Original Research Article

A Hospital Based Prospective Study to Compare Outcome of Osteosynthesis Versus Hemiarthroplasty for the Treatment of Displaced Femoral Neck Fracture

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Abstract

Background: Cemented Bipolar hemiarthroplasty thus appears a good option for fracture neck femur in the elderly population. With limited evidence for cemented hemiarthroplasty for improved functional outcome and one of the meta-analysis showing increased post-operative mortality. The aim of this study to assess the comparison of functional outcome of osteosynthesis versus hemiarthroplasty for the treatment of displaced femoral neck fracture. **Materials & Methods**: A hospital based prospective clinical study done on 80 patients involving intracapsular fracture of neck of femur. These patients were randomly divided in two groups; HA group (N=40) and OS group (N=40) selected from Department of Orthopaedic and indoor at our centre Dr Baba Saheb Ambedkar Medical College & Hospital, Rohini, Delhi, India during 2016 to 2019. All patients were operated under General/Spinal anaesthesia for bipolar cemented hemiarthroplasty and internal fixation. The results were classified as excellent, good, fair and poor based on points scored on HARRIS HIP SCORE following functions were taken into consideration. **Results:** The maximum age of patients was 89 year and minimum age of 50 year with mean age of 74.33 years in HA group & 75.12 yrs in OS group, statistical non-significant (P>0.05). The average hospital stay was 11.27 days in HA group & 12.78 days in OS group, statistical non-significant (P>0.05). They were excellent in 10% patients, 60% patients were having good Harris hip score, 27.5% patients were having fair Harris hip score and only 2.5% patients fell in poor Harris hip score in HA group and in OS group Harris hip score was excellent in 7.5% patients, 50% patients were having good Harris hip score, 35% patients were having fair Harris hip score and only 7.7% patients fell in poor Harris hip score. **Conclusion:** We concluded that cemented bipolar hemiarthroplasty appears to be an excellent procedure to achieve good clinical results in elderly patients with fracture femoral neck. A continued clinical and radiologically evaluation is essential for identifying complicating factors.

Keywords: Hemiarthroplasty (HA), Osteosynthesis (OS), Harris Hip Score, Femoral Neck, Fracture.

Introduction

Hip fractures are located in the proximal femur and can involve the femoral neck, trochanteric and subtrochanteric regions. The two most common types are trochanteric (inter-trochanteric) and femoral neck (cervical) fractures (FNF). Femoral neck fractures (FNFs) constitute approximately 50% of all hip fractures, and approximately 75% of all FNFs are displaced. Sir Astley Cooper (1768-1841) first described FNFs in 1822. Conservative treatment with bed rest or a spica-cast for abduction and internal rotation represented the most common methods for many years[1].FNFs are mainly a fragility fracture in the elderly and frail, predominantly affecting women after menopause but recent reports have indicated an increased incidence in elderly men[2].The first osteosynthesis is attributed to the German surgeon Von Langenbeck (1810-1887), who nailed a non-united FNF with a metal silver screw in 1858. However, the patient died because of infection. Loreta reported the first successful attempt of this procedure in 1888. In 1941, the American Academy of Orthopedic Surgeons (AAOS) advocated the trifin nail technique for internal fixation. However, in 1976, the British Medical Research Council indicated that the trifin nail was not suitable for displaced FNFs. Asnis cannulated screws were developed in 1980, and they are still in use today.[1]The first biomechanical classification was Pauwels' classification (1935), which is still frequently used in the literature and calculates the angle between the fracture line of the distal fragment and the horizontal line to determine the shearing stress and compressive force. Investigations of the reliability of Pauwels' classification[3,4]have shown low inter-observer agreement, thus demonstrating the unreliability of this classification. The AO classification has been difficult to use in practice and has shown low intraobserver and interobserver reliability[5].The most commonly used classification method is likely that of Garden (1961), which consists of four groups and utilizes the degree of displacement or impaction as a discriminator. The Garden and AO classifications are more reliable than Pauwels' classification[6].Nonoperative treatment of femoral neck fracture is linked to poor functional outcome and is associated with a high risk of pain, fracture displacement and medical complications.[7] Accurate apposition and impaction of bone fragments with closed or open reduction and internal fixation therefore present increased importance for fracture healing. Operative treatment is almost mandatory. Displaced FNFs will not unite without internal fixation. The surgical procedure differs worldwide but mainly includes internal fixation and hip arthroplasty.Internal fixation (IF) remains the treatment of choice for patients below 65 years of age with a displaced fracture because of its lower failure rate compared to

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that in elderly patients where there is a risk of long-term prosthetic complications and need for revision surgery.[8]

Hemiarthroplasty (HA) is the most commonly used treatment for patients with a displaced FNF.[9] Treatment with HA involves the resection of the femoral head and the majority of the femoral neck. The acetabulum is left intact. There are three different types of HA prosthesis; monoblock, modular unipolar and modular bipolar.

