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ORIGINAL RESEARCH

To compare the clinical and functional outcome of hemiarthroplasty hip lateral v/s posterior approach in fracture neck of femur

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ABSTRACT

Aim: To compare the clinical and functional outcome of hemiarthroplasty hip lateral v/s posterior approach in fracture neck of femur. **Materials and method:** All patients with femoral neck fracture who are aged more than 60 years, aged less than 60 years with failed osteosynthesis or delayed presentation, with non-union and with given informed consent were included in the study. All the patients with infected hip pathology, significant cardiovascular, renal or hepatic disease, pregnancy, malignancy, severe systemic comorbidities, vascular insufficiency e.g. DVT, whose status were unable to walk before falling and those having another fracture in the same or other limb were excluded from the study. Patients was admitted in orthopaedic ward and was divided consecutively into 2 groups, with equal number of patients in each group, i.e. lateral approach and in conventional posterior approach groups. **Results:** The mean pre-op Modified Harris Hip Score was comparable between both the groups as per Student t-test (66.04±4.40 vs. 65.02±5.06; $p>0.05$). The post-op Modified Harris Hip Score during follow-up period was comparable between both the groups - post-op 2 weeks (74.32±4.18 vs. 74.88±4.16), post-op 1 month (76.24±3.48 vs. 76.64±3.60), post-op 3 months (81.92±3.09 vs. 83.52±2.10) and post-op 6 months (84.36±2.34 vs. 85.64±2.16). There was "no significant difference between the groups" ($p>0.05$). However, it was observed that there was significant improvement in Harris Hip Score within both the groups during follow-up period ($p<0.05$). **Conclusion:** In our study we have found direct lateral approach (Hardinge's approach) is better compared to the posterior approach (Moore's approach) in term of low dislocation rate and better functional recovery. Hardinge approach had reduced complications in comparison to the Moore's approach in terms of dislocation/sciatic nerve injury/infection.

Keywords: Hemiarthroplasty hip lateral, Posterior approach, Fracture neck of femur

INTRODUCTION

The hip joint connects the lower limb to the pelvic girdle, it provides stability and is responsible for a wide range of movements. This multi axial ball and socket joint caters to motion on three planes stipulating the range of movements of the lower limb as well as providing shock absorption to the trunk and upper body.[1] As proceeding towards the background of the study, Pain is the most important complaint leading to disability in humans and is the presenting feature in hip fractures. Hip fractures compromise 20% of all orthopaedic surgeries with~1.7million people suffering from hip fractures every year.[2] Geriatric population is primarily affected with higher risk in women (40%-50%) compared to men (13%-22%). [3] Following a fall, younger individuals are less prone for femoral neck fractures whereas intracapsular fractures are more commonly seen in elderly. Surgical exposures require in-depth knowledge of anatomy of hip joint and its variations along with proper positioning of the patient and appropriate incisions. Hemiarthroplasty or total hip replacement is the mode of treatment in hip fractures and infections. [5] Healing process depends highly on good blood supply which is extensive, intricate and complicated around neck and head of femur. Most common complications include avascular necrosis (AVN), non- union, and secondary degenerative arthritis.[6]Return pre-fracture functionality without mortality and long-term disability is the main aim of treatment. Replacement of femoral head is preferred due to high rates of AVN, non-union and re-operation after osteosynthesis in elderly patients as compared to internal fixation.[7] Hemi-Arthroplasties harvest better outcomes than osteosynthesis as reported by some authors. Prosthesis replacement was introduced as early as 1950's with vitallium intramedullary prosthesis becoming popular very early on due to less

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incidence of non-union and AVN. [8] There are 2 different types of HA: unipolar and bipolar. Bipolar prosthesis has an advantage of reduced acetabular damage due to their dual bearing system however a risk of inter-prosthetic dissociated maybe seen which has been reduced in modern systems.[9]Immediate weight bearing due to prosthetic implants allows elderly patients to return to daily activity hence preventing complications due to recumbency. A Cochrane study involving seven randomized control trial comparing unipolar with bipolar hemiarthroplasty wherein four trial used cemented stems and three trials used Austin Moore prosthesis. The evidence was inconclusive and neither supported or rejected bipolar prosthesis.[10]

