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## Comparison of results of hemireplacement arthroplasty versus total hip arthroplasty for displaced fracture of neck of femur in active elderly patients: Study of 65 patients

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### Abstract

65 patients were enrolled for the study. Randomization was done between the Total Hip Arthroplasty and Hemiarthroplasty. 48 patients could be followed up for a minimum period of 6 months. Mean age was 59.19 years (55-70) with slight male preponderance (58.3%). 23 patients each had a Dorr type B & C femora whereas 2 had a Dorr type A femur. Mini Mental State examination was done to rule out any cognitive impairment. 28 patients were treated with Hemireplacement Arthroplasty whereas 20 were treated with Total Hip Arthroplasty. Mean blood loss was 271ml for HRA group and 332.5 ml for THA group. One patient in the THA group had a posterior dislocation as compared to none in the HRA group. One HRA patient developed Acetabular erosion. At 6 months mean Harris Hip score was 90.04 (HRA group) and 86 (THA group).

**Keywords:** Arthroplasty, hip

### Introduction

Worldwide incidence of hip fractures is 1.5 million per year and is expected to increase to 8 million by 2050. Neck femur fractures constitute approximately half of the hip fractures. It has been estimated that by 2050 half of hip fractures will occur in Asia. In India 4.4 lac patients suffer from hip fractures every year with a female: male ratio of 3:1 [1].

Life expectancy in India has risen by 5 years over the last 10 years (67 years) with about 10% (100 million) of Indian population being above 50 yrs of age. This elderly population is prone to neck femur fractures due to increased osteoporosis, impaired co-ordination, visual impairment & other co-morbidities. The one year mortality in the elderly for hip fractures may be as high as 36% [2].

There is a consensus on operative management of these fractures due to the high morbidity & mortality associated with non operative management. Since long arthroplasty has been favoured over internal fixation in the elderly patients as it allows earlier return to pre injury ambulatory status and less requirement of revision surgeries, however the choice of the type of arthroplasty is still debatable.

Hemiarthroplasty & Total Hip Arthroplasty are both approved treatments for displaced femoral neck fractures but the surgeons have been found to prefer HRA over THA [3].

Some studies have found THA to give better functional outcomes [4, 5], still there are no strict guide lines on which procedure to be preferred.

In this study we have tried to compare the functional and the radiological outcomes of Cemented Modular Bipolar Hemiarthroplasty with Cemented Total Hip Arthroplasty in active elderly patients.

### Materials and methods

The study proposal was submitted to the Human Research Ethics Committee of the institute and approval obtained before starting the study.

Sixty-five patients in the age group of 55 to 70 years operated for displaced Femoral neck fracture between October 2015 to July 2016 at New Civil Hospital, Surat were included in the study. All the patients were independently active (outside the house ambulatory) before injury. Cognitive impairment was ruled out using Mini-Mental State Examination [43].

**Inclusion Criteria**

- All patients between 55 years to 70 years old diagnosed with neck femur fracture giving informed consent
- Closed fractures Garden type II or higher
- Time since injury not more than 3 weeks
- Independently active, outside the home ambulatory pre-injury
- No cognitive impairment in Mini mental state examination (MMSE) [43].

**Exclusion Criteria**

- Age < 55yrs.
- Open fractures
- Rheumatoid arthritis or any other arthropathies.
- pre-injury Non ambulatory patients
- Other injuries or systemic disorders that may affect rehabilitation post surgery.
- Associated with neuro vascular injury
- Patients not fit for anaesthesia
- Pathological fracture
- Impaired cognition as per MMSE

Preoperative and postoperative radiographs were taken with standardized protocol with limb in 15° internal rotation, pelvis squared without tilt and the xray tube at a distance of 100cm from the plate. A true lateral view of the operated hip was taken to assess version of acetabulum. The radiographs were assessed for fracture type (Garden classification), osteoporosis (Singh index), bone quality & canal width (Dorr typing [44] of femur) & osteoarthritic changes.

These patients were randomized between THA & HRA Thromboembolic prophylaxis was not used routinely All surgeries were performed by surgeons well experienced in these procedures with more than 5 years experience in arthroplasty.

