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Prospective study of functional outcome in surgical management of intracapsular femur neck fracture treated using modular bipolar prosthesis in elderly

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Abstract

Background: Displaced femoral neck fractures are common in the elderly patient, it is predicted that, the number of hip fractures would triple by 2050, and these patients are subjected to an increased disability, morbidity, and mortality. The optimal treatment for displaced fracture neck of femur with best clinical outcome is still inconclusive and determined by the mobility and functional demands of the patient.

Materials and Methods: Thirty cases of fracture neck of femur in elderly patients above the age of 60 years treated by hemiarthroplasty using bipolar prosthesis between November 2018 to May 2020 were selected according to inclusion and exclusion criteria. Cases were followed up for 6 months and the short term functional results were analysed by using modified Harris hip score.

Results: out of 30 patients, most of the patients were in the age group of 60 to 70 years with mean average age of 68.9 years. Females were predominant, there were 36% excellent results and 43% good results.

Conclusion: Modular Bipolar hemiarthroplasty for fractures neck femur provides better range of movement, freedom from pain and more rapid return to unassisted activity with an acceptable complication rate. The end functional results depend on the age of the patient, associated co-morbidity and optimum post-operative rehabilitation. Early functional results are satisfactory.

Keywords: femur neck fracture, hemiarthroplasty, modular bipolar prosthesis, harris hip score

Introduction

Hip fractures in the elderly represent a major public health concern, account for a quarter of all fractures in patients aged 75 years and over [1, 2]. It is predicted that, the number of hip fractures would triple by 2050 [3], and these patients are subjected to an increased disability, morbidity, and mortality [4].

The optimal treatment for displaced fracture neck of femur with best clinical outcome is still inconclusive [5]. And determined by the mobility and functional demands of the patient, two widely accepted options, i.e. monopolar or bipolar hemiarthroplasty (HA) and total hip arthroplasty (THA) both with optional use of bone cement in elderly are superior to internal fixation in terms of mobility, reoperation and functional outcome [6].

Bipolar prosthesis over monopolar prosthesis have higher percentage of satisfactory results, less post-operative pain, greater range of movements, more rapid return to normal routine and reduced frequency of acetabular erosion [7, 8], on the other hand THR is associated with increased operative time, increased blood loss and increased risk of dislocation [9].

Hemiarthroplasty done with a modular bipolar prosthesis, has the advantage of converting to total hip arthroplasty in future by adding the acetabular cup and allowing changes in length and offset following cementation during operation [10].

Conceptually, the modular hemiarthroplasty design provides the surgeon with multiple options to restore leg length and femoral offset with a range of stem sizes, with different offset options, and head sizes that allow for minor adjustments during surgery.

This study aims to assess the functional outcome of modular bipolar hemiarthroplasty in NOF fractures in elderly.

Methods and methodology

This is a prospective study of 30 cases of fracture neck of femur in elderly patients above the age of 60 years treated by hemiarthroplasty using modular bipolar prosthesis which were admitted to SGITO, Bangalore, Karnataka between November 2018 to May 2020 were included after obtaining the permission from the Institutional Ethical Committee.

Patients with age group >60yrs of either sex and ambulatory, patient with intracapsular femur neck fracture, neglected femur neck fracture more than 3-4 weeks old in elderly patients, ability to understand the content of the subject information / informed consent form and to be willing to participate in the clinical investigation were included patients <60 yrs. of age, compound femur neck fractures, pathological fractures, polytrauma patients, Not willing to give informed written consent.

Cases were followed up for 6 months and the short term functional results were analysed by using Harris hip score.

