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Original Research Article

Comparative outcome assessment of total hip arthroplasty versus bipolar hemiarthroplasty in intracapsular neck of femur fracture in old age

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ABSTRACT

Background: This prospective study aimed to compare the outcomes of total hip replacement (THR) and bipolar hemiarthroplasty for the treatment of displaced femoral neck fractures in elderly patients.
Methods: A total of 30 patients aged over 60 years with femoral neck fractures were included in the study, with 15 patients receiving a bipolar prosthesis and patients receiving THR between June 2021 and January 2023. The patients were followed up for 6 months postoperatively, with functional analysis conducted using the modified Harris hip score.
Results: The results showed that the modified Harris hip score was significantly higher in the THR group compared to the bipolar prosthesis group at day 1, 3, 6 and 12 months postoperatively. Pain levels were similar between the two groups at all follow-up intervals. Gait and range of motion were significantly higher in the THR group compared to the bipolar prosthesis group at all-time points.
Conclusions: Based on the short-term functional outcomes of this study, THR appears to be a preferable option over bipolar prosthesis for managing femoral neck fractures in elderly.

Keywords: Total hip replacements, Bipolar hip arthroplasty, Intracapsular neck of femur fracture, Old age

INTRODUCTION

Fracture of the femoral neck is a common injury among the elderly population and is associated with significant morbidity and mortality.[1,7-9] It presents a significant challenge to orthopaedic surgeons and remains a topic of ongoing research and debate in terms of optimal treatment and outcomes. The typical patient with a femoral neck fracture is characterized by old age, severe osteoporosis, and comorbidities.[2] The primary goal of treatment is to enable early ambulation for the patient. This can be achieved through surgical interventions such as the use of a primary prosthetic replacement, either a bipolar prosthesis or a total hip replacement (THR).[2,3,7,8] This study aims to evaluate the outcomes of patients with displaced femoral neck fractures who were treated with either THR or bipolar prosthesis using the modified Harris hip score and compare their results.[2-5] By assessing functional outcomes, this study aims to contribute to the existing body of knowledge regarding the treatment options for femoral neck fractures and provide insights into the best approach for maximizing patient mobility and overall outcomes.

METHODS

This prospective study was conducted at a tertiary care centre in the department of orthopaedics, Government Medical College and Hospital, Aurangabad after obtaining institutional ethical clearance between June 2021 and January 2023. Patients with displaced femoral neck fractures who presented to the emergency department were admitted and underwent surgical treatment. Patient records

were collected by taking their history and conducting examinations. Only patients who were independent in their activities of daily living prior to the trauma were included in the study. Patients with open fractures, suspected pathological fractures, associated fractures, head injuries, or those unable to afford surgical charges were excluded.

Patients were divided into two groups: group 1 received bipolar prosthesis, and group 2 received a THR. A total of 30 patients were included in the study, with 15 in the bipolar prosthesis group and 15 in the THR group. Detailed histories and clinical assessments were performed for each patient. Preoperatively, skin traction was applied to the affected lower limb for 2-3 days to relieve pain and prevent shortening and unnecessary movements. Analgesics were administered to manage pain. Radiographs of the affected hip joint and pelvis were taken for all patients.

Surgery was performed using the standard posterior approach. The majority of surgeries were conducted within 2-3 days after passing fitness for anaesthesia. Post-surgical rehabilitation was similar for both groups and included a joint-care program and rehabilitation protocol. Full weight-bearing and active exercises were initiated within the first three days after surgery, as tolerated. Patients were discharged following standard protocols after 5-7 days and continued rehabilitation during the study period. Modified Harris hip score was used for functional assessment at 1, 3, 6 and 12 months postoperatively.

Data were entered into Microsoft excel and analysed using MedCalc statistical software (trial version). The Mann-Whitney U test was used to compare age, duration of surgery, blood loss, and Harris hip score parameters between the two groups. The Chi-square test was used to analyse gender differences. A p value less than 0.05 was considered significant.

RESULTS

In our study mean age most common age group involved was 55-70 (Table 1).