The modified Gibson posterolateral approach and the Hardinge lateral approach were used at random. Cementing was done using third generation cementing technique with low viscosity cement (CMW3 or similar) Implants used were cemented Modular bi-polar prosthesis collarless, polished stem (INOR), cemented THA (INDUS) with polished collarless stem, 12/14 taper neck, 28mm head and highly cross-linked polyethylene liner.

Stability was assessed and wound closed with suction drainage. Operative details and blood loss were recorded. Post surgery mobilization and weight bearing was started next day as tolerated by the patient. Dressing was changed and drain removed after 48 hrs.

**Result**

Out of the 65 patients enrolled for the study 11 patients could not be followed up post discharge and 6 patients died within 3 months of surgery. Only 48 could be followed up till the end of the study. The outcomes at a minimum follow up of 6 months have been evaluated using the Harris Hip score [6, 45] and radiological evaluation [7, 8] 28 were male and 20 females with 77% of the patients in the

55-60 years age range.

In 31(64.6%) patients fractures were seen on left side and 17(35.4%) patients fractures were on right side and about 32 (66%) patients sustained the fracture due to trivial trauma (simple fall) and 16(33.3%) patients sustained the fracture due to road traffic accident. 32(66.7%) patients had garden type 3 fracture, 11(22.9%) had Garden type 2 fracture pattern and 5 patients had a garden type 4 fracture. 23 patients had dorr index of B, 23 patients had dorr index of C and 2 patients had dorr index of A. 29 patients had Singh's index of grade 4, 11 had grade 5, 7 patients had grade 3, and 1 patient had grade 2.

Harris hip score					
Duration	Procedure	N	Mean	Std. Deviation	P value
3Months postop	HRA	19	88.11	6.324	0.969
	THR	11	88.00	8.307	
6Months post op	HRA	28	90.04	7.005	0.224
	THR	20	86.00	13.223	

Mean harris hip score at 3 month was 88.07 and at the end of 6 months follow up mean harris hip score of those 30 patients was 90.83. This difference of mean Harris hip score showed p value of 0.000.

Outcome & Type of procedure Cross tabulation					
		Procedure			Total
		HRA	THR		
Harris Grading	Poor	Count	2	3	5
		%	7.1%	15.0%	10.4%
	Fair	Count	1	1	2
		%	3.6%	5.0%	4.2%
	Good	Count	6	4	10
		%	21.4%	20.0%	20.8%
	Excellent	Count	19	12	31
		%	67.9%	60.0%	64.6%
Total		Count	28	20	48
		%	100.0%	100.0%	100.0%

Most THR and HRA group patients had excellent/good Harris hip score at 6 month follow up. Only few patients (10.4%) had a poor Harris hip score.

Surgical approach					
	surgical Approach	N	Mean	Std. Deviation	P value
Harris hip score at 6Month	Lateral	22	84.18	12.971	.014
	Posterior	26	91.88	4.885	

22(45.8%) patients were operated through lateral (Hardinge) & 26(54.1%) operated through posterior (Gibson) approach. statistically significant difference was found in mean harris hip score concluding that patients operated through posterior approach had better functional outcome compare to patients operated through lateral approach.

29 patients develops stress shielding either on Greater Trochanter & Lesser trochanter, 19 patients did not develops stress shielding. 5 patients had intra operative leakage of cement

Harris hip score vs femoral stem positioning						
			Femur stem positioning			Total
			Central	Valgus	Varus	
Harris Grading	Poor	Count	4	0	1	5
		%	10.0%	0.0%	33.3%	10.4%
	Fair	Count	2	0	0	2
		%	5.0%	0.0%	0.0%	4.2%
	Good	Count	6	3	1	10
		%	15.0%	60.0%	33.3%	20.8%
	Excellent	Count	28	2	1	31
		%	70.0%	40.0%	33.3%	64.6%
Total		Count	40	5	3	48
		%	100.0%	100.0%	100.0%	100.0%

Poor outcome was seen with 1 varus and 4 centrally placed stems.

Cement Mantle- Peri-prosthetic Fracture Cross tabulation					
			Periprosthetic Fracture		Total
			NO	Yes	
cement mantle	Adequate	Count	41	0	41
		%	89.1%	0.0%	85.4%
	Inadequate	Count	5	2	7
		%	10.9%	100.0%	14.6%
Total		Count	46	2	48
		%	100.0%	100.0%	100.0%

Periprosthetic fractures were seen in 2 patients, inadequate cementing and periprosthetic fracture showing statistically significant association with p value of 0.019

**Discussion**

Considering the mean life expectancy of 67.9 yrs (WHO) in the Indian population we had set the age limit for the study between 55 to 70 years.

