



A STUDY OF FUNCTIONAL OUTCOME IN SURGICAL MANAGEMENT OF FRACTURE NECK OF FEMUR WITH BIPOLAR HEMIARTHROPLASTY

Orthopaedics

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ABSTRACT

Introduction: Proximal femoral fractures are one of the most devastating injuries occurring in an individual at old age. The objective of the study was to assess the age and sex incidence of fracture neck of femur, morbidity and mortality associated with the procedure, quality of life after hemiarthroplasty and associated complications. Fracture neck of femur has been recognized since the time of Hippocrates and commonly affect the frail and elderly population with devastating consequences for the individuals and places high demands over the health care system and society in general. The life time risk of sustaining a hip fracture is 9% for a female of the age of 50, but this rises to 12% by the age of 70 and 18% by the age of 90 years. The figures for the men are 2% 4% and 8% respectively. **Methodology:** 50 cases of fracture neck of femur in elderly patients above the age of 55 years treated by hemiarthroplasty using Bipolar endoprosthesis, in the Department of Orthopaedics at Sardar Patel Medical College, Bikaner, Rajasthan between August 2018 to November 2020 were followed up for 6 months and the short term functional results were analyzed by using Harris hip scoring system. **Results:** The age group of patients was 55 to 90 years with mean age of 68.64 years. Females were predominant. Majority of the fractures were subcapital radiologically. In 90 percent cases the mode of injury was trivial trauma. There were 38.33% excellent results and 36.67% good results. Thus 86.67% of the hips were classified as having a good to excellent results. **Conclusion:** Hemiarthroplasty for fracture neck of femur is a good option in elderly patients. Early functional results are good to excellent.

KEYWORDS

Elderly, Femoral neck fracture, Bipolar, Hemiarthroplasty

INTRODUCTION:

Fracture neck of femur has been recognized since the time of Hippocrates and commonly affects the frail and elderly population with devastating consequences for the individuals and places high demands over the health care system and society in general. The life time risk of sustaining a hip fracture is 9% for a female of the age of 50, but this rises to 12% by the age of 70 and 18% by the age of 90 years. The figures for the men are 2%, 4% and 8% respectively. As life expectancy increases and the mean age of society shifts progressively towards the senior category, the incidence of hip fractures will continue to rise.^{1,2}

The incidences of fracture neck femur occur in two different age groups. One group (3% to 5%) consists of young patients subjected to high energy trauma. The remainder occurs in elderly population and approximately 90% of these injuries are the result of simple fall from standing position. It has been observed that age specific incidence of hip fracture doubles every 5 - 6 years after the age 30 in women reaching 18 fractures per 1000 per year in women over 85. The factors that inhibit fracture healing are limited and unprotected blood supply to the femoral head, the intracapsular location and severe trabecular atrophy of femoral neck are and leads to osteonecrosis and segmental collapse of femoral head.

Ambrose Pare back in 16th century described fractures of the proximal femur which lead to the development of treatment rationale for femoral neck fractures. But it was in mid 19th century, the concept of dynamic traction was introduced and the importance of anatomical reduction and its maintenance in plaster was emphasized. The development of stable internal fixation devices and finally the development of implant arthroplasty, which led to the era of total joint replacement. The complications like Nonunion, Avascular Necrosis and the end result frequently being a destroyed femoral head warrants prosthetic replacement for femoral head.

In Hemireplacement Arthroplasty, we retain the natural acetabulum and acetabular cartilage and replace the femoral head with modular bipolar prosthesis. Hemi-replacement arthroplasty though not a perfect substitute for the natural head, yet restores joint function and fairly achieves the goals of treatment namely minimizing mortality and morbidity of the patients, thus providing effective rehabilitation

which otherwise would cause disastrous complications of recumbency in the elderly. Earlier Austin Moore used vitallium or stainless steel for hemiarthroplasty of hip which was popular and produced fairly good results. But later on it developed loosening and reactions at acetabulum.³

The limitations of this procedure were overcome by a new type of prosthesis, which also provides a second joint line, below the acetabulum. It is called BIPOLAR PROSTHESIS. It contains outer stationary head of metal that articulates with acetabulum and a second mobile inner small metallic head articulates with the High Density Polyethylene (HDPE) lining the inner surface of the outer head. This prosthesis proved good and encouraging results. Many surgeons perform hemireplacement arthroplasty as a primary procedure for the treatment of fracture neck of femur.^{4,6}

