

Original article:

Evaluation of Outcome of Bipolar Hip Arthroplasty in Young Adults as Treatment of Avascular Necrosis of Femoral Head

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ABSTRACT

Background: Surgical management of femur's head avascular necrosis include various treatment options like core decompression, bone grafting both vascular and avascular, osteotomies, hip resurfacing, hip arthroplasty and total hiparthroplasty. The present study was conducted with the aim to evaluate the Outcome of Bipolar Hip Arthroplasty in Young Adults as Treatment of Avascular Necrosis of Femoral Head.

Materials and methods: A prospective study was done to evaluate the subjects who underwent bilateral hip arthroplasty in the Department of Orthopedics, Government District Hospital, Dungarpur, Rajasthan. Classification of subjects was done on the basis of Ficat's classification. Superficial smoothing of the acetabulum was performed in all the cases. Snug fitting of the trial cups was confirmed and care was taken that there is no gross movement between outer cup and acetabulum. All the data was arranged in a tabulated form and analyzed using SPSS software. Student t test was used to compare the results. Probability value of less than 0.05 was considered significant.

Results: The present study was conducted using 36 subjects these 14 were females and 22 were males. There were 12 subjects belonging to Ficat 3 class group and 24 subjects belonging to Ficat's 4 class group. The mean range of movements in Ficat 3 and Ficat 4 group was 108 ± 9.2 and 97.16 ± 9.14 respectively. There was a significant difference in the mean range of movements between both the groups. There were total 4 cases of groin pain. Outer cup migration was seen amongst 6 subjects.

Conclusion: Bipolar hip arthroplasty with tight fitting cup for avascular necrosis of femur neck has a few chances of groin pain, erosion of acetabulum, and revision during follow up.

Keywords: Arthroplasty, Acetabulum, Hip, Necrosis.

INTRODUCTION

Surgical management of femur's head avascular necrosis include various treatment options like core decompression, bone grafting both vascular and avascular, osteotomies, hip resurfacing, hip arthroplasty and total hip arthroplasty.¹⁻³ Total hip arthroplasty is indicated amongst young subjects in avascular necrosis with acetabular involvement; however, its action is not clear amongst cases without involvement of acetabulum.⁴ Bilateral hip arthroplasty was initially restricted to hip osteoarthritis, non united fractures and acute femur fractures.^{5,6} It was Bateman⁷ and Giliberty⁸ who first performed bilateral hip arthroplasty in Ficat Stage 3 type of avascular necrosis on basis of the hypothesis that "acetabular floor has a regenerative property, that regenerates bone in the area of subchondrum, if weight bearing stimulation is given by an accurately fitted cup" and gave the theory that preferential motion at inner side will decrease the erosion of cartilage erosion. Studies have shown both satisfactory⁹⁻¹⁴ and unsatisfactory results by bilateral hip arthroplasty.^{5,15-17}

Prevalence of groin pain in this treatment varied between 11.5% to 42% 18-20 and prevalence of acetabular erosion and protrusion varied from 0% to 45%.^{18, 19} The amount of erosion and the occurrence of symptoms was determined by the activity and duration of follow up. The main problem seemed to be motion between the acetabulum and outer cup and chances of particulate wear.¹⁶ The present study was conducted with the aim to evaluate the Outcome of Bipolar Hip Arthroplasty in Young Adults as Treatment of Avascular Necrosis of Femoral Head.

MATERIALS AND METHODS

A prospective study was done to evaluate the subjects who underwent bilateral hip arthroplasty in the Department of Orthopedics, Government District Hospital, Dungarpur, Rajasthan. All the subjects younger than 60 years, operated between 2000 and 2015 were included in the study. All the preoperative details were obtained from the records of the hospital. All the subjects were informed about the study and the subjects willing to come for follow up were included in the study. Ethical committee clearance was obtained from the institute's ethical board. Classification of subjects was done on the basis of Ficat's classification.²⁰ Subjects with radiographs showing no or little acetabular involvement were included in the study whereas those with advanced protrusion or osteoarthritis were excluded from the study. Lateral decubitus position was used to perform all the surgeries. Joint capsule was excised if diseased. Superficial smoothing of the acetabulum was performed in all the cases. Snug fitting of the trial cups was confirmed and care was taken that there is no gross movement between outer cup and acetabulum. All the subjects were allowed to ambulate with assistance on 5th postoperative day and continued the same for 4-6 weeks. All the subjects were regularly followed up clinically and radio graphically. Analysis of the subjects was also done on the basis of subgroup that was divided according to Ficat's classification. All the data was arranged in a tabulated form and analyzed using SPSS software. Student t test was used to compare the results. Probability value of less than 0.05 was considered significant.

