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Role of Replacement Bipolar Hip Arthroplasty in Advance Stages of AVN in Poor Socio-Economic Conditions for Restoration of Hip Functions

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Abstract

Background: A collection of symptoms dominated by pain, loss of function, and bony collapse brought on by anoxemia and other arterial feeding deficiencies of the femoral head that last long enough to induce noticeable bone degradation, including necrosis are known as avascular necrosis. ***Objective:*** To assess the effectiveness of replacement bipolar hip arthroplasty for hip function restoration in advanced stages of AVN in low socioeconomic circumstances. ***Materials and Methods:*** This was a retrospective study was conducted in JIMCH, Bajitpur, Kishoreganj. Patients with Ficat-Arlet type III –IV, Idiopathic, both bilateral and unilateral avascular necrosis of femoral head patients were included in this study. Age <20 years and >35 years, infective conditions. Previous history of surgery to hip including arthroscopy, Progressive neuromuscular disorders, revision THR, dermatological conditions around hip were excluded in this study. They were followed up for a minimum period of 5 year and evaluated for surgical and functional outcome using X-rays and Harris hip score. The follow up schedule was at 1month, 6 months, 1-year and every yearly post-surgery. The pre and post-operative pain, deformity and functional outcomes were compared. ***Results:*** All of the patients were between the ages of 20 and 35. Young people frequently have femoral head AVN. There were 19 female patients and 31 male patients out of 50. The primary presenting symptom of necrosis, which affected all patients (100%), was pain. Excellent results were present only in 16% (8 patients) of the cases in 3 weeks. 64% percent (32 patients) excellent results after 36 weeks and 36(72.0%) after 52 weeks postoperatively. ***Conclusion:*** Bipolar hip arthroplasty for AVN hip has a low incidence of post-operative complications in long-term follow-up and high good and excellent functional outcome.

Keyword: Avascular necrosis, femoral head, bipolar hip arthroplasty, Harris Hip Score.

INTRODUCTION

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 osteoarthritis of the hip bone followed by subsequent destruction of femoral head and hip joint [1].

Osteonecrosis has etiologies that include both traumatic and nontraumatic causes. Corticosteroid drugs, hip fractures and dislocations, and prolonged alcohol consumption are some of the most common causes. It's idiopathic in about 30% of individuals [2]. Males are more usually affected than females, and bilateral presentation is common [2]. Acetabular erosion and groin pain are the most allowing for gross motion between the common complications [3].

Bipolar hip arthroplasty (BHA) is one of the options for treatment of avascular necrosis (AVN) of the femoral head. Total hip Replacement (THR) is a remarkable surgical procedure that provides mobility stability as well as better quality of life in persons suffering from hip disorder. It is procedure in which surgical excision of femoral head and proximal neck is done and is replaced with metal ball; while the acetabulum is resurfaced with metal shell & plastic liner. THR is a reconstructive procedure, that improves the management of those diseases of hip joint that respond poorly to conventional medical therapy and produce

great problems in patient thus eliminate pain and restore function of hip [4,5].

Avascular necrosis is defined as a group of symptoms, dominated by pain, loss of function and bony collapse caused by anoxemia and other deficiency in arterial nutrition of the head of the femur, prolonged enough to result in the marked degeneration, even necrosis of bone. Its most frequent cause is abrupt disruption, thrombosis or embolism of a large amount of coronary artery [6].

Avascular necrosis (AVN), also called osteonecrosis or bone infarction, is death of bone tissue due to interruption of the blood supply. Early on, there may be no symptoms. Gradually joint pain may develop which may limit the ability to move. Complications may include collapse of the bone or nearby joint surface [7].

Surgical treatment of avascular necrosis (AVN) of head of femur include core decompression, osteotomies, nonvascularized bone grafting, free vascularized fibular grafts, hip resurfacing, bipolar hip arthroplasty (BHA) and total hip arthroplasty (THA) [8,9] THA is indicated in the young individual in AVN with acetabular involvement; however, its role is unclear in cases without acetabular involvement.4 BHA was initially limited to be used in hip osteoarthritis, nonunions and acute neck femur fractures [10,11].