Table 1: Age incidence.

Age in years	No. of patients (hemiarthro-plasty)	%	No. of patients (THR)	%
55-60	2	32	1	20
60-70	5	36	5	32
70-75	5	20	5	32
75-80	2	8	2	8
<80	1	4	2	8
Total	15	100	15	100

So in our study of 30 patient female preponderence is there in both group (Table 2).

Table 2: Sex incidence.

Gender	Hemiarthro-plasty	Total hip replacement	%
Male	6	7	46
Female	9	8	54
Total	15	15	100

In our study of 30 patients who are treated with THR and bipolar arthroplasty, Maximum patients were of type 4 followed by type. Patients followed by type 2 patients. According to Garden classification (Table 3).

Table 3: Type of IC neck of femur according to garden classification.

S. no.	Type	No. of cases	%
1	I	0	0
2	II	3	10
3	III	12	30
4	IV	15	50
	Total	30	100

In our study operative time was <120 min for 73.3% of THR and 86.7% for bipolarin. Our study operative time was >120 min for 26.7% of THR and 813.7% for bipolar (Table 4).

Table 4: Operative time (min).

S. no.	Time (min)	THR	%	Bipolar	%
1	<120	11	73.3	13	86.7
2	>120	04	26.7	02	13.3
3	Total	15	100	15	100

In our study of 30 patients, there is no any limb length discrepancy noted in 25 (83.3%) patients while 1 cm is seen in 4 (13.3%) patients and 1.5 cm lengthening seen in 1 (3.3%) patient (Table 5).

Table 5: Post op limb length discrepancy.

S. no.	Lengthening (cm)	THR	%	Bipolar	%
1	1	4	26.6	5	33.3
2	1.5	1	6.6	1	6.6
3	Not applicable	10	66.6	9	60
4	Total	15	100	15	100

In our study of 30 patients, 11 patients of total hip arthroplasty had no complications while 1 case each reported of nerve injury, surgical site infection, varus malposition, component loosening. 9 patients of bipolar had no complications while 1 case each reported of nerve injury, surgical site infection, varus malposition, component loosening (Table 6).

Table 6: Complications.

S. no.	Criteria	THR	Bipolar
1	Nerve injury	1	1
2	Periprosthetic fractures	0	1
3	Dislocation	0	1
4	Varus	1	1
5	Component loosening	1	1
6	Surgical site infection	1	1
7	No complications	11	9
8	Total	15	15

In our study of 30 patients, 15 patients of THR excellent outcome is seen in 6 (40%) patients. Also, good outcome is seen in 6 (40%) patients while 1 (6.67%) case of poor result. 15 patients of bipolar excellent outcome are seen in 1 (6.7%) patients and good outcome is seen in 8 (53.3%) patients while 1 (6.67%) case of poor result (Table 7).

Table 7: Modified Harris hip score at 1 month.

Result	THR	%	Bipolar	%
Excellent	6	40	1	6.7
Good	6	40	8	53.3
Fair	2	13.3	5	33.3
Poor	1	6.7	1	6.7
Total	15	100	15	100

In our study of 30 patients, 15 patients of THR excellent outcome is seen in 20% patients. Also, good outcome is seen in 60% patients while 1 (6.67%) case of poor result. 15 patients of bipolar excellent outcome are seen in 13% patients and good outcome is seen in 47% patients while 1 (6.67%) case of poor result (Table 8).

Table 8: Modified Harris hip score at 3 months.

HHS after 3 month	THR	%	Bipolar	%
Excellent (90-100)	3	20	2	13
Good (80-89)	9	60	7	47
Fair (70-79)	2	13	5	33
Poor (<70)	1	7	1	7

Table 9: Modified Harris hip score at 6 months.

HHS after 6 month	THR	%	Bipolar	%
Excellent (90-100)	4	26	2	13
Good (80-89)	8	54	5	33
Fair (70-79)	2	13	7	47
Poor (<70)	1	7	1	7

In our study of 30 patients, 15 patients of THR excellent outcome is seen in 26% patients. Also, good outcome is seen in 54% patients while 1 (6.67%) case of poor result. 15 patients of bipolar excellent outcome are seen in 13% patients and good outcome is seen in 47% patients while 1 (6.67%) case of poor result (Table 9).

