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Original Research Article

Functional Outcome of Modular Bipolar Prosthesis in Intracapsular Neck of Femur Fractures

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Abstract:

Background: One of the most frequent fractures in the elderly is the femoral neck fracture. Bipolar prosthesis, which is said to have a lower incidence of problems than the tried-and-true unipolar prosthesis, is gradually replacing it. Modularity has the advantage of various sizes in the prosthesis which helps in maintaining limb length offset and soft tissue tension and helps in achieving identical anatomy and biomechanics as that of a hip joint. Therefore, this study will help us to evaluate the functional outcome of modular bipolar prosthesis in intracapsular femoral neck fractures.

Methodology: After obtaining consent from 50 patients admitted in hospital who came with intracapsular fracture of femoral neck was included in this study. They underwent treatment by modular bipolar prosthesis after all necessary investigations and clinical examination. After ruling out any intraoperative complications and immediate postoperative complications, patients were followed up at 6 weeks, 3 months and at 6 months post-surgery. Post- operative wound was examined and checked for any complications, including limb shortening. Clinical evaluation was done using Modified Harris Hip score.

Results: In this study of 50 cases there were 16 males and 34 females, with a maximum age of 80 years, minimum age of 50 years. There was a slight predominance of right sided fractures when compared to the left. At the final six months follow up assessment with Harris Hip Score 15 patients (30%) achieved 'Excellent' result, 22 patients (44%) achieved 'Good' result and 13 patients (26%) achieved 'Fair' result. At the end of study majority of the participants did not have any complications, only 5 (10%) and 3(6%) of them had wound infection and limb shortening as complications.

Conclusion: We can conclude that modular bipolar hemiarthroplasty produces good functional outcomes with minimal complications for displaced intracapsular femoral neck fractures and has several advantages.

Keywords: Femoral neck fracture, Modular Bipolar Prosthesis, Hemiarthroplasty, Harris hip score.

Introduction

One of the most frequent injuries in the elderly is a femoral neck fracture, which has always presented orthopaedic surgeons with significant difficulties. Nearly half of all hip fractures are femoral neck fractures, and the majority of these cases affect elderly patients after uncomplicated falls. [1-3] With an increase in life expectancy, an increase in osteoporosis, poor vision, neuromuscular incoordination, and changes in lifestyle that encourage sedentary behaviors, the prevalence of these fractures has increased. Femoral neck fractures in the elderly are associated with high morbidity and mortality. [4]

Surgical treatment of femoral neck fracture is one of the most common procedures performed by orthopaedic surgeons. The ideal course of treatment is still debatable. [5] Hemiarthroplasty, complete hip arthroplasty, and reduction and internal fixation are currently available treatments. The main objective of fracture treatment is to restore the patient to their pre-injury level of function, regardless of the patient's age or fracture type. Prosthetic replacement is frequently advised in elderly patients who are ambulatory due to the considerable risk of non-union and avascular necrosis associated with fractures. [6-13] Early return to daily activities is the goal of replacement surgery for transcervical fracture neck femur.

The era of hemiarthroplasty of the hip as a treatment for these fractures began with the invention of a single piece unipolar metal prosthesis by Thomson in 1954 and Austin Moore in 1957 to replace the femoral head. The clinical outcomes of the fixed-head hemiarthroplasty are impacted by high rates of acetabular erosion and protrusion, which makes revision to a total hip

arthroplasty challenging. [14] Numerous surgeons have opted for a bipolar design as a result of these difficulties.

A bipolar hemiarthroplasty has the potential to lessen acetabular erosion, wear, and the symptoms that go along with it. [15] Bipolar prostheses were initially non-modular in design, and then transitioned to modular prostheses in the present. The prosthesis' modular design enables neck length modification with replaceable stems.

A modular prosthesis makes it simpler to convert in the future to a total hip replacement because just the acetabular component needs to be inserted. In the industrialized world, primary Total Hip Replacement (THR) is being provided as a therapeutic option for these fractures because it is well established that prosthetic replacement is superior to internal fixation in the elderly.

In our country, total hip arthroplasty is still not widely used as a form of treatment for femur neck fractures because of the significant increase in cost of treatment. In addition, there are more dislocations and morbidities linked to the surgery. [17]

Modularity has the advantage of various sizes in the prosthesis which helps in maintaining limb length offset and soft tissue tension and helps in achieving identical anatomy and biomechanics as that of a hip joint in addition to easier conversion to total hip arthroplasty by changing the acetabular component alone. [18] Therefore, this study will help us to evaluate the functional outcome of modular bipolar prosthesis in femoral neck fractures.

