

ORIGINAL RESEARCH

A longitudinal study of functional outcome of fracture of neck of Femur in elderly patients treated by Cemented Bipolar prosthesis

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ABSTRACT

The standard of care for fracture neck of femur in an older individual remains hemiarthroplasty of the hip. Initially the implant for hemiarthroplasty of the hip was a unipolar prosthesis such as Austin Moore prosthesis and the Thomsons prosthesis. But over the years it was noted that the use of these implants in patients who often have severe osteoporosis led to progressive acetabular erosion and protrusion ultimately leading to their failure. Cases were selected from the elderly patients with displaced fracture neck of femur who required hemiarthroplasty with cemented bipolar prosthesis who satisfied the inclusion and exclusion criteria. After taking consent patients were evaluated clinically and radiologically. All patients selected for study were examined according to protocol. The Laboratory investigations were carried out in order to get fitness for surgery. Mean HHS for males was 84.40 and for females was 85.16 (P value was 0.71). This is statistically insignificant. This shows that cemented bipolar arthroplasty gives similar good results in both males and females at one year follow up.

Key words: Functional outcome, fracture neck of femur, cemented bipolar prosthesis

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INTRODUCTION

Total hip replacement as a treatment of fracture neck of femur can be done as a primary procedure in a physiologically active older patient, or as a salvage procedure following failed internal fixation, or as revision following failed hemiarthroplasty. However it has a few disadvantages namely longer operative time, more blood loss requiring transfusion, costlier implants and longer hospital stay.¹

The standard of care for fracture neck of femur in an older individual remains hemiarthroplasty of the hip. Initially the implant for hemiarthroplasty of the hip was a unipolar prosthesis such as Austin Moore prosthesis and the Thomsons prosthesis. But over the years it was noted that the use of these implants in patients who often have severe osteoporosis led to

progressive acetabular erosion and protrusion ultimately leading to their failure. To reduce the wear between the metal implant surface and acetabular surface the bipolar prosthesis was developed in 1974 by Bateman⁶, where he used the Charnley low friction principle in the treatment of fracture neck of femur.²

The bipolar implants used nowadays have been designed to have a completely mobile head element, and a second head surface for motion in the acetabulum, creating a compound system providing a greater distribution for the bearing surfaces, and so minimizing wear and tear both on the implant and the tissues. The internal head is locked onto an UHMW polyethylene bearing insert (low friction universal joint). This polyethylene is then capped with a metallic cup, forming a second bearing surface for the

acetabulum. The device is only fixed through the femoral stem. The friction differential means that even very small acetabular irregularities favours movement at the inner bearing, decreasing outer shell action on the acetabulum, and hence diminishing the amount of acetabular wear, erosion and protrusion. In addition because of the compound bearing surface, it has been postulated that the bipolar design would provide a greater overall range of motion than unipolar and total hip designs.^{3,4}

METHODOLOGY

Patients above the age of 60 years who presented with fracture neck of femur and treated using cemented bipolar prosthesis in the Department of Orthopaedics, were included in the study. After obtaining approval from Hospital Ethics Committee and getting written informed consent from patients.

STUDY DESIGN

This was a longitudinal study with retrospective data collection and prospective analysis included patients who were treated surgically based on inclusion and exclusion criteria.

SAMPLE SIZE: 98.

INCLUSION CRITERIA

1. Patients with fracture neck of femur with displacement (GARDEN type (III, IV)).
2. Patients with age >60 years.
3. Patients who had given informed consent for operative care.
4. Patients with minimum follow up of 1 year.

EXLUSION CRITERIA

1. Patients with age < 60 years.
2. Patients medically unfit for anesthesia.
3. Patients with pathological fracture.
4. Patients with Ipsilateral lower limb fracture which interferes with functional outcome.

5. Bilateral cases.
6. Patients with preexisting inflammatory or degenerative arthritis of the injured hip.
7. Patients who have not given consent for study.
8. Patients who were lost to follow up during the study period.
9. Patients who underwent other modalities of treatment.