Surgical approach-southern moore's posterior approach to the hip After induction of either spinal or epidural anaesthesia the patient was placed on the lateral position on the operative table with the affected side facing up. A curved incision is taken from 8 cm distal to the posterior superior iliac spine, extended distally and laterally, parallel with fibers of gluteus maximus muscle to the posterior margin of the greater trochanter. The incision is then directed distally 5 -8 cms along the femoral shaft. The deep fascia is exposed and divided in line with the skin incision. By blunt dissection the fibers of the gluteus maximus are separated taking care not to disturb the superior gluteal vessels in the proximal part of the exposure. The gluteus maximum muscle is split and short external rotators are exposed. Stay sutures are applied to the short external rotators, and a tenotomy of the short external rotators is done close to their insertion on the inner surface of the Greater trochanter. The short external rotators are retracted to protect the sciatic nerve and expose the posterior hip capsule. The capsule is incised by a T-shaped incision, and the hip flexed, adducted and internally rotated to dislocate the hip joint. Using a head extractor and bone levers, head is delivered out of the acetabulum and the acetabulum is cleared of debris. The size of the extracted head is measured by measuring gauze, and the size of prosthesis is selected. Preparation of proximal femur, The neck is trimmed leaving 1cm medial calcar, on which the shoulder of the prosthesis would eventually sit. The proximal femur was reamed with rasp, the length of the rasp corresponding to the stem of the prosthesis. The direction of the insertion of the rasp for was ascertained by using the lesser trochanter as a guide to achieve correct seating of the prosthesis in 10-15° anteversion. Insertion of the modular bipolar prosthesis, the appropriate sized femoral head component and neck component selected intraoperatively. The final seating of the prosthesis is by gentle blows with the help of a mallet and the inserter. Adequate seating of the prosthesis on the calcar is visualized directly. The hip joint is reduced by gentle traction with external rotation of the hip and simultaneous manipulation of the head of the prosthesis into the acetabulum. The range of movement in all directions is checked by taking the joint through the whole range of movements. The stability of the prosthesis and its tendency to dislocate is checked by flexing and adducting the hip. The limb is kept in slight abduction and external rotation for suturing the wound. Great care is taken to achieve adequate closure of the posterior capsule and anatomical reattachment of the short external rotators. The rest of the wound is closed

in layers over a suction drain placed beneath the gluteus maximus. Hemostasis is maintained throughout the procedure. In 10 patients 43 mm prostheses were used. Cemented stems were used in 19 cases and Uncemented in 11 cases. The advantage was that the rasp corresponded to the exact length and width of the prosthesis which prevented any additional broaching of the canal and subsequent loose seating of the prosthesis or fractures of the femur. The medullary canal was washed with normal saline. Cement was prepared and finger packing into the canal was done. The prosthesis was then inserted maintaining correct anteversion.

Postoperative protocol

All the patients who were operated were kept in supine position with the involved lower limb in 20-30°abduction. The drain was removed between 24-48 hours depending on the amount of collection. Perioperative prophylaxis of Ceftriaxone-S given 1.5g 8th hourly intravenous was continued for the first 5 -7 days. The wound was inspected at the time of drain removal and at the time of suture removal. If however, there was soakage of the dressing or if patient had high fever the wound was inspected accordingly. Most of our study patients were mobilized in bed on day one of surgery and with weight bearing as tolerated using a walker, within the 72 hours postoperative period. Patients were initially advised to touch weight bearing and later advised progress to full weight bearing as tolerated. The sutures were removed between 10-14 days. The patients were examined before discharge for the evidence of any infection at the operated site.