RESULTS

The present study was conducted using 36 subjects these 14 were females and 22 were males. The Male:Female ratio was 1.57:1. The mean age of the study subjects was 43.21 \pm 7.8 years. The age range of the subjects enrolled in the study was 31-58 years. The mean duration of follow up of the study was 3.4 years. (Table 1)

Table 2 shows the comparison of variables between Ficat 3 and Ficat 4 subjects. There were 12 subjects belonging to Ficat 3 class group and 24 subjects belonging to Ficat's 4 class group. There was a significant difference in the frequency of both the groups. The mean age of subjects in Ficat 3 and Ficat 4 group was 36.90 \pm 6.50 and 43.40 \pm 6.89 years respectively. The preoperative and postoperative harris hip score in Ficat 3 group was 47.80 \pm 4.90 and 92.22 \pm 3.19 respectively. The preoperative and postoperative harris hip score in Ficat 4 group was 36.53 \pm 3.20 and 89.14 \pm 7.44 respectively. There was a significant difference in the preoperative harris score amongst both the groups. The mean range of movements in Ficat 3 and Ficat 4 group was 108 \pm 9.2 and 97.16 \pm 9.14 respectively. There was a significant difference in the mean range of movements between both the groups. There were total 4 cases of groin pain. Outer cup migration was seen amongst 6 subjects.

DISCUSSION

Surface replacement is treatment option available for young subjects with avascular necrosis, but it has limited indications and is a highly demanding method with increased cost.²¹ The studies published for surface

replacement are also not uniform and there is lack of long term follow up.²¹⁻²³ Total hip arthroplasty is the treatment of choice for the management of advanced avascular necrosis of the head of femur.^{5,24,25} However, because of its overuse there can be increased wear and requirement for early revision amongst young adults.¹⁴ Numerous studies have shown the functional utility of Total hip replacement reduces to approximately 80% by 10 years, 33% by 16 years, therefore requiring a revision surgery. When this procedure is compared with bilateral hip arthroplasty, confusing and conflicting results were seen. According to the study conducted by Chan and Shih²⁴ there was no difference in the incidence of osteolysis, pain, rate of dislocation and rate of revision between bilateral and total hip arthroplasty. They concluded that amongst young subjects with Ficat Stage 3 avascular necrosis, bilateral hip arthroplasty can be considered useful alternative for total hip arthroplasty. Furthermore revision is easier in bilateral hip arthroplasty as compared with total hip arthroplasty because of intact acetabulum.²⁶ According to the study conducted by Lee et al.³ there were 23% cases of outer cup migration, 15% cases of gluteal pain and 20% cases of groin pain after performing bilateral hip arthroplasty. According to our study, there were 12 subjects belonging to Ficat 3 class group and 24 subjects belonging to Ficat's 4 class group. There was a significant difference in the frequency of both the groups. The mean age of subjects in Ficat 3 and Ficat 4 group was 36.90 ± 6.50 and 43.40 ± 6.89 years respectively. The preoperative and postoperative Harris hip score in Ficat 3 group was 47.80 ± 4.90 and 92.22 ± 3.19 respectively. The preoperative and postoperative Harris hip score in Ficat 4 group was 36.53 ± 3.20 and 89.14 ± 7.44 respectively. There was a significant difference in the preoperative Harris score amongst both the groups. The mean range of movements in Ficat 3 and Ficat 4 group was 108 ± 9.2 and 97.16 ± 9.14 respectively. There was a significant difference in the mean range of movements between both the groups. There were total 4 cases of groin pain. Outer cup migration was seen amongst 6 subjects. As per Ito et al.¹⁵ there were 42% radiological failures, 42% cases of groin pain that required revision surgery. Similar kind of results were found in studies by Cabanela¹⁴ and Lachiewicz and Desman¹⁷. Pain in groin and erosion of acetabulum were the chief reasons for bad results of bilateral hip arthroplasty. Due to the retention of groin capsule, there are chances of groin pain or due to the irritation of the nerve endings.¹⁴ According to a study conducted by Pellegrini et al.¹⁹ there are higher chances of revision with acetabular reaming whereas according to Muraki et al.⁵ they concluded that acetabular reaming increases the chances of migration in superomedial direction.

CONCLUSION

Bipolar hip arthroplasty with tight fitting cup for avascular necrosis of femur neck has a few chances of groin pain, erosion of acetabulum, and revision during follow up. Further studies need to be conducted on large scale to determine the exact incidence of the postoperative complications.

REFERENCES

1. Hamilton TW, Goodman SM, Figgie M. SAS weekly rounds: Avascular necrosis. HSS J 2009;5:99-113.
2. Steinberg ME, Corces A, Fallon M. Acetabular involvement in osteonecrosis of the femoral head. J Bone Joint Surg Am 1999;81:60-5.