Methodology

By purposive sampling all consecutive cases of femoral neck fractures attending the Department of Orthopaedics, Government Medical College, and Thiruvananthapuram were included in the study until the sample size of 50 was attained.

(Sample size was calculated by taking the standard deviation of modified hip score as 5.46 from a study published in Malays Orthopedic Journal and absolute precision as 1.5).[9] All patients were assessed for any intraoperative and post-operative complications and for modified Harris hip score at 6 weeks, 3 months and 6 months post operatively to evaluate the functional outcome of modular bipolar prosthesis. All data was then entered and analyzed using Microsoft excel 2019 and expressed in proportions.

Institutional Ethical clearance was taken. Individual informed consent was taken from every study participant before the study.

Results

50 patients were treated with modular bipolar hemiarthroplasty for fracture neck of femur.

Socio – Demographic Characteristics: In the present study, 28(56%) were from 61 – 70 years of age. 14(28%) and 8 (16%) belonged to age groups 51-60 years and 71-80 years respectively and of the 50 participants, 16(32%) were males and 34 (68%) were females.

Characteristics of Injury Pre-Operative: Out of 50 participants, it was seen that 27(54%) of the study participants had right side limbs affected whereas 23(46%) of them had their left limbs affected and majority 33(66%) of them slipped and had injury, 10 (20%) of them had injury due to road traffic accidents (RTA) and 7 (14%) of them suffered injury due to giddiness. Majority 20(40%) of study participants presented to hospital after injury within 24 – 72 hours, 16(32%) presented within less than 24 hours and 4(8%) of them presented after 3 weeks of which 25(50%) had a trans cervical type fracture, 16(32%) had sub capital type and 9(18%) had basicervical type on radiological scan. Among the 50 study participants, 24 (48%) had grade 3 type of Singh's Index of Osteoporosis. 5(10%), 10(20%), 8(16%) and 3(6%) of them had index of grade 2, 4,5 and 6 respectively.

Table 1: Distribution of Study Participants Based On Socio Demographic Factors Age (N = 50)

AGE		
Determinants	**Frequency**	**Percentage**
50 – 60	14	28
61 – 70	28	56
71 – 80	8	16
Total	**50**	**100.0**
GENDER		
Male	16	32
Female	34	68
Total	**50**	**100**

Table 2: Distribution Of Study Participants Based on characteristics of injury (N = 50)

Side Affected		
Determinants	**Frequency**	**Percentage**
Left	23	**46**
Right	27	**54**
Total	50	**100**
Mode of Injury		
Slipping	33	**16**
Giddiness	7	**14**
RTA	10	**20**
Total	50	**100**
Time To Presentation After Injury		
<24 hours	16	**32**
24 hours – 72 hours	20	**40**
72 hours – 1 week	8	**16**
1 – 3 weeks	2	**4**
> 3 weeks	4	**8**
Total	**50**	**100**
Injury – Radiological Type		
Trans – cervical	25	**50**
Sub - Capital	16	**32**
Basi Cervical	9	**18**
Total	**50**	**100**
Singh's Index Of Osteoporosis		
Grade 2	5	**10**
Grade 3	24	**48**
Grade 4	10	**20**
Grade 5	8	**16**
Grade 6	3	**6**
Total	**50**	**100**

Post-Operative Characteristics: Out of 50 participants in this study, the majority 42(84%) of them had no complications at all, whereas 5(10%) and 3 (6%) had superficial infection and limb shortening as complications respectively. When the functional outcome was assessed based on Modified Harris Hop Score at 6 weeks post-surgery, 28 (56%) of them had poor, 20 (40%) and 2(4%) of them had fair and good Harris hip score respectively. At 3-month post-surgery, only 2(4%) had poor score, 25(50%), 22(44%) and 1(2%) had fair, good and excellent score respectively.

At 6 months post operatively 22(44%) of the study participants had good Harris hip score, 15(30%) and 13(26%) had excellent and fair score at end of 6 months post-surgery and no participants had poor score at all.

Table 3: Distribution of Study Participants Based On Post-Operative Complications (N = 50)

Post-Operative Complications		
Determinants	**Frequency**	**Percentage**
Limb Shortening	3	**6**
Superficial Infection	5	**10**
Nil	42	**84**
Total	**50**	**100.0**

Table 4: Distribution Of Study Participants Based On Harris Hip Score At 6 Weeks, 3 Months and 6 Months (N = 50)

Harris Hip Score at 6 weeks	**Frequency**	**Percentage**
Poor	28	**56**
Fair	20	**40**
Good	2	**4**
Total	**50**	**100.0**
Harris Hip Score at 3 Months	**Frequency**	**Percentage (%)**

