Bipolar or unipolar hemiarthroplasty for displaced femoral neck fractures in elderly patients

Alireza Hootkani[1], Mohammad Hosein Taraz Jamshidi[1], Seid Reza Sharifi[2], Masood Mirkazemi[3], Mehran Azami[3], Hamid Reza Norozi[3], Mohsen Darban Astan[3], Sara Amel Farzad[4], Mohammad Taghi Peivandi[2]

[1.] Assistant Professor of Orthopedic Surgery, Orthopedic and Trauma Research Center, Mashhad University of Medical Sciences, Mashhad, Iran
[2]. Associated Professor of Orthopedic Surgery, Mashhad Orthopedic and Trauma Research Center, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran
[3.] Orthopedic Resident ,Department of Orthopedic Surgery, Mashhad Orthopedic and Trauma Research Center, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran
[4] Ph.D. of Pharmacology, Mashhad University of Medical Sciences, Mashhad, Iran
peivandimt@mums.ac.ir

Abstract: Treatment of femoral neck fractures with displacement remains controversial and confusing yet. Among different therapeutic methods, Hemiarthroplasty is associated with good pain control and satisfactory results with low rate of revision. Morbidity and mortality of this method is also lower than total hip replacement. In this study we have compared the surgical outcome of Thompson unipolar hemiarthroplasty, Moore unipolar hemiarthroplasty and bipolar hemiarthroplasty among patients with femoral neck fracture. 109 older than 65 years patients with femoral neck fracture were treated by unipolar or bipolar Hemiarthroplasty from 2005 to 2008 in Emam Reza hospital- Mashhad Iran. Functional results and complications were assessed 3 months and one year after treatment. During one year follow up, 7 patients died and 6 cases were missed, so 96 cases completed the study. 37 patients were treated by bipolar prosthesis, 42 cases were treated by Thompson unipolar and 17 by Moore unipolar prosthesis. All groups were sex matched but mean age in bipolar group was significantly lower than others. Although complications were less common in bipolar group especially compared to Moore group, the difference was not significant statistically. There was no significant difference in functional results between 3 groups after 3 months follow up but after one year follow-up, all functional indices indicated significantly better results in bipolar group. We suggest bipolar prosthesis for treatment of femoral neck fractures especially in younger adults because of better functional results and less complications.
[Hootkani A, Taraz JMH, Sharifi SR, Mirkazemi M, Azami M, Norozi HR, Darban AM, Amel FS, Peivandi MT. **Bipolar or unipolar hemiarthroplasty for displaced femoral neck fractures in elderly patients.** *J Am Sci* 2013;9(10):320-323]. (ISSN: 1545-1003). http://www.jofamericanscience.org. 42

Keywords: Femoral neck fractures; Hemiarthroplasty; Bipolar; Unipolar

1. Introduction

Increased femoral neck fractures due to old age have caused evermore hip arthroplasty operations. Reduction and internal fixation of femoral neck fracture involves shorter hospitalization time and reduced mortality compared to other therapeutic methods, but treatment failure and requirement of repeated operation in it can be as high as 30 percent [1, 2, and 3].

Total hip arthroplasty gives better results for pain control with better clinical outcome but there are different and at times contradictory reports in this regard [4, 5]. Hemiarthroplasty has also had good acceptable results in pain control with fewer requirements for repeated operation and less complications and mortality relative to total hip arthroplasty but higher relative to internal fixation method [6, 7].

A number of factors including age, background diseases, personal conditions and surgeon's point of view are important in choice of treatment method in femoral neck fracture [8]. Increase in population of senior citizens in our country and cultural differences in life style demand more studies in geriatrics. The goal of our study was to comparatively survey the results of treatment using Thompson-Moore unipolar Hemiarthroplasty and bipolar arthroplasty in persons over 65 years old because bipolar prosthesis is more expensive than unipolar prosthesis.

2. Material and Methods

This prospective study was performed on patients diagnosed with type III and IV femoral neck fracture over 65 years old between 2004 and 2007 in Emam Reza university hospital. Exclusion criteria of the study were as follows: dementia, lack of ability to walk before fracture, pathological fracture, existence of accessory fractures and patients living in senior citizens residence. The patients were selected randomly between bipolar and unipolar arthroplasty groups.

Personal information, age, gender, prosthesis type, quality of life and competence, minor and major

complications and follow-up period data were recorded in questionnaire. Minor post operation complications were urinary infections, heterotopic ossification, operation site hematoma and fever; major complications included Thromboembolism, deep wound infection, bed sore, revision surgery and prosthesis dislocation, periprosthetic fractures and implant failure. During follow-up period the surveyed complications were recorded and evaluated by an orthopaedic surgeon. Periodic examinations were performed within 1, 3 and 12 months. The patients were examined by surveillance, CBC, serial radiography but not Doppler sonography or urine culture routinely. During follow-up period musculoskeletal functional assessment was completed for all patients. The data collected were processed using descriptive statistics and frequency distribution tables using SPSS software and chi square test.

