Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Original Article

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

Jaspal Singh[1], Sukhraj Singh[2], Bharat Singla[3], H. S Sohal[4], Santosh Pandey[5], Swapnil Patil[6]

[1]Associate Professor, [2]Senior Resident, [3,5,6]Junior Resident, [4]Professor and Head,

Department of Orthopaedics, GMC Amritsar, Punjab, India

ABSTRACT:

Background: Avascular necrosis (AVN) of the femoral head is now recognised as a major musculo-skeletal problem mostly affecting the young people in their productive years of life. It causes pathologic death of osteocytes and can eventually lead to osteo-arthritis of the hip bone followed by subsequent destruction of femoral head and hip joint. In the present study, we aim to assess the outcome of bipolar hip arthroplasty in young adults as treatment of avascular necrosis of femoral head upto stage 3. **Materials & methods:** The present study consisted of 20 cases. Clinical history, general physical examination and local examination were performed. The diagnosis was based on radiological analysis and clinical history. Under general anaesthesia/spinal anaesthesia/epidural anaesthesia, with aseptic conditions after proper painting and draping the parts, modified Gibbson technique was used for hemiarthroplasty. Patients were gradually followed up for 1 year after an interval of 3 weeks, 6 weeks, 12 weeks, 24 weeks, 36 weeks, and 52 weeks. Patients were accessed clinically and radiologically using Harris hip score. All the results were analyzed by SPSS software version. **Results:** Out of total 20 patients, 14 (70%) were males while remaining 6 (30%) were females. Mean age of the subjects in the present study was 40.6 years. All the patients exhibited a poor grading of HHS score at pre-operative time. After three weeks, 45 percent (9 patients) of the patients showed good results followed by 40 percent (8 patients) of the patients that showed fair results of HHS grading. Excellent results were present only in 15 percent (3 patients) of the cases postoperatively at 3 weeks. 65 percent (13 patients) cases shared excellent results after both 36 weeks and 52 weeks postoperatively. Statistically significant results were obtained while comparing the mean HHS at different time intervals. **Conclusion:** Bipolar hip arthroplasty is a good option for treatment in young adults with Ficat Stages II and III AVN of the femoral head.

Key words: Avascular necrosis, Bipolar hip arthroplasty, Harris Hip Score.

Received: 25 November 2017 Revised: 18 December 2017 Accepted: 22 December 2017

Corresponding author: Dr Bharat Singla, 14-A Dhillon Colony Near Mohindra College Patiala, Pin Code 147001

This article may be cited as: Singh J, Singh S, Singla B, Sohal HS, Pandey S, Patil S. Assessment of the Outcome of Bipolar Hip Arthroplasty in Young Adults as Treatment of Avascular Necrosis of Femoral Head. J Adv Med Dent Scie Res 2018;6(1):117-122.

INTRODUCTION

Osteonecrosis (ON) is a disorder resulting from a temporary or permanent loss of blood supply to the bone. Blood carries essential nutrients and oxygen to the bones. When the blood supply is disrupted, the bone tissues (osteo) begin to break down (necrosis). This can weaken the bone and eventually result in its collapse. If this occurs near a joint, it can lead to the collapse of the joint surface, resulting in pain and inflammation (arthritis). Osteonecrosis is also referred to as avascular necrosis or "AVN", "aseptic necrosis", and "ischemic bone necrosis".[1] Osteonecrosis of the femoral head (ONFH) is now recognised as a major musculo-skeletal problem mostly affecting the young people in their productive years of life. It causes pathologic death of osteocytes and can eventually lead to osteo-arthritis of the hip bone followed by subsequent destruction of femoral head and hip joint.[2,3] There have been a variety of traumatic and atraumatic factors that have been identified as risk factors for ON, but the etiology and pathogenesis still remains unclear.[4]

Currently there is no consensus regarding the treatment of the different stages of ONFH in the adult population. A recent survey of 753 members of the American Association of Hip and Knee Surgeons reported that total hip replacement was the most common intervention for treatment of post-collapse stages of ONFH, whereas core decompression was the most common procedure for symptomatic pre-collapse stages of ONFH. Other less frequently performed treatments include conservative management, vascularized and non-vascularized bone grafts, hemi-arthroplasty, osteotomy, and arthrodesis.

