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Original Research Paper

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FUNCTIONAL AND RADIOLOGICAL OUTCOME IN DISPLACED FRACTURE NECK OF FEMUR AMONGST SENILE PATIENTS TREATED BY UNIPOLAR OR BIPOLAR PROSTHESIS – A PROSPECTIVE STUDY

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ABSTRACT Fracture neck femur in elderly is usually treated with arthroplasty so as to give them a painless joint and quick mobilization. Unipolar, bilpolar (cemented / uncemented) and total hip replacement are methods used. These methods have their own pros and cons. This prospective study compared the 1st 3 mentioned methods according to set protocols in a sample size of 85. Patients were followed up for 12 months. At the end it was found that above 60 years age, cemented bipolar hemiarthroplasty showed significantly better outcome than uncemented bipolar and unipolar methods both in patient satisfaction and long term economic benefit.

KEYWORDS : fracture neck femur, unipolar, bipolar, cemented, uncemented

INTRODUCTION

95% of fracture neck femur patients are elderly. Approximately 90% of these injuries are result of trivial trauma even a simple twist. Progressive osteoporosis is generally believed to be the primary force responsible for this increase in its incidence

Proponents of replacement note that the rate of nonunion increases with age and that the increased need for early re-operation associated with fixation failure makes replacement a more reliable and definitive treatment option for the elderly patients Replacement provides early mobilization, eliminates chance of avascular necrosis of head, nonunion and re-operation[1]. For elderly patients early return of mobility is more important than the late problems of loosening and wear.

Replacement of femoral component by metallic prosthesis of different variety are in use. The first widely used hemiarthroplasties were stemmed, single component stainless steel implants designed to be inserted without cement such as the Austin Moore or F. R.Thomson prosthesis (Unipolar)[2,3]. Austin Moore prosthesis has produced excellent result but difficulties have been encountered with thigh pain and protrusio acetabuli with this device.

The bipolar variety of prosthesis was developed to reduce the acetabular erosion and thigh pain and to increase mobility.

This prospective study was taken up comparing the results of un-cemented unipolar (Austin Moore) prosthesis, bipolar un-cemented and bipolar cemented prosthesis. The purpose was to study the functional outcome for each of these and the result was based on Harris Hip Score [4].

MATERIAL AND METHODS

This was a Randomized prospective study conducted in Dep't of Orthopaedics, in a tertiary hospital conducted over a period of 12 months in Central India. A total of 85 elderly patients of both sexes were included in the study.

Exclusion criteria

(1) Fracture neck femur in young and middle-aged group (60 yrs.)
(2) fracture NOF with ipsilateral fracture shaft of femur.
(3) Associated with multi-organ disease like (a) CRF (b) post CVA with hemiplegia on affected side (c) COPD with gross dyspnea on effort and (d) long standing bed ridden patient with gross asthenia.

Inclusion criteria

(1) Over 60 years of age.
(2) Unilateral, isolated fracture neck of femur.
(3) Fresh or old cases admitted through emergency or outdoor.
(4) Patients treated primarily with hemiarthroplasty by unipolar or bipolar with or without cement.
(5) Minimum follow up 12 months.

Clinically the follow up information was obtained by interview and physical examination. Harris Hip Score were calculated post-operatively at 3,6 and 12 months after surgery. The radiograph examination included an AP x-ray of pelvis with both hip and upper thigh and lateral view of affected hip.

HARRIS HIP SCORE[4]:- Interpretation by Thomas J Blumenfeld.

Harris hip score developed by Dr.William Harris in 1969, a prominent orthopaedist in Massachusetts. Harris hip score is a tool for the evaluation of how a patient is doing after their hip is replaced. Total of **100 points possible.**

PROTOCOL FOR MANAGEMENT

After Initial resuscitation of patient, below knee skin traction with 3 kg weight in Buck's pulley applied, analgesic and other symptomatic treatment started and preop protocol. After surgery, on 3-4th post-operative day patient made to stand walk few steps with support and discharged from hospital with advice to attend physiotherapy clinic for gait training and muscle strengthening exercises. Patients were called after 6 weeks, 3 months ,6 months and 12 months for functional and radiological assessment. The scoring done on the guideline of Harris hip score chart at 3rd, 6th and 12th months. Appropriate statistical tests were applied on observations e.g. student t-test, Chi-square test, Fischer exact test and Pearson correlation. The critical values for significance of the results were considered at 0.05 levels (95% confidence limits).

