displaced FNFs in 40 patients aged >50 years. 23 patients were in hemiarthroplasty group with mean age of 77 years while 17 patients were in THA group with mean age of 82 years. The authors found that at the end of a 1-year follow-up, the Harris hip scores were 80 and 84, respectively, without a significant difference. Cadossi et al.^[15] performed a study of patients with displaced FNFs aged >70 years, 49 of whom underwent hemiarthroplasty and 47 of whom underwent THA; at the 3-year follow-up, their Harris hip scores were 78 and 71, respectively, and this difference was significant. Liao et al.^[16] conducted a meta-analysis evaluating hemiarthroplasty and THA for the treatment of displaced FNFs in 983 elderly patients in a total of 8 publications. The results indicated that patients who underwent THA had higher Harris hip scores at the 1-year postoperative follow-up, and this good outcome was still present at the 2-year follow-up. Although the clinical differences obtained after arthroplasty surgery for the treatment of displaced FNFs are reportedly due to patient-specific and surgeon-specific factors, additional studies with larger sample sizes and longer follow-up periods are needed to make more accurate assessments.^[16-18]

This study consisted of 40 patients with displaced FNFs with age >65 years, 20 of whom underwent hemiarthroplasty with mean age of 71.9 years while 20 underwent THR with mean age of 70.2 years. The mean Harris Hip Score was 81.3 in hemiarthroplasty group while 88.2 in THR group at end of 6 months follow-up. The complications that occurred in hemiarthroplasty group were 2 cases of infection, 1 case of pulmonary embolism while in THR group there were 3 cases of limb length discrepancy, 1 case of infection and 1 case of dislocation.

Conclusion:-

There was no statistically significant difference in short-term functional outcome for elderly patients with displaced FNFs who underwent hemiarthroplasty or THR. But THR proved to be superior in terms of higher increase in Harris Hip Score. Dislocation rates were higher in the THR group but can be prevented with adequate measures. Limb length discrepancy was also higher in the THR group. Infection rates were comparable in both the groups. THR should be preferred method of management of displaced femoral neck fractures in active elderly patients with acceptable rates of complications. But a larger sample size and longer duration of follow-up are required to ascertain this fact.

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