ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 06 | June - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A RANDOMISED STUDY OF FUNCTIONAL OUTCOME OF BIPOLAR HEMIARTHROPLASTY THROUGH DIRECT LATERAL APPROACH VERSUS POSTEROLATERAL APPROACH IN FRACTURE NECK OF FEMUR

Orthopaedics

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ABSTRACT

Objectives: To evaluate and compare the functional outcome of Bipolar hemiarthroplasty through direct lateral approach and posterolateral approach in fracture neck of femur. To evaluate and compare the complications of bipolar Hemiarthroplasty through direct lateral approach and posterolateral approach in fracture neck of femur. To compare intraoperative blood loss, duration of surgery between the mentioned two groups. **Materials and Methods:** In a prospective study, 40 patients were enrolled with displaced femoral neck fracture. Patients were assigned to treatment using posterior approach and lateral approach with hemiarthroplasty by systematic random sampling. Intra-operative assessments included, duration, blood loss, subjective assessment of difficulty of surgery, intra-operative complications. Immediate post-operative assessment of pain and complications were measured. Patients were followed up at 6weeks, 3months, 6months and 1 year post-operative and functional assessment was done using Harris Hip Score. **Results:** The mean Harris hip score for both the groups were similar ,but the incidence of posterior dislocation of hip and foot drop were slightly higher in case of posterior group **Conclusion :** There is no statistically significant difference in the functional outcome at 6 weeks, 3 months , 6 months and 1 year post operatively between lateral and posterior approach. Both lateral and posterolateral approach in hemiarthroplasty are good options for treatment of displaced femoral neck fracture in elderly and can be used as per surgeon's preference.

KEYWORDS

Fracture neck of femur , Posterior approach, direct lateral approach, Functional outcomes, Randomised control study

INTRODUCTION

Femoral neck fractures, one of the most common injuries in the elderly. About 50 percent of total hip fractures population has a displaced femoral neck fracture. The prevalence of these fractures has increased with improvement in life expectancy, increased incidence of osteoporosis, poor vision, neuro-muscular incoordination and changes in lifestyle leading to sedentary habits. The incidence of these fractures are expected to double in the next twenty years and triple by the year 2050[1]. Patients with a hip fracture have a high mortality and disability. It has been observed that age specific incidence of hip fracture doubles every 5 - 6 years after age 30 in women reaching 18 fractures per 1000 per year in women over 85 [2].With the superiority of prosthetic replacement over internal fixation in elderly being well established, primary Total Hip Replacement (THR) is being offered at many centres as a treatment option for these fractures. Total hip arthroplasty is still not popular as a treatment modality for fracture neck of femur in our country because majority of the patients do well with hemiarthroplasty and also due to the high costs involved[3]

The best approach for hip joint arthroplasty, however, remains controversial recently some less invasive modifications have been described and compared to the standard approaches such as posterior, lateral, anterolateral and anterior. All of them seem to have several advantages and every modification leads to different new problems. Hemireplacement arthroplasty by using vitallium or stainless steel was popularly practiced by Austin Moore□s produced fair results[9,10]. Most studies comparing surgical approaches include only total hip arthroplasty (THA) and are not necessarily valid for Hemiarthroplasty. The surgical approach used for hemiarthroplasty is expected to affect the treatment outcomes, in terms of dislocations, performance in daily activities and quality of life after the procedure and the learning curve for surgeons. The purpose of this prospective study is to compare outcomes of hemiarthroplasty using lateral approach with posterior approach.

OBJECTIVES

1. To evaluate and compare the functional outcome of Bipolar hemiarthroplasty through direct lateral approach and posterolateral approach in fracture neck of femur.
2. To evaluate and compare the complications of bipolar Hemiarthroplasty through direct lateral approach and posterolateral approach in fracture neck of femur.

METHODOLOGY

Study Design

The present study includes 40 cases of Fracture neck of femur in elderly aged more than 60y, who were divided into 2 groups with 20 patients in each group, the groups were being assigned randomly.The details of the patients were feeded into a computer and the patients were assigned randomly into the two groups to avoid bias. One group of the patients was treated by hemiarthroplasty using Posterior approach whereas the other group was treated with hemiarthroplasty using Lateral approach.Randamised control trial was done.