MATERIALS AND METHOD

It is an Analytical Prospective Study conducted at Orthopaedics Department in Hind Institute of Medical Sciences, Safedabad, Barabanki from January 2023 to January 2024 (12months) All patients with femoral neck fracture who are aged more than 60 years, aged less than 60 years with failed osteosynthesis or delayed presentation, with non-union and with given informed consent were included in the study. All the patients with infected hip pathology, significant cardiovascular, renal or hepatic disease, pregnancy, malignancy, severe systemic comorbidities, vascular insufficiency e.g. DVT, whose status were unable to walk before falling and those having another fracture in the same or other limb were excluded from the study. In advance of the study's initiation, the Institutional Ethics Committee (HIMS) was consulted for ethical approval. Prior to their enrolment, written informed consent was obtained from all study subjects. Patients was admitted in orthopaedic ward and was divided consecutively into 2 groups, with equal number of patients in each group, i.e. lateral approach and in conventional posterior approach groups. Exclusion criteria also included patients who could not walk before falling. The duration of the surgery and the intraoperative bleeding volume data will be collected. Furthermore, the length of the wound will be measured after it was closed. The postoperative care program going to be same for both the groups. Mobilization will be initiated on postoperative day 2 using a walker, with partial weight-bearing as tolerated, based on the individual's level of cooperation and on the pain intensity. All patients who will be able to walk with a walker, will be discharged. Follow-up appointments going to be scheduled at two weeks, six weeks, three months and six months. Patient was assessed during each follow up both clinically and functionally by modified Harris hip scoring. Demographic data, such as sex, age, body mass index, underlying musculoskeletal disease and drug usage, duration of the surgery, length of the surgical wound, intraoperative bleeding volume, postoperative days of walking with a walker, and postoperative complications, will be collected

STATISTICAL ANALYSIS

The information was input into Microsoft Excel and analysed utilising version26 of the statistical software SPSS (SPSS Inc. Chicago, IL, USA). When necessary, the continuous variables were assessed using the range value or the mean (standard deviation). Utilizing chi-square, the dichotomous variables were analysed in number/frequency format. In order to compare the means of two or more groups, the student t-test was utilised for analysis.

RESULTS

Comparative study done is a tertiary hospital setup was conducted with 50 patients to compare the outcome between hemiarthroplasty done by Posterior (Moore's) v/s lateral (Hardinge's) approach. Two equal groups of 25 cases each were created. Moore's: Moore's approach in hip hemiarthroplasty was done on 25 patients Hardinge's: Hardinge's approach in hip hemiarthroplasty was done on 25 patients. Predominantly, cases in Moore's belong to age groups of 66-70 years (28%) followed by 24% belong to 61-65 years and 76-80 years, 12% belong to 71-75 years, 8% belong to group 81-85 years and 4% belong to <60 years. Mean age noted in Moore's was 68.56 ± 6.18 years. Hardinge's group consisted predominantly of 76-80years old(28%) patients, followed by 24% from 61-65 years and 71-75 years, 12% belonging to 66-70 years, 8 % from < 60 years and 4% belonging to 81-85 years. Mean age noted in Hardinge's was 69.54 ± 5.40 years. The two groups have "no statistically significant difference" in age distribution ($p>0.05$).

Table 1: Age distribution of patients

AGE (YEARS)	MOORE'S		HARDINGE'S		P value
	N	%	N	%	
< 60 years	1	4%	2	8%	
61-65 years	6	24%	6	24%	
66-70 years	7	28%	3	12%	
71-75 years	3	12%	6	24%	
76-80 years	6	24%	7	28%	
81-85 years	2	8%	1	4%	
TOTAL	25	100%	25	100%	
Mean±SD	68.56± 6.18		69.54±5.40		>0.05

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It was observed that 16 (64%) and 14 (56%) of patients were male in Moore's and Hardinge's respectively, whereas 36% and 44% of the study group were females. The two groups have "no statistically significant difference" in sex distribution (p>0.05).

