AN OBSERVATIONAL STUDY OF COMPLICATIONS IN PATIENTS TREATED WITH CEMENTED BIPOLAR HEMIARTHROPLASTY IN GERIATRIC FRACTURE NECK OF FEMUR AT A TERTIARY SETUP

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ABSTRACT

Background- The term" femoral neck fracture" is often used to describe fracture through the intracapsular part of the femoral neck. Most patients with a femoral neck fracture have experienced low-energy trauma. The concept of bipolar and universal endoprosthesis for these fractures was introduced in 1974. Modular bipolar has all the advantages of bipolar and in addition has the option of various stem sizes, neck length, and the ease with which it can be converted into Total Hip Arthroplasty.

Methodology-

This prospectiveobservationalstudywasconductedintheDepartmentofOrthopaedics,Velammal Medical College, Madurai, Tamil Nadu, during the period 15th July 2020 to 1st June 2021 in those patients treated surgically with cemented bipolar hemiarthroplasty who were diagnosedwithfracture neck of femur. 50 patients fulfilling the inclusion and exclusion criteria were included in the study. Standard preoperative evaluations were followed with a complete assessment by physician andanaesthetist. Routine institutional protocols were followed for preoperative preparation andsurgery. All patients were followed up at 6 weeks and monthly for a period of 3 months. During every visit,patients were assessed clinically regarding hip and knee function, ability to bear weight andwalk,deformity, andother complications. **Results-** The mean age of the patients in the study was 74.26 years. The present study also had a higher number of females. Majority of the study patients (96%) sustained the injury due to a trivial trauma like slipping or tripping. The mean delay in surgery was 2.52 days. Thereis no significant relation between outcome or mortality with delay in surgery. Hypertension was found to be the most common co-morbidity seen in 62 % of the studypatientsfollowedbyDiabetesmellitus50%. No radiological changes or complications were noted in any patients, at the end of the 3-month follow-up. **Conclusion-** Cemented Bipolar hemiarthroplasty for fractures of the femoral neck provides a better range of movement, freedom from pain, and a more rapid return to unassistedactivity with an acceptable complication rate.

Keywords-Bipolar hemiarthroplasty, pain, fracture, femoral neck, mobility

INTRODUCTION

Fractures described as basicervical fractures or extracapsular femoral neck fractures are less common than intracapsular neck fractures comprising approximately 7-8% of all femoral neck fractures.[1] The goal of treatment of this fracture is restoration of pre-fracture function without any or least associated morbidity. Anatomical reduction and internal fixation of these fractures in the elderly have poor outcomes including high rate of non-union and avascular necrosis. Most patients with a femoral neck fracture have experienced a low-energy trauma. The usual

symptoms of a hip fracture include almost invariably pain in the affected hip, inability to move and bear weight on the leg, usually shortening and external rotation of the affected extremity, and pain on passive movement.[2]

Bateman in 1974 introduced the concept of bipolar and universal endoprosthesis for these fractures. The advantage of bipolar prosthesis is that it lessens the tension at the prosthesis-cartilage interface and thereby decreasing acetabular erosion, friction, and pain. The reason is that the primary articulation occurs between bone and metal at the outer surface of the prosthesis. It is cheaper compared to total hip prosthesis and also easier and less time consuming to perform than Total Hip Arthroplasty. Bipolar prosthesis is slowly replacing conventional unipolar prosthesis in the ever-increasing population of 'active elderly' due to its superior benefits with satisfactory results like greater range of movements, lesser post-operative pain, lesser incidence of acetabular erosion[3] and more rapid return to unassisted mobilization and activity within affordable pricing. Total hip arthroplasty is not popular as a treatment modality for Neck of femur fractures in India as majority of the patients perform well with hemiarthroplasty.[4]

Bipolar hemiarthroplasty thus appears to be the ideal option for fracture neck femur in the elderly patients of our population. However, not much literature or studies are available regarding the long term results of this procedure. Some studies expressed doubt about the degree of inner bearing motion in the long term, thus pointing to doubt about its effectiveness.[5] Hence this study was conducted to study the various aspects like pain, mobility, and stability after cemented bipolar hemiarthroplasty.

