

Original research article

A study of intracapsular fracture neck femur treated with bipolar prosthesis

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Abstract

Background and Objectives: Fractures of the neck of the femur occur predominantly in the elderly, typically result from low energy falls and may be associated with osteoporosis. Most fractures of the femoral neck are intracapsular. The incidence of femoral neck fractures is set to double over the next 30 years; this is the reflection of a higher number of individuals living beyond 65 years. Presently, there are multiple surgical treatment options available. Open reduction and internal fixation of these fractures in elderly has poor outcome due to high rate of non - union and avascular necrosis. With unipolar hemiarthroplasty the problems encountered were acetabular erosion and loosening of stem giving rise to pain. The main aim is to reduce immobilization and make patient walk early. The unipolar prosthesis is being slowly replaced by bipolar prosthesis. The objective of this study was to know the functional outcome of intracapsular fracture neck femur with bipolar prosthesis and to study the associated complications in these cases.

Materials and Methods: The present study was prospective study of 35 cases of fracture neck of femur admitted in Khaja Banda Nawaz Teaching and General Hospital, Kalaburagi, between the study period from November 2015 to October 2017. Cases were selected according to inclusion and exclusion criteria. Written informed consent was taken after appropriate medical and anesthetic fitness. Cemented modular bipolar prosthesis was used in all the patients and the functional analysis was performed at regular intervals.

Results: The average age of the patients in this study was 71.6 yrs, 12 (34.28%) were males and 23 (65.71%) were females. Final analysis of the Harris hip score was done after completion of one year. 32 (91.43%) patients had none to slight pain, 31 (88.57%) patients had none to mild limp, 29 (82.59%) patients used none to single cane for long walks, 30 (85.71%) patients could walk unlimited to more than 500 meters. There was no fixed deformity in our patients. In our study, 32 (91.43%) patients had range of motion between 161-300 degrees. The final Harris Hip Score ranged from 59 to 97 with an average of 82.17. 9 (25.7%) of the patients had an excellent Harris Hip Score, 15 (42.9%) had good score, 7 (20%) had fair score and 4 (11.4%) had poor score. There were no significant radiological abnormalities.

Conclusion: Bipolar hemiarthroplasty provides better range of motions, good relief of pain and good level of activities with minimal complications. We conclude that bipolar hemiarthroplasty is a good method to manage intracapsular fracture neck of femur in elderly patients.

Keywords: Fracture neck femur; Elderly; Hemiarthroplasty; Bipolar prosthesis; Harris Hip Score.

Introduction

Femoral neck fractures is one of the most common injuries in the elderly. The prevalence of these fractures has increased with increased incidence of osteoporosis, poor vision, neuromuscular incoordination, improvement in life expectancy 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 2050¹. The prevalence of the fracture also doubles for each decade of life after the fifth decade².

The goal of treatment of femoral neck fractures is restoration of pre-fracture function without associated morbidity³. Open reduction and internal fixation of these fractures in elderly has poor outcome including high rate of non-union and avascular necrosis. Currently, surgeons can choose between unipolar hemiarthroplasty, bipolar hemiarthroplasty and total hip arthroplasty in the treatment of intracapsular fractures of the neck of femur in the elderly⁴.

The problems encountered with unipolar prostheses (Austin Moore's Prosthesis and Thomson's Prosthesis) were acetabular erosion and loosening of stem giving rise to pain.

The unipolar prosthesis is being slowly replaced by bipolar prosthesis. Bipolar prosthesis had mobile head element and had additional head surface to allow movement within the acetabulum. This led to reduced wear of acetabular surface and hence reduced incidence of pain and acetabular protrusion because motion is present between the metal head and the polyethylene socket (inner bearing) as well as between the metallic head and acetabulum (outer bearing)⁵. The modular nature of the prosthesis allows for neck length adjustment with interchangeable stems.

With the superiority of prosthetic replacement over internal fixation in elderly being well established, 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. It also has a higher incidence of dislocations and higher morbidity associated with the procedure⁶.

Bipolar hemiarthroplasty thus appears to be the best option for acute fracture neck femur in the elderly in our population⁷. However, not much literature is available about its long term results. Some authorities have also expressed a doubt regarding the degree of inner bearing motion on long term use, thus putting into doubt its effectiveness⁸. We have taken up this study to gain a deeper understanding of the results and problems associated with this procedure.

