Title : A comparative study of outcomes of unipolar versus bipolar hemi-arthroplasty in geriatric age group- a study of 60 cases.

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Abstract

Introduction:

Femoral neck fracture, recognised since the time of Hippocrates, still remains a vexing clinical problem for orthopaedic surgeons. Fracture neck of femur are usually sustained by elderly persons from a trivial fall. It has been predicted that by 2050 the number of hip fractures would triple. As a consequence, proximal femur fractures are a significant cause of morbidity and mortality in all age groups, especially in elderly, whether to use bipolar or monopolar hemi replacement arthroplasty still remains a dilemma.

Material and methods:

This is a prospective study of sixty cases (thirty in each group) with Intra Capsular Neck Femur fractures in geriatric age group and followed for two years. Implant selection was based on age, bone quality , femoral canal type and patient's economic status. Final evaluation done on basis of radiology and modified Haris Hip Score.

Results:

Most patients were women with age group of 61-70 years(average 66.5 years). Patients who were operated with bipolar have better Harrris Hip score of 88.02 as compared to patient's with Austin Moore Prosthesis (86.40). Both groups of patients had achieved functional range of motion, but bipolar patients had slighter more range of motion. Acetabular erosion was more common in unipolar (Six patients) than bipolar (two patients) with one case of unipolar having developed protrusio acetabulum.

Discussion:

Average HHS in Austin Moore Prosthesis (86.40)and in bipolar(88.02)which is statistically not significant(p value 0.8514). Bipolar is more expensive and associated with cementing related complications in patients with significant cardio-vascular compromise. So, in light of less life expectancy , it was prudent to use unipolar in these patients. This also shortens the duration of surgery. However for better evaluation randomised controlled trial with long term follow up is needed.

Key Words:

Neck femur fracture, geriatric fractures, osteoporotic fractures, unipolar vs bipolar, hemi replacement arthroplasty, Unsolved fracture, cemented prosthesis.

Introduction

Femoral neck fractures, recognised since the time of Hippocrates, still remain a vexing clinical problem for orthopaedic surgeons. Fracture neck of femur are usually sustained by elderly persons from a trivial fall. At one time this fracture was thought to be a terminal event in the life of feeble and fragile individuals. Despite earnest work by many in this field, the problem still remains far from being solved, hence rightly labeled as " Unsolved Fracture" by Speed.(REF 5)

It has been predicted that by 2050 the number of hip fractures would triple. As a consequence, proximal femur fractures are a significant cause of morbidity and mortality in all age groups, especially in elderly. Various methods of treatment have been employed since ages. The prolonged immobilization in elderly, will further lead to decubitus problems and associated complications, and hence surgery was resorted to achieve early ambulation.

It is known fact that the hip is a weight bearing joint performing many functions. A successful surgery at the joint should provide painless, stable hip with wide range of movements.

Several authors have considered replacement of the femoral head as an alternative due to the frequent development of non-union, failure of osteosynthesis and avascular necrosis of the femoral head.(REF 7)

The theoretical advantage of bipolar over unipolar prosthesis is the reduction of acetabular erosion due to movement at two poles causing less movement at prosthetic head and acetabulum. The same mechanism is described for less pain during locomotion(REF 4). Use

of bipolar arthroplasty, however has been challenged by studies mentioning that shortly after implantation, the motion at the inner bearing ceases, converting the prosthesis to a unipolar implant(REF 10).

The aim of this study is to compare the functional results of unipolar and bipolar hemi-arthroplasty in the treatment of displaced femoral neck fractures.

Material and methods:

In this prospective study to begin with 60 patients operated not less than before six month for hemi-replacement arthroplasty , with unipolar (Austin Moore Prosthesis - 30 patients) and bipolar prosthesis (30 patients); were enrolled and were traced for the follow up examinations. Data collection was done from medical records. Patients were followed radiologically and functionally (Harris Hip Score) at 3 month, 6 month , 1 year and 2 years. All patients were followed up subjectively, clinically and radiologically to compare the results in standard manner. All the patients' operated through posterior Gibbson's approach.

Observations:

1) **Age at time of fall:**

Age Group(years)	No. of cases	Percentage
50-60	14	23.33%
61-70	26	43.33%
71-80	20	33.33%
81-90	0	00.00%
>90	0	00.00%
Total:	**60**	**100%**

Table 1 : Age distribution among Patients

Most patients were of 61-70 years age group with female preponderance (70%) probably because of post-menopausal osteoporosis(REF 6).