Most of our patients were in the 55 to 60 yrs age range with a male preponderance but there was no statistical significance. In a study by Sankaran [1] B *et al* higher female to male ratio (3:1) was seen for fracture neck femur incidence. We cannot establish relation between postmenopausal osteoporosis and higher incidence.

Harris hip score in whom follow up was possible (n=30) at both 3 month & 6 month showed significant statistical difference. Mean harris hip score at 3 month was 88.07 and at the end of 6 months follow up mean harris hip score of those 30 patients was 90.83. This difference of mean harris hip score showed p value of 0.000. This suggests soft tissue healing and physiotherapy may contribute to improvement in the hip function with time. In the patients (n=26) who could be further followed up no significant improvement was seen beyond 6 months.

At the end of 6 months follow up mean harris hip score of 28 patients operated with hemi replacement arthroplasty was 90.04 compared to mean Harris hip score of 20 patients operated with total hip replacement being 86.00 showing no statistical significant difference.

In 2008 William Macaulay *et al* [28], 40 patients were enrolled in the study. They did not find any significant difference in functional outcome & in quality of life at the end of 6 month in both group but THA patients seemed better off at 24 months.

In 2010 M.P.J. van den bekerom *et al* [31], 252 patients were studied in which HRA group (137) & THR group (115) patients compared at one & five year follow up no difference was observed between functional outcome in between this group.

We found better patient satisfaction in HRA group & many of

HRA group patients started cross leg sitting and squatting despite instruction, this may be possible due to the large head & inherent stability achieved with bipolar HRA which may have a better acceptance in Indian patients.

In this study out of 48 patients 22 (16 THR+6 HRA) were operated by lateral approach and remaining 26(22 HRA+4THR) were operated by posterior approach. Harris hip score of 22 patients operated by lateral approach was 84.18 and remaining 26 operated through posterior approach having mean Harris hip score of 91.88 and this was found to be statistically significant with p value of 0.014.

In this study out of 48 patient 31(64.6%) had excellent outcome in the form of Harris hip score >90. Out of them 12 were operated with THR and 19 were operated with HRA.

Mean blood loss in hemi replacement arthroplasty was 271 ml as compared to mean blood loss in total hip replacement with 332.5ml and this was found to be statistically significant with p value of 0.000.

Out of 28 patients operated with hemi replacement arthroplasty 2 patients developed periosteal reaction which had no clinical and laboratorial association with infection.

One hemi replacement arthroplasty patient developed Acetabular erosion but was not willing for revision surgery.

Two patients with hemi replacement arthroplasty developed heterotrophic ossification as per Booker’s classification class a.

Only one patient among HRA group developed superficial infection & was cured by intravenous antibiotics.

Mean time duration between fracture & surgery was 4.7 days No patients developed DVT, may be due to early surgery and early post op mobilization and physiotherapy

None of the patients developed loosening of femoral stem or Acetabular component.

Two patients of total hip replacement developed periprosthetic fracture (B1 in Vancouver classification) and this may be due to inadequate cementing.

One patient of total hip replacement developed posterior hip dislocation after 4 month of surgery. This patient had poor Harris hip score of 49. Open reduction was done and after 2 months of reduction surgery Harris hip score was 50. Baker *et al*. [25] (2006) showed about 7% dislocation rate in primary

THA done for fracture neck of the femur. In 2010 M.P.J. van den Bekerom *et al.* [31] conducted a study with 252 patients. HRA group (137) & THR group (115) patients, 8 dislocation found in THR group and no dislocation in HRA group patients.

### Conclusion

Although we would need a longer follow up and a larger sample size to reach a definite conclusion we could conclude the following from our study:

HRA using the Cemented modular Bipolar prosthesis gave similar short term results when compared to cemented THA Patient satisfaction was better in the HRA group THA had a higher risk of complications like dislocation with need for operative reductions and/or revision surgery Both procedures require exacting techniques and experienced surgeons to give a long lasting good result There is no significant advantage of the lateral approach over the posterior approach

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