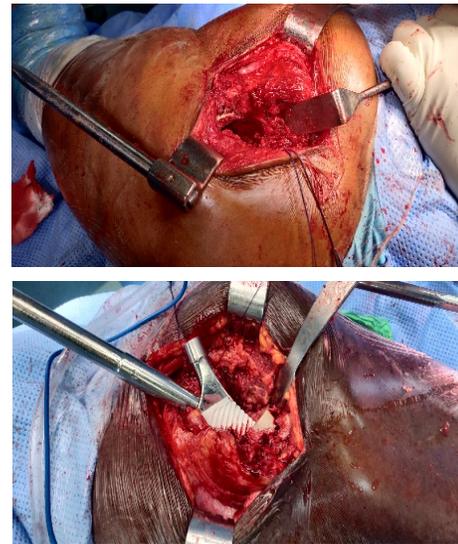


Fig 1: femoral canal preparation and insertion of modular femoral prosthesis



Fig 2: preop- radiograph

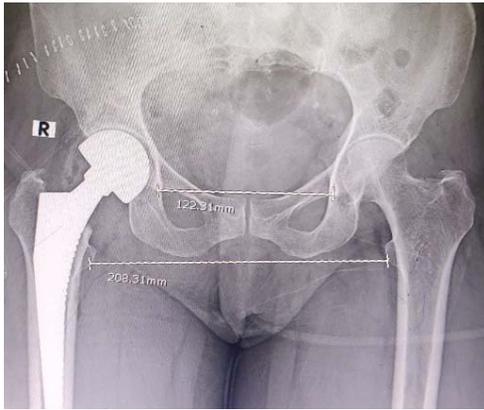


Fig 3: post –op radiograph

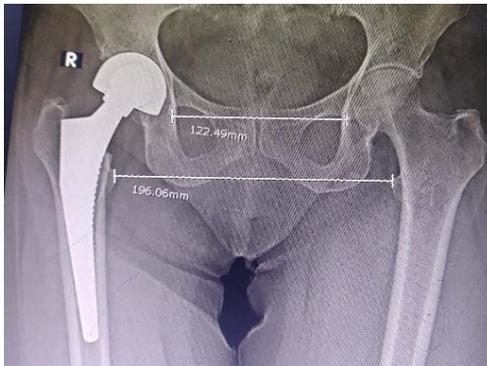


Fig 4: final followup

Observations and Results

The average age was noted to be 68.7 years.

Table 1: Age distribution

Age	No.of patients	percentage
60-70	21	70%
70-80	7	23%
>80	2	7%

Table 2: sex distribution

Sex	No.of patients	Percentage
Males	9	30%
Females	21	70%

In 18 patients left side was involved and in 12 patients right side involved, Majority of the patients (83.5%) had a trans-cervical fracture while four patients had sub-capital and one patient with basicervical fracture.

Table 3: Mode of Injury

Mode of Injury	No. of patients	Percentage
Slipping/trivial fall	19	63.3%
RTA	11	36.6%

19 patients were operated with cemented hemiarthroplasty as these patients had osteoporotic bone and to make the prosthesis snug fit to prevent iatrogenic fracture during serial rasping.

Table 5: Type of Hemiarthroplasty

Type	No. of patients	Percentage
Cemented	19	63.3%
uncemented	11	36.6%

The size of the prostheses used, in 35% of the cases 45 mm prostheses were used. This was followed in frequency by 43 mm (27.5%), 47 mm (20%), 41 mm (10%) and 39mm (2.5%) prostheses in the order of frequency. All the prostheses were inserted by press fit technique and 19 (63.3%) required an additional augmentation with cement.

The pain status of the patient was assessed by Harris Hip score and showed that it decreases significantly following the operation. Only 2 patients had significant pain following the operation.

According to the clinical outcome of our study were graded excellent, good and fair. All the 30 patients before operation was categorized as poor according to Harris Hip score

Table 6: Final Harris hip score and clinical result

HHS	No.of patients	percentage
Excellent	11	36.6%
Good	13	43.3%
Fair	4	13.3%
Poor	2	6.6%
	30	100

Overall, 11 patients (36.6%) achieved Excellent result, 13 patients (43.3%) achieved Good result, 4 patients (13.3%) achieved fair result and 2 patients (6.6%) achieved poor result.80 % of the patients achieved an excellent or good result.

The progression of Harris hip score The average Harris Hip Score at 6 weeks after surgery was 60.04 with the highest score being 70 and the lowest being 43. The average Harris Hip Score at the second follow-up of 3 months was 73.46 with the maximum score being 86.8 and the minimum 59. At the final follow-up at 6 months the average Harris Hip Score was 82.7 with the highest being 94 and the lowest being 62.

Comparing this score with preoperative score using paired’t test was found to be statistically significant (<0.05%).

In our study valgus malpositioning of the stem was found in 2 patients (6.66%). There were no major postoperative complications like wound infection and other.

Limb lengthening (<2cm) was observed in 5 patients (16.6%) post- operatively due to technical errors in the form of the prosthesis sitting proud of the calcar.