The successful application of it in the hands of various surgeons point to its continued usefulness. This is a prospective randomized clinical study of functional and radiological outcome of bipolar hemiarthroplasty in femoral neck fractures in the elderly. Outcomes at 3 days, 1 month, 3 months and 6 months were analyzed by modified Harris hip scoring system and by radiographs taken during follow up. The functional results were analyzed with the objective, to study the age and sex incidence of fracture neck of femur, morbidity and mortality associated with the procedure, quality of life after hemiarthroplasty, physical, social and mental recovery and associated complications.⁷⁻¹³

METHODS:

The present prospective study of 2 years duration included 50 cases of intra-capsular fracture neck of femur in elderly patients above the age of more than 55 years irrespective of sex and duration of fracture treated by hemiarthroplasty using Bipolar endoprosthesis, in the Department of Orthopaedics at S.P. Medical College and P.B.M. Group of Hospitals, Bikaner (Rajasthan) between from August 2018 to December 2020. Before the start of the study the clearance was obtained from institutional ethical committee and written informed consent was taken from the subjects. Intracapsular fracture neck of femur below 50 years, fracture neck of femur associated with fracture shaft of femur or trochanteric fracture and Acetabular fracture, pathological intracapsular fracture neck of femur in elderly were

excluded. In all patients were admitted in Trauma Centre, Bikaner through triage protocol and the data were collected through detailed history taking, general physical examination, systemic examination and local examination. Any history of associated illness was recorded. Routine blood investigations were done including Hb%, BT, CT, urine routine (albumin, sugar, microscopy) etc. In addition FBS, PPBS, Blood urea, Serum creatinine, blood grouping and Rhtyping, ECG & chest X-Rays were taken. Radiographs. X-ray plain of pelvis with bilateral Hipin 15° internal rotation AP view and lateral view to assess the type of fracture, to measure the size of the head, and to assess the amount of calcar. Patients were put on Buck's traction pre-operatively till the date of operation. Adequate analgesics either oral or parenteral were given to provide relief from pain. Patients with associated medical illness like anemia, Hypertension, Diabetic mellitus etc were referred to the physician and appropriate treatment should be instituted. Pre-anesthetic evaluation were carried out and informed one day before surgery to the patients regarding surgery and their complications and obtaining informed written consent. Parenteral antibiotics were started on the night prior to surgery and continued for 5–7 days.

Surgical Procedures:

Under spinal anesthesia, patients were positioned in a lateral position on unaffected side. After scrubbing, painting and draping done, posterior approach (Moore & Southern) were used for incision is made approximately 10cm distal to the posterior superior iliac spine and extended distally and laterally parallel to the fibers of gluteus maximus to the posterior. The incision were directed distally 8–10 cms parallel with femoral shaft. The deep fascia were divided in line with the skin incision by blunt dissection the fibres of gluteus maximus were divided avoiding injury to superior gluteal vessels in the proximal part. The proximal fibres of gluteus maximus are retracted proximally exposing the greater trochanter. The distal fibres are retracted distally. The sciatic nerve were identified and retracted carefully. The short external rotators identified and stay sutures applied and exposing the capsule. The hip joint was opened by T shaped incision over posterior capsule. The thighs were knee are flexed to 90° and internally rotated to dislocate the hip joint. The head were extracted using an extractor or by using levers. The acetabular cavity were cleared of soft tissue remnants and ligamentum teres.

The neck of the femur were cut using a electric saw retaining approximately 10–15mm of calcar over lesser trochanter at an angle parallel to that of the prosthesis shoulder. Next the femoral canal was reamed using the specific reamer of the prosthesis, the entry point being more laterally, so as to avoid avarus position. The reamer (rasp) should be positioned in the femoral canal with 5–10° of anteversion while reaming. Reaming were done by hand and the hammer was used gently for insertion and extraction of the rasp. The correct size of the prosthesis as determined by measuring the extracted head with measuring gauge, was taken and trial reduction performed which should reduce or dislocate out of acetabulum with a suction sound. Then the stem of the prosthesis were placed in the proximal femur, impacted with 10–15° of anteversion till the collar is flush with calcar and reduction done by traction, external rotation of the thigh and gentle manipulation of the head of the prosthesis into the acetabulum. Stability of the joint was assessed by movement of hip joint in different directions. Wound was closed in layers with suction drain in situ.