Objectives

1. To study the functional outcome of intracapsular fracture of femoral neck treated with bipolar prosthesis
2. To study the associated complications in these cases.

Methodology

Patients who have sustained an intracapsular femoral neck fracture and are admitted to Khaja Banda Nawaz Institute of Medical Sciences, Kalaburagi are taken for this study after obtaining their consent. This is a prospective study from November 2015 to October 2017. Thirty five cases with intracapsular neck of femur fractures were included in our study.

Inclusion criteria

1. Displaced intracapsular fractures of the femoral neck.
2. Age of patient more than 55 years
3. Failed prior internal fixation.
4. Avascular necrosis of femoral head secondary to fracture of the femoral neck.
5. Non union of fractures of femoral neck

Exclusion criteria

1. Patients below 55 years.
2. Pathological fractures
3. Patients not willing for surgery
4. Patients medically unfit for surgery.

All patients selected for the study were worked up clinically and radiologically according to protocol, associated injuries, if any, were noted and investigations carried out in order to evaluate fitness for anesthesia.

Preoperative protocol

All study patients were put on high tibial skeletal traction and 4-7 kilograms of weight applied to maintain the length of the lower limb and facilitate subsequent hemiarthroplasty procedure. Adequate medical management of associated co-morbid conditions were initialized. All cases were done under regional anaesthesia which included spinal or epidural anaesthesia.

The patient was placed on the lateral position on the operative table with the affected side facing up. **Surgical Approach – Moore's posterior approach to the hip⁹**. 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.

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.

Insertion of the bipolar 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. The final seating of the prosthesis is by gentle blows with the help of a mallet and the insertor. 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. Haemostasis is maintained throughout the procedure.

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. All the patients were advised to sit with back rest from the 2nd postoperative day and advised deep breathing exercises. Mobilization with a walker was started between third and seventh post-operative day. Patients were initially advised toe-touch weight bearing and later advised progress to full weight bearing as tolerated. The sutures were removed between 10-12 days. The patients were discharged from the hospital on an average of 21 days. Abduction and quadriceps exercises were advised for a period of 6 weeks. Regular

follow up of all cases was done at 6 weeks, 3 months, 6 months, 9 months and one year. At each follow up patients were evaluated clinically using the Harris Hip Score¹⁰ and radiologically with appropriate X-rays. The final Harris Hip Score calculated at one year is taken to determine the result of the procedure in the present study. Results are rated as Excellent: 90-100, Good: 80-89, Fair: 70-79 and Poor: <70.

Results

The age of the patients in the study ranged from 55 to 85 yrs, average being 71.6 yrs. Out of 35 patients, 12 (34.28%) were males and 23 (65.71%) were females. of 35 patients, 16 (45.72%) had an injury of right femur and the other 19 (54.28%) had an injury of left femur. 26 (74.29%) of the patients sustained the injury by tripping/stumbling, 6 (17.14%) due to an RTA and the remaining 3 (8.57%) by fall from height. 6(17.14%) patients presented within 24 hrs, 13(37.15%) presented between 24 – 72 hrs, 10(28.57%) presented between 72 hrs – 1 week and 6(17.14%) presented after a delay of 1 week. 14(40%) had transcervical type of fracture, 11(31.43%) had basicervical type of fracture and 10 (28.57%) had subcapital type of fracture. 31.94% patients had Hypertension, 25.71% had Diabetes mellitus, 11.43% had COPD, 8.57% had Bronchial asthma and 5.8% had BPH. The most commonly used prosthesis size was 41mm followed by 43mm, 45mm, 39mm, 47mm and one 49mm and 51mm. Majority of the patients had a blood loss of below 750ml. 3(8.57%)of patients had superficial infections, 1(2.86%) patient had DVT and 1(2.86%) patient had periprosthetic fracture. The minimum duration of hospital stay among the patients was 14 days. All patients were followed up regularly at 6 weeks, 3 months, 6 months, 9 months and one year.