The monoblock HA prosthesis is casted in one piece and the surgeon is unable to modify the length of the neck or the offset. Modular bipolar or unipolar heads are manufactured in pieces and assembled during surgery to fit the specific needs of each patient. The unipolar head is a solid metal head in the same size as the measured native femoral head. The bipolar head was developed to decrease acetabular erosion and involves an articulation between a small and a larger head that swivels during movement.

Currently, choices for orthopaedic surgeons for treating these fractures in elderly are unipolar

hemiarthroplasty, bipolar hemiarthroplasty and total hip arthroplasty. Acetabular erosion and loosening of stem giving rise to pain are the main problems encountered with unipolar prostheses (Austin Moore's Prosthesis[10] and Thompson's Prosthesis[11]). In 1974, Bateman [12] introduced the Bipolar prosthesis (initially popular as Bateman's prosthesis) having mobile head element and had head surface additional to allow movements in the acetabulum. Greater range of movements, less post-operative pain, reduced incidence of acetabular erosion, reduction in the loosening of stem (when cement is used), higher percentage of satisfactory results, more rapid return to unassisted activity are the advantages of bipolar prosthesis over unipolar endoprosthesis. Total hip arthroplasty is still not popular as a treatment modality for these fractures because majority of the patients do well with hemiarthroplasty and also due to high costs involved. Use of the cement gained in popularity after Sir John Charnley[13] began using PMMA, intended for denture repair, to anchor femoral head prosthesis in the femur during total hip arthroplasty (THA). Cemented Bipolar hemiarthroplasty thus appears a good option for fracture neck femur in the elderly population. With limited evidence for cemented hemiarthroplasty for improved functional outcome and one of the meta-analysis showing increased post-operative mortality. The aim of this study to assess the comparison of functional outcome of osteosynthesis versus hemiarthroplasty for the treatment of displaced femoral neck fracture.

Materials & methods

A hospital based prospective clinical study done on 80 patients involving intracapsular fracture of neck of femur. These patients were randomly divided in two groups; HA group (N=40) and OS group (N=40) selected from Department of Orthopaedic and indoor at our centre Dr Baba Saheb Ambedkar Medical College & Hospital, Rohini, Delhi, India during 2016 to 2019. All patients were operated under General/Spinal anaesthesia for bipolar cemented hemiarthroplasty and internal fixation.

Inclusion Criteria

1. Displaced intracapsular fracture of neck of femur
2. Subcapital fractures
3. Transcervical fractures
4. Age>50 years
5. Road traffic accident
6. Pathological fractures

Exclusion Criteria

1. Open fractures
2. Age <50 years
3. Patients not fit for GA/SA due to any medical comorbidity.
4. Patients not giving informed consent.
5. Drop out from study.

Methods

Management and Follow up Protocol: The patients with intracapsular fracture neck of femur were operated by cemented bipolar hemiarthroplasty after they present with fracture in OPD/Emergency of Dr Baba Saheb Ambedkar Medical College & Hospital. The patients were admitted in indoor would undergo routine investigations required for preanaesthetic check-up. After anaesthetic clearance patient were taken for elective surgery. Following the operated patients kept under observation for average 14 days and discharged after stitches removal and called for follow up at regular intervals for clinical and radiological evaluation.

Post Procedure Follow Up:

Follow up- All patients were followed up at 2 weeks, 4 weeks and every 6 weeks from date of discharge. Then at 6 months, 9 months and 1 year from date of discharge.

Statistical analysis: The data analysis was done for 6 months using parameters ratio, rates and percentage of different outcome as per the HARRIS HIP SCORE, which were computed and compiled.

The results were classified as excellent, good, fair and poor based on points scored on HARRIS HIP SCORE following functions were taken into consideration.

Results

The present study included that maximum age of patients was 89 year and minimum age of 50 year with mean age of 74.33 years in HA group & 75.12 yrs in OS group, statistical non-significant (P>0.05). Majority of cases was seen in female (62.5%) and rest were males (37.5%). 49 patients were operated on right side while 28 patients were operated on left side and only 3 patients operated both side in both groups (table 1).

Table 1: Age wise distribution of patients

Demographic profile	Hemiarthoplasty group (N=40)	Osteosynthesis group (N=40)	P-value
Age (yrs)			
51-60	10 (25%)	12 (30%)	
61-70	16 (40%)	16 (40%)	
71-80	7 (17.5%)	6 (15%)	
81-90	7 (17.5%)	6 (15%)	
Mean±SD	74.33±7.28	75.12±7.80	>0.05
Sex			
Male	15 (37.5%)	15 (37.5%)	1.00
Female	25 (62.5%)	25 (62.5%)	
Affected site			
Right	24 (60%)	25 (62.5%)	>0.05
Left	15 (37.5%)	13 (32.5%)	
Bilateral	1 (2.5%)	2 (5%)	

In this study average hospital stay was 11.27 days in HA group & 12.78 days in OS group, statistical non-significant (P>0.05). All the patients were prepared for surgery as early as possible. In some patients undue pre op delay, because getting physician clearance (table 2).