OBSERVATION AND RESULT

85 patients were included where 32 were males and 53 females.

The total number of patients treated with unipolar prosthesis (Austin Moore prosthesis) were 40, of which 14 were male and 26 were female. Five patients were lost to follow up so all results were based on available 35 patients. Patients treated with un-cemented bipolar prosthesis were 22, of which 9 male and 13 were female. 2 patients failed to turn up for follow up so results were based on 20 patients. The total number of patients treated with cemented bipolar prosthesis were 23,of which 9 were male and 14 female. 3 were lost to follow up so results were on 20 patients

AGE DISTRIBUTION

	Mean age	S D	Minimum age	Maximum age	Variance
Unipolar prosthesis	70.075	8.113	60	100	65.825
Un-cemented bipolar prosthesis	67.68	5.205	60	81	27.095
Cemented bipolar prosthesis	71.35	7.583	62	93	57.45

Harris hip score analysis

Type of prosthesis used	Mean HHS at 3rd month	Mean HHS at 6th month	Mean HHS at 12th month	S.D after 12 months	Max. HHS after 12th months	Minim. HHS after 12th months	Variance after 12 months	P value after 12 months
Unipolar	62.8	71.74	72.23	15.199	97	35	231.025	.001
Un-cemented bipolar	65.95	77.33	82.05	12.416	97	44	154.157	.001
Cemented bipolar	73.60	84.27	88.0	10.208	100	69	104.21	.001

In our study the mean Harris hip score recorded after 12 months was 72.23 (fair) in patients treated with unipolar prosthesis ,82.05 (good) in patients treated with un-cemented bipolar prosthesis and 88.00 (good) in patients treated with cemented bipolar prosthesis. The standard deviation was 15.199 ,12.416 and 10.208 respectively. The maximum and minimum Harris hip score recorded was 97 & 35 in unipolar ,97 & 44 in un-cemented bipolar and 100 & 69 in cemented bipolar prosthesis. The P value calculated using probability table was 0.001 in all three groups and the value was highly significant.

Final result (Patients satisfaction index)

PSI at the end (12 months) of study	Unipolar No. of patients	Unipolar %	Bipolar without cement, No. of patients	Bipolar without cement, %	Bipolar with cement, No. of patients	Bipolar with cement, %
Excellent	05	14.28 %	04	20 %	11	55 %
Good	06	17.14 %	09	45 %	05	25 %
Fair	12	34.28 %	04	20 %	03	15 %
Poor	08	22.86 %	02	10 %	01	05 %
Failed	04 total 35	11.43 %	01 total 20	05 %	00 total 20	00 %

Co-relation between degree of osteoporosis and functional outcome

The degree of osteoporosis affects the functional result. In severely (grade I) osteoporosed hip the mean Harris hip score was 40 in unipolar, 44 in un-cemented bipolar and 77.33 in cemented bipolar prosthesis. In grade II the score was 66.8, 79.36 and 88.46 respectively. In grade III the score was 80.76, 90.5 and 94.5 respectively.

Radiological assessment

Radiological outcome at the end of 12 months.

Type of prosthesis used	No. of patients	Radiological outcome	Percentage
Unipolar	03 01 32	Distal migration periprosthetic dislocation No change from initial radiograph.	08.33% 02.77% 88.88%
Bipolar without cenent	01 19	Distal migration no change from initial radiograph.	05% 95%
Bipolar with cement	20	No change from initial radiograph	100%

DISCUSSION

In our study the functional outcome after prosthetic replacement poses specific relation with the age. Higher the age[7], lower the Harris hip score[4] in all three groups of patients. By presence of such a specific relation, it may be concluded that the age of the patient has effect on the functional outcome after prosthetic replacement of any variety.

80% fracture in grade IV and 20% grade III and grade of fracture does not affect the result after prosthetic replacement.