31 (88.57%) patients had none to mild limp. Upto 29 (82.59%) patients uses none to single cane for long walks. Up to 30 (85.71%) patients can walk unlimited to more than 500 meters. Up to 31 (88.57%) patients can climb stairs with or without using railing. Up to 21 (60%) patients can put slippers/chappels with ease. Up to 31 (88.57%) patients could sit comfortably on chair for long hours and 30 (85.71%) patients can enter the public transportation. There is no fixed deformity in our cases. In our study, 32 (91.43%) patients had range of motion between 161 – 300 degrees. In our study, the final Harris Hip Score ranged from 59 to 97 with an average of 82.17. Radiological Assessment: In the present study there were no significant radiological abnormalities.

Table 1: Age Distribution

Age in years	No of patients	Percentage
55 – 65	8	22.86%
66 – 75	15	42.86%
76 – 85	12	34.28%
Total	35	100%

Table 2: Gender Distribution

Gender	No of patients	Percentage
Male	12	34.28%
Female	23	65.71%
Total	35	100%

Table 3: Side of injury

Side of injury	No. of patients	Percentage
Right	16	45.72%
Left	19	54.28%

Total	35	100%
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Table 4: Mode of injury

Mode of injury	No. of patients	Percentage
Tripping/Stumbling	26	74.29%
RTA	6	17.14%
Fall from height	3	8.57%
Total	35	100%

Table 5: Time to presentation after injury

Time to Presentation after injury	No. of patients	Percentage
< 24 hrs	6	17.14%
24 hrs – 72 hrs	13	37.15%
72 hrs – 1 week	10	28.57%
>1 week	6	17.14%
Total	35	100%

Table 6: Radiological type of Fracture

Radiological type	No. of patients	Percentage
Transcervical	14	40%
Basicervical	11	31.43%
Sub-capital	10	28.57%
Total	35	100%

Table 7: Systemic comorbidities

Systemic comorbidity	No. of patients	Percentage
Hypertension	13	31.94%
Diabetes mellitus	9	25.71%
COPD	4	11.43%
Bronchial asthma	3	8.57%
BPH	2	5.8%

Table 8: Size of Prosthesis

Size of Prosthesis	No. of Patients	Percentage
39 mm	3	8.57%
41 mm	15	42.86%
43 mm	8	22.86%
45 mm	5	14.28%
47 mm	2	5.71%
49 mm	1	2.86%
51 mm	1	2.86%
Total	35	100%

Table 9: Average blood loss

Average blood loss	No. of Patients	Percentage
< 500 ml	19	54.29%
500 – 750 ml	11	31.42%
>750 ml	5	14.29%

Total	35	100%
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Table 10: Post operative complications

Post operative complications	No. of patients	Percentage
Superficial infection	3	8.57%
DVT	1	2.86%
Periprosthetic fracture	1	2.86%
Nil	30	85.71%
Total	35	100%

Table 11: Pain

Pain	No. of Patients	Percentage
None	24	68.57%
Slight	8	22.86%
Mild	3	8.57%
Moderate	0	0
Marked	0	0
Totally disabled	0	0
Total	35	100%

Table 12: Limp

Limp	No. of Patients	Percentage
None	2	5.71%
Slight	29	82.86%
Moderate	4	11.43%
Severe	0	0
Total	35	100%

Table 13: Support

Support	No. of Patients	Percentage
None	10	28.57%
Single cane for long walks	19	54.28%
Single cane for most of the times	5	14.29%
One Crutch	1	2.86%
Two Canes	0	0
Two Crutches	0	0
Not able to walk	0	0
Total	35	100%

Table 14: Distance walked

Distance walked	No. Of Patients	Percentage
Unlimited	15	42.855%
<1000 meters	15	42.855%
<500 meters	5	14.29%
Indoor only	0	0
Bed and Chair	0	0
Total	35	100%

Table 15: Stairs

Stairs	No. of Patients	Percentage
Without using railing	13	37.14%
Using railing	18	51.43%
In any manner	1	2.86%
Unable	3	8.57%
Total	35	100%

Table 16: Put on Slippers/Chappals

Put on Slippers/Chappals	No. of Patients	Percentage
With ease	21	60%
With difficulty	14	40%
Unable	0	0
Total	35	100%