Poor	2	**4**
Fair	25	**50**
Good	22	**44**
Excellent	1	**2**
Total	**50**	**100.0**
Harris Hip Score at 6 Months	**Frequency**	**Percentage (%)**
Fair	13	**26**
Good	22	**44**
Excellent	15	**30**
Total	**50**	**100.0**

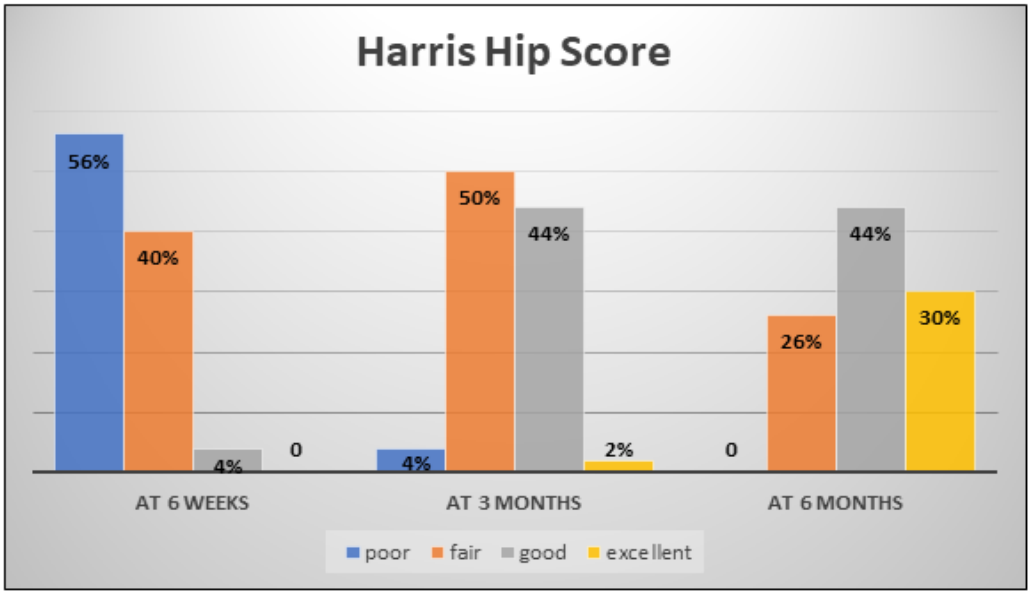

Figure 1:

Discussion

Femoral neck fractures in the elderly are frequently treated by hemiarthroplasty. The choice of whether to undergo hemiarthroplasty with a unipolar or bipolar prosthesis is still debatable, with supporters on both sides.

The idea of dual bearing surfaces has many benefits since it allows motion to be shared across the two surfaces, which reduces net wear on either surface and prevents erosion at the acetabular-joint contact. Additionally, the joint's overall range of motion is expanded. The system's value lies in its modularity, which is made possible by the availability of different-sized stems and necks, as well as in how easily it can be converted into a total hip replacement without having to replace the femoral stem.

Out of 50 participants in this study, the majority 42(84%) of them had no complications at all, whereas 5(10%) and 3 (6%) had superficial infection and limb shortening as complications respectively. Infections treated with proper antibiotic and dressings and shortening treated with heel raisers. There were no cases of mortality in this study.

In another study conducted in 2020 by Ravi Kumar K, Hemanth R, Mohammed Tanzeem P, Prajwal Sadalagi saw that at the end of 6 months follow up duration, of 30 cases there were 2 cases of limb length discrepancy in the form of shortening of less than 1cm, 1 case of chronic hip pain. There were no cases of infection, no cases of hip dislocation. [18]

Also, in another study in 2019 by Dr. Ashish Gaur, Dr. Mahendra Prakash Jain and Dr. Vinay Josh showed that one patient had superficial wound infection which was treated with meticulous wound care and antibiotics no patient had deep infection or pulmonary infection. One had bed sore which was treated with air bed and wound dressing. After 3 months of follow up fair result in 4 patients, good result in 12 patients and excellent result in 24 patients. Eventually all had good to excellent result after 1 yr. [19]

There are various benefits; these findings are comparable to those of other studies.

Conclusion

From this study it was seen that most of the study participants had excellent to good functional out-

come by modular bipolar hemiarthroplasty. It is needed to conduct longer-term research on a bigger sample size to better understand the long-term outcomes of modular bipolar hemiarthroplasty. The patient's age, any accompanying co-morbidities, and the best post-operative therapy all affect the final functional outcomes. For femoral neck fractures, modular bipolar hemiarthroplasty offers a higher range of motion, pain relief, and a quicker return to independent activity with a manageable complication rate.

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