Table 2: Sex distribution of patients

SEX	MOORE'S		HARDINGE'S		P value
	N	%	N	%	
MALE	16	64%	14	56%	
FEMALE	9	36%	11	44%	
TOTAL	25	100%	25	100%	>0.05

In Moore's, 19 (76%) patients had right hip being affected while 6 (24%) patients had left involvement. In Hardinge's group, Right hip joint was affected in 20 (80%) while left hip joint was involved in 5 (20%) patients. The two groups have "no statistically significant difference" in laterality distribution (p>0.05). Fall was identified as the commonest mode of injury in Hardinge and Moore groups (84% and 92% respectively) followed by Road Traffic Accident (16% and 8% respectively). The two groups have "no statistically significant difference" in mode of injury distribution (p>0.05).

In Moore's, surgical time was <30 minutes in 1 patient (4%) whereas 18 (72%) patients had 30-60mins and 6 (24%) patients had >60 minutes. The mean surgical time was 46.48 ± 14.45 minutes. In Hardinge's, surgical time was <30 minutes in 2 patients (8%) whereas 17 (68%) patients had 30-60mins and 6 (24%) patients >60 minutes. The mean surgical time was 47.16 ± 14.64 minutes. The two groups have "no statistically significant difference" in surgical time distribution (p>0.05).

Table 3 Comparison of laterality, mode of injury, operative time and loss of blood among groups

LATERALITY	MOORE'S		HARDINGE'S		P value
	N	%	N	%	
RIGHT	19	76%	20	80%	
LEFT	6	24%	5	20%	
TOTAL	25	100%	25	100%	>0.05
Mode of Injury					
Trivial Trauma	21	84%	23	92%	>0.05
RTA	4	16%	2	8%	
Total	25	100%	25	100%	
Operative Time (mins)					
<30 mins	1	4%	2	8%	>0.05
30-60 mins	18	72%	17	68%	
>60 mins	6	24%	6	24%	
Total	25	100%	25	100%	
Mean ± SD	46.48 ± 14.45		47.16 ± 14.64		
LOSS OF BLOOD(ml)					
<150 ML	12		48%		
150-175 ML	5		20%		>0.05
175-200 ML	8		32%		
TOTAL	25		100%		
MEAN±SD	150.40±30.61		140.14±23.42		

In Moore's, 12 (48%) patients had blood loss <150 ml whereas in 5 (20%) and8 (32%) patient's blood loss of 150-175 ml and 175-200 ml was noted respectively. The mean blood loss was 150.40 ± 30.61 ml. In Hardinge's, 16 (64%) patients had blood loss <150 ml whereas 8 (32%) and 1 (4%) patient had blood loss of 150-175 ml and 175-200 ml respectively. The mean blood loss was 140.14 ± 23.42 ml. "No statistically significant difference" was seen in loss of blood amongst the groups (p>0.05).In Moore's, majority of the patients (64%) were admitted for ≤5 days followed by 6-10 days (20%), 11-15 days (8%) and >15 days (8%). The mean duration of inpatient time was 10.41 ± 5.09 days. In Hardinge's, maximum patients (76%) were admitted for ≤5 days followed by 6-10 days (12%) and 11-15 days (12%). The mean duration of inpatient time was 7.48 ± 3.80 days. A "significant statistical difference" was noted amongst the two groups (p<0.05).

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Table 4 Comparison of duration of inpatient time amongst groups

DURATION OF INPATIENT TIME	MOORE'S		HARDINGE'S		P value
	N	%	N	%	
≤ 5 DAYS	16	64%	19	76%	
6-10 DAYS	5	20%	3	12%	
11-15 DAYS	2	8%	3	12%	
>15 DAYS	2	8%	0	0%	
TOTAL	25	100%	25	100%	
MEAN±SD	10.41± 5.09		7.48±3.80		<0.05
COMPLICATIONS					
SUPERFICIAL INFECTION	2	8%	1	4%	>0.05
DISLOCATION	2	8%	0	0%	
ABDUCTOR LURCH GAIT	1	4%	2	8%	
SCIATIC NERVE INJURY	1	4%	0	0%	
NO COMPLICATIONS	19	76%	22	88%	
TOTAL	25	100%	25	100%	

In Moore's 2 (8%) patients had superficial infection while 2 (8%) patients had dislocation, abductor lurch gait and sciatic nerve injury in 1 (4%) patient each.In Hardinge's approach 2 (8%) patients had abductor lurch gait while 1 (4%) patient had superficial infection, no dislocation and no sciatic nerve injury. The two groups have "no statistically significant difference" in complication distribution (p>0.05).