2) TYPE OF FRACTURE ACCORDING GARDEN CLASSIFICATION

Garden Type	No.Case	Percentage
Type 1	4	6.66%
Type2	4	6.66%
Type3	22	36.66%
Type4	30	50.00%

Table 2 : Type of fracture according Garden Classification(REF 8)

Patients who were operated mostly fall in type 4 Garden fracture pattern with right hip being more common (56.67%). Most of the patients were operated within 1 week of trauma.

3) **) SIZE OF PROSTHESIS USED:**

Size of prosthesis(millimetre)	**No .of cases**	**Perctange**
39	4	6.67%
41	2	3.33%
43	22	36.67%
45	14	23.33%
47	10	16.66%
49	8	13.33%

Table 3 : Size of prosthesis used

- In our study most commonly used size is 43mm followed by 45mm

3) ASSOCIATED ILLNESS:

	No. of cases	Percentage (%)	Expired cases
Ischemic Heart Disease	6	10.00 %	0
Hypertension	20	36.66 %	0
Diabetes Mellitus	10	16.66 %	0
Psychotic disorder	00	00.00 %	0
Parkinsonism	00	00.00 %	0
Epilepsy	00	00.00 %	0
Pulmonary Koch's	00	00.00 %	0
Respiratory disease	04	6.66 %	0
Blindness	00	00.00 %	0
Total:	**40**	**69.98 %**	**0**

Table 4: Associated illness

20 patients are not associated with any significant co-morbidity.

The major illnesses associated with patient of Neck Femur Fracture are

1. Ischemic Heart Diseases
2. Hypertension
3. Diabetes Mellitus
4. Respiratory disease

5) POST OPERATIVE COMPLICATION (ACCORDING TO THE HISTORY GIVEN BY THE PATIENT'S):

Complication	No. Of Cases	Percentage
Infection	6	10.00 %
Dislocation	0	00.00 %
Periprosthetic fracture	0	00.00 %
Prosthetic #	0	00.00 %
Femoral Ectasia	0	00.0 %
Pulmonary Embolism	1	3.33%

Table: 5 : Complications

- Here, We would like to stress that although the number may be statistically insignificant, 1 patient of bipolar and 1 patient of monopolar got superficial infection

and those patient who developed superficial infection were from the poor socioeconomic class . The remaining 1 patient was from the middle socioeconomic class and he could get rid of the infection after 3 weeks of vigorous treatment with antibiotics and debridement.

- This suggests the general health condition, which is not so good in poor socioeconomic groups also plays a major part in post replacement infection.
- Pulmonary embolism is very fatal complication. It happened in one patient during cementing in bipolar hemiarthroplasty. This patients cardio-vascular status was already significantly compromised .

6) FOLLOW UP EXAMINATIONS:

L.1 Pain at the time of Follow Up

In cases of AMP :

Pain	Hip Score	No. of pt.	Percentage
None	44	14	46.66 %
Mild	40	14	46.66%
Occasional Moderate	20	2	06.66 %

Moderate	10	0	2.50 %
Severe	00	0	0.00 %
Total:		**30**	**100%**

Table: 6.1 Pain in AMP Patients

- Most patients were having none to mild pain with 6.66 % having occasional moderate pain after exertion.
- Almost all patients with moderate pain were able to pursue their day to day activities with little modification in cases of AMP.

In case of bipolar

Pain	Hip score	No.of pt.	Percentage
None	44	18	60%
Mild	40	12	40%
Occasional moderate	20	0	00%
Moderate	10	0	00%
Severe	00	0	00%

Table 6.2: Pain in Bipolar Patients

Most of the patients were having none to mild pain in cases of bipolar

(L-2) Functional Limp at follow up:

In case of AMP:

Functional Limp	Score	No. of cases	%
None	11	12	40.00 %
Slight	08	18	60.00 %
Moderate	05	00	00.00 %
Sever	00	00	00.00 %
Total:		**30**	**100.00 %**

Table: 6.3 Limp in AMP Patient

- About 40% patient don't have any limp and 60% patient having slight limp in cases which operated with AMP.