METHOD OF COLLECTION OF DATA

Cases were selected from the elderly patients with displaced fracture neck of femur who required hemiarthroplasty with cemented bipolar prosthesis who satisfied the inclusion and exclusion criteria. After taking consent patients were evaluated clinically and radiologically. All patients selected for study were examined according to protocol. The Laboratory investigations were carried out in order to get fitness for surgery.

PRE-OPERATIVE PROTOCOL INJURY SURGERY INTERVAL

All surgeries were done at the earliest time at which the patients were fit for anesthesia. If needed optimization of the patient's general condition requiring delay of day or two was accepted.

PRE-ANAESTHETIC CHECK UP

Blood investigations, X-ray of the chest posteroanterior view and ECG were routinely done and a detailed preanaesthetic evaluation regarding fitness for surgery was done in all patients. If the patient needed further specialist evaluation and investigation, according to the anaesthesia team this was done. Blood was taken for grouping and cross matching and two units of blood were arranged. If the patient needed any intervention to improve fitness for surgery such as blood transfusion or other medical interventions, this was done. A dose of intra venous antibiotic (cefoperazone + sulbactam 1 gram) was given one hour before surgery.

RESULTS

Table 1: Distribution based on Radiological parameters

| Radiological parameters | | Number |
|-------------------------|---------------|-------------|
| Femoral stem position | Central | 46 (46.94%) |
| | Varus | 3(3.06%) |
| | Valgus | 49(50%) |
| Cement mantle | Less than 2mm | 11 (11.23%) |
| | 2mm or more | 87 (88.77%) |
| Horizontal offset | Normal | 76 (77.55%) |
| | Increased | 20 (20.41%) |
| | Decreased | 2 (2.04%) |
| Vertical offset | Normal | 92 (93.89%) |
| | Increased | 1 (1.01%) |
| | Decreased | 5(5.1%) |
| Version | Anteversion | 96 (97.96%) |
| | Neutral | 2(2.04%) |
| | Retroversion | 0 |

There were 42 (42.86) patients with Good functional outcome, 33.68% of patients had Excellent result, 17(17.34%) had Fair result and 6.12% had poor

functional outcome. Mean Harris hip score at one year was 84.92.

Table 2: Distribution based on Functional outcome

| | n | % | Mean | SD |
|-----------|----|-------|-------|------|
| Excellent | 33 | 33.68 | 93.96 | 2.49 |
| Good | 42 | 42.86 | 84.0 | 1.91 |
| Fair | 17 | 17.34 | 76.26 | 1.59 |
| Poor | 6 | 6.12 | 38.50 | 2.12 |

(ANOVA) ($p < 0.05$ -Significant*, $p < 0.001$ ** highly significant), Mean HHS score is 84.92 (9.56)

P value of our study is 0.001, which is highly significant.

insignificant. This shows that cemented bipolar arthroplasty gives similar good results in both males and females at one year followup.

Mean HHS for males was 84.40 and for females was 85.16 (P value was 0.71). This is statistically

Table 3: Distribution based on Gender and HHS

| | Mean | SD | P value |
|--------|-------|-------|---------|
| Male | 84.40 | 11.09 | 0.71 |
| Female | 85.16 | 8.89 | |

(Independent t test) ($p < 0.05$ -Significant*, $p < 0.001$ ** highly significant)

Table 4: Distribution based on Injury surgery interval and HHS

| Days | Mean | SD | P value |
|--------------------------------------|-------|-------|---------|
| A (surgery within 48 hours) | 84.53 | 10.64 | 0.58 |
| B (surgery between 48 hrs to 1 week) | 86.52 | 6.63 | |
| C (surgery after 1 week) | 83.0 | 7.74 | |

When the time to surgery was correlated to HHS no significant correlation was found ($P = 0.58$). This

indicate that a delay in surgery did not adversely impact the functional outcome after surgery.

Table 5: Distribution based on Comorbidities and HHS

| Condition | Mean HHS | SD |
|-------------------|----------|------|
| Hypertension | 83.2 | 9.54 |
| Diabetes Mellites | 81.6 | 6.89 |
| CAD | 79.4 | 7.56 |
| COPD | 80.2 | 8.5 |

Mean HHS for HTN was 83.2, DM was 81.6, CAD was 79.4, COPD was 80.2. Patients with comorbidities have lesser Mean HHS compared Average HHS (84.92) of study.