Table 2: Average stay of patients in hospital

Hospital Stay	Hemiarthoplasty group (N=40)	Osteosynthesis group (N=40)
3-5	5 (12.5%)	4 (10%)
6-10	11 (27.5%)	10 (25%)
11-15	24 (60%)	26 (65%)
Mean±SD	11.27±3.45	12.78±4.12

Our study showed that results were excellent in 10% patients, 60% patients were having good Harris hip score, 27.5% patients were having fair Harris hip score and only 2.5% patients fell in poor Harris hip score in HA group and in OS group Harris hip score was excellent in 7.5% patients, 50% patients were having good Harris hip score, 35% patients were having fair Harris hip score and only 7.7% patients fell in poor Harris hip score (table 3).

Table 3: Grading of Harris hip score

Grading	Hemiarthoplasty group (N=40)	Osteosynthesis group (N=40)
Excellent	4 (10%)	3 (7.5%)
Good	24 (60%)	20 (50%)
Fair	11 (27.5%)	14 (35%)
Poor	1 (2.5%)	3 (7.5%)

In this study 57.5% patients were in excellent radiological grade; 40% patients were in good radiological grade and 2.5% patient were in poor radiological grade in HA group and in OS group 50% patients were in excellent radiological grade (table 4).

Table 4: Radiological Results

Grading	Hemiarthoplasty group (N=40)	Osteosynthesis group (N=40)
Excellent	23 (57.5%)	20 (50%)
Good	16 (40%)	18 (45%)
Poor	1 (2.5%)	2 (5%)

Discussion

Femoral neck fracture is a common problem in the elderly patients because most of patients are frail and have many pathological conditions like osteoporosis and osteomalacia. With the advancement in medicine the life expectancy is now increased. So geriatric population is increased, the intertrochantric fracture of femur is a disease of old age.The present study included that maximum age of patients was 89 year and minimum age of 50 year with mean age of 74.33 years in HA group & 75.12 yrs in OS group, statistical non-significant (P>0.05). In older patients the risk of non-union fracture was very high. Non-union fracture is uncommon in below 50 years of age but increases to approximately 40% for patients in their seventies. Yurdakul E et al (2015)[14] found that mean age of patients was 78.16 years (range: 60-110 years). YS Prashanth, M Niranjan in 2017[15] found that mean age of patients was 70 years.

In this study average hospital stay was 11.27 days in HA group & 12.78 days in OS group, statistical non-significant (P>0.05). Average hospital stay of 18 days with bipolar hemiarthroplasty has been reported by Lestrange[16].Drinker and Murray et al[17] have reported an average hospital stay of 23 days with the same procedure. There were no late postoperative complications like loosening, dislocation, erosion, secondary osteoarthritis, protrusioacetabuli or periprosthetic fracture.Several recent systematic reviews address the problem with comparing different types of arthroplasty that may have shortcomings with stability of fixation that is not directly related to whether they are cemented or not: Parker conclude in a Cochrane review (2006) that there is limited evidence that cemented prostheses may be associated with less pain[18]Blomfeldt R et al[19]found that the rate of hip complications was 30% in the internal fixation group and 23% in the hemiarthroplasty group; this was not significant. There was a trend towards an increased number of re-operated patients in the internal fixation group compared with the hemiarthroplasty group, 33% and 13%, respectively (p =0.067), but the total number of surgical procedures which were required did not differ between the groups. Of the survivors at two years, 54% were totally dependent in ADL functions and 60% were bedridden or wheelchair-bound regardless of the surgical procedure.

In this study 57.5% patients were in excellent radiological grade, 40% patients were in good radiological grade and 2.5% patient were in poor radiological grade. Early radiological studies of interprosthetic motion in bipolar hemiarthroplasties observed little or no motion between the stem and the head over time when analyzing passive movement of the hip without weight bearing (Langan P. 1979 & Verberne GH. 1983)[20,21]

According to Rödén M et al[22] duration of surgery was shorter and the blood loss was less in the group with screws. Dislocation of the prosthesis occurred in 7/47 patients, all within 4 months. After a minimum follow-up of 5 years, 34 of 53 patients had been reoperated on in the screw group and 3/47 patients in the prosthesis group. No differences in patient mortality were noted between the groups after 2 or 5 years. The bipolar prosthesis seems to be a suitable alternative for primary treatment of displaced femoral neck fractures.