MATERIALS AND METHODS

Study place- ThisstudywasconductedintheDepartmentofOrthopedics, Velammal Medical College, Madurai, Tamil Nadu,during the period 15th July 2020 to 1st June 2021 in those patients treated surgically with cemented bipolar hemiarthroplasty who were

diagnosedwithfracture neck of femur.

Study design- Thisisaprospectiveobservationalstudy done onpatientswithfractureNeckof femurtreatedwithCementedbipolarhemiarthroplastyin our hospital.

Inclusion criteria: Patients with Fracture Neck of femur (AO TYPE 31B1.3, 31B2, 31B3), those who were able towalkindependently(walkingaidsareallowed) before the injury, and age of patients> 50 years.

Exclusion criteria: patientsunfitforsurgery, withother associatedfractures, withpathologicalfractures, admittedforre-operation, patient not willing to participate in the study, patient age < 50 years and having fracture neck of femur (AO TYPE 31B1.1, 31B1.2 or Garden type 1).

Sample size- Simplerandomsamplingisusedforselectingindividualsforthestudy.

(As per the study done by TS Ragavendra and Ram Kumar Ponraj[6,7])

$$n = \frac{(z\alpha)^2 \times p \times q}{d^2}$$

Where zα is the z value for α error of 5%

p= proportion of treated cases showing good or excellent results using modified Harris hip score

q= 100-p

d= 20% of p (allowable error of precision)

$$\text{So } n = \frac{(1.96)^2 \times 80 \times 20}{(0.2\times 80)^2} = 24.01 \cong 25$$

The 0.2 in the calculation of d is the β

Power =1- β error

i.e 1-0.2 = 0.8 that is 80%

The minimum number of samples required is 25, in this study, we are taking 50 participants.

Data analysis- Results will be expressed in percentages assessed by Harris Hip Score. That is how many show excellent results, and how many show good, fair, and poor results. The percentage of complications will also be calculated. Patients were followed up at the end of 6 weeks and 3 months. During each visit, functional outcome was assessed by using Harris Hip score which is a 100-point score that measures pain, gait, functional activity, deformity, and range of motion. It is graded a score <70 as poor, 70 to 79 as fair, 80 to 90 as good, and 90 to 100 as excellent.

Ethical Considerations- Ethical clearance was obtained from the Institutional Ethics Committee of Velammal Medical College andHospital. Only necessary investigations that form part of the evaluation were done and facilities available at Velammal Medical College, Hospital were utilized. No undue financial burden was given to the patient.

Standard preoperative evaluation will be followed with a complete assessment by physician andanaesthetist. Routine institutional protocol will be followed for preoperative preparation andsurgery. Outcome and mortality analysis following management offracture neck of femur withCemented Bipolarhemiarthroplasty is assessed with regular clinical evaluation at 6 weeks and up to 3monthspostoperatively with HARRIS HIP SCORE assessment.

HARRISHIPSCORE

Score	**Rating**	
90-100	Excellent	4
80-89	Good	3
70-79	Fair	2
60-69	Poor	1
<60	Failed	0

RESULTS

Table 1: Shows the Mean age of patients in the study

	Mean	**Std.Deviation**
Age	74.26	10.133

Table2:Agedistributionofthestudypopulation

Age	**Frequency**	**Percent**
≤60	6	12.0
61-70	12	24.0
71-80	17	34.0
≥81	15	30.0
Total	50	100.0

Table 2 shows the distribution of age in the patients. The mean age is 74.26 with a standarddeviation of 10.133. Most of the patients are in the age group of71-80 years. The age groupof <60 had 12%and 61-70 had 24%. 30% belongs to the age group of >81 years. Thus wecansay fractureneck offemur isseen mostly intheoldagepopulation

Table3:Genderdistributionofthepopulation

Sex	Frequency	Percent
Female	28	56.0
Male	22	44.0
Total	50	100.0

Table 3 shows the gender distribution of the study population. More ofthepatientswerefemales28(56%)and22(44%)weremales.