Post Operative Protocol:

During the postoperative period the patients were placed in an abduction position by pillow for 5–7 days. If stability was doubtful, immobilized by Thomas splint. On second postoperative day, the patient were made to sit in bed. By 3rd post-operative day patients were mobilized using by walker. Full weight bearing and ambulation were allowed as tolerated. The suction drain was removed after 48 hours. Parenteral antibiotics should be given for 5 days and then switched over to oral antibiotics till sutures were removed. Sutures were removed on 12th to 14th day of surgery. Check radiographs were obtained in all the cases after drain removed. Most of the patients were discharged by the end of second week of surgery. On discharge patients should be advised not to sit cross-legged, or squat to avoid excessive loading on the prosthesis decreasing its lifespan.

Follow up examination were done at 2 weeks, 1 month, 3 months, 6 months, one year and thereafter. Radiographs should be taken during follow up for evidence of any complications. Outcome of the surgery

were assessed by using Harris hip score system. Assessments of patients were done on functional, clinical and radiological criteria.

In Indian social habits the importance of squatting and sitting cross-legged is much more important than the west. In squatting and sitting cross-legged the prime movement is flexion, abduction and external rotation.

Radiological assessment was done on the basis of fraction of total movement at hip joint that occurs at in built joint of prosthesis. Follow up were done immediately post-operative, at one month, three months and six months.

Radiological examination, using image intensification, were carried out immediately after operation and after 1 & 3 months. First the view were taken in Supine position in neutral and then in full abduction. Then views were taken in lateral position in neutral & full flexion. The total hip excursion was noted. Movement at Inbuilt joint & between cup and acetabulum were noted. The fraction of total hip movement which occurs at in built joint of prosthesis is noted.

DISCUSSION:

This study was conducted in 50 consecutive cases of intracapsular fracture neck of femur in which cemented bipolar modular prosthesis was used. Implant used in this study was bipolar modular prosthesis with 37–55 mm head size, small, medium, large neck size with small, medium, large stem size. All patients were operated by posterior southern and Moore approach in lateral position. The clinical and radiological study was done and final clinical analysis was done on Harris hip score.

In this study we analysed radiologically, the intraprosthesis movement in bipolar prosthesis used in plain sky gram in A.P. and lateral view in extremes range of hip excursion.

In active older patients especially need in gearly mobilization, primary prosthetic replacement should be considered.

Majority of patients (44%) were between 6th decades. Youngest patient was 53 years and oldest patient was 87 years old. The mean age was 68.64 years with average male of 72.15 & average female of 66.18 years old. The majority of the patients (32%) were female. Male to female ratio was 19:31.

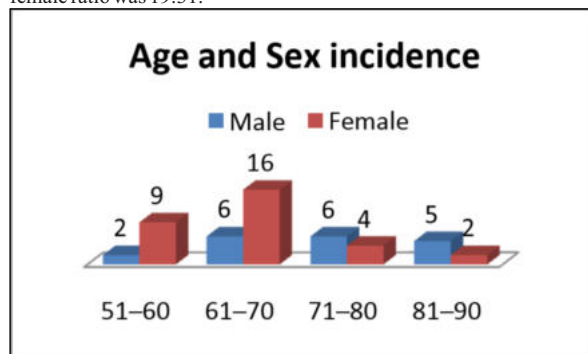


Figure 1

Patients were younger than above mentioned series, may be because average age of patients is much lower in our country. A sizeable number of patients had high velocity trauma is 10% which obviously was more in young patients, because of poor nutritional status and earlier menopause in female leading to early osteoporosis.

Because of post-menopausal hormonal changes, females are more prone for osteoporosis than males, so the fracture incidents in the present series 31 out of 50 in females. Male to female ratio was 1:2, it is comparable with earlier reports.

In our study, common mode of trauma was trivial fall while walking (90%), 45 out of 50 cases, while 10% (5 cases out of 50) have a high velocity trauma.

Out of 50 patients, 22 (44%) patients of preoperative delay were 11–20 days of duration. 2 (4%) patients were maximum duration was >30 days. This preoperative delay due to comorbid condition of the patient

to make fit for pre anesthetic check up.

