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Dr. Sachindra Nayak Kapadi
Post Graduate, Department of
Orthopedics, Sri Devaraj Urs
Medical College, SDUAHER,
Kolar, Karnataka, India

Dr. Prabhu E
Associate Professor Department
of Orthopedics, Sri Devaraj Urs
Medical College, Sduaher. Kolar,
Karnataka, India

Dr. Arun HS
Professor, Department of
Orthopedics, Sri Devaraj Urs
Medical College, SDUAHER,
Kolar, Karnataka, India

Dr. Cecil Fernando
Post Graduate, Department of
Orthopedics, Sri Devaraj Urs
Medical College, SDUAHER,
Kolar, Karnataka, India

Functional outcome of displaced fracture neck of femur in elderly treated by bipolar hemiarthroplasty versus total hip arthroplasty

Dr. Sachindra Nayak Kapadi, Dr. Prabhu E, Dr. Arun HS and Dr. Cecil Fernando

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Abstract

With a reversing ageing pyramid and an increasing incidence of osteoporosis, hip fracture especially fracture neck of femur is an established public health concern globally. The purpose of this study is to analyze and compare the role of total hip arthroplasty and bipolar hemiarthroplasty in elderly patients with displaced fracture neck of femur. The data of 54 elderly patients who underwent either total hip arthroplasty or bipolar hemiarthroplasty for displaced fracture neck of femur from June 2014 to June 2016 fitting into the inclusion criteria were included in this parallel group comparative study. The peri-operative and post-operative data as well as the functional outcome at 4 and 12 months post-operatively were obtained, analyzed and compared between the two groups. From our study it was found that the blood loss and the operative time was significantly more in the total hip arthroplasty group. However the functional outcome at the end of 12 months of follow up was significantly better in total hip arthroplasty group. We concluded that both total hip arthroplasty and bipolar hemiarthroplasty give satisfactory outcome in elderly patients with displaced fracture neck of femur. However total hip arthroplasty is superior to bipolar hemiarthroplasty in the treatment of mentally competent, independent active patients with relatively low co-morbidities with displaced fracture neck of femur.

Keywords: fracture neck of femur, total hip arthroplasty, bipolar hemiarthroplasty

1. Introduction

Demographic Changes in the next 60 years will lead to a huge increase in the elderly population in Asia, South America and Africa [1]. With this reversing ageing pyramid and an increasing incidence of osteoporosis, hip fracture especially fracture neck of femur is an established public health concern globally [2]. It is estimated that the number of these fractures is 1.26 million cases annually worldwide, which is expected to amount to 2.6 million cases in 2025 and to 4.5 million cases in 2050.

Despite the great knowledge about the epidemiology and prognosis of fracture neck of femur, the ideal treatment modality is still a long way from reality. The dilemma is whether to internally fix the fracture or to replace the joint with an endoprosthesis. In undisplaced fractures and in fractures in the young, internal fixation is the preferred treatment modality [3].

There was a generalized opinion among orthopedic surgeons that hemiarthroplasty is the treatment of choice in elderly patients with displaced fracture neck of femur. However Meta analysis of recent randomized studies have shown a more favorable functional outcome with total hip arthroplasty in elderly patients who are relatively healthy both mentally and physically [4, 5].

A landmark study was done by Richard blomfeldt *et al.* in Sweden comparing the results of primary total hip arthroplasty done in fracture neck of femur in the elderly with that of secondary total hip replacement done in case of failed internal fixation and hemiarthroplasty. Health related quality of life was significantly better in the patients treated primarily with total hip arthroplasty and that the outcome of total hip arthroplasty as a salvage procedure would indeed give an inferior outcome as compared to primary total hip arthroplasty [6].

Correspondence

Dr. Prabhu E
Associate Professor Department
of Orthopedics, Sri Devaraj Urs
Medical College, Sduaher. Kolar,
Karnataka, India

This challenged the concept of total hip arthroplasty as a secondary salvage procedure after a trial with internal fixation or hemiarthroplasty.