Source of data

Data collected from patients presenting with fracture Neck of femur satisfying inclusion criteria admitted in Sanjay Gandhi Institute Of Trauma and Orthopaedics, Bangalore.

Study Period: Dec 2020 To June 2022
Place Of Study: Sanjay gandhi institute of trauma and orthopaedics, bengaluru

Statistical Analysis

Statistical Package for Social Sciences [SPSS] for Windows Version 22.0 Released 2013. Armonk, NY: IBM Corp., was used to perform statistical analyses.

Inclusion Criteria

1) Age more than 60 years of either sex
2) Old and fresh neck of femur fracture
3) Ability to understand the content of the informed consent and willing to participate in clinical investigation
4) Written informed consent

Exclusion Criteria

1) Neck of femur fracture associated with other fractures of femur
2) Pathological neck of fracture
3) Polytrauma
4) Who are unfit for surgery
5) Who do not give consent
6) Patients with Neurovascular deficits
7) Patients with fractures in opposite limb

METHODOLOGY

The in-patients in the Department of Orthopaedics fulfilling the inclusion criteria were enrolled in the study. After obtaining written consent and fitness for surgery these patients underwent bipolar hemiarthroplasty through direct lateral approach or posterolateral approach for fracture neck of femur as per results of randomization. Follow-up visits will be at 6 weeks (visit 1), 12 weeks (visit2), 6 month and 1 year from the date of surgery. At follow-up visits, patient were evaluated clinically (wound Status, Soft Tissue Status, Neurovascular Deficits), radiologically and complications are noted. Based on these data the final outcome was assessed according to Harris Hip Score.

Preoperative Management

Patients were admitted to the ward. Detailed history was taken with particular emphasize on mode of injury and associated medical illness. In depth, clinical assessment was carried out in each case.

In all patients preoperatively skin traction with appropriate weight was applied, to the fractured lower limb, with the aim of relieving pain preventing shortening and to reduce unnecessary movements of the injured limb. Oral or parental NSAIDs were given to relieve the pain

Informed Consent

Patients as well as the attenders were explained about the surgery and its risk factors and written consent for the surgery was taken for all patients

Surgical Procedure And Intraoperative Images

1] Posterior Approach

With the hip flexed approximately 45 degrees, a straight incision is made approximately 10 cm distal to the posterior superior iliac spine and extend it distally and laterally parallel with the fibers of the gluteus maximus to the posterior margin of the greater trochanter. Direct the incision distally 10 to 13 cm parallel with the femoral shaft. Incise the fascia lata on the lateral aspect of the femur to uncover the vastus lateralis. Lengthen the fascial incision superiorly in line with the skin incision, and split the fibers of the gluteus maximus by blunt dissection There is no true internervous plane in this approach. However, the gluteus maximus, which is split in the line of its fibers, is not significantly denervated because it receives its nerve supply well medial to the split.

Retract the fibers of the split gluteus maximus and the deep fascia of the thigh. Underneath is the posterolateral aspect of the hip joint, still covered by the short external rotator muscles, which attach to the upper part of the posterolateral aspect of the femur Internally rotate the hip to put the short external rotator muscles on a stretch (making them more prominent) and to pull the operative field farther from the sciatic nerve Insert stay sutures into the piriformis and obturator internus tendons just before they insert into the greater trochanter. Detach the muscles close to their femoral insertion and reflect them backward, laying them over the sciatic nerve to protect it during the rest of the procedure. (The upper part of the quadratus femoris may also have to be divided to fully expose the posterior aspect of the joint capsule, but the muscle contains troublesome vessels that arise from the lateral circumflex artery. Normally, it should be left alone.)The posterior aspect of the hip joint capsule is now fully exposed. The hip joint capsule can be incised with a longitudinal or T-shaped incision. . Posterior joint capsulotomy will have exposed the femoral head and neck