28 cases out of 50 had some associated medical problems including hypertension (14 out of 50) and bronchial asthma (3 out of 50), Diabetes mellitus (11 out of 50) and coronary artery disease (6 out of 50).

All the patients were treated by bipolar modular prosthesis with stem fixed with bone cement (polymethylmethacrylate) the prosthesis was named bipolar because of its configuration of the covering of the head like a pole and since the movement occurs in between the head and outer covering & outer cover of the prosthesis and acetabular cartilage. The modularity of the present system is largely confined to the size of neck which was in increment with small, medium and large neck. The size of the prosthesis cup was used 37–55mm.

In the study weight bearing started in 41 (82%) number of cases in 0–6 days. 6 (12%) cases were in 7–12 days and 3 (6%) patients after 12 days. Persistence of pain is one of the most important criteria to evaluate the success of arthroplasty. These were verified according to criteria included in Harris Hip Score. Pain was primarily felt at the joint level and thigh pain was not detected in any patient.

Assessment of mild pain on day 3 is 27 out of 50 and moderate pain, 23 out of 50 and there is no severe pain. Mild pain on 1 month duration is 16 out of 50 patients, with no moderate or severe pain patients. No patient had pain on 3 month duration of evaluation.

Most of the patients (47 out of 50 patients) had adequate range of flexion (90–120 degree) to allow sitting with cross legged and 40 patients out of 50 had adequate abduction (20–40 degree) and 38 patient out of 50 had adequate external rotation (10–20)°.

According to Harris Hip Score in the series 47 out of 50 patients could climb stairs. Out of those, 35 out of 50 could climb foot over foot without use of banister, 12 patients out of 50 could climb stairs foot over foot with the use of banister, and 3 patients out of 50 patients could climb stairs in any manner.

Total 46 (92%) out of 50 cases had no limp and 8% had minor limp. While comparing relation between sex and limp, almost equal results were found. In present study there was significant correlation between limp and age, 100% (33 out of 33 cases) of 50 to 70 years of age group had no limp, while, in case of 70 to 80 age group, 9 patients had no limp and 1 patient had slight limp. In the age group 81 to 90, 4 patients had no limp and 3 patients had slight limp out of 7 patients. Younger patients had better outcome compared to elder age in this study, there was as on behind was that patient of lower age group had greater physical and mental efficiency and can tolerate pain better than higher age group.

32 cases out of 50 cases could walk unlimited, 14 patients out of 50 could walk 1 mile, and 4 out of 50 patients could walk half a mile. In comparing sex with walking distance, in male patients 9 out of 19 could walk unlimited, 7 out of 19 could walk 1 mile, 3 out of 19 could walk half a mile. In female patients, 23 out of 31 could walk unlimited, 7 out of 31 could walk 1 mile, 1 out of 31 could walk half a mile.

We found a significant relationship between walking distance and age. 100% of the cases (33 out of 33) of age group 51 to 70 years of age could walk more than one mile. In age group of 81 to 90 years of age, 4 out of 7 cases could walk one mile and 3 out of 7 cases could walk half a mile. This study shows that in higher age group the walking distance is less as compared to younger age. This is probably due to higher physical efficiency, lower pain perception and fewer complications in lower age group.

In our study, 15 (30%) patient had excellent result, it is better than Gallinario (1990) study which was 23%. 24 (54%) patient had good results, 8 (16%) had fair results. There are no patients in poor result in our study.

Higher percentage of excellent and good result may be because of better surgical technique, better available resources, better aseptic condition, newer potent broad-spectrum antibiotics and better rehabilitation. Most surgeons agree that prosthesis is the answer to the displaced fracture neck of femur and non-union of femoral neck fracture in elderly.