Table 4: Delay in surgery

	Mean	Std.Deviation

Delayinsurgery(days)	2.52	1.776

Table5:Distributionof co-morbiditiesamongthepatient

Comorbidity	Yes		No	
	Frequency	Percent	Frequency	Percent
DM	25	50.0	25	50.0
COPD	5	10.0	45	90.0
HTN	31	62.0	19	38.0
CAD	9	18.0	41	82.0
CKD	10	20.0	40	80.0
HYPO	3	6.0	47	94.0
CVA	5	10.0	45	90.0
CA	1	2.0	49	98.0
DLP	6	12.0	44	88.0
RA	1	2.0	49	98.0

Table 5 shows the distribution of co-morbidities in the study population. Most of them havehypertension(62%)anddiabetes(50%).20%haveCKDand18%haveCAD.12%haveDLP.10% have CVA and10% have COPD.

Table6:HHSscoreat3months

HHS3m onth	Frequency	Percent
0	7	14.0
1	1	2.0
2	9	18.0
3	19	38.0
4	14	28.0
Total	50	100.0

Table 6 shows the HHS in the study group, 38% show good functional outcome, 28 % have excellentoutcome, 18%have a fairand 14%have failedoutcome.

Table7:Distributionoffunctional outcome

FunctionalOutcome	Frequency	Percentage
Excellent	14	28%
Good	19	38%
Fair	9	18%
Poor	1	2%

Table8: Mortalityinthe studygroup

Mortality	Frequency	Percent
No	40	80.0
Yes	10	20.0
Total	50	100.0

Among the 10 cases of mortality, two mortality occurred on the next postoperative day.4 cases of mortality occurred within 6 weeks of follow-up. Among these cases, the post-operative day of mortality were 5, 8, 8 & 14. The rest 4 cases of mortality occurred after 6weeks. Among these cases, the post-operative day of mortality were 45,58,62,68.

All of the mortality cases were attributed to the premorbid status of the patient. One was associated with surgical site infection but that case had a history of prolonged Foley catheterization and uncontrolled blood sugars. Almost all mortality cases had significant comorbidities which was not promptly addressed before the injury which was the prime cause of

post-operative mortality. The mortality cases within 6 weeks of follow-up were 3 in the Intensive care unit and 1 patient at home.

Among mortality, cases occurred after 6 weeks 2 have occurred in the intensive care unit and two at home.

DISCUSSION

The mean age of the patients in the present study was 74.26 years, the youngest being 60 years and the eldest being 93 years. Age distribution is an important factor in the management of hip fractures. Theresultsofourstudyshowedthatthe ageofthepatienthadminimalinfluence onthefinalfunctional outcome. The present study also had a higher number of females who sustained a fracture neck of femur as compared to the male population. Elderly females are more prone to fracture Neck of femur due to osteoporosis. [8] Inourstudy56%werefemale. But in most other studies there is a significant difference as femalesare more in number who sustain these fragility fractures. One of the other factors studied was the days taken for surgery following the fracture. The major reasonforthe delaywaslatepresentationtothe hospital.Someotherreasonsweredelayindecision makingfromthe patient'ssideandpoorgeneralconditionwhichhastobecorrectedto anacceptable limit prior to surgery. The mean delay in surgery in this group is 2.52 days. There is no significant relation between outcome and mortality with the delay of surgery. A slight increaseinmortalityorpoorfunctionaloutcomeincaseswheresurgerywasdelayedmaybebecauseof the poor general condition of the patient and the time taken was only to do basic resuscitationbeforethismajorprocedure. Immediate surgical intervention is required to avoid complications like respiratory infections, catheter sepsis, cardiac failure, and the occurrence of bed sores. It also helps in early mobilization and rehabilitation of the patient. Hypertension was found to be the most common co-morbidity seen in 62 % of the studypatientsfollowedbyDiabetesmellitus50%. Theothercomorbiditiesseenin the order of decreasing frequency were CKD (20%), CAD (18%) Dyslipidemia (12%),COPD (10%), CVA (10%), Hypothyroidism (6%). Remarkably (16%) patients did not haveanycomorbidityandtheywerenotonanydrugs.Thecategoryofpatientsnothavingcomorbidities

had significantly better functional outcomes and no mortality in 3 monthsfollow-upofthisstudy.Itwasobservedthatthepostoperativerehabilitationandhospitalstay ofpatientswere significantlyaffectedbythepresenceoftheaboveco-morbidities and alsohad aneffect on the final functionalresult of the procedure.[9]