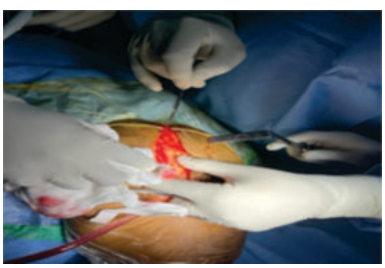


Fig-1- Incision

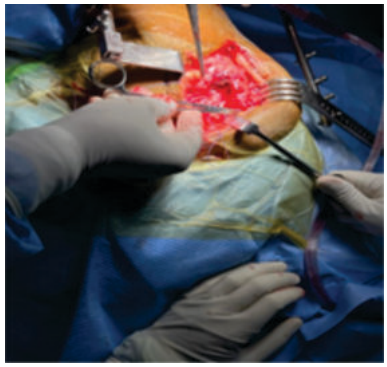


Fig-2- Gluteus Maximus And Fascia Split

Fig-3- Short External Rotators Identified

Fig-4- Head Extracted

Fig-5- Neck Cut

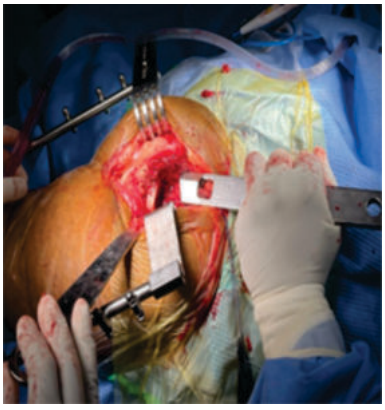


Fig-6- Box Cut

Fig-7- Femoral Canal Reamed

Fig-8- Femoral Canal Broached

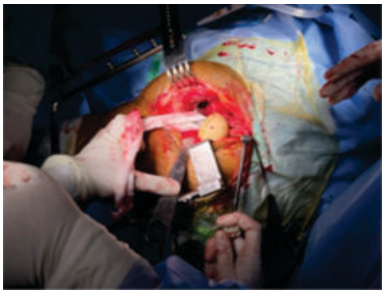


Fig-9- Trial Insertrted

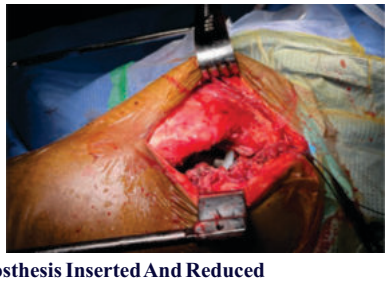


Fig-10- Prosthesis Inserted And Reduced

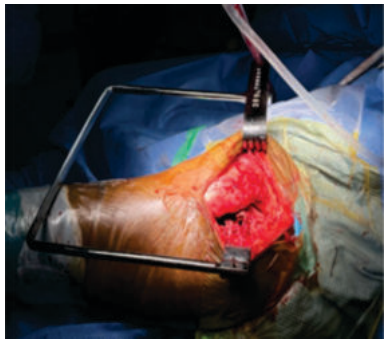


Fig-11- Short External Rotators Sutured To Greater Trochanter.

2] Direct Lateral Approach

Make a posteriorly directed lazy-J incision centered over the greater trochanter. Divide the fascia lata in line with the skin incision and centered over the greater trochanter.Retract the tensor fasciae latae anteriorly and the gluteus maximus posteriorly, exposing the origin of the vastus lateralis and the insertion of the gluteus medius.

Incise the tendon of the gluteus medius obliquely across the greater trochanter, leaving the posterior half still attached to the trochanter. Carry the incision proximally in line with the fibers of the gluteus medius at the junction of the middle and posterior thirds of the muscle. Placing the abductor "split" more anterior, directly over the femoral head and neck. This gluteus medius split should be no farther than 4 to 5 cm from the tip of the greater trochanter to avoid damage to the superior gluteal nerve and artery. Distally, carry the incision anteriorly in line with the fibers of the vastus lateralis down to bone along the anterolateral surface of the femur. Elevate the tendinous insertions of the anterior portions of the gluteus minimus and vastus lateralis muscles. Abduction of the thigh exposes the anterior capsule of the hip joint. Incise the capsule as desired.Limb placed in figure of four position, and head extracted During closure, repair the tendon of the gluteus medius with nonabsorbable braided sutures

Fig-12- Lazy J Incision

Fig-13- Gluteus Maximus Split

Fig-14- Fascia Lata Split

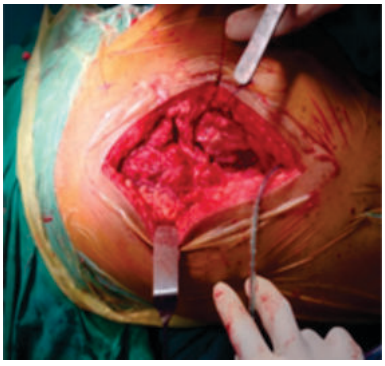


Fig-15- Gluteus Medium Tendon Identified.