ONFH tends to affect younger patients, therefore a variety of joint preserving surgical procedures have been developed to delay the progression of the disease and afford pain relief.[4, 5]

Bipolar hemi-arthroplasty has been used as treatment for advanced cases of AVN femoral head. The published literature is full of conflicting results with this procedure. Alonge TO et al evaluated results of cementless bipolar hemi-arthroplasty done for secondary osteoarthritis resulting from Osteonecrosis of femoral head in sickle cell disease in six patients. They reported good results with this procedure with advantage of avoiding damage to acetabulum and ease of revision surgery if needed in future.[6, 7]

Hence; under the light of above mentioned data, we planned the present study to assess the outcome of bipolar hip arthroplasty in young adults as treatment of avascular necrosis of femoral head upto Ficat stage III.

MATERIALS & METHODS

The present study was conducted in the department of Orthopedics of Government Medical College, Amritsar. This study consisted of a total of 20 cases. Approval was taken from institutional ethical committee and written consent was obtained from all the subjects after explaining in detail the entire research protocol.

Inclusion criteria

- Patients with avascular necrosis using a Bipolar arthroplasty
- A patient of either sex above the age of 18 years with AVN hip (Ficat and Arlet grade IIb, III)
- Patients without any known drug allergy

Exclusion criteria

- Patients with pathologic fractures, neck of femur fracture, multiple fracture
- Pre-injury non- ambulatory patients
- Abbreviated mental test score < 6.
- Patients with medical contraindication for surgery and anesthesia
- Psychiatric patients with mental instability

Clinical history, general physical examination and local examination were performed as per proforma attached. Patients were investigated for operative and anesthetic purposes.

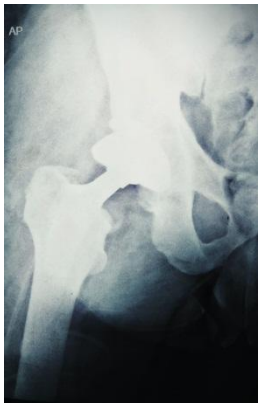
The diagnosis was based on radiological analysis and clinical history. Antero-posterior and lateral radiographs, MRI if possible were used to evaluate the extent and degree of avascular necrosis whenever required.

Surgical procedure:

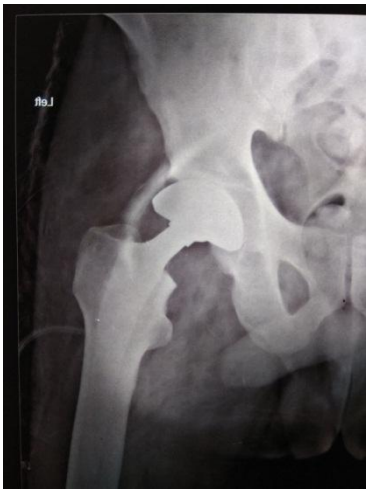
- Under general anaesthesia/spinal anaesthesia/epidural anaesthesia, under all aseptic conditions after proper painting and draping the parts, modified Gibbson technique was used for hemiarthroplasty.
- In this approach curved skin incision was given at a point starting 7-8 cm anterior to posterior superior iliac spine extending distally along the anterior edge of greater trochanter and further along the line of femur.
- Skin subcutaneous tissue was cut.
- Fascia lata and fascia over gluteus maximus were incised with maintaining proper hemostasis.
- Then Charnley self-retaining retractor was applied beneath fascia lata.
- Trochanteric bursa was bluntly retracted posteriorly while maintaining limb in extension.
- Then knee was flexed and internally rotated so that short external rotators got toned.
- Then short external rotators with proximal half of quadrates femoris was reflected posteriorly for protecting sciatic nerve after incising and putting stay sutures.
- Then hip joint capsule was divided along the attachment to femur.
- Femur was retracted anteriorly and the level of osteotomy of neck will be marked 1.5 – 2cm above lesser trochanter medially and osteotomy was done by oscillating saw in 45 degree inclination to the marked site.
- Removal of femoral head done with the help of cork crew.
- Femoral canal entry was made with help of box chisel and trochanteric reaming followed by optimal rasping after locating the medullary cavity was done.
- Then canal was thoroughly washed with normal saline and packed with roll gauze.
- For exposure of acetabulum femur was retracted anteriorly and anterior capsule of hip joint was divided whenever required.
- After that acetabular labrum and osteophytes was completely excised with help of electrocautery/rongeur.
- Bony margins of acetabular rim were exposed and liagmentumteres were excised and soft tissue curetted. Gentle acetabular reaming was carried out.
- Care was taken of not to ream the articular cartilage. Then the femoral trial component with optimal neck length was introduced along with shell and cup.
- Then length anteversion and excursion checked with femoral trial component-shell and cup.
- Then joint was relocated and movements and leg length was checked followed by replacement of trial component with femoral component shell and cup.
- Then wound was stitched in layers over negative suction drain. Antiseptic dressing was done.
- Weight bearing was started on 5^{th} day. Patients were gradually followed up after 3 weeks, 6 weeks, 12 weeks, 24 weeks, 36 weeks, and 52 weeks.
- Patients were accessed clinically and radiologically using Harris hip score on every follow-up. Complications if any were recorded accordingly.