The mean pre-op Modified Harris Hip Score was comparable between both the groups as per Student t-test (66.04±4.40 vs. 65.02±5.06; p>0.05). The post-op Modified Harris Hip Score during follow-up period was comparable between both the groups - post-op 2 weeks (74.32±4.18 vs. 74.88±4.16), post-op 1 month(76.24±3.48 vs. 76.64±3.60), post-op 3 months (81.92±3.09 vs. 83.52±2.10) and post-op 6 months (84.36±2.34 vs. 85.64±2.16). There was "no significant difference between the groups" (p>0.05). However, it was observed that there was significant improvement in Harris Hip Score within both the groups during follow-up period (p<0.05).

Table 5 Modified harris hip score in patients during follow-up period

MODIFIED HARRIS HIP SCORE	MOORE'S		HARDINGE'S		P VALUE
	MEAN	SD	MEAN	SD	
PRE-OP	66.04	4.40	65.02	5.06	
POST-OP 2 WEEKS	74.32	4.18	74.88	4.16	
POST-OP 1 MONTH	76.24	3.48	76.64	3.60	
POST-OP 3 MONTHS	81.92	3.09	83.52	2.10	
POST-OP 6 MONTHS	84.36	2.34	85.64	2.16	>0.05
P VALUE	<0.05		<0.05		

DISCUSSION

A comparative study based in a tertiary hospital was conducted with 50 patients to compare the outcome between hemiarthroplasty done by Moore's v/s Hardinge's approach. Patients were divided into two groups of 25 each. Moore's: Moore's approach in hemiarthroplasty of hip was done on 25 patients Hardinge's: Hardinge's approach in hemiarthroplasty of hip was done on 25 patients. Hardinge described the direct lateral approach in 1982 which provided adequate exposure of hip joint. It was associated with low rates dislocation on follow up clinically. Moore propagated the posterior in 1950. Surgeons across the world endorse the lateral approach due to its muscle sparing nature and enhanced exposure of hip. However, it carries the risk of sciatic nerve injury which needs to be protected meticulously intraoperatively. In our study, predominant cases in Moore's belong to age groups of 66-70 years (28%) followed by 24% belong to 61-65 years and 76-80 years, 12% belong to71-75 years, 8% belong to group 81-85 years and 4% belong to <60 years. Mean age noted in Moore's was 68.56 ± 6.18 years. Hardinge's group consisted predominantly of 76-80years old(28%) patients, followed by 24% from 61-65 years and 71-75 years, 12% belonging to 66-70 years, 8 % from < 60 years and 4% belonging to 81-85 years. Mean age noted in Hardinge's was 69.54 ± 5.40 years. There was "no statistically significant difference" observed amongst the two groups (p>0.05). Male predominance was seen in Moore's 16 (64%) and Hardinge 14 (56%) with no significant difference (p>0.05). These results were consistent with prior studies of Bhise S et al[11], Aparajit P et al.[12], Divya V et al.[13] and Kalyanasundaram S et al.[14] Bhise S et al[11] retrospective comparative study found similar results in gender distribution. They conducted hemiarthroplasty using anterolateral and posterolateral approaches, 53 patients were enrolled in the study and divided into two groups. In anterolateral group, 18