Normal hip joint is subjected to many stresses during daily activities performed by an individual. Since it is one of the major weight bearing joints of the body, its normal function is necessary for daily activities. Avascular necrosis (AVN) of the femoral head is one of the common causes of painful hip in a young adult. Core decompression, fibular sturt graft can be considered in early stages, total hip arthroplasty in later stages of AVN of femoral head. To study surgical and functional outcome following uncemented total hip arthroplasty in young adults.

MATERIALS AND METHODS

This was a retrospective study was conducted in JIMCH, Bajitpur, Kishoreganj. Patients with Ficat-Arlet type III –IV, Idiopathic, both bilateral and unilateral avascular necrosis of femoral head patients were included in this study during January'2019 to December'2024. Age <20 years and >35 years, infective conditions. Previous history of surgery to hip including arthroscopy. Progressive neuromuscular disorders, revision THR, dermatological conditions around hip were excluded in this study. They were followed up for a minimum period of 5 years and evaluated for surgical and functional outcome using X-rays and Harris hip score. Patients were followed at 3 weeks, 36 weeks and 52 weeks and every yearly post-surgery. The pre and post-operative pain, deformity and functional outcomes were compared. Detailed history of all patients was taken. All patients were assessed clinically and functionally using the Harris hip score. The preoperative medical evaluations of all patients were done to evaluate any potential complications that can be life-threatening or limb-threatening. Standard guidelines were utilized to obtain hip radiographs – standing anteroposterior view. All the patients after thorough pre-operative evaluation, they were taken up for surgery under combined epidural and spinal anesthesia. All patients received 1gm of Ceftriaxone 15mins prior to surgery. Using Southern Moore approach, incision was taken with patient in lateral decubitus position. The Fascia lata incision is taken. Gluteus maximus muscle is split. Short external rotators - piriformis and Obturator internus are dissected and retracted. Longitudinal or T- shaped capsular incision is taken. Hip dislocation is done with internal rotation. Arthritic femoral head is cut upto the femoral neck leaving the calcar intact. Femoral canal broaching is done femoral stem is placed. Hydroxyapatite coated femoral stem of appropriate size is fixed. Appropriate size of femoral head is placed. Range of movements of the hip is checked and evaluated for stability. The hip is reduced. The capsule is closed. Short external rotators suturing is done. Wound closed in layers with drain in place. Bilateral AVN patients are operated in staged manner with 1 week apart. 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 < 0.05 was taken as significant.

RESULTS

The majority of the patients were from age group of 20-30 years (52%). AVN of the femoral head is common in young individuals. Out of 50 patients, 31 were males and 19 were females. The overall male to female ratio was 1.63:1. The mean BMI were 29.18 ± 4.08 kg/m2 (Table-1). The majority, 25 (50%), reported moderate pain, 15 (30%), mild pain, and 10 (20%), severe pain (Figure -I). From the figure II it was observed that pain was the main presenting feature of necrosis which occurred in all patients (100%). On examination most of the patients were found to be anemic (46%). Icterus was present only in 5 patients (10%). Edema noticed in one patient, who was taken steroids for nephrotic syndrome. Antalgic gait was noticed in 12 patients (24.0%). Tenderness at hip joint 20(40%). From the table 2 it was observed that most of the cases were unilateral (66.0%). Bilateral AVN were noticed in 17 patients (34.0%). From the table 3 it was observed that out of all 50 unilateral patients AVN affects predominantly in left side (62.0%) compared to right side (38.0%). From the table 4 it was observed that avascular necrosis of femoral head was associated in 15 alcoholic patients (30%) and in 18 smoking patients (36.00%). Traumatic causes like posterior dislocation of hip (16.0%) were implicated in the causation of

osteonecrosis of femoral head. Steroid was implicated in causation of AVN in 12 patients (24.0%). Patients of Hemoglobinopathies like sickle cell disease are more prone to develop AVN of bone. In 15 patients (29.0 %) cause that could not be elicited. Table -5 shows all the patients exhibited a poor grading of HHS score at pre-operative time. After three weeks, 40 percent (20 patients) of the patients showed good results followed by 34% (17 patients) of the patients that showed fair results of HHS grading. Excellent results were present only in 16% (8 patients) of the cases in 3 weeks. 64% percent (32 patients) excellent results after 36 weeks and 36(72.0%) after 52 weeks and 5 years postoperatively.