For clinical evaluation- preoperatively and post operatively harris hip score was be used. All the results were analyzed by SPSS software version.Chi- square test and student t test were used for assessment of level of significance. P- value of less than was taken as significant.

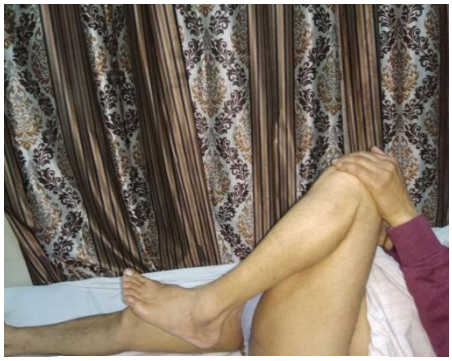
Preoperative X- Ray



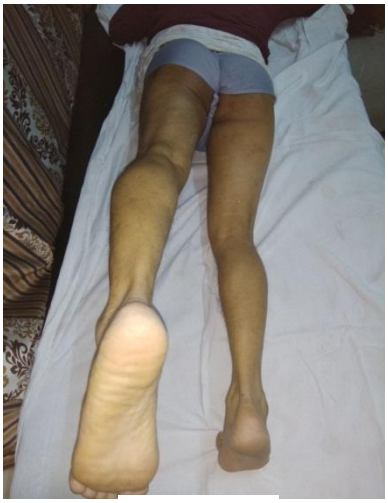
Postoperative 12 weeks



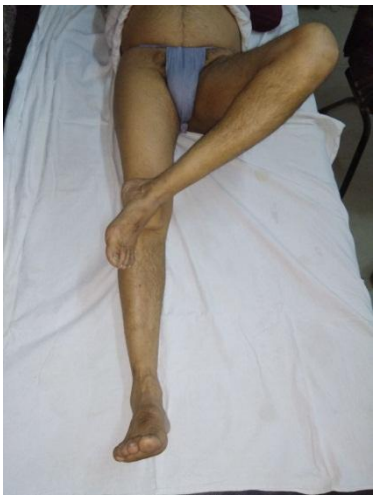
Postoperative 52 weeks



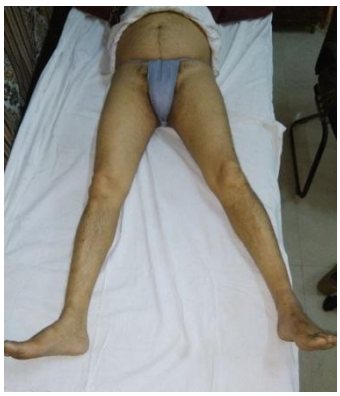
Flexion at hip joint



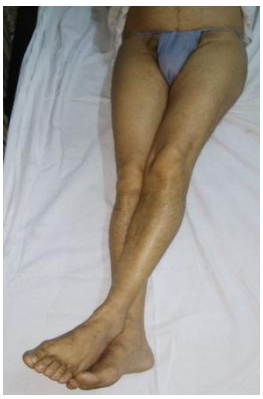
Extension



External Rotation



Abduction at hip joint



Adduction at hip joint

RESULTS

Out of total 20 patients, 14 (70%) were males while remaining 6 (30%) were females.13 patients (65%) in the present study belonged to the age group of 41 to 50 years, while 5 patients (25%) belonged to the age group of 20 to 30 years. 2 patients (10%) belonged to the age group of 31 to 40 years. All the patients exhibited a poor grading of HHS score at pre-operative time. After three weeks, 45 percent (9 patients) of the patients showed good results followed by 40 percent (8 patients) of the patients that showed fair results of HHS grading. Excellent results were present only in 15 percent (3 patients) of the cases. At 6 weeks postoperatively, 55 percent (11 patients) and 25 percent (5 patients) showed good and excellent results respectively. 50 percent (10 patients) and 35 percent (7 patients) exhibited good and excellent results after 12 weeks postoperatively respectively. 45 percent (9 patients) of the patients showed excellent results after 24 weeks postoperatively. 65 percent (13 patients) excellent results after both 36 weeks and 52 weeks postoperatively. Mean age of the subjects in the present study 40.6 years.Statistically significant results were obtained while comparing the mean HHS at different time intervals.

Table 1: Distribution of subjects according to HHS at pre-operative time