There were no late postoperative complications like loosening, dislocation, erosion, secondary osteoarthritis, protrusion acetabuli, periprosthetic fracture till the final followup.

Discussion

In the present study of 30 cases of intracapsular fracture neck of femur treated with hemiarthroplasty with modular bipolar prosthesis of both the sexes. In all cases uncemented /cemented modular femoral prosthesis were used. All the study patients were taken up for the surgical procedure between the 4th and 12th day after the trauma, the average delay to surgery being 7 days. Delay in taking up for surgery was usually for optimizing the medical condition of the patient and some patients presented late. All cases were performed on an elective basis.

The mean age of the patients in the present study was 68.9 years. The aim of assessing age is to estimate the patient’s mean survival time and their ability to comply with rehabilitation protocol. Patients with hip fractures have an increased mortality rate during the first year after fracture but after one year the mortality rate is comparable to that of the general population. The results of our study showed that age

of the patient had minimal influence on the final clinical result. As in most standard studies, the present study also had a higher number of females with the left side more commonly affected than the right.

Majority of the patients (83.5%) had a trans-cervical fracture while four patients had sub-capital and one patient with basicervical fracture. The anatomical type of fracture and the displacement did not have any effect on the final function.

The main difficulty faced was calculating the angle of the neck osteotomy which resulted in poor seating of the prosthesis collar on the neck and calcar. The second difficulty encountered was miscalculation of the amount of neck to be resected. Inadequate resection of the neck resulted in the prosthesis sitting proud of the calcar and subsequent limb lengthening in some cases.

Pain following hemiarthroplasty is a major concern. Bhandari *et al.* [13] showed arthroplasty was a good option with regard to provision of pain relief with a relative risk of no or little pain of 1.12 (95%CI,0.88 to 1.35). Keating *et al.* [14] showed significant decrease of pain out of 102 patients at 12-month follow-up.

In this study pain was reduced in 28 (93.33%) patients which was statistically significant and comparable to other studies.

Ozer *et al.* [14] showed 47% excellent result, 23% good result, 18% fair and 12% poor result treated with modular prosthesis in fracture neck of femur. Ali [11] showed 75% satisfactory results out of 13 patients of fracture neck of femur treated with modular bipolar prosthesis. Balan *et al.* [10] described 94% satisfactory outcome in intracapsular neck of femur fracture treated with modular bipolar prosthesis. Sakthivel *et al.* [15] showed 20% excellent results and 80% good results in a study of hip arthroplasty using bipolar prosthesis.

In this study according to Harris hip score results were 36.6% excellent, 43.3% good, 13.33% fair and 6.67% poor which was comparable to other studies.

In our study valgus malpositioning of the stem was found in 2 patients (6.66%). There were no major postoperative complications like wound infection and other.

Sullivan *et al.* [17] found 3.7% periprosthetic fracture Following Modular Hip Hemiarthroplasty out of 429 patients. Balan *et al.* [10] found no periprosthetic fracture out of 30 patient treated with modular bipolar prosthesis. In our study no periprosthetic fracture has occurred our study is not without its own shortcomings. Firstly, our duration of follow-up of is less in assessing the longevity and functional endurance of the prosthesis used and hence come to definitive conclusions. Secondly, we have not evaluated the degree of intra-prosthetic motion at the inner bearing at each follow -up. Such studies are indicated because there are claims that the motion at the inner bearing reduces over time and most prostheses behave as unipolar prostheses over a period of time.

Conclusion

Hemiarthroplasty with modular bipolar prosthesis for fracture neck of femur gave satisfactory functional outcome, provides better range of movement, freedom from pain and more rapid return to unassisted activity with an acceptable complication rate. The complications were the exception rather than the norm. In view of late presentation, the outcome was good with decreased pain, improved daily living and function.

Satisfactory functional results, minimal incidence of major radiological complications and the biomechanical advantage that comes with modular bipolar prosthesis made it a dependable endoprosthesis in orthopaedic practice. A longer

follow up, along with a larger sample population should be able to show the durability and overall patient satisfaction with the modular bipolar prosthesis.

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