Table 1: Demographic characteristics of the study respondent

Demographic characteristics	Number	Percentage
Age in years		
20-25	11	22
26-30	15	30
31-35	24	48
Gender		
Male	31	62
Female	19	38
BMI		
≤30 kg/m²	29	58
>30 kg/m²	21	42
Mean ±SD	29.18 ± 4.08 kg/m²	

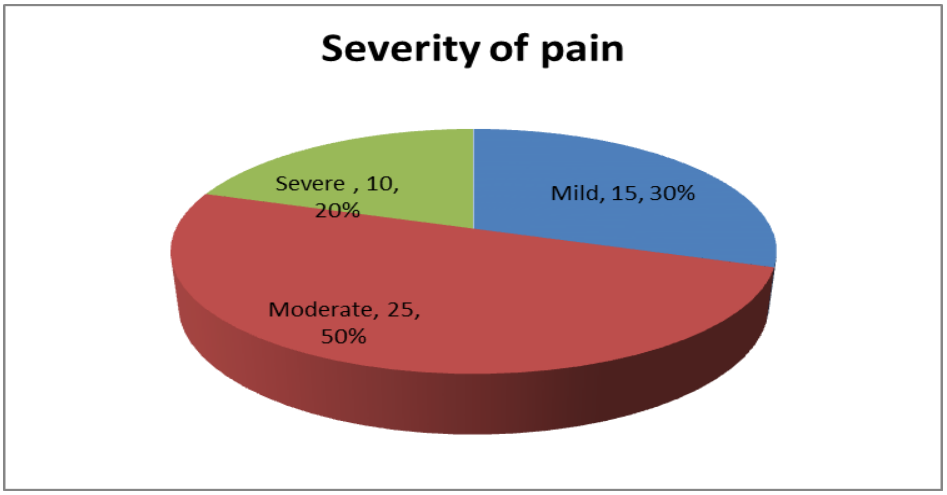

Figure I: showing in relation to Severity of Pain

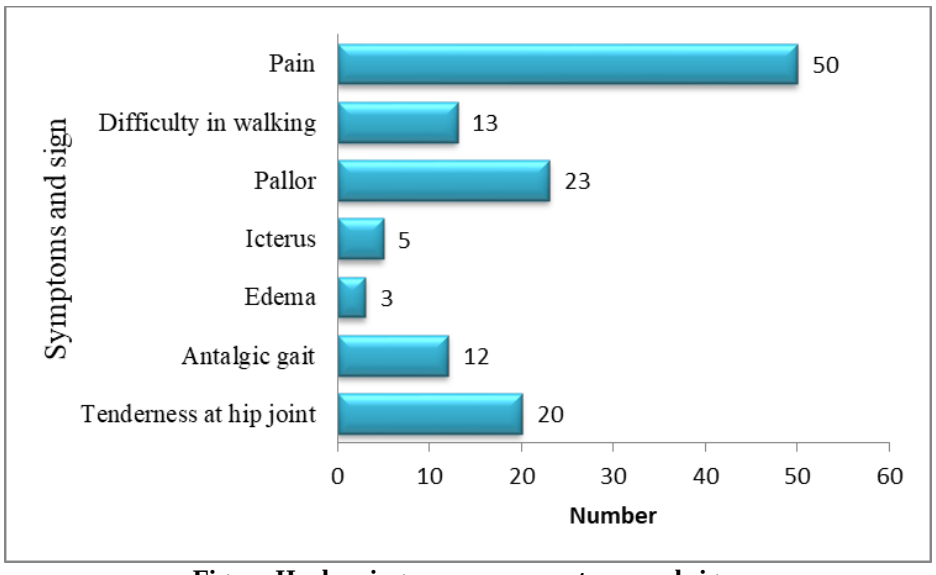

Figure II: showing common symptoms and signs

Table 2: Unilateral vs. Bilateral

Laterality	Number	Percentage
U/L cases	33	66.0
B/L cases	17	34.0
Total	50	100.00

Table 3: Side Affected in U/L Cases

Side	Number	Percentage
Right	19	38.0
Left	31	62.0
Total	50	100.00

Table 4: Showing in Relation to Etiology Distribution

Etiology	Number	Percentage
Traumatic	8	16.0
Steroid	12	24.0
Alcohol	15	30.0
Smoking	18	36.0
Haemoglobinopathy	5	10.0
Idiopathic	15	30.0

Table 5: Outcome categories for Harris hip score, reported based on different follow up

Outcome by Harris hip score	Follow up post-operative time			p value
	3 weeks	36 weeks	52 weeks	
Poor	5 (10.0)	3 (06.0)	2 (04.0)	
Fair	17 (34.0)	5 (10.0)	3 (06.0)	<0.001
Good	20 (40.0)	10 (20.0)	9 (18.0)	
Excellent	8 (16.0)	32 (64.0)	36 (72.0)	

DISCUSSION

In this study, 50 cases of advanced AVN of the femoral head (Ficat and Arlet stage III and IV) were treated by Bipolar hip arthroplasty. The study was undertaken to know the vital role of Replacement hemi arthroplasty in AVN of head of the femur. AVN of head of femur forms one of the major indications for replacement hemi arthroplasty. Replacement hemi arthroplasty is the only predictable effective treatment of AVN of the femoral head when the disease process has reached Ficat and Arlet stages III and IV.

In this study showed that the majority of the patients were from age group of 20-30 years (52%). AVN of the femoral head is common in young individuals. Out of 50 patients, 31 were males and 19 were females. The overall male to female ratio was 1.63:1. The mean BMI were 29.18 ± 4.08 kg/m^2. Reddy *et al.,* [2] study also found similar observation; they showed that the majority of the patients were from age group of 20-35 years. AVN of the femoral head is common in young individuals. Out of 30 patients, 24 were males and 6 were females. The overall male to female ratio was 4:1. Previousy studies show that younger age groups are equally benefited though there are some problems [12,13].