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(66%) patients were male while rest were female whereas posterolateral group consisted of 17males (62%) and rest females, reflecting a similar distribution as our study. Aparajit P et al.[12] in a prospective comparative study evaluating and comparing posterior and lateral approaches based on surgical complications found similar mean age of patients consistent with our study. Mean age of patients in their study was 64.30 ± 5.39 years in posterior group and 65.85 ± 5.64 years in lateral. There was an almost equal distribution of males and females in the study with a ratio of 1.6:1 and 1.4:1 in posterior and lateral groups respectively. A marginally lower mean age was seen in a prospective randomized study conducted by Divya et al comparing Hardinge and Moore's approach. Mean age group of noted to be 43.48 and 44.24 in Hardinge's and Moore's group respectively, with "no significant difference" was noted in the study. Sex distribution in the study showed 16 (53%) and 18 (60%) females in Hardinge's and Moore's respectively. Male distribution seen was 14 males(46.6%) in Hardinge's and 12 males (40%) in Moore's distribution.[13]

In our study, right side of hip joint was affected more with 19 (76%) patients in Moore's and 20 (80%) patients in Hardinge's being involved. While left side of hip joint was involved in 6 (24%) patients in Moore's and 5 (20%) patients in Hardinge's. "No statistically significant difference" was seen in laterality($p>0.05$). These results were consistent with Aparajit P et al who conducted a prospective comparative study in which both surgical groups showed right laterality to be more common than the left side. [12]In our study, fall (84% and 92% respectively) was found to be the commonest mechanism of injury in both groups followed by Road Traffic Accident (16% and 8% respectively). There was "no significant statistical difference" between the groups was seen($p>0.05$). This is comparable to the studies of Aparajit P et al[12], Kalyanasundaram S et al.[14] and Divya V et al.[13] Aparajit P et al showed low energy trauma as the commonest etiology such as fall at home in geriatric population. An equal distribution of falls was seen in both the groups with 90% to 92.5% presenting with trivial trauma. In younger age group of 50 to 55years, road traffic accidents were found to be more common. Kalyanasundaram S et al showed similar results with 75% patients in elderly age group presenting with trivial fall at home and road traffic accidents contributing to 20% of the cases.[14] RCT done by Divya V et al.[13] found patients undergoing Hardinge approach were due to Assault (2), fall from height (17) and RTA (11). Whereas Moore's approach was done on fall from height (17) and RTA (13) cases. Duration of surgery in our study was shown to be <30min in 1 (4%), 30- 60minutes in 18 (72%) and >60minutes in 6 (24%) patients in Moore's approach with a mean duration of 46.48 ± 14.45 minutes. Surgical time in Hardinge's approach was seen to be <30 minutes in 2 (8%), 30-60minutes in 17 (68%) and>60minutes in 6 (24%) patients with mean duration of 47.16 ± 14.64 minutes. There was "no significant difference" between the two groups ($p>0.05$). Study done by Aparajit P et al noted similar results in their study with mean duration of surgery being 48.43±5.38 minutes in Moore's approach and 47.50±7.59 minutes in Hardinge approach.[12]Loss of blood in our study was analysed in categories of < 150ml, 150 -175ml and 175-200ml with Moore's showing 12 patients (48%), 5 patients (20%), and8 patients (32%) respectively whereas Hardinge's showed 16 patients (64%), 8 patients (32%) and 1 patient (4%) respectively. Average loss of blood was150.40 ± 30.61 ml in Moore's and 140.14 ± 23.42 ml in Hardinge's approach was observed with "no significant statistical difference" ($p>0.05$). Similar results were also portrayed by Aparajit P et al with a mean loss of blood 144.75±17.68 ml in Moore's and 148.38±15.03 ml in Hardinge's approach which was "statically insignificant".[12]In our study, duration of stay in hospital in Moore's was predominately ≤5 days (64%), with 8% showing 11-15days and >15days each and remaining 20% being admitted for 6-10days. Mean duration of stay in hospital was 10.41 ± 5.09 days. In Hardinge's, 76% patients stayed for ≤5 days, 6-10 days was seen in 12% and 11-15 days in 12% with a mean duration of stay being 7.48 ± 3.80 days. Significant statistical difference was seen ($p<0.05$).In our study that in Moore's 2 (8%) patients had superficial infection while 2 (8%) patients had dislocation, abductor lurch gait and sciatic nerve injury in 1 (4%)patient each.In Hardinge's approach 2 (8%) patients had abductor lurch gait while 1 (4%) patient had superficial infection, no dislocation and no sciatic nerve injury. "No significant difference" was seen ($p>0.05$)between the two groups which was reciprocated by other studies of Bhise S et al, Aparajit P et al, Kalyanasundaram S et al, Jeyaraman M et al and Divya V et al.[11-15] Bhise S et al retrospective comparative study observed that severe complications such as thrombosis and pulmonary embolism were absent from both groups. Aparajit P et al also portrayed infection as the "most common complication" with an average infectivity rate of 15%, 17.50% in Moore's and 12.50% in Hardinge group. Incidence of dislocation was only seen in Moore's with 2 patients suffering from the complication. Whereas, abductor weakness was seen only in Hardinge's approach with 3 patients being affected. All other surgical complications including mortality were absent in both groups. Similar results were observed by Divya V et al[13], they found increased complications were seen in Moore's approach. Their study showed 4 patients had dislocations, 4 sciatic nerve injuries, 3 patients developed infections, 2 patients had version of prosthesis and 1 patient developed reduced range of movements postoperatively. Only abductor lurch gait was seen in Hardinge's group (3 patients). A "highly positive correlation" between Hardinge's approach and