Richard Iorio *et al.* published a study on the various treatment modalities of fracture neck of femur in the elderly with special emphasis on the cost effectiveness of each modality. A cost benefit analysis was formed incorporating the inpatient hospital costs, the rehabilitation costs, and the probabilities of reoperation prorated over the first 2 years after surgery for all four surgical interventions in various orthopedic literature. It was found that Total hip arthroplasty offered a more functional, cost-effective, and enduring arthroplasty result than bipolar or unipolar hemiarthroplasty [7]. Paul T.P.W Burgers *et al.* published a Meta analysis of randomized trials on treatment of fracture neck of femur in elderly by total hip arthroplasty and hemiarthroplasty. It was seen that total hip arthroplasty was associated with higher rate of dislocation and mortality [8]. Also total hip arthroplasty has been found to have higher blood loss and increased need of post-operative blood transfusions.

The overall conclusion is that there is inadequate evidence to support the choice between the two types of arthroplasty. Hence the title of 'the unsolved fracture' for fracture neck of femur given by Dickson [9] in 1953 still holds good to this day!

The purpose of this retrospective study is to analyze and compare the role of total hip arthroplasty and bipolar hemiarthroplasty in elderly patients with displaced fracture neck of femur.

2. Materials and Methods

The study was done in the orthopedics department of R.L. Jalappa charitable hospital attached to the Sri Devaraj Urs medical college in Kolar. The data of 54 patients who underwent either total hip arthroplasty or bipolar hemiarthroplasty for fracture neck of femur from June 2014 to June 2016 fitting into the inclusion criteria were included in this retrospective parallel group comparative study. The study was conducted after institutional ethical clearance. The data was primarily collected from the medical records section of the hospital.

Inclusion criteria – 1) Patients of age more than 55 years (elderly) 2) Gardens type III /IV fracture neck of femur

Exclusion criteria – 1) morbidly obese patient 2) Patients with

psychiatric and neurological illness at the time of surgery / during the subsequent follow up 3) patients who had symptoms of rheumatoid / Osteoarthritis before the fracture

A total of 54 patients, of which 27 each were operated with cemented bipolar hemiarthroplasty and cemented total hip arthroplasty were selected for the study. All surgeries were performed within an average period of 4.2 days for bipolar hemiarthroplasty and 3 days for total hip arthroplasty. The mean age in bipolar hemiarthroplasty group was 80.7 (70 – 89) and 80.5 (70.2 – 89.7) in the total hip arthroplasty group. The demographic data were comparable in the two groups and the difference was statistically insignificant.

Table 1: Baseline demographic data of all the patients

Characteristics	Bipolar	THA
Mean Age	80.7	80.5
Sex(M:F)	11:16	19:8
Mode(Fall:Rta)	25:2	19:7
Side (R:L)	17:10	14:13

Of the 27 fractures in bipolar hemiarthroplasty group, 9 were gardens type III and 18 were gardens type IV. In the total hip arthroplasty group out of 27 cases, 8 were gardens type III and 19 were gardens type IV fracture neck of femur. As per the department protocol for arthroplasty all the patients were operated in lateral decubitus position by either posterolateral / posterior approach to the hip. Antibiotic prophylaxis was followed (1.2 gm IV amoxicillin with clavulanic acid 30 minutes before procedure) as per hospital antibiogram. All the cases were operated by one of the three lead surgeons of the hospital.

As a hospital policy every post-operative follow up of a patient is attached to the original file at the medical records section, which was obtained for the data for this study. The peri operative data that were assessed and compared between the two groups were – operative time (OT), intra-operative blood loss (BL) and blood transfusion units (BTU). Post operative data that were assessed and compared between the two groups were – complications specific to the hip (CH), general complications (CG) and the mean hospital stay (SD)

The functional assessment was assessed by the Harris hip score (HHS). For the sake of uniformity the functional assessment of patients of the two groups at 4 months and 1 year post operatively were obtained and compared.