In case of Bipolar:

Functional Limp	Score	No. of cases	%
None	11	10	33.33 %
Slight	08	20	66.67 %
Moderate	05	00	13.75 %
Sever	00	00	03.75 %
Total:		**30**	**100.00 %**

Table: 6.4 Limp in Bipolar Patient

- In my study operated with bipolar 33.33% patient walk without limp and about 67% patient walk with support which suggest patient require gait training and abductor strengthening exercises programme postoperative and thereafter.

- All most all patients are walking with no to slight limp without any effect on normal life style in both groups of patients.

♦ **(L-3) Requirement of support at follow up :**

In case of AMP:

Support	Score	No. of cases	Percentage
None	11	22	73.33 %
1 stick	07	08	26.67 %
2 stick(walker)	03	00	00.00 %
Disabled	00	00	00.00 %
Total:		**30**	**100%**

Table: 6.5 Need for support in AMP Patient

In case of Bipolar:

Support	Score	No. of cases	Percentage

None	11	24	80.00 %
1 stick	07	06	20.00 %
2 stick(walker)	03	00	00.00 %
Disabled	00	00	00.00 %
Total:		**30**	**100%**

Table: 6.6 Need for support in Bipolar Patient

- Most patients were able to walk without support but two patients among the study still preferred to use a stick due to fear of fall when prolonged walking and not in household activities.

(L-4) Shows Walking distance at time of follow up:

In case of AMP:

Distance walking	Score	No. of cases	Perctange
Unlimited	**11**	16	53.33%
Six blocks	**8**	14	46.67%
Two or three blocks	**5**	**0**	**0.00%**
Indoor	**2**	**0**	**0.00%**
Bed/Chair	**0**	**0**	**0.00%**

Table: 6.7 Walking distance in AMP patients

In case of Bipolar:

Distance walking	Score	No. of cases	Perctange
Unlimited	**11**	**20**	**66.67%**
Six blocks	**8**	**10**	**33.33%**
Two or three blocks	**5**	**0**	**0.00%**
Indoor	**2**	**0**	**0.00%**
Bed/Chair	**0**	**0**	**0.00%**

Table: 6.8 Walking distance in Bipolar patients

- Most of patients in both group of study are able to walk without significant limitation and suggest no any significant changes among two study groups in this parameter

(L-5) Performance of Activities of Daily Living :

In case of AMP:

Result	Score	No. of Cases	Percentage
Good	>12	22	73.33%
Fair	7-11	08	26.67 %
Poor	<7	00	0.00 %
Total:		**30**	**100%**

Table: 6.9 Performance of activity in AMP patients

In case of bipolar:

Result	Score	No. of Cases	Percentage
Good	>12	26	86.67 %
Fair	7-11	04	13.33 %
Poor	<7	0	0.00 %
Total:		**30**	**100%**

. **Table: 6.10 performance of activity in Bipolar patients**

- Almost all patients were able to give justice to their routine low demand life style without any difficulties and were living a near normal life as all patients in my study are old age an required low demand activities and they perform well in both the groups.

(L-6) Limb length discrepancy :

In case of AMP:

Length discrepancy	No. of cases	Percentage
Shortening	08	26.67 %
Lengthening	0	0.00%
No change	22	73.33%
Total	**30**	**100%**

. **Table: 6.11 Limb Length Discrepancy in AMP patients**

In case of Bipolar:

Length discrepancy	No. of cases	Percentage
Shortening	04	13.33 %
Lengthening	00	0.00%
No change	26	86.67%

Total	**30**	**100%**

Table: 6.12 Limb Length Discrepancy in Bipolar patients

- Shortening in our series is ranging from 0.5 to 2.5 cm. Shortening was because of improper neck preparation, calcar fracture, sinking of prosthesis and protrusio acetabuli.

(L-7) The Rage of motion of hip at follow up :

In case of AMP:

Range of movement		Scoring	No. of Cases	Percentage
Flexion	≥ 90°	01	20	66.67 %
	< 90°	00	10	33.33 %
Abduction	≥ 15°	01	20	66.67%
	< 15°	00	10	33.33%
Adduction	≥ 15°	01	20	66.67 %
	< 15°	00	10	33.33 %
External rotation	≥ 30°	01	20	66.67 %
	< 30°	00	10	33.33 %
Internal	≥ 15°	01	22	73.33 %

rotation				
	< 15°	00	08	26.67 %

. **Table: 6.13 ROM in AMP patients**

In case of Bipolar:

Range of movement		**Scoring**	**No. of Cases**	**Percentage**
Flexion	≥ 90°	01	26	86.67 %
	< 90°	00	04	13.33%
Abduction	≥ 15°	01	26	86.67 %
	< 15°	00	04	13.33%
Adduction	≥ 15°	01	24	80.00 %
	< 15°	00	06	20.00 %
External rotation	≥ 30°	01	26	86.67%
	< 30°	00	04	13.33 %

Internal rotation	≥ 15°	01	26	86.67 %
	< 15°	00	04	13.33 %

. **Table: 6.14 ROM in Bipolar patients**

- All most all patients were having functionally acceptable Range of motion in all planes among both groups of study no statistical important differences among groups.