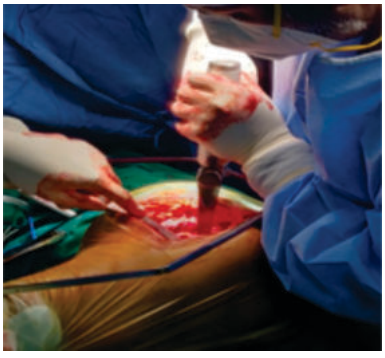


Fig-16- Femoral Neck Cut

Fig-17- Femoralementation

Fig-18- Cementation

Fig-19- Bipolar Prosthesis Insertion

Postoperative Management

In case of spinal anaesthesia, foot end elevation was given depending on the patient's postoperative blood pressure. Every half an hour blood pressure, pulse rate, temperature, and respiratory rate was monitored for the first 24 hours. Whenever necessary, postoperative blood transfusion was given. Intramuscular analgesics were given as per patient's compliance; intravenous antibiotics were continued for 3days followed by oral antibiotic for another 10days.

Patients were made to sit up on the first day, encouraged to perform static and dynamic quadriceps exercise, standup with support (walker),on the first or second day, and were allowed to full weight bear and walk with the help of a walker depending on his/her pain tolerance and were encouraged to walk thereafter. Sitting cross-legged and squatting were not allowed. Suture removal was done on the postoperative day12-15.The patients were assessed for any shortening or deformities if any and discharged from the hospital. Patients who had infection and bedsores were treated accordingly before discharging them from the hospital.

Follow Up

At the time of discharge the patients were asked to come for follow up after 6 weeks and for further follow up at 6 months. . At follow up, detailed clinical examination was done systematically. Patients were evaluated according to Harris hip scoring system.

Harris Hip Scoring System

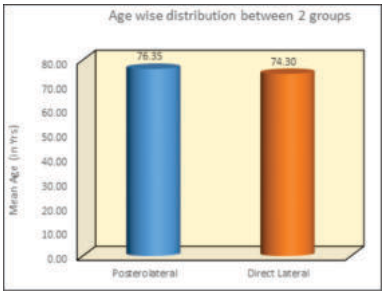
Domains and items	Point
Pain	
None or ignores it	44
Slight, occasional, no compromise in activities	40
Mild pain, no effect on average activities, rarely moderate pain with unusual activity, may take diclofenac	30
Moderate pain, tolerable but makes concessions to pain, some limitation of ordinary activity and work: may require occasional pain medicine stronger than diclofenac	20
Marked pain, serious limitation of activities	10
Totally disabled, crippled, pain in bed, bedridden	0
Function: Gait.	
Limp	
None	11
Slight	8
Moderate	5
Severe or not able to walk	0
Support	
None	11
Cane for long walks	7
Cane most of the time	5
One crutch	3
Two canes	2
Two crutches or not able to walk	0
Distance walked	
Unlimited	11
Six blocks	8
Two or three blocks	5
Indoors only	2
Bed and chair	0
Functional activities	
Stairs	
Normally without using a rail	4
Normally using a rail	2
In any manner	1
Unable	0
Squatting	
With ease	4
With difficulty	2
Unable	0
Sitting cross legged	
With ease	5
With difficulty	3
Unable	0
Public transportation	
Able to use	1
Unable to use	0
Hip range of motion (Clinician assessed)	
Flexion (maximum = 140°)	
Abduction (maximum = 40°)	
Adduction (maximum = 40°)	
External rotation (maximum = 40°)	
Internal rotation (maximum = 40°)	
Range of motion scale (sum of the range of motion)	
211–300	5
161–210	4
101–160	3
61–100	2
31–60	1
0–30	0
Absence of deformity (Clinician assessed)	
• Less than 30 ° fixed flexion contracture – Yes/No	
• Less than 10 ° fixed abduction – Yes/No	
• Less than 10 ° fixed internal rotation in extension – Yes/No	
• Less than 3.2 cm limb length discrepancy – Yes/No	
If all 4 yes	4
If less than 4 yes	0

There are 10 items. The score has a maximum of 100 points (best possible outcome) covering pain (1item,0-44 points), function (7 items, 0-47 points), absence of deformity (1 item, 4 points), and range of motion (2 items, 5 points).