In this study observed that pain was the main presenting feature of necrosis which occurred in all patients (100%). On examination most of the patients were found to be anemic (46%). Icterus was present only in 5 patients (10%). Edema noticed in one patient, who was taken steroids for nephrotic syndrome. Antalgic gait was noticed in 12 patients (24.0%). Tenderness at hip joint 20(40%). Similar observation was found Hanumantharaya *et al.,* [6] they observed that pain was the main presenting feature of necrosis which occurred in all patients (100%). On examination most of the patients were found to be anemic (45%). Icterus was presentonly in 2 patients (10%).

Present study observed that most of the cases were unilateral (66.0%). Bilateral AVN were noticed in 18 patients (36.0%). Hanumantharaya *et al.,* [6] also agreed with our study.

In this study, it was observed that out of all 50 unilateral patients AVN affects predominantly in left side (62.0%) compared to right side (38.0%). Similar observation was found Hanumantharaya *et al.,* [6] they showed AVN affects predominantly in left side (61.54%) compared to right side (38.46%).

Current study, it was observed that avascular necrosis of femoral head was associated in 15 alcoholic

patients (30%) and in 18 smoking patients (36.0%). Traumatic causes like posterior dislocation of hip (16.0%) were implicated in the causation of osteonecrosis of femoral head. Steroid was implicated in causation of AVN in 12 patients (24.0%). Patients of Hemoglobinopathies like sickle cell disease are more prone to develop AVN of bone. In 15 patients (29.0 %) cause that could not be elicited. Reddy *et al.,* [2] reported that this age group has the causes as idiopathic or related to alcohol or steroid intake. Hanumantharaya *et al.,* [6] also agreement with our study. Alcohol, opioid and steroid were found to be the most common etiologic factors in the Singh *et al.,* [1] study group (percentage of opioid and steroid 25 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 [14]. 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 [15].