HHS grading	No. of patients	Percentage
Poor	20	100
Fair	0	0
Good	0	0
Excellent	0	0
Total	20	100

Table 2: Distribution of subjects according to HHS at 3 weeks post-operative time

HHS grading	No. of patients	Percentage
Poor	1	5
Fair	8	40
Good	9	45
Excellent	3	15
Total	20	100

Table 3: Distribution of subjects according to HHS at 6 weeks post-operative time

HHS grading	No. of patients	Percentage
Poor	1	5
Fair	3	15
Good	11	55
Excellent	5	25
Total	20	100

Table 4: Distribution of subjects according to HHS at 12 weeks post-operative time

HHS grading	No. of patients	Percentage
Poor	1	5
Fair	2	10
Good	10	50
Excellent	7	35
Total	20	100

Table 5: Distribution of subjects according to HHS at 24 weeks post-operative time

HHS grading	No. of patients	Percentage
Poor	1	5
Fair	2	10
Good	8	40
Excellent	9	45
Total	20	100

Table 6: Distribution of subjects according to HHS at 36 weeks post-operative time

HHS grading	No. of patients	Percentage
Poor	1	5
Fair	1	5
Good	5	25
Excellent	13	65
Total	20	100

Table 7: Distribution of subjects according to HHS at 52 weeks post-operative time

HHS grading	No. of patients	Percentage
Poor	1	5
Fair	1	5
Good	5	25
Excellent	13	65
Total	20	100

Table 8: Comparative evolution of HHS at various time intervals

Time interval	Mean HHS	P- value
HHS Pre-OP	44.5	0.00 (Significant)
HHS Post OP 3 Weeks	61.2	
HHS Post OP 6 Weeks	69.5	
HHS Post OP 12 Weeks	72.2	
HHS Post OP 24 Weeks	80.2	
HHS Post OP 36 Weeks	86.1	
HHS Post OP 52 Weeks	88.4	

DISCUSSION

Avascular necrosis of the femoral head is manifested with death of bone cells resulting in the impairment of normal reparative processes within the micro-fractures in the femoral head. Because the exact pathophysiology is not elucidated yet, there is a variable nomenclature for this condition.[8] In the present study, we evaluated a total of 20 patients of AVN of femoral head that underwent bipolar total hip arthroplasty. We used the HHS for assessment of results.