- **(L-8) Strength of abductor muscle :**

In case of AMP:

Strength	No. of Cases	Percentage
Grade V	10	33.33 %
Grade IV	14	46.67 %
Grade III	6	20.00 %
Grade II	0	4.66 %
Grade I	0	0.0 %
Grade 0	0	0.0 %
Total	**30**	**100%**

. **Table: 6.15 Strength of abductors in AMP patients**

In case of Bipolar:

Strength	No. of Cases	Percentage
Grade V	16	53.33 %
Grade IV	12	40.00 %
Grade III	2	6.67 %
Grade II	0	0.0 %
Grade I	0	0.0 %
Grade 0	0	0.0 %
Total	**30**	**100%**

. **Table: 6.16 Strength of abductors in Bipolar patients**

- Almost 95 % of the patient regains their functionally acceptable strength of Abductors postoperatively. Four patient out of all having power grade 3 power suggests important role of post operative physiotherapy abductor strengthening .

(7) Follow-up Radiological Examination:

Following were the radiological findings of our series.

(M.1) Greater Trochanter Osteoporosis :

In case of AMP:

Osteoporosis	No. of Pt.	Percentage
Present	26	86.67 %
Absent	04	13.33 %

Table 7.1: Greater Trochanter Osteoporosis in AMP

In case of Bipolar :

Osteoporosis	No. of Pt.	Percentage
Present	24	80.00 %
Absent	06	20.00 %

Table 7.2: Greater Trochanter Osteoporosis in Bipolar

- Greater trochanter osteoporosis was due to stress shielding amongst the both groups (REF 9,11).

(M-2) Status of Calcar Femorale:

In case of AMP:

Status of Calcar	No. of Pt.	Percentage
Resorption	04	13.33%
No Resorption	26	86.67 %

Table 7.3: **Status of Calcar Femorale in AMP**

In case of Bipolar:

Status of Calcar	No. of Pt.	Percentage
Resorption	02	6.66 %
No Resorption	28	93.33 %

Table 7.4: **Status of Calcar Femorale in Bipolar**

We noticed that calcar resorption was a constant radiological sign associated with mild to moderate degree of pain. We fail to associate it with quality of our results.

(M-3) Neck Shaft Angle :

In case of AMP:

Neck Shaft Angle	No. of Pt.	Percentage
Varus	18	60.00%
Valgus	2	6.67 %

Normal	10	33.33 %

Table 7.5 Neck Shaft Angle in AMP

- Most of patient (60%) having neck shaft angle in varus which may suggest additional cause mild to moderate pain in this group.

In case of Bipolar:

Neck Shaft Angle	No. of Pt.	Percentage
Varus	14	46.67 %
Valgus	04	13.33 %
Normal	06	40.00 %

Table 7.6 Neck Shaft Angle in Bipolar

- Approximately 47 % patient among group of bipolar have varus angle suggest to improve technique for proper placment of prosthesis to decrease post operative pain.

- **(M-4) Other Radiological findings :**

In case of AMP:

Radiological Finding	**No. of Pt.**	**Percentage**
Loosening	05	16.67 %
Acetabular degenerative change decreased joint space.	03	10.00 %
Protrusio Actabuli	1	3.33 %
Periprosthetic fracture	0	0 %
Prosthetic fracture	0	0 %
Stress fracture	0	0 %
Femoral ectasia	0	0 %
Sinking	3	10.00 %
Ectopic bone formation	0	0.00 %
Total	**12**	**40%**

Table 7.7: Other radiologic findings in AMP

- Loosening present on 5 out of 30 patients of AMP and decreased joint space as indicator of acetabular degeration is seen in 10% case with one patient having protrusion acetabuli suggest more stress on joint among group of AMP.