DISCUSSION

In our present study we were able to maintain good femoral stem position in 87.7% of patients (45.9% valgus, 41.8% in central). In 87.77% patients, cement mantle were adequately distributed all around the stem of the prosthesis. We were able to maintain the prosthesis in adequate ante version (97.96%) so that the incidence of posterior dislocation were low. Of the 2 dislocated cases, one had neutral version and the other had ante version. There were no significant limb length discrepancy noted among patients signify that the vertical as well as horizontal offset were appropriate.

In a study by Sakthivel N *et al.*⁵, there were 40% of cases in Valgus stem position, 44% cases of central stem position which is comparable to our study.

In our study we had 2(2.04%) superficial infection, and were treated by IV antibiotics and drainage of the collection. The infections got subsided. According to the study by Saberi *et al.*⁶

There were 4 (2.66%) infection, and Kalantri *et al.*⁷ had 20% superficial infection. Lesser infections in our study may be due to the optimum operation theatre environment in the hospital.

3(3.06%) patients had pulmonary embolism detected in early post-operative period. In spite of giving DVT pump and Anti thrombotic drugs 1 male and 2 females developed pulmonary embolism. Which diagnosed by Xray and Echo Cardiography. They were treated by Heparin and improved. In the study by Saberi *et al.*, 2.66% developed pulmonary embolism (2(1.33%) males and 2(1.33%) females). Kalantri *et al.* study

showed 3.3% of pulmonary embolism which are comparable to our study.

In the present study, 2(2.06%) females patients developed grade two pressure sore and those were patients whom we operated late. The sore healed following ambulation and proper pressure sore care. Study by Sadegh Saberi and *et al.*⁶ showed 2(1.33%) pressure sore cases which were males. One of our patient had DVT diagnosed by doppler study was treated with low molecular weight heparin. The patient improved.

2(2.04%) had intra operative periprosthetic fracture; They had Vancouver type-B2 periprosthetic fracture and was treated with fixation with multiple circlage wiring. 1 patient had cement extrusion detected postoperatively and didn't require any treatment.

In a study by PS Maini *et al.*⁸ showed 3% acetabular erosion, 3.7% femoral stem loosening which was higher compared to present study. In our study we had 2 (2.04%) Acetabular erosion, 1 (1.02%) loosening were found. At present the patients are ambulant but they may require a revision procedure later. Lower incidence of complications in our study may be due to the shorter follow up period compared to the 10 year study done by PS Maini *et al.* 2(2.04%) patients developed posterior dislocation in the initial post-operative days, which were reduced by manipulation under anaesthesia and skin traction were given. In Sadegh Saberi and *et al.*⁶ study 10 (6.66%) had dislocation. Prokop A *et al.* study there were 10 (3%) dislocation. Compared to those studies we had lesser number dislocations.

Patients with complications like Acetabular erosion, Posterior dislocation, Periprosthetic fractures, Prosthesis loosening had poor Harris hip score.

There were 42 (42.86%) patients with Good functional outcome, 33 (33.68%) of patients had Excellent result, 17(17.34%) had Fair results and 6.12% had poor functional outcome. Mean harris hip score at one year was 84.92.

When compared to other studies we got similar functional outcome, almost in all the studies there were satisfactory results for 70 to 80 % of the patients. Our mean HHS was comparable with Venkateswara Rao *et al.* Prasad K D *et al.* study.^{9,10}

CONCLUSION

Cemented Bipolar Hemiarthroplasty provided immediate stability and freedom from pain and sense of security in fracture neck femur. Bipolar hemiarthroplasty for the unstable hip fractures in the elderly has good results with early mobilization and minimal complications. With proper postoperative rehabilitation, the patients can get back to his or her normal life at the earliest. This ultimately affects the general health of the patients and reduces morbidity and mortality. Therefore, bipolar hemiarthroplasty can be considered as one of the best techniques for displaced neck of femur fractures in the elderly.

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