Majority of the patients in our study belonged to the age group of 41 to 50 years (65 percent). Males outnumbered the females with ratio of 70 percent to 90 percent. In one of the study, authors also observed the presence of AVN especially in younger adult population; usually between the 3rd and 5th decade of life, affecting mainly men.[9]

Alcohol, opioid and steroid were found to be the most common etiologic factors in the present study group (percentage of opioid and steroid25 percent cases each). The reason may be attributed to increasing trends of alcohol intake, trauma and other common causes. Also, Alcohol consumption increases the risk of development of AVN of femoral head. A significant increase in the serum triglycerides and cholesterol levels is induced by alcohol. It also leads to liver and bone marrow fatty infiltration. Triglyceride deposition in osteocytes leads to pyknosis and an increased percentage of empty osteocyte lacunae. Therefore; alcohol increases adipogenesis and decreases osteogenesis.[10]Similar findings were observed in the past study, in which authors observed that alcohol was the etiologic factor in 37.8 percent of the AVN patients.[11]

At the end of three weeks, 12 patients showed improvement in HHS from base value of less than 70 to value ranging from 70 to 79. In one patient, HHS value increased to 80 to 89. At the end of six weeks, 9 more patients showed improvement on follow-up with HHS increasing up to value ranging from 80 to 89. By the end of one year follow-up, 90% of the patients showed significant improvement in terms of HHS with 85% of the patients showing good to excellent results (P- value < 0.05).

Our results were in concordance with the result obtained in a past study, in which authors reported a significant improvement in the HHS of the patients after one year of follow-up time (P- value < 0.05). In their study, they reported excellent HHS in 54.1 percent of their subjects, after one year follow-up time, which was also observed in our study, where we observed excellent post-operative HHS in 55 percent of the subjects at one year follow-up time.[12]

In one of the study, authors also reported similar findings in their study.[10, 11] percent of the patients of their study undergoing hip arthroplasty showed excellent HHS at one year follow-up time.[13]

Surface replacement is another option in younger people with AVN, but has limited indications. The results published by for surface replacement are not uniform and a long-term follow-up is lacking.[12, 14]

One of the past authors compared results of bipolar hemi-arthroplasty against total hip arthroplasty in patients with grade 3 Avascular necrosis of femoral head.36 patients with Grade III Osteonecrosis of femoral head were included in this study. The average increase in HHS in THA group was 47.3points (S.D. - 4.8) and 38.9 (S.D. - 2.7) in BHA group with t value 5.4. All the patients in BHA group had fair to good results. In THA group eight excellent, five good and one had fair to poor result after the surgery Fair to poor results were seen in one patient in THA with dislocation in early postoperative period. BHA group had one case of superficial infection at operative site. Very higher incidence of groin pain and activity limitation was seen in patients with BHA.[15, 16]

Chan and Shih have reported that there was no difference in the incidence of osteolysis, thigh or groin pain, dislocation rates and revision rates between BHA and THA. They concluded that in young patients with Ficat Stage III AVN, BHA may be a useful alternative to THA. Furthermore, BHA is less demanding, blood loss is comparatively less and revision is easier as compared with the revision of THA as the acetabulum is still intact.[16]In another study, authors reported that Bipolar hemiarthroplasty is a useful, successful modality of treatment for stage 3 osteonecrosis of the femoral head in Sickle cell disease patients in low income countries.[17]

BHA is a significant treatment option when the joint surface is still preserved and the articular cartilage is minimally damaged. With good patient selection and surgical technique this procedure can restore patient function although pain relief may not be as predictable as after THR. It causes little distortion of the anatomy, preserves bone, and produces minimal particle debris.it causes less blood loss and leads to earlier mobilization of the patient. BHA for AVN hip has a low incidence of post-operative complications in midterm follow-up. This procedure can be used for treatment in young adults with Ficat Stages III AVN of the femoral head to defer a definitive THA.

CONCLUSION

Bipolar hip arthroplasty for AVN hip has a low incidence of post-operative complications in long-term follow-up. This procedure can be used for treatment in young adults with Ficat Stages II and III AVN of the femoral head. Further large series with long term follow-ups, multicentric randomized studies and reproducibility of results will be needed to establish this method.