Table 17: Sitting

Sitting	No. of Patients	Percentage
Comfortably in ordinary chair 1 hour	31	88.57%
On a high chair for ½ hour	4	11.43%
Unable to sit comfortably in any chair	0	0
Total	35	100%

Table 18: Enter public transportation

Enter public transportation	No. of Patients	Percentage
Yes	30	85.71%
No	5	14.29%
Total	35	100%

Discussion

Fractures of the neck of the femur occur predominantly in the elderly, typically result from low energy falls, may be associated with osteoporosis. Most fractures of the femoral neck are intracapsular¹¹. The economic impact of treating, rehabilitating and caring for this group of patients is increasingly being recognized¹². The treatment goal is to return the patient to his or her pre-morbid status of function¹³. Bateman in 1974 introduced the prosthesis which had mobile head element and had additional head surface to allow movement within the acetabulum¹⁴. This led to reduced wear of acetabular surface and the prosthesis. The main aim is to reduce immobilization and make patient walk early.

In the present study, 35 cases of intracapsular fracture neck of femur were surgically managed by bipolar prosthesis. Period of study was from January 2016 to June 2017. The aim of this study was to see whether bipolar hemiarthroplasty meets desired end result.

The average age of the patients in this study was 71.6 yrs. In Pongkunakorn A et al¹⁵ mean age of the patients was 76 yrs. In PS Mainiet al¹⁶ mean age of the patients was 69.8yrs. In the present study 12 (34.28%) were males and 23 (65.71%) were females. In Yusuf et al¹⁷ 29 (60.4%) were females and 19 (39.6%) were males. In PS Mainiet al¹⁶ 144 (53.1%) were females and 127 (46.9%) were males. The size of the prosthesis used, in general matched well with the preoperatively measured size of the head as assessed by X rays. In 15 (42.86%) patients 41mm prosthesis was used. Size of prosthesis can be varied in different studies as it will depend upon the racial differences in the build of the patients.

Most of the surgeries were completed between 70-120 minutes of starting the procedure. Similar duration of the procedure has been reported by Haidukewych et al¹⁸ and Drinker et al¹⁹. Neither the intra-operation blood loss nor the duration of the procedure had any effect on final function.

All patients were followed up for 3 months, 6 months, 9 months and 1 year. Final analysis of the Harris hip score was done after completion of one year.

At the end of 1 year of follow up 32 (91.43%) patients had none to slight pain. Our study can be compared with Bochneret al²⁰ (91%) and Wetherell and Hinves et al²¹ (95%). In our study 31 (88.57%) patients had none to mild limp. Our study can be compared with Bochneret al²⁰ (83%). Up to 29 (82.59%) patients uses none to single cane for long walks. Our study is in relation to Bochner et al²⁰(83%), Vijayamohan RKB et al²²(85%) but in contrast to Wetherall and Hinves et al²¹ (69%). Up to 30 (85.71%) patients can walk unlimited to more than 500 meters. Up to 31 (88.57%) patients can climb stairs with or without using railing. Up to 21 (60%) patients can put slippers/chappels with ease. Up to 31 (88.57%) patients could sit comfortably on chair for long hours and 30 (85.71%) patients can enter the public transportation. There is no fixed deformity in our cases. In our study, 32 (91.43%) patients had range of motion between 161 – 300 degrees.

In our study, the final Harris Hip Score ranged from 59 to 97 with an average of 82.17. Final Harris Hip Score of our study can be compared to other studies.

Result	Score	Present Study	SKSMarya et al ¹³	Sherwani et al ²³
Excellent	91 – 100	9 (25.7%)	40.75%	31%
Good	80 – 89	15 (42.9%)	33.34%	46%
Fair	70 – 79	7 (20%)	18.51%	15%
Poor	<70	4 (11.4%)	7.9%	8%

Radiological Assessment: In the present study there were no significant radiological abnormalities.

Conclusion:

Bipolar hemiarthroplasty can be safely performed in intracapsular fracture neck of femur patients of different age group (55yrs – 85yrs) possessing different problems related to management along with various comorbidities with satisfactory results. Bipolar hemiarthroplasty provides better range of motions, good relief of pain and good level of activities with minimal complications. We conclude that bipolar hemiarthroplasty is a good method to manage intracapsular fracture neck of femur.

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