3. Results

During the study period of one year, seven patients out of 109 with femoral neck fracture died and six patients were not accessible. 96 patients completed the study. 37 patients (38.5%) were treated using cementless bipolar prosthesis, 42 patients (43.8%) using Thompson unipolar prosthesis and 17 patients (17.7%) using unipolar Moore prosthesis.

In bipolar group mean age was 69.29 years (range 65-84) and in Thompson prosthesis group it was 76.29 (range 65-92) and finally in Moore prosthesis group the mean age was 76.05 (mean 65-90).

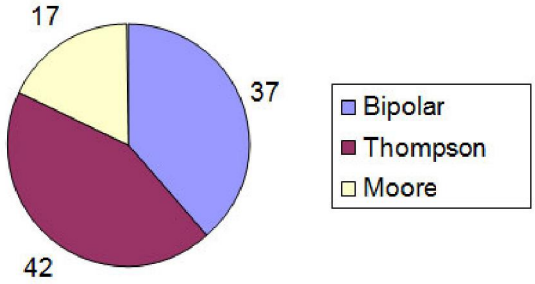

Figure 1. The kinds of arthroplsties for the patients

In comparison of the patients' age in the three groups based on treatment method, there was a significant difference (P<0.001) according to ANOVA test, and in comparison of groups using Tukey test there was a significant difference between mean patient age under treatment with bipolar prosthesis relative to unipolar prosthesis (P<0.05) while there was no significant difference between Moore and Thompson groups (P=0.927).

Table 1. *Frequency distribution of major complications after operation in femoral neck fracture patients based on treatment type*

Major complications	Bipolar		Thompson		Moore		P Value
	Prevalence	Percent	Prevalence	Percent	Prevalence	Percent	
Thromboembolism	7	18.9	11	26.2	4	23.5	0.743
Deep Infection	1	2.7	5	11.9	1	5.9	0.283
Bed Sore	1	2.7	14	33.3	6	35.3	0.002
Revision Surgery	3	8.1	8	19	0	0	0.082
Dislocation	1	2.7	5	11.9	1	5.9	0.283
Periprosthetic Fracture	1	2.7	5	11.9	1	5.9	0.283
Implant Failure	1	2.7	2	4.8	0	0	0.624

Table 2. Frequency distribution of minor complications after operation in femoral neck fracture patients based on treatment type

Minor Complication	Bipolar		Thompson		Moore		P Value
	Prevalence	Percent	Prevalence	Percent	Prevalence	Percent	
Urinary Infection	1	2.7	5	11.9	1	5.9	0.283
Heterotopic Ossification	6	16.2	12	28.6	8	47.1	0.048
Hematoma	2	5.4	3	7.1	0	0	0.534
Fever	2	5.4	6	14.3	1	5.9	0.346

Table 3. Operation results at the end of the first 3 months follow-up in femoral neck fracture patients based on treatment group

Practical Result	Bipolar		Thompson		Moore	
	Prevalence	Percent	Prevalence	Percent	Prevalence	Percent
Very bad	0	0	5	11.9	6	35.3
bad	2	5.4	4	9.5	4	23.5
Poor	4	10.9	18	42.8	4	23.5
Good	10	27	8	19	1	5.9
Very Good	10	27	5	11.9	2	11.8
Excellent	11	29.7	2	4.8	0	0

Table 4. Operation results at the end of the first follow-up year in femoral neck fracture patients based on treatment group

Practical Result	Bipolar		Thompson		Moore	
	Prevalence	Percent	Prevalence	Percent	Prevalence	Percent
Very bad	0	0	3	7.1	3	17.6
bad	0	0	5	11.9	7	41.2
Poor	2	5.4	16	38.1	5	29.4
Good	0	0	6	14.3	0	0
Very Good	14	37.8	9	21.4	2	11.8
Excellent	21	56.8	3	7.1	0	0

22 patients showed symptoms of deep vein thrombosis (22%). 7 patients had deep infection (13.7%). 21 patients were afflicted with bed sore during treatment period (21%). 11 patients repeated operation due to different reasons such as infection and open placement of prosthesis (11.4%). 7 patients were subject once to prosthesis dislocation (13.7%).

In tables one and two the complications in the studied groups has been recorded. As it can be seen in the tables, the complications were more frequent in Thompson prosthesis group and less frequent in bipolar group, and there was a significant difference in bed sore prevalence in groups.

As can be seen in table 2, minor post operation complications during follow-up period were more frequent in Thompson prosthesis group and less so in bipolar groups. Heterotopic ossification was reported considerably more in Moore prosthesis group. In tables 3 and 4 the operation results at the end of 3and 12 months has been recorded. In survey of practical results after one year follow-up, there was a significant difference between groups in view of chi square test ($P<0.001$), and practical results in bipolar group were much better than the other two groups with better results in Thompson group relative to Moore.