The functional outcome of the patient after prosthetic replacement was assessed on the basis of Harris hip score calculation and grading into patient satisfaction index. In our series we found that the mean Harris hip score recorded at 3rd , 6th and 12th months. It was 62.8, 71.74 and 72.23 respectively in patients treated with unipolar prosthesis . Similarly it was 65.95, 77.33 and 82.05 respectively in patients managed with un-cemented bipolar prosthesis, and 73.60, 84.27 and 88 respectively in patients treated with cemented bipolar prosthesis. The score recorded clearly indicates that functional result was best with cemented bipolar prosthesis. The thigh and hip pain was minimum with cemented bipolar prosthesis, maximum with unipolar prosthesis and in between was the un-cemented bipolar prosthesis. The cause of thigh and hip pain is due to inadequate press fit, lack of 3-point fixation in short stemmed prosthesis, distal migration in osteoporosed bone and acetabular erosion. In uncemented unipolar (Austin Moore) prosthesis the stem is short, inadequately press fit, and has more acetabular erosion.

The cemented bipolar prosthesis gives press fit, 3-point fixation and decreased acetabular erosion and so the pain was minimum and better recovery & early return to pre-injury status[6,7]. It was also found that greater range of hip motion and better gait in patients treated with bipolar prosthesis with or without cement.

Our study showed that 11 cases (55%) treated with cemented bipolar prosthesis had excellent result whereas in patients where un-cemented bipolar was used had 4 cases (20%) and in unipolar prosthesis had 5 cases (14.28%) only[8]. Similarly result was highest (45%) in un-cemented bipolar and lowest (17.14%) in unipolar and in between (25%) in cemented bipolar prosthesis. The patients treated with unipolar prosthesis had maximum poor (22.86%) and failed (11.43%) result in comparison to un-cemented bipolar 10% and 5% and to cemented bipolar prosthesis 5% and 0% respectively. The overall patient satisfaction index recorded after 12 months in unipolar was fair, in un-cemented bipolar was good and in cemented bipolar was high good or close to excellent.

We also studied the relation between the grade of osteoporosis of hip (based on Singh's index)[9] with functional result. We found that all hips included in our study had between grade IV to I. The mean Harris hip score recorded in unipolar group was grade IV – 97, III – 80.76, II – 66.8 and I – 40. Similarly in un-cemented bipolar group it was grade IV – patient lost to follow up ,III – 90.5 ,II – 79.36 and I – 44. In cemented bipolar group it was grade IV – patient lost to follow up, III – 94.5, II – 88.46, and I – 77.33. The data clearly indicates that the degree of osteoporosis affects the result in all three groups. In severely osteoporosed (grade I & II) hips the score comparison in all three groups showed that cemented bipolar prosthesis had best functional result and worst in unipolar prosthesis. In severely osteoporosed bone the medullary canal is wide, the prosthesis will be less press fit and chances of sinking always there. The use of cement gives better bone prosthesis contact, gives.

In our study the radiological assessment of every patient was done at 3, 6 & 12 months. After 12 months we found that, in unipolar group 3 cases (8.33%) had stem loosening & distal migration, 1 case (2.79%) had periprosthetic dislocation and rest 32 cases (88.88%) had no change from initial

radiographs. Similarly in un-cemented bipolar group 1 case (5%) had stem loosening & distal migration and rest 19 cases (95%) had no change from initial x-rays. In cemented bipolar prosthesis 100% showed no change in follow up radiographs.

The common people in our country have low per capita income It is difficult to afford a second surgery if required in case of failure. The analysis of total cost showed that the only difference among those was the material cost (unipolar, bipolar and cement). Rest of the cost like O.T charges, hospital stay, medicine cost are same for all three groups. Our result showed that the functional result mostly excellent in cemented bipolar, good in un-cemented bipolar and fair & poor in unipolar prosthesis. The patients treated with unipolar prosthesis may require revision surgery subsequently to get better result and relieve from pain and further complication. In revision the chances of mortality and morbidity further increased in addition to double cost.

Hence the bipolar prosthesis with or without cement will be the better option to avoid revision & further complication.

CONCLUSION

Ever since the hemiarthroplasty came into existence, controversy exists regarding the choice of prosthesis to be used.

Though our series is a small series and maximum follow up period was only 12 months our observation indicates important features.

(1) Bipolar prosthesis with or without cement gave definitely better functional and radiological result compared to unipolar prosthesis.
(2) Bipolar prosthesis provide better pain relief, better gait and more range of motion with less complication.
(3) Use of cement in severely osteoporosed bone gives better functional outcome,

The marginally extra cost in bipolar prosthesis should not be problem to get better quality of life and less morbidity.

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