Fig 1: A. pre operative x ray of gardens type IV fracture neck of femur. B. Post operative x-ray of surgery with bipolar hemiarthroplasty

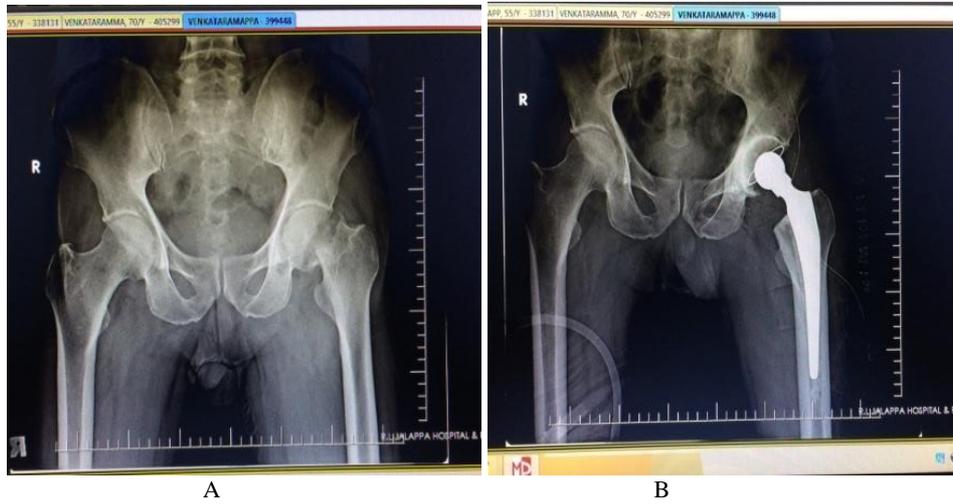


Fig 2: A- gardens type IV fracture neck of right femur. B-post operative X ray of surgery with Total hip arthroplasty

3. Results

3.1 Demographics -The study included 27 patients in each group consisting 16 females and 11 males in the bipolar hemiarthroplasty group whereas in the total hip arthroplasty group there were 8 females and 19 males. In both groups mainly the mode of injury was self-fall. The patients in both the groups were comparable in their demographics (p value > 0.001)

3.2 Peri operative data-It was found that the mean operative time was significantly longer in the total hip arthroplasty group with 100 minutes (70 -151 minutes) as compared to the bipolar hemiarthroplasty surgery with 78 minutes (43 – 131 minutes). Also the intra – operative blood loss was significantly more in the total hip arthroplasty group 460 ml (100-1100 ml) versus 320 ml (50 – 850 ml) in the bipolar hemiarthroplasty group. The blood transfusion units required was comparatively more in the total hip arthroplasty (270 ml versus 200 ml) but was statistically not significant. (Table 2)

Table 2: Peri-operative data of all patients

Characteristics	Bipolar	Tha	P-Value
Operative Time (Mins)	78	100	<0.001
Intra-Operative Blood Loss (ml)	320	460	<0.001
Blood Transfusion Units (ml)	200	270	0.322

3.3 Post-operative data – it was found that the mean hospital stay was 5.4 days in the hemiarthroplasty group and 7 days in

the total hip arthroplasty group. There were two cases of prosthetic dislocation in the total hip arthroplasty group. Both were promptly reduced under general anesthesia in the OT and the functional outcome was good thereafter. There was one case of superficial surgical site infection in a bipolar hemiarthroplasty case. This was dealt with by wound debridement and antibiotics. Secondary suturing was done once the infection subsided and the patient’s progress was uneventful since then. The rate of generalized complications was low in both the groups with one case of urinary tract infection in a case of total hip arthroplasty and two cases with bed sore in bipolar hemiarthroplasty. There were no cases with deep vein thrombosis, pneumonia, pulmonary embolism. There was no mortality at the end of 1 year in both the study groups. (Table 3).

Table 3: post-operative data of all patients

Characteristics	BIPOLAR	THA
Complications Related To Hip		
Generalised Complications	1	1
Uti	-	1
Bed Sores	2	-
Dvt	-	-
Embolism	-	-
Pneumonia	-	-
Mortality	-	-