Present study showed all the patients exhibited a poor grading of HHS score at pre-operative time. After three weeks, 40 percent (20 patients) of the patients showed good results followed by 34% (17 patients) of the patients that showed fair results of HHS grading. Excellent results were present only in 16% (8 patients) of the cases in 3 weeks. 64% percent (32 patients) excellent results after 36 weeks and 36(72.0%) after 52 weeks postoperatively. Reddy *et al.,* [2] reported there was a significant improvement in function as measured with the Harris hip score. The overall preoperative Harris hip score was 43, which remarkably improved to 89 postoperatively. The results observed, showed that all patients had good to excellent results, (Harris hip score ≥80) thus showing a good degree of pain relief, improvement in function and range of motion. 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 [16,17]. 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 [3].

CONCLUSION

In long-term follow-up, bipolar hip arthroplasty for AVN hip has a high good and excellent functional success and a low incidence of post-operative complications. Young adults with Ficat Stages II and III AVN of the femoral head may benefit from this operation. To validate this approach, more extensive series with long-term follow-ups, multicentric randomized investigations, and reproducible outcomes are required.

REFERENCE

1. 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. Journal of Advanced Medical and Dental Sciences Research. 2018 Jan;6(1).
2. Reddy VB, Chary NB, Nikitha K. Surgical management of avascular necrosis of femoral head in young adults treated with uncemented total hip replacement. International Journal of Research in Orthopaedics. 2021 Nov;7(6):1166-69.
3. 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 Jun;49:329-35.
4. Shukla R, Singh M, Jain RK, Mahajan P, Kumar R. Functional outcome of bipolar prosthesis versus total hip replacement in the treatment of femoral neck fracture in elderly patients. Malaysian orthopaedic journal. 2017 Mar;11(1):1.
5. Sonaje JC, Meena PK, Bansiwal RC, Bobade SS. Comparison of functional outcome of bipolar hip arthroplasty and total hip replacement in displaced femoral neck fractures in elderly in a developing country: a 2-year prospective study. European Journal of Orthopaedic Surgery & Traumatology. 2018 Apr;28:493-8.
6. 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.
7. Karimi MT, Mohammadi A, Ebrahimi MH, McGarry A. Evaluation of the magnitude of hip joint deformation in subjects with avascular necrosis of the hip joint during walking with and without Scottish Rite orthosis. Medical Engineering & Physics. 2017 Feb 1;40:110-6.
8. Hamilton TW, Goodman SM, Figgie M. SAS weekly rounds: Avascular necrosis. HSS J 2009;5:99-113.
9. Lee SB, Sugano N, Nakata K, Matsui M, Ohzono K. Comparison between bipolar hemiarthroplasty and THA for osteonecrosis of the femoral head. Clin Orthop Relat Res 2004;424:161-5.
10. Lieberman JR, Berry DJ, Mont MA, Aaron RK, Callaghan JJ, Rajadhyaksha AD, et al. Osteonecrosis of the hip: Management in the 21st century. Instr Course Lect 2003;52:337-55.

11. 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 Orthop Sci 2008;13:313-7.
12. Chan YS, Shih CH. Bipolar versus total hip arthroplasty for hip osteonecrosis in the same patient. Clin Orho. 2000;379:169-77.
13. Kim YH, Oh SH, Kim JS, Koo KH. Contemporary total hip arthroplasty with and without cement in-patients with osteonecrosis of the femoral head. J Bone Joint Surg Am. 2003;85-A(4):675-81.
14. 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.
15. 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.
16. 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.
17. Chan YS1, Shih CH. Bipolar versus total hip arthroplasty for hip osteonecrosis in the same patient. Clin Orthop Relat Res. 2000 Oct;(379):169-77.