In this study 12 month follow up shows no significant difference in Harris hip score (Table 10).

Table 10: Modified Harris hip score at 12 months.

HHS after 12 month	THR	%	Bipolar	%
Excellent (90-100)	4	26	2	13
Good (80-89)	8	54	5	33
Fair (70-79)	2	13	7	47
Poor (<70)	1	7	1	7

Figure 1: Uncemented THR IC neck of femur fracture.

Figure 2: Cemented THR in IC neck of femur fracture.

Figure 3: Bipolar in IC neck of femur fracture.

DISCUSSION

The goal of an orthopaedic surgeon in management of intracapsular neck of femur fracture is a pain free hip with adequate strength and mobility to permit normal activities and function. This is what a patient also expects from the surgeon, but none is perfect. the reason for this may be the complex phenomenon of human locomotion, demanding co-ordinated action of musculoskeletal component through conscious and subconscious neurological control and feedback mechanism.

Likewise, there is an ongoing debate regarding use or not use cement while fixing the stem in femoral canal. Proponents of each have their own views regarding merits and demerits but certain obvious points can be made from thereof. Cementless fixation has an advantage for obtaining a permanent fixation with bone which does not deteriorate with time. Secondly, in cementless fixation is accompanied by bony formation.

Pre-op planning is of utmost importance which includes selection of implant, offset measurements, leg length discrepancy. Leg length correction up to 4 cm is taken under consideration. >1 case of 5 cm correction had led to sciatic nerve injury.

Age

Shukla et al shows 68.5±6.5 mean age for bipolar hemiarthroplasty and 65.36±6.5 for total hip arthroplasty with p value 0.1235.[1] This prospective study included 47 patients of greater than 60 years of age and having fracture of neck of femur, out of which 25 patients were managed by cemented bipolar prosthesis and remaining 22 were managed by cemented THR.[4]

The mean age of patients was 73 years in hemiarthroplasty group and 78 years in THR group present study shows 74.2 mean age for bipolar hemiarthroplasty and 76.12 for total hip arthroplasty with p value 0.25, comparable with previous studies.[2]

Sex

Shukla et al shows 9 male and 16 female for bipolar hemiarthroplasty and 8 male and 14 female for total hip arthroplasty.[1] Sharma et al shows 45 male and 55 female in their study.[2] Present study shows 6 male and 9 female for bipolar hemiarthroplasty and 7 male and 8 female for total hip arthroplasty, comparable with previous studies.

Operative time

According to Blomfeldt et al, the duration of surgery was longer in the total hip replacement group (102 minutes (70 to 151)) versus 78 minutes (43 to 131) (p<0.001).[5] Shukla et al shows mean duration of surgery in the THR group (110.00 min) was significantly higher than the mean duration of surgery in the bipolar prosthesis group (82.12 min) (p<0.0001).[1] Mean operative time was 35 minutes in hemiarthroplasty group and 45 minutes in THR.[2] Mean of total duration of surgery was found to be 51.80±8.70 min in BHA group which was significantly lesser than 119.10±16.75 min of THA group (p<0.0001).[3] In present study operative time was >120 min for 26.7% 0f THR and 813.7% for bipolar.[4]

Blood loss

The mean blood loss in THR group (468.18 ml) was significantly higher than the mean blood loss in the bipolar prosthesis group (320.40) (p=0.015).[1] Total amount of blood loss while performing BHA was 238.15±20.43 ml compared to 336.85±23.56 ml in THR (p<0.0001).[3] Average intraoperative blood loss was 200 cc and 300 cc in hemiarthroplasty and THR respectively.[2] Intra-operative blood loss was increased 460 ml (100 to 1100) versus 320 ml (50 to 850) (p<0.001).[5] Present study mean blood loss in total hip arthroplasty was 307.46 ml. Mean blood loss in bipolar hemiarthroplasty was 204.2 ml which is comparable to previous studies.