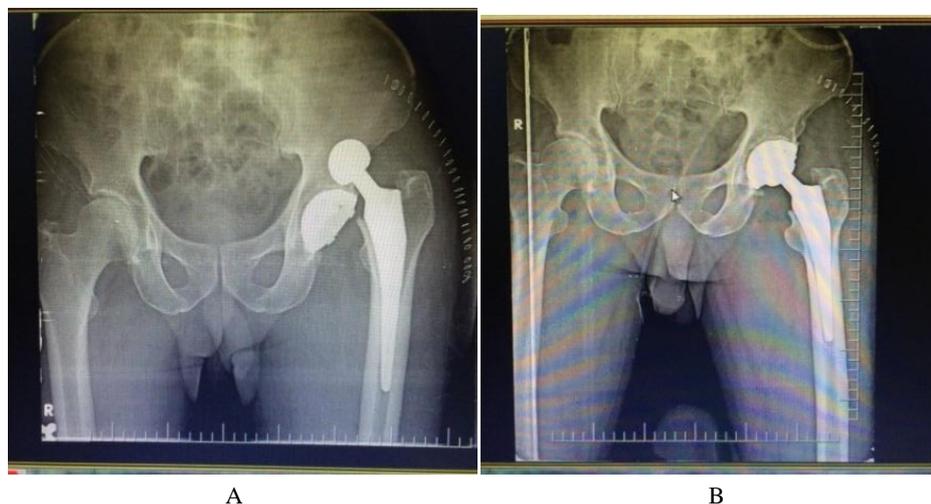


Fig 3: A. case of prosthetic dislocation in the THA group. B. post reduction X ray

3.4 Functional outcome-The mean harris hip score at 4 months follow up was slightly better in the total hip arthroplasty group with 82.5(45.0-99.9) than the bipolar hemiarthroplasty group 77.5 (47.7 to 100). However this difference was not statistically significant.

However there was significant difference in the mean harris hip score between the two groups at the 1 year post-operative follow up with a score of 86.2 (58.6 to 100) in the total hip arthroplasty group as compared to 79 (50.0 to 99.8) in the bipolar hemiarthroplasty group (p value <0.001)

Table 4: functional outcome by harris hip score at 4 months and 1 year post op follow up

Characteristics	Bipolar	Tha	P- Value
4 Months	77.5 (47.7 To 100)	82.5(45.0-99.9)	0.011
1 Year	79 (50.0 To 99.8)	86.2 (58.6 To 100)	<0.001

4. Discussion

54 elderly patients with displaced fracture neck of femur (gardens type III & IV) who underwent hip arthroplasty by either bipolar hemi arthroplasty or total hip arthroplasty were included in a parallel comparative study. The results obtained have been presented here. We compared our results with other landmark studies that were present in the literature.

The patients were predominantly elderly females following a simple fall rather than following high velocity Road traffic accidents. This was in accordance with other studies in the literature. Allover the world it is found that fracture neck of femur is almost two times more common in women than men. This could be explained by the lower bone mass and increased incidence in trivial trauma in women ^[10].

The blood loss was significantly more in the total hip arthroplasty group and required more post-operative blood transfusion. This could be attributed to the acetabular component preparation and the longer operative time that is associated with THA but not with bipolar hemiarthroplasty. The operative time was significantly longer with total hip arthroplasty. In a study by macaulay. W *et al.* showed only 7 minutes longer average operative time as compared to the bipolar hemiarthroplasty group and this difference was not significant statistically ^[11].

The incidence of complications related to the hip were low and consisted of one prosthetic dislocation in the total hip arthroplasty group and one superficial surgical site infection in the bipolar hemiarthroplasty group. prosthetic dislocation is a well-known complication in total hip arthroplasty. various studies have reported dislocation rates ranging from 2.3% by Gebhard. J.S *et al.* ^[12] to 12.5% in a study by Skinner. P *et al.* ^[13]. In this study only posterior and postero lateral approach were used. In a study done by Enocsons. A *et al.* on total hip arthroplasty, it was stated that the use of the antero-lateral approach to the hip was associated with the lower rates of dislocation at 2 % while the postero-lateral approach was associated with the highest rate of dislocation at 14% ^[14].

The functional outcome by the Harris hip score was comparable at 4 months follow up. This was in accordance with many studies which showed comparable results between total hip arthroplasty and bipolar hemi arthroplasty up to 4 months. However there was significant difference in the Harris hip score at 1 year follow up with total hip arthroplasty having better functional outcome. This may be due to the acetabular erosion that may be present early and may not be evident radiologically.

5. Conclusion

Both total hip arthroplasty and bipolar hemiarthroplasty give satisfactory outcome in elderly patients with displaced fracture neck of femur. However from our study it is evident that total hip arthroplasty is superior to bipolar hemiarthroplasty in the treatment of mentally competent, independent active patients with relatively low co morbidities.

6. Limitations

Retrospective nature of the study. Lack of radiological outcome evaluation and comparison. Hence long term, randomized controlled trials are required to further assess the outcome in an Indian population.

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