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complications (rho 'p' = 0.83) by Jeyaraman M et al. On contrary to other studies, they found a reduced correlation of complications with Moore's (rho 'p'=0.59) with a "statistically significant difference between the two surgical groups ($p<0.05$)".[15] Kalyanasundaram S et al used "Modified Hardinge's approach" on 20 patients and observed that none of the patients had postoperative complications routinely seen such as dislocations and abductor lurch.[14]

Functional outcomes were assessed using Modified HHS pre and post operatively at intervals of 2weeks, 1, 3 and 6months. Our study observed that there was "no statistically significant difference between the two approaches ($p>0.05$)". A significant improvement in scores was noted during follow up periods in both the groups. In Moore's vs Hardinge's group, mean pre-operative scores were 66.04±4.40 vs. 65.02±5.06. Comparable scores were seen postoperatively at Two weeks (74.32±4.18 vs. 74.88±4.16), 1 month (76.24±3.48 vs.76.64±3.60), 3 months (81.92±3.09 vs. 83.52±2.10) and 6 months (84.36±2.34vs. 85.64±2.16). These results were comparable to other studies of Aparajit P et al[12], Jeyaraman M et al.[15], Divya V et al and Barrett WP et al[16]. Aparajit P et al observed average HHS was "comparable in both groups" over a follow up period of 1 year postoperatively (85.62 vs 83.40). [61] Other studies conducted by various authors showed a significant improvement in modified HHS consistently postoperatively as shown in our study. Jeyaraman M et al analysed functional outcomes using modified HHS and showed 68.08% (32 patients) had excellent results in Hardinge's group vs 61.90% (26 patients) in Moore's group.Poor results were seen in 4.25% (2 patients) and 7.14% (2 patients) respectively with rest of the patients showing good results.[15] Divya V et al[13] reported similar findings with excellent scores in 8 patients in Hardinge's and 5 patients in Moore's and poor scores seen in 3 patients and 8 patients respectively. Barrett WP et al assessed HHS at intervals of 6 weeks, 3months, 6month and 12 months in posterior and anterior approaches. They attributed improved HHS to clinical end points such as ability to climb stairs and walk long distances. The study observed "no statistically significant difference between the two groups".[16]

CONCLUSION

In our study we have found direct lateral approach (Hardinge's approach) is better compared to the posterior approach (Moore's approach) in term of low dislocation rate and better functional recovery. Hardinge approach had reduced complications in comparison to the Moore's approach in terms of dislocation/sciatic nerve injury/infection. Though this approach is not as popular as the posterior approach, the complication rates are much less compared to the posterior approach (Moore's approach).Hence, we propose that surgeons should also get themselves accustomed to Hardinge approach as the complication rates seem to be lower compared to the Moore's approach (Posterior approach).

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