Harris hip score

At six months, the Harris hip score was measured in both the groups.[1] The total score in the bipolar prosthesis group was 74.68 in comparison to 80.68 in the THR group. The difference was significant (p value <0.0001). At six months, there was no significant difference in the mean pain score of bipolar prosthesis group or the THR group (p value=0.083). Gait score, activity score and range of motion was significantly higher in THR than bipolar prosthesis group.[2] The mean Harris hip score was better in THR group as compared to hemiarthroplasty group at one year follow-up. The weighted mean of the Harris hip score was 81 points after THA versus 77 after HA.[6] The subdomain pain of the HHS (weighted mean score after THA was 42 versus 39 points for HA), the rate of patients reporting mild to no pain (75% after THA versus 56% after HA).

24-month follow-up, patients in BHA group had a mean modified Harris hip score of 83.85±6.62 and patients in THR group had a mean modified Harris hip score of 88.00±5.76 (p value=0.067).[3] Seven (35%) patients in BHA group and 11 (55%) patients in THR group had hip scores from 91 to 100 (excellent), 9 (45%) patients in BHA and seven patients (35%) in THR had hip scores 81–90 (fair) and 4 (20%) patients in BHA group and 2 (10%) patients in THR group were rated 71–80 (good) and none was found in poor category.

In present study of 30 patients, out of 15 patient of total hip arthroplasty excellent outcome is seen in (26%) patients and good outcome is seen in (54%) patients while 1 (6.67%) case of poor result. Out of 15 patients of bipolar hemiarthroplasty excellent outcome is seen in (13%) patients and good outcome is seen in 47% patients while 1 (6.67%) case of poor result. Results are comparable to

previous study and total hip arthroplasty shows better results than bipolar hemiarthroplasty.

In present study, we reported 1 (3.33%) case of sciatic nerve injury, 1 (3.33%) case of periprosthetic fracture, 1 (3.33%) case of dislocation, 1 (3.33%) case of varus, 1 (3.33%) case of surgical site infection in series of 30 patients. 80% patients had no complications. Limb length discrepancy of 1 cm in 4 (13.3%) cases and 1.5 cm in 1 (3.3%) case is noted. Deep vein thrombosis in present study there was 3 cases of deep vein thrombosis in total hip arthroplasty and 1 case of deep vein thrombosis in bipolar hip arthroplasty. Surgical site infection is controlled by pus culture report and antibiotics are given according to sensitivity after debridement is done. Infection subsided and patient got back to daily activities. Dislocation is found in one patient of bipolar hemi arthroplasty. Dislocation occurred at home as patient did squatting in immediate postop one month. Dislocation is reduced under general anaesthesia. And patient is kept on long knee brace to avoid flexion of hip and knee and kept in wide abduction for 1 month. Patient is strictly advised to keep limbs in abducted position, avoid squatting and cross-legged position, avoid log rolling and flexion at hip joint at time of discharge. Periprosthetic type B2 Vancouver classification is seen in one patient in 1-year postoperative period due to fall at home. Patient is elderly and osteoporotic. There is poor bone stock. Revision arthroplasty is done with long femoral stem and bone grafting and cerclage done. And patient is advised delayed weight bearing and taught static quadriceps and ankle exercises sciatic nerve palsy in one patient occurred was followed up for 1 year. She had foot drop and weakness of ankle dorsiflexors. Foot drop splint applied. She did not improve. Nerve exploration and neurolysis done and patient is now improving.[9-25]

Limitations

The study's primary constraints encompassed a limited sample size and a short follow-up period. To conduct a thorough investigation of postoperative complications, an extended observation period would be essential.

CONCLUSION

Total hip replacement is the best option for patients with intracapsular neck of femur fracture in old age.

Recommendations

Careful pre-op planning, good and sterile operative technique, best selection of implant, good post-op physiotherapy and precautions taken by patients help in minimizing complications. The overall clinical and functional outcome has shown excellent results in our study. Durability of implant depends upon the patient activities.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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