REFERENCES

1. Hanumantharaya GH, Kamala GR. A study on AVN cases attending at a tertiary care hospital: Etiological factors and treatment. Indian Journal of Orthopaedics Surgery 2016;2(1):69-76.
2. Steffen RT, Athanasou NA, Gill HS, Murray DW. Avascular necrosis associated with fracture of the femoral neck after hip resurfacing: histological assessment of femoral bone from retrieval specimens. J Bone Joint Surg Br. 2010 Jun. 92(6):787-93.
3. Babhulkar SS. Osteonecrosis of the femoral head (in young individuals). Indian J Orthop 2003;37:2.
4. Moya-Angeler J, Gianakos AL, Villa JC, Ni A, Lane JM. Current concepts on osteonecrosis of the femoral head. World J Orthop 2015 September 18; 6(8): 590-601.
5. McGrory BJ, York SC, Iorio R, Macaulay W, Pelker RR, Parsley BS, Teeny SM. Current practices of AAHKS members in the treatment of adult osteonecrosis of the femoral head. J Bone Joint Surg Am. 2007;89:1194–1204.
6. Orlic D, Jovanovic S, Anticevic D, Zecevic J. Frequency of idiopathic aseptic necrosis in medically treated alcoholics. IntOrthop. 1990;14(4):383–6.
7. Alonge TO, Shokunbi WA. The choice of arthroplasty for secondary osteoarthritis of the hip joint following avascular necrosis of the femoral head in sicklers. J Natl Med Assoc. 2004 May;96(5):678-81.
8. Pouya F, Kerachian MA. Avascular Necrosis of the Femoral Head: Are Any Genes Involved? Archives of Bone and Joint Surgery. 2015;3(3):149-155.
9. Kamal D, Trăistaru R, Alexandru DO, Grecu DC, Mogoantă L. Epidemiologic Study of Avascular Necrosis of the Femoral Head. Current Health Sciences Journal. 2013; 39(3): 169- 174.
10. Wang Y1, Li Y, Mao K, Li J, Cui Q, Wang GJ. Alcohol-induced adipogenesis in bone and marrow: a possible mechanism for osteonecrosis. ClinOrthop Relat Res. 2003 May;(410):213-24.
11. Al-Edanny M. Non Vascularized Bone Graft versus Core Decompression in Treatment of Early Stages of Non Traumatic Hip Osteonecrosis. Karbala Journal of Medicine Dec 2012.Volume 5, Number 1. 1194 -1405.
12. Dudani B, Shyam AK, Arora P, Veigus A. Bipolar hip arthroplasty for avascular necrosis of femoral head in young adults. Indian Journal of Orthopaedics. 2015;49(3):329-335.
13. Scheerlinck T, Dezillie M, Monsaert A, Opdecam P. Bipolar versus total hip arthroplasty in the treatment of avascular necrosis of the femoral head in young patients. Hip International 2002; 2: 142-9.
14. Beaulé PE, Amstutz HC. Management of Ficat stage III and IV osteonecrosis of the hip. J Am AcadOrthop Surg. 2004;12:96–105.
15. Mankar SH, Dwidmuthe SC, Mohammad Faizan, Sakhare R. A comparative study of bipolar hemi-arthroplasty and total hip joint replacement for the treatment of grade III Osteonecrosis of femoral head. Panacea Journal of Medical Science, May – August 2015:5(2);73-77.
16. Chan YS1, Shih CH. Bipolar versus total hip arthroplasty for hip osteonecrosis in the same patient. ClinOrthopRelat Res. 2000 Oct;(379):169-77.
17. Lawal YZ, Maitama MI, Ejagwulu FS, Dahiru LI, Nattawa M, Lawal A. (2017). Bipolar hemiarthroplasty for stage III sickle cell-related avascular necrosis of the femoral head: a successful alternative to total hip replacement. SA Orthopaedic Journal, 16(3), 31-34.

Source of support: Nil **Conflict of interest:** None declared