The long-term survivorship of bipolar hemiarthroplasty prostheses used to treat displacedfemoral neck fractures in the elderly was high, and the procedure can be considered definitiveforthe majority ofelderly patients with afemoral neck fracture. Most of the cemented bipolar hemiarthroplasty was done within a duration of 90 minutes. A similar duration of the procedure has been reported by Haidukewych, et al.[10] Becauseofthemeticulousmeasuresofsterilityandaccurateoperationtheatresetting,the postoperative infection rate was insignificant and among the two cases of surgical site infections one had mortality and the other one was resolved without any sequelae after treatment with adequate debridement and antibiotics. Also, the surgical site infection that had mortality was associated with prolonged catheterization preoperatively too. The infection rate of 3.9% after bipolar hemiarthroplasty reported by Nottage and McMaster was comparable with the 4% infection rate of our study.[11]

Deep vein thrombosis prophylaxis was given for all patients, using low molecular weight heparins and it was not seen as a complication of this morbid fracture. Almostallourpatients weremadeto sitwithknees hangingfrom the edgeofthebedon1stpostoperative day. Patients were provided with physiotherapy assistance and walker assisted weightbearingmobilization onpostoperativeday2.

All patients were followed up regularly at 6 weeks to 3 months. The Harris Hip Scores wererecorded at each follow-up visit. Most of the patients who were able to mobilize in immediatepostoperative days showed good HHS at 6 weeks and 3 months. HHS slightly increased on 3month follow-up. In our study, the final Harris hip score as evaluated at 6 months follow up averaged 82.7. Our results are comparable with standard studies of bipolar hemiarthroplasty performed for fracture neck of femur. Most of the patients have decent HHS

and it shows that this procedure isaptfor the condition. Wangetal.[12] conductedacomparativestudyofbipolarhemiarthroplastyandtotalhiparthroplasty for displaced femoral neck fractures in the healthy elderly. They assessed EightRCTs which included a total of 1,014 patients; (523 had BHA and 491 had THA). The data fromincluded RCTs were divided into four subgroups according to different follow-up durations.The Harris Hip Score after BHA was not different from that after THA in all subgroups. TheRCTs included follow-up within a year, within 2 years, within 4 years, and after 4 years. Theaveragescoreinallstudiesturnouttobe80whichiscomparablewiththisstudy. Wang et al.[12] concluded that in healthy elderly patients with a displaced fracture neck of femur,treatment with bipolar hemiarthroplasty led to better outcomes regarding dislocation rate,whileTHAwasbetterregardingacetabularerosionrateandreoperationrate.When comparing bipolar hemiarthroplasty with THA, there were no significant differences in otherimportant outcomes such as Harris Hip Score, infection rate, general complications, and oneyear mortality. Except for the acetabular erosion, it's a reasonable procedure for fracture neckoffemur. Yurdakul et.al[13] in their study assessed 133 patients, half of whom received cemented bipolarand the other half receiving uncemented bipolar hemiarthroplasty, and assessed their functionaloutcome using the Harris hip score. Their mean Harris hip score was 75 for both cemented anduncemented. Almost similar study being done and our average score suggests that cementedbipolar can give more satisfying results to the patient in terms of functional outcome though alargersample study is needed to prove the same.

CONCLUSION

Throughout the preview of the present study, our experience with cemented bipolar prosthesis hasbeensignificantlybetterthanthatwithordinarynon-modularbipolarprosthesis. Even ifthe follow-up was done only for 3 months this much excellent functional outcome for thepatient substantiates that Cemented Bipolar hemiarthroplasty for fractures of the femoral neck provides a better range of movement, freedom from pain and more rapid return to unassistedactivity with an acceptable complication rate. Thelong-

termresultsusingcementedbipolarhemiarthroplastyneedsfurtherstudi e s foralonger period in a larger sample to know the effect of modularity on acetabular wear, cementrelatedlongtermproblems,
andalsotheallegationoftensaidthatthebipolaritybeingconvertedtounipolaritywithtime.

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