4. Discussions

Complications of treatment of femoral neck fracture using Hemiarthroplasty method in bipolar group were less than other groups. Most complications were seen in Thompson prosthesis group. The studied complications appeared during the one year follow-up period and are documented. Functional evaluation in bipolar group was better than other groups, and can be true due to old age of patients and use of musculoskeletal functional assessment questionnaire. Impossibility of Doppler sonography to explore venous thrombosis in all patients was a limitation of this study. In a systematic review study in the Netherlands, Raaymakers et al preferred bipolar prostheses to unipolar ones due to limited surgery, less probability of repeated surgery and need for total hip replacement, and feasibility of leaving stem in case of repeated surgery while the need for further study has been indicated in this study [9].

In another study, Kenzora from Maryland University in a one year follow-up of patients reported less pain and better functional situation in bipolar relative to unipolar prostheses in patients over 65 years old [10]. In a study by Gjertsen et al published in 2008 pain, quality of life and patient satisfaction was evaluated four months after surgery. Patients had been treated using internal fixation or bipolar arthroplasty. They recommended treating femoral neck fracture by displacement using Hemiarthroplasty [11]. The studied groups were uniform in view of gender distribution but the age of patients under treatment with bipolar prosthesis was significantly lower. Major and minor post treatment complications were also evaluated in patients. While there were fewer complications in bipolar group compared with Moore group, the difference was not significant. Only bed sore was significantly more prevalent in Moore group among major complications, and heterotopic ossification was significantly more common in Moore group compared to other groups.

Functional evaluation of patients after operation was done using musculoskeletal functional assessment questionnaire considering movement, pain and walking using instrument criteria, and there was no significant difference between the three groups at the end of three months of follow-up with significantly higher scores in bipolar group. Finally, in the end of one year follow-up of patients all functional criteria indicated better results in bipolar group than the other two unipolar groups with description of functional evaluation of nearly 95% of patients under treatment with bipolar prosthesis as very well and excellent, while very well and excellent results appeared 27.5% in Thompson and 11.8% in Moore prosthesis groups. One advantage of bipolar prostheses is easier revision because there is no need for extracting stem and its re ream, and it can be left in place. In conclusion, se of bipolar prostheses in treating femoral neck fractures gives better functional results and fewer complications, and it is especially recommended in young people.

Acknowledgements:

The authors appreciate research deputy of MUMS for financial support in approving and execution of this project.

Corresponding Author:
Dr. Mohammad Taghi Peivandi,
Mashhad Orthopedic and Trauma Research Center,
Faculty of Medicine, Mashhad University of Medical Sciences,
Mashhad, IR Iran.
Tel: +98.5118523200,
Fax: +98-5118523200,
E-mail: peivandimt@mums.ac.ir

References

1. Davison JN, Calder SJ, Anderson GH et al. Treatment for displaced intracapsular fracture of the proximal femur. A prospective, randomized trial in patients aged 65 to 79 years. J Bone Joint Surg 2001; 83-B (3): 206-212.
2. Heikkinen T, Wingstrand H, Partanen J, Thorngren KG, Jalovaara P. Hemiarthroplasty or osteosynthesis in cervical hip fractures: matched-pair analysis in 892 patients. Arch Orthop Trauma Surg 2003; 123(2): 134-138.
3. Parker MJ. Internal fixation or Arthroplasty for displaced sub capital fractures in the elderly? Injury 1992; 23(7): 521-524.
4. Ravikumar KJ, Marsh G. internal fixation versus hemi-arthroplasty versus total hip Arthroplasty for displaced sub capital fractures of femur- 13 year results of a prospective randomized study. Injury 2000; 31(9): 793-797.
5. Rodriguez-Merchan EC. Displaced intracapsular hip fractures: hemiarthroplasty or total Arthroplasty? Clin Orthop 2002; 399(1): 72-77.
6. Parker MJ, Pryor GA. Internal fixation or Arthroplasty for displaced cervical hip fractures in the elderly: a randomized controlled trial of 208 patients. Acta Orthop Scand 2000 Oct; 71(5): 440-446.
7. Partanen J, Saarenpaa I, Heikkinen T, Wingstrand H, Thorngren KG, Jalovaara P. Functional outcome after displaced femoral neck fractures treated with osteosynthesis or hemiarthroplasty: a matched-pair study of 714 patients. Acta Orthop Scand 2002; 73(5): 496-501.
8. Follacci FM, Charnley J. A comparison of the results of femoral head prosthesis with and without cement. Clin Orthop 1969; 62(2): 156-61.
9. Raaymakers EL. Fractures of the femoral neck: a review and personal statement. Acta Chir Orthop Traumatol Cech. 2006;73(1):45-59.
10. Kenzora JE, Magaziner J, Hudson J, Hebel JR, Young Y, Provenzano G. Outcome after hemiarthroplasty for femoral neck fractures in the elderly. Clin Orthop Relat Res. 1998 Mar;(348):51-8.
11. Gjertsen JE, Vinje T, Lie SA, Engesaeter LB, Havelin LI, Furnes O, Fevang JM. Patient satisfaction, pain, and quality of life 4 months after displaced femoral neck fractures: a comparison of 663 fractures treated with internal fixation and 906 with bipolar hemiarthroplasty reported to the Norwegian Hip Fracture Register. Acta Orthop. 2008 Oct; 79(5):594-601.

8/8/2013