In case of Bipolar:

Radiological Finding	**No. of Pt.**	**Percentage**
Loosening	9	30.00 %
Acetabular degenerative change decreased joint space.	1	3.33 %
Protrusio Actabuli	0	0 %
Periprosthetic fracture	0	0 %
Prosthetic fracture	0	0 %
Stress fracture	0	0 %
Femoral ectasia	0	0 %
Sinking	2	6.67 %
Ectopic bone formation	0	0.00 %
Total	12	**40%**

Table 7.8: Other radiologic findings in AMP

- Loosening is the major radiological finding in our series; loosening was present in 9 patients out of which 2 showed sinking of prosthesis in bipolar group
- Loosening was associated with the pain at follow up. More the loosening more was the pain.

(8) Patient satisfaction:

In case of AMP:

Satisfaction	No. Of Cases	Percentage
Fully satisfied	24	80.00%
Partly satisfied	06	20.00 %
Unsatisfied	00	00.00 %
Total	**30**	**100 %**

Table 8.1: Patient's satisfaction in AMP

- 80.00 % patients were satisfied with the operation.

- 20 % of the patients required to readjust their life style and were partly satisfied

In case of Bipolar:

Satisfaction	No. Of Cases	Percentage
Fully satisfied	26	86.67%
Partly satisfied	04	13.33 %
Unsatisfied	00	06.25 %
Total	**30**	**100 %**

Table 8.2: Patient's satisfaction in Bipolar

In case of bipolar 86.67% patients are satisfied and about 13% patient are partly satisfied and among both of this groups on this parameter no significant differences present all the patient in both the groups are happy or partly happy with treatment

(9) Over All Result using Modified Harris Hip Score:

In case of AMP:

Result	Score	No. Of Pt.	Percentage
Excellent	90-100	14	46.67 %
Good	80-89	10	33.33 %

Fair	70-79	06	20.00 %
Poor	< 70	0	0.00 %
Total:		**30**	**100 %**

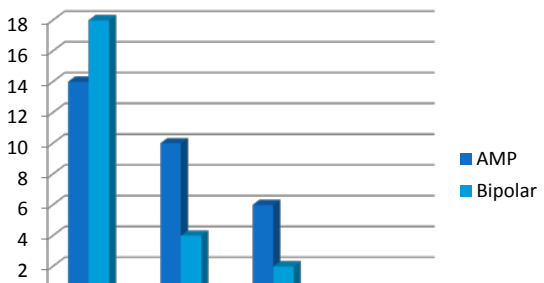
Table 9.1: Modified HHS in AMP

In case of Bipolar:

Result	**Score**	**No. Of Pt.**	**Percentage**
Excellent	90-100	18	60.00 %
Good	80-89	08	26.67 %
Fair	70-79	04	13.33 %
Poor	< 70	0	0.00 %
Total:		**30**	**100 %**

Table 9.2: Modified HHS in Bipolar

- Table shows majority of the patients followed up fall into the category of good to excellent that is about 80.00%. in Austin Moore Prosthesis group and 86.67% in bipolar which is slight higher than AMP. Almost all were living a sedentary life style with low work demand. This was the most constant finding with good to excellent results in our series.



- Cornell et al. performed a prospective six month follow-up of thirty three bipolar and fifteen unipolar hemiarthroplasties and found no differences in postoperative complication rates, length of hospitalizations, or hip rating outcomes between the two groups of patients.(REF 2)

- Hudson et al., in an eight-year retrospective review of ninety unipolar and forty-eight bipolar hemiarthroplasties, showed no statistically significant differences in the rates of mortality, surgical complications, or other events including medical complications.(REF 1)

Parameters	DATTA.D BAJRACHARYA.AR		P value	OUR STUDY		p value
	AMP	BIPOLAR		AMP	BIPOLAR	
Age	74.13	78.67	0.66	72.84	76.74	0.2874(NS)
Gender	27:73	40:60		26:74	33:67	
Comorbid disease	70%	66.7%	> 0.05	60%	66%	
Operative delay days	11	13	0.326	5.6	6.3	0.7576(NS)
HHS at final follow up	85.40	85.20	0.975	86.40	88.02	0.8514(NS)

(REF 12)

- Most of the patients who were grouped good or excellent were in their late decade of life about 60 years or more.

PREOP

POSTOP BIPOLAR

PROTRUSIO ACETABULI in AMP

POSTOP AMP

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