RESULTS

Age and gender distribution among 2 groups

Variable	Category	Posterolateral		Direct Lateral		p-value
		Mean	SD	Mean	SD	
Age	Mean	76.35	6.95	74.30	6.39	0.37a
	Range	62 – 89		63 - 84		
		N	%	n	%	
Sex	Males	10	50%	9	45%	0.75b
	Females	10	50%	11	55%	



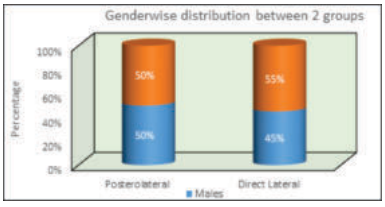


Chart-1- Age And Gender Distribution Among 2 Groups.

In the study conducted the mean age of the patients who underwent bipolar hemi arthroplasty through posterolateral approach was 76.35 and direct lateral approach was 74.30 with equal distribution of males and females in posterolateral group and 45 percent males and 55 percent female in direct lateral group.

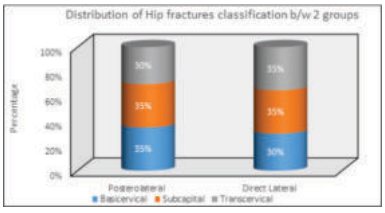


Chart-2- Distribution Of Hip Fractures Among 2 Groups

In 20 patients who underwent posterolateral approach, 7(35%) had basi-cervical, 7(35%) sub-capital & 6(30%) had trans-cervical femoral neck fractures.

In 20 patients who underwent lateral approach, 6(30%) had basi-cervical, 7(35%) sub-capital & 7(35%) had trans-cervical femoral neck fractures.

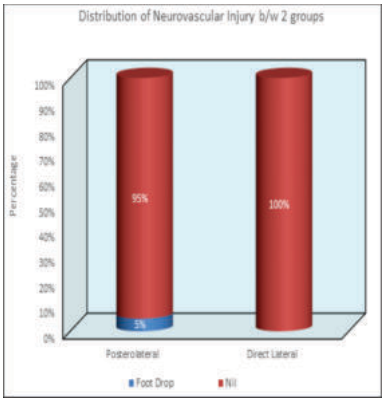


Chart-3- Distribution Of Neurovascular Injury Among 2 Groups

Only one patient in posterolateral group had foot drop and no other neurovascular complications were noted among other patients in both groups.

Comparison of Post-op complications b/w 2 groups using Chi Square Test						
Variable	Category	Posterolateral		Direct Lateral		p-value
		n	%	n	%	
Post-op Complications	Dislocation	1	5%	0	0%	0.55
	Foot Drop	1	5%	0	0%	
	Infection	1	5%	1	5%	
	Nil	17	85%	19	95%	

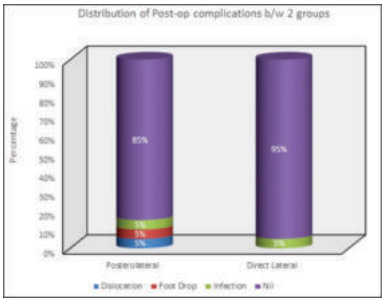


Chart-4- Distribution Of Postoperative Complications Among 2 Groups.