Our study had its own limitations because the degree of intra-prosthesis motion at the inner- bearing of prosthesis was not evaluated. Longer term studies were required to improve the long-term functional outcome of cemented bipolar hemi arthroplasty for fracture of neck of femur in elderly. The strength of the study was that the functional outcome of cemented bipolar hemi arthroplasty had shown an increased in quantity and quality of life with a better outcome.

Conclusion

We concluded that cemented bipolar hemiarthroplasty appears to be an excellent procedure to achieve good clinical results in elderly patients with fracture femoral neck. A continued clinical and radiologically evaluation is essential for identifying complicating factors. Larger sample size with longer follow up is required to further strengthen the interference drawn from the present study.

References

1. Whitman, R. The Abduction Treatment of Fracture of the Neck of the Femur: An Account of the Evolution of a Method Adequate to Apply Surgical Principles and Therefore the Exponent of Radical Reform of Conventional Teaching and Practice.Ann Surg, 1925. 81(1): p. 374-91.

2. Bergstrom U, Jonsson H, Gustafson Y, Pettersson U, Stenlund H, Svensson O. The hip fracture incidence curve is shifting to the right. Acta Orthop. Oct 2009;80(5):520-4.
3. van Embden, D., et al., The Pauwels classification for intracapsular hip fractures: is it reliable? Injury, 2011. 42(11): p. 1238-40.
4. Gaspar, D., et al., AO group, AO subgroup, Garden and Pauwels classification systems of femoral neck fractures: are they reliable and reproducible? Med Glas (Zenica), 2012. 9(2): p. 243-7.
5. Blundell, C.M., et al., Assessment of the AO classification of intracapsular fractures of the proximal femur.J Bone Joint Surg Br, 1998. 80(4): p. 679-83.
6. Turgut, A., et al., Is surgeons' experience important on intra-and inter-observer reliability of classifications used for adult femoral neck fracture? Acta Orthop Traumatol Turc, 2016. 50(6): p. 601-605.
7. Handoll HH, Parker MJ. Conservative versus operative treatment for hip fractures in adults. Cochrane Database Syst Rev. Jul 2008;16;(3):CD000337.
8. Damany DS, Parker MJ, Chojnowski A. Complications after intracapsular hip fractures in young adults. A meta-analysis of 18 published studies involving 564 fractures. Injury. Jan 20056;36(1):131-41.
9. Rogmark C, Spetz CL, Garellick G. More intramedullary nails and arthroplasties for treatment of hip fractures in Sweden. Acta Orthop.2010; 81(5):588-92.
10. Moore AT. The Self-Locking Metal Hip Prosthesis. J Bone Joint Surg Am.1957;39:811-827.
11. Thompson FR. Two and a half years' experience with a vitallium intramedullary hip prosthesis. J Bone Joint Surg Am. 1954;36:489-500.
12. Bateman JE. Single assembly total hip prosthesis: Preliminary report. Orthop Dig 1974;2:15-19.
13. Charnley J. Total hip replacement by low friction arthroplasty. Clin Orthop 1970; 72:7-21.
14. Yurdakul E, Karaaslan F, Korkmaz M, Duygulu F, Baktır A. Is cemented bipolar hemiarthroplasty a safe treatment for femoral neck fracture in elderly patients?Clin Interv Aging. 2015; 10:1063–67.
15. YS Prashanth, M Niranjan. Comparative Study of Surgical Management of Fracture Neck of Femur with Cemented Versus Uncemented Bipolar Hemiarthroplasty. Journal of Clinical and Diagnostic Research. 2017 Feb; 11(2): RC17-RC21.
16. Lestrange NR. Bipolar arthroplasty for 496 hip fractures. Clin Orthop 1990; 251:7 -18.
17. Drinker H, Murray WR. The universal proximal femoral endoprosthesis – A short term comparison with conventional hemiarthroplasty. J Bone Joint Surg1979;61A:1167-1174.
18. Parker MJ, Gurusamy K. Arthroplasties (with and without bone cement) for proximal femoral fractures in adults. Cochrane Database Syst Rev. 2006;3:CD001706.
19. Blomfeldt R, Törnkvist H, Ponzer S, Söderqvist A, Tidermark J. Internal fixation versus hemiarthroplasty for displaced fractures of the femoral neck in elderly patients with severe cognitive impairment. J Bone Joint Surg Br. 2005;87:523–529.
20. Langan P. The Giliberty bipolar prosthesis: a clinical and radiographical review. Clin Orthop Relat Res. 1979 Jun (141):169-175.
21. Verberne GH. A femoral head prosthesis with a built-in joint. A radiological study of the movements of the two components. J Bone Joint Surg Br. 1983;65(5):544-7.
22. Rödén M, Schön M, Fredin H. Treatment of displaced femoral neck fractures: a randomized minimum 5-year follow-up study of screws and bipolar hemiprostheses in 100 patients. Acta Orthop Scand. 2003;74:42–44.

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