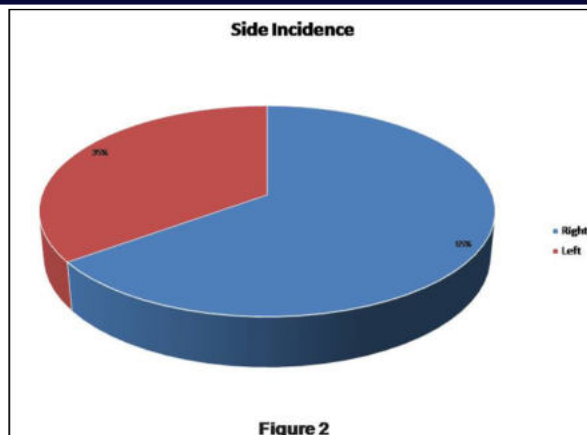


Figure 2

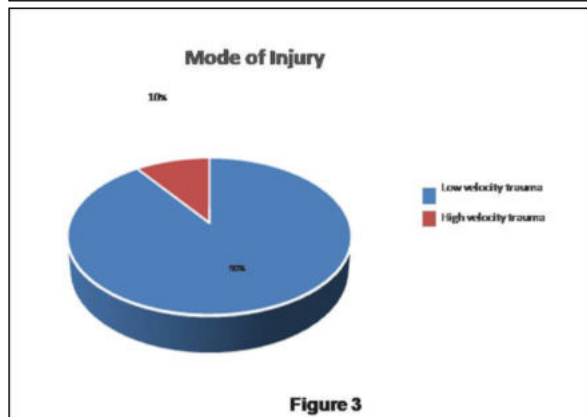


Figure 3

Author	Excellent	Good	Fair	Poor
Vandermark (1980)	44%	50.3%	2.6%	3.1%
Gallinario (1990)	23%	47%	24%	6%
Whittaker (1972)	36.2%	34.5%	15.5%	13.8%
Bateman (1974)	46%	44.90%	6.5%	2.6%
Moshein (1990)	44.21%	38.3%	11.7%	5.8%
Present study	30%	54%	16%	Nil

Figure 4

RESULTS:

In our study, we found a significant correlation between age and result. 100% patient's age group of 51 to 60 had excellent to good result (11 out of 11 patients), age group of 60 to 70 had 21 patient out of 22 with excellent to good result. More than 70 years age group had good to fair result. The explanation could be given on the basis that younger people had less preoperative medical illness, good nutritional status, higher physical efficiency and higher pain perception.

In this study, factors affecting results were age of patients (Lower age group better results), duration of surgery (less duration better results), pre-operative delay (less delay–better results).

REFERENCES:

- Cooper JA. The classic Fractures of the neck of the thigh-bone. Sir Astley Cooper, BART, F.R.S., surgeon to the King. ClinOrthop 1973;92:3–5.
- Senn N. The class: The treatment of fractures of the neck of the femur by immediate reduction and permanent fixation 1889. ClinOrthop 1987;218:4–11.
- A.K. Mishra, P.K. Chalise, S.B. Shah. Comparative study in surgical outcome of intracapsular fracture neck of femur in active elderly patients treated with hemiarthroplasty with Austin Moore's and bipolar prosthesis. Nepal Med Coll J. 2013 Mar; 15(1):81–3.
- Bateman JE: Single assembly total hip prosthesis. Preliminary report. orthop. Digest 2: 15, 1974.
- Bateman JE: Experience with a multi-bearing implant in reconstruction hip deformities. Ortho. Trans., 1:2, 1977.
- Bateman JE: Long term results of bipolar arthroplasty in osteoarthritis of the hip. Clin. Orthop. And related Research, No. 251: 54–56, 1990.
- McConville Owen B: Bipolar hemiarthroplasty in degenerative arthritis of hip. Clinical orthopaedic and related research. PP 67–74, 1990.

8. Crock HV, An atlas of the arterial supply of the head and neck of femur in men. CORR 1980;152:17–27.
9. Treuta J, Harrison MH. The normal vascular anatomy of femoral head in an adult man. JBJS 1953;35B:442–461.
10. Wilson JN. Watson–Jones Fractures and Joint injuries. 6th ed. B.I. Churchill Livingstone 2002.
11. Pauwels F. Der Schenkelsbruch: Ein mechanisches problem. Stuttgart Ferdinand Enke Verlag, 1935.
12. Garden RS. Low angle fixation in fracture of femoral neck. JBJS 1961;43B 647–663.
13. A.K. Mishra, P.K. Chalise, S.B. Shah. Comparative study in surgical outcome of intracapsular fracture neck of femur in active elderly patients treated with hemiarthroplasty with Austin Moore's and bipolar prosthesis. Nepal Med Coll J. 2013 Mar; 15(1):81–3.