Of the 20 patients in posterolateral group 1(5%) had posterior dislocation, 1(5%) had foot drop, 1(5%) had wound site infection, and 1(5%) in direct lateral group developed wound site infection

Comparison of mean Harris Hip scores b/w 2 groups at different time intervals using Mann Whitney Test						
Time	Approach	N	Mean	SD	Mean Diff	p-value
6 weeks	Posterolateral	19	52.74	3.66	-0.31	0.82
	Direct Lateral	20	53.05	3.22		
3 months	Posterolateral	19	57.79	4.38	-0.81	0.40
	Direct Lateral	20	58.60	3.72		
6 months	Posterolateral	19	64.37	4.47	-0.08	1.00
	Direct Lateral	20	64.45	3.97		
1 Year	Posterolateral	19	74.05	4.13	1.80	0.18
	Direct Lateral	20	72.25	4.44		

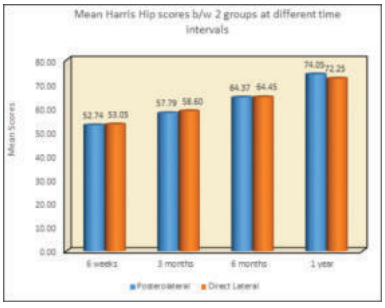


Chart-5- Compoarison Of Harris Hip Score Between 2 Groups At Different Time Intervals.

The mean Harris hip score at the end of 6weeks, 3 months, 6 months and 1 year in Posterolateral were 52.74,57.79,64.37, 74.05 respectively and the mean Harris hip scores in direct lateral group at the end of 6 weeks, 3 months, 6 months and 1 year were 53.05,58.6,64.45, and 72.25 respectively

Comparison of mean Harris Hip Scores b/w diff. time intervals in Posterolateral Approach group using Friedman's Test						
Time	N	Mean	SD	Min	Max	p-value
6 weeks	19	52.74	3.66	44	58	<0.001*
3 months	19	57.79	4.38	47	64	
6 months	19	64.37	4.47	56	71	
1 year	19	74.05	4.13	63	82	

Chart-6- Comparison Of Mean Harris Hip Score Between Different Time Intervals In Posterolateral Group

Comparison of mean Harris Hip Scores b/w diff. time intervals in Direct lateral Approach group using Friedman's Test						
Time	N	Mean	SD	Min	Max	p-value
6 weeks	20	53.05	3.22	44	58	<0.001*
3 months	20	58.60	3.72	49	64	
6 months	20	64.45	3.97	54	71	
1 year	20	72.25	4.44	61	79	

Chart-6- Comparison Of Mean Harris Hip Score Between Different Time Intervals In Direct Lateral Approach Group.

The mean Harris hip score at the end of 6weeks, 3 months, 6 months and 1 year in Posterolateral were 52.74,57.79,64.37, 74.05 respectively and the mean Harris hip scores in direct lateral group at the end of 6 weeks, 3 months, 6 months and 1 year were

53.05,58.6,64.45, and 72.25 respectively

Fig-20- Range Of Movements In Posterolateral Group

Fig-21- Range Of Movements In Direct Lateral Group.

DISCUSSION

The most common treatment for a displaced femoral neck fractures in elderly is hemiarthroplasty. In a metaanalysis of randomized controlled trials by Cecilia Rogmark, comparing hip replacement with internal fixation in displaced femoral neck fractures, has clearly shown that for major method-related complications as well as for reoperations with open surgery, there is an advantage to performing hip replacements with an odds ratio of about 0.12 with a tight confidence limit. One concern has been increased mortality. After 30 days, there was an odds ratio of 1.30 but no significant difference in mortality. After 1 year, the mortality was the same in both groups. There are various approaches described for hip arthroplasties. The best approach for hip joint arthroplasty,however, remains controversial recently some less invasive modifications have beendescribed and compared to the standard approaches such as posterior, lateral,anterolateral and anterior. we undertook the present study to evaluate the immediate results ofcomparative study of posterior and lateral approach in hemi replacement hip surgeriesin elderly population. The mean age of incidence in our study was 75. 3 years

Among the forty patients included who were included in this study there were thirteen basi cervical, fourteen sub capital and thirteen trans cervical fractures.