3. Lee SB, Sugano N, Nakata K, Matsui M, Ohzono K. Comparison between bipolar hemiarthroplasty and THA for osteonecrosis of the femoral head. *ClinOrthopRelat Res* 2004;424:161-5.
4. Lieberman JR, Berry DJ, Mont MA, Aaron RK, Callaghan JJ, Rajadhyaksha AD, et al. Osteonecrosis of the hip: Management in the 21 st century. *Instr Course Lect* 2003;52:337-55.
5. Muraki M, Sudo A, Hasegawa M, Fukuda A, Uchida A. Long term results of bipolar hemiarthroplasty for osteoarthritis of the hip and idiopathic osteonecrosis of the femoral head. *J OrthopSci* 2008;13:313-7.
6. Haidukewych GJ, Israel TA, Berry DJ. Long term survivorship of cemented bipolar hemiarthroplasty for fracture of the femoral neck. *ClinOrthopRelat Res* 2002;403:118-26.
7. Bateman JE. The classic: Single-assembly total hip prosthesis-preliminary report 1974. *ClinOrthopRelat Res* 2005;441:16-8.
8. Giliberty RP. Bipolar endoprosthesis minimizes protrusioacetabuli, loose stems. *Orthop Rev* 1985;14:27.
9. McConville OR, Bowman AJ Jr, Kilfoyle RM, McConville JF, Mayo RA. Bipolar hemiarthroplasty in degenerative arthritis of the hip. 100 consecutive cases. *ClinOrthopRelat Res* 1990;251:67-74.
10. Vázquez-Vela G, Vázquez-Vela E, Garcia Dobarganes F. The Bateman bipolar prosthesis in osteoarthritis and rheumatoid arthritis. A review of 400 cases. *ClinOrthopRelat Res* 1990;251:82-6.
11. Moriya M, Uchiyama K, Takahira N, Fukushima K, Yamamoto T, Hoshi K, et al. Evaluation of bipolar hemiarthroplasty for the treatment of steroid-induced osteonecrosis of the femoral head. *IntOrthop* 2012;36:2041-7.
12. van Egmond PW, Taminau AH, van der Heide HJ. Hemiarthroplasties in young patients with osteonecrosis or a tumour of the proximal femur; an observational cohort study. *BMC MusculoskeletDisord* 2013;14:31.
13. Kim SS, Sohn SK, Kim HJ, Sun SK. Bipolar hip arthroplasty vs total hip arthroplasty for osteonecrosis of the femoral head. *J Korean OrthopAssoc* 2010;45:273-80.
14. Cabanela ME. Bipolar versus total hip arthroplasty for avascular necrosis of the femoral head. A comparison. *ClinOrthopRelat Res* 1990;261:59-62.
15. Ito H, Matsuno T, Kaneda K. Bipolar hemiarthroplasty for osteonecrosis of the femoral head. A 7- to 18-year followup. *ClinOrthopRelat Res* 2000;374:201-11.
16. Hwang KT, Kim YH, Kim YS, Choi IY. Is bipolar hemiarthroplasty a reliable option for Ficat stage III osteonecrosis of the femoral head? 15- to 24-year follow up study. *Arch Orthop Trauma Surg* 2012;132:1789-96.
17. Lachiewicz PF, Desman SM. The bipolarendoprosthesis in avascular necrosis of the femoral head. *J Arthroplasty* 1988;3:131-8.
18. Pace TB, Prather B, Burnikel B, Shirley B, Tanner S, Snider R. Comparative outcomes assessment: Hip hemiarthroplasty as an alternative to THA in patients with surgically pristine acetabulum – Is there still a role? *ISRN Orthop* 2013;2013:632126.
19. Pellegrini VD Jr, Heiges BA, Bixler B, Lehman EB, Davis CM 3 rd . Minimum ten-year results of primary bipolar hip arthroplasty for degenerative arthritis of the hip. *J Bone JointSurg Am* 2006;88:1817-25.

20. Ficat RP. Idiopathic bone necrosis of the femoral head. Early diagnosis and treatment. J Bone Joint Surg Br 1985;67:3-9.
21. Cuckler JM, Moore KD, Estrada L. Outcome of hemiresurfacing in osteonecrosis of the femoral head. ClinOrthopRelat Res 2004;429:146-50.
22. Beaulé PE, Amstutz HC. Management of Ficat stage III and IV osteonecrosis of the hip. J Am AcadOrthopSurg 2004;12:96-105.
23. Old A, McGrory B. Clinical review: Osteonecrosis of the femoral head in adults. Hosp Physician 2008;44:13-9.
24. Chan YS, Shih CH. Bipolar versus total hip arthroplasty for hip osteonecrosis in the same patient. ClinOrthopRelat Res 2000;379:169-77.
25. Steinberg ME. Management of avascular necrosis of the femoral head: An overview. Instr Course Lect 1988;37:41-50.
26. Pandit R. Bipolar femoral head arthroplasty in osteoarthritis. A prospective study with a minimum 5-year followup period. J Arthroplasty 1996;11:560-4.

Table 1: Preoperative characteristics of the study population

VARIABLE	VALUE
M:F	1.57:1
Mean age	43.21+/-78 years
Age range	31-58 years
Mean follow up duration	3.4 years

Table 2: Comparison of variables between Ficat 3 and Ficat 4 subjects

VARIABLE	FICAT 3	FICAT 4	P VALUE
Frequency	12	24	<0.05
Age	36.90±6.50	43.40±6.89	>0.05
Preoperative harris hip score	47.80±4.90	36.53±3.20	<0.05
Postoperative harris hip score	92.22±3.19	89.14±7.44	>0.05
Range of movements	108±9.2	97.16±9.14	<0.05
Groin pain	1	3	>0.05
Outer cup migration	2	4	>0.05