La Belle L.W et al evaluated (1989) clinical results of Bipolar prosthesis after years of follow up in 128 patients were treated with cemented proximal femoral bipolar hemiarthroplasties. Seventy nine percent of surviving patients has no or slight pain after their primary procedures. None of these patients developed acetabular protrusion. Ten percent of the survivors required late revision; 88% of the unrevised hips had no or slight pain. When compared with studies of noncemented Moore and Thompson fixed head prosthesis, the cemented Bateman bipolar prosthesis had decreased protrusion and less pain4 .Wesley and William (1989) conducted a retrospective study of 76 proximal femoral endoprosthesis with a mean follow-up period of 32 months, which was compared to a group of 36 Thompson endoprostheses and 16 Moore endoprostheses with a mean follow-up period of 35 months and 31 months respectively. The primary indication for surgery was acute femoral neck fracture. Harris hip scores yielded a mean score of 85 for the Bateman group, compared to a mean of 77 for both the Thompson and Moore groups. 15 patients received the Bateman device for reconstructive purposes and had a mean Harris hip score of 90. Morbidity was comparable between the Bateman and Thompson groups. The deep infection rate was 3.9% and the 32 days perioperative mortality was 4.6% rising to 29% at the time of review. Preselection factors placed younger, more functional patients in the Bipolar prosthesis group (mean age 65 yrs; mortality, 11%), compared to the Thompson group (mean age, 72yrs;mortality, 39%) and the Moore group (mean age 73 yrs; mortality 41%)5

Maricevic et al in 1998 conducted a study to know the effectiveness of treatment with bipolar prosthesis in elderly patients with femoral neck fractures reported that there were no poor results. Hence the authors concluded that bipolar hemiarthroplasty is the treatment preferred in elderly patients with femoral neck fracture 6.

Bhushan M. Sabnis et al, concluded Patients who underwent bipolar hemiarthroplasty achieved better outcomes for mortality and mobility. Among patients who were able to walk unaided before injury,more of those having bipolar hemiarthroplasty were able to do so at 4th month than those operated with unipolar hemiarthroplasty[7].

M. P. J. van den Bekerom et al studied 252 patients >70years of age of whom 47 (19%) were men, with a mean age of 81.1 years (70.2 to 95.6). Patients were randomly allocated whether they haved to be treated with either a cemented hemiarthroplasty (137 patients) or cemented THR (115 patients). There were no dislocations of any bipolar hemiarthroplasty and eight dislocations of a THR during follow-up. Because of a higher intra-operative blood loss ($p < 0.001$), an increased duration of the operation ($p < 0.001$) and a higher number of early and late dislocations ($p = 0.002$), recommend THR as the treatment of choice in patients aged ≥ 70 years with a fracture of the femoral neck in the absence of advanced radiological osteoarthritis or rheumatoid arthritis of the hip8.

In posterolateral group there were one intra operative, one immediate post operative and two late complications. In direct lateral group there were four intra operative and one late complications.Large amount of blood loss was more common in direct lateral group when compared to posterolateral group as contrary to many other studies, and the time required for bipolar hemiarthroplasty through direct lateral approach was more than posterior approach which is also contrary to many studies which might be due to the fact that most of the surgeons in our institute are more accustomed to posterior approach than lateral approach.

In our study, post operative posterior hip dislocation was seen in only one patient, and foot drop included in the posterolateral approach group. The rate of dislocation as compared to other studies is mentioned in the table below.

Clinical studies	Dislocation rate in percentage	
	Posterolateral approach	Posterior approach
In our study	5	0
M.T.Hongisto et.al	3.4	0
S Mukka et.al	6	1
Roland Biber et.al	3.9	0.5

Functional Outcome

In our study functional outcome was assessed by Harris hip Score.In our study, among the posterolateral group according to Harris hip score one patient had good outcome, sixteen patients had fair outcome and two patients had poor outcome.In our study, among the posterolateral group according to Harris hip score seventeen patients had fair outcome and three patients had poor outcome.In both groups the score improved gradually over a period of time which was assessed at six weeks, three months, six months and one year respectively. There was no statistically significant difference among two groups.In our study there was no significant difference with respect to pain, performing day to day activities and walking aid requirements among the two groups.

CONCLUSION

Fracture neck of femur is a geriatric disease more so common following a self-fall.Time required for surgery and blood loss is less in posterolateral approach then in direct lateral approach, but there is a slightly higher incidence of posterior dislocation in case of posterolateral approach.There is no statistically significant difference in the functional outcome at 3 weeks, 3 months, 6months and 1 year post-operatively between lateral and posterior approach.

The end functional results depend on the age of the patient, associated comorbidity and optimum post-operative rehabilitation.Both lateral and posterior approach in hemiarthroplasty are good options for treatment of displaced femoral neck fracture in elderly and can used as per surgeons preference.

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