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"Study of Management of Avascular Necrosis of Head of Femur by Different Surgical Modalities"

Dr.D.Avinash
M.S. Orthopaedics
Working as consultant in Aditya superspecality hospital , sricilla , telangana

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ABSTRACT

INTRODUCTION- The aseptic necrosis of the femoral head is a disease, which is caused by partial or total disruption of the blood flow to the femoral head. The lack of blood flow at this level results in the death of the bone marrow and bone cells followed by the collapse of the bone structure, events which finally lead to the destruction of the bone tissue, local pain and loss of functionality of the hip joint. Aseptic necrosis of the femoral head is an illness, which affects mostly young adults, in their 3rd or 5th decade. It is considered that this disease affects men 4 times more frequently than women. The severity of this disease resides in the fact that it affects mostly young adults, socially and professionally active and with a great life span. Early diagnosis and appropriate intervention can delay the need for joint replacement. Without treatment, the process is almost always progressive, leading to joint destruction within 5 years.

METHODS- A prospective study was conducted on 30 patients having avascular necrosis of femoral head, who came to department of Orthopaedics and referred from other departments from july 2014 to November 2016 in NRI INSTITUTE OF MEDICAL SCIENCES AND GENERAL HOSPITAL,chinkakani,Guntur,Andhra Pradesh. The clearance from institutional ethical committee was obtained before starting the study. A total of 30 patients, who had given an informed, bilingual and written consent, posted for surgery were included in to the study.

RESULTS- A prospective study was carried out on 30 patients who underwent Core decompression, bipolar hemiarthroplasty,cemented/uncemented ,Total Hip Replacement in Department of Orthopaedics.This study has shown that, the mean age of patients in the study group was42.30±11.43 years. About 43.3% of the avascular necrosis patients in the study group belonged to 31-40 years age group. The sex distribution of the study group has shown that, about 76.7% of the patients were Males and 23.3% were females. The outcome after total hip replacement was excellent in 80.0% of the study group. About 20.0% of the study group had good outcome.

CONCLUSIONS- Avascular necrosis (AVN) primarily affects the axial skeleton and hip joints. The other joints such as humerus, shoulders, ankles and the jaw also can get involved. Patients with avascular necrosis are usually young and more active and problems are related to function, men are usually affected more than women. Idiopathic osteonecrosis in more common followed by steroid induced and post-traumatic AVN. Total hip arthroplasty is a well documented surgical procedure. It relieves pain and functional disability experienced by patients with moderate to severe arthritis of the hip, secondary to AVN and improving their quality of life.

This study suggests that the current generation of uncemented implants used in total hip replacement for arthritis of the hip joint secondary to AVN, provides satisfactory clinical and radiographic outcomes after an intermediate duration follow up. Even though the procedure is not free of complications, the overall functional and clinical outcome had shown good to excellent result.

I. INTRODUCTION:

The aseptic necrosis of the femoral head is a disease, which is caused by partial or total disruption of the blood flow to the femoral head. The lack of blood flow at this level results in the death of the bone marrow and bone cells followed by the collapse of the bone structure, events which finally lead to the destruction of the bone tissue, local pain and loss of functionality of the hip joint. Aseptic necrosis of the femoral head is an illness, which affects mostly young adults, in their 3rd or 5th decade. It is considered that this disease affects men 4 times more frequently than women. The severity of this disease resides in the fact that it affects mostly young adults, socially and professionally active and with a great life span. Early diagnosis and appropriate intervention can delay the need for joint replacement. Without treatment, the process is almost always progressive, leading to joint destruction within 5 years. [1,2-4]

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Causes : Any Condition That Shuts Off The Blood Supply Produces Avascular Necrosis Of Bone.
These Include –Traumatic Causes
Non Traumatic Cause
Traumatic Causes- Fracture Neck Of Femur, Dislocation Of Femoral Head.
Non Traumatic Causes- Haemoglobinopathies, Gaucher's Disease, Caisson Disease, Alcohol Abuse, Corticosteroid Therapy, Coagulation Disorders, Systemic Lupus Erythematous, Rheumatoid Arthritis [5].

In most countries, the incidence and prevalence of AVN are unknown. A Japanese survey estimated that 2500-3300 cases of AVN of the hip occur each year; of these, 34.7% were due to corticosteroid use, 21.8% to alcohol abuse, and 37.1% to idiopathic mechanism [6-9] .AVN accounts for more than 10% of total hip replacement surgeries performed in the United States.

Nowadays, there are more than 16 different classification systems used to classify and describe aseptic necrosis of the femoral head, from which the classification system introduced by Ficat is the most commonly used [2-4.]

The Ficat classification system consists of five stages (0 to IV): the first three describe the events that occur before the collapse of the femoral head and the last two stages describe the post-collapse changes. [2-4]

Conventional radiography is the most convenient and inexpensive first line of investigation, but is not sensitive in detecting early AVN lesions .Bone scintigraphy helps catch AVN at an earlier stage, but is not specific for diagnosing AVN by itself. MRI is more sensitive than plain radiograph for diagnosing early-stage AVN, but is the most expensive option. [10]

Treatment of osteonecrosis of femoral head requires a lot of consideration. Prime importance in this is the age of patients, whether both hips are affected, etiology of the associated diseases, demands and requirement of the patients, and the stage of the disease when the patient presents for treatment is equally important. The treatment should be planned according to staging. Non-weight bearing conservative management of ischaemic necrosis has not been proved to be beneficial and hence various operative procedures are done depending upon the stage of necrosis of femoral head. Surgical treatment of AVN of femoral head can be broadly categorized as either hip preserving procedure and reconstruction procedures. Hip preserving procedures include core decompression with or without bonegrafting and valgus osteotomy. Reconstruction procedures include hemiarthroplasty and total hip replacement. [2-4]

Core decompression involves drilling one larger hole or several smaller holes into the femoral head to relieve pressure in the bone and create channels for new blood vessels to nourish the affected areas of the hip [11]. Osteotomies are performed in attempt to move necrotic bone away from primary weight-bearing areas in the hip joint. Bipolar arthroplasty theoretically decreases shear stress and impact load on acetabulum.Total hip arthroplasty is perhaps the most commonly performed and successful surgery for advanced AVN of the hip. [12,13]

The purpose of this study was to evaluate functional outcomes of patients with avascular necrosis of head of femur treated with different surgical modalities i,e; core decompression,bipolar hemiarthroplasty and total hip replacement .

II. AIMS AND OBJECTIVES :

1. To assess the study of different surgical modalities in the treatment of avascular necrosis of head of femur.
2 .Comparing pre-operative and post-operative functional status with MODIFIED HARRIS HIP SCORING SYSTEM

III. METHODOLOGY :

A prospective study was conducted on patients having avascular necrosis of femoral head, who came to department of Orthopaedics and referred from other departments from july 2014 to November 2016 in NRI INSTITUTE OF MEDICAL SCIENCES AND GENERAL HOSPITAL,chinkakani,Guntur,Andhra Pradesh. The clearance from institutional ethical committee was obtained before starting the study.

A total of 30 patients, who had given an informed, bilingual and written consent, posted for surgery were included in to the study. Patients were admitted and examined according to protocol both clinically and radiologically, and functional outcome was assessed by distribution of ―Harris hip score‖ both preoperatively and postoperatively and the patients are reviewed with post op x-rays immediately after surgery at the end of 6, 12, 24 weeks after the surgery.

Inclusion criteria :
Patients of avascular necrosis of femoral head.
Patients in the age group of 30 to 75 years.
Patients willing to give informed consent.

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Exclusion criteria :
Patients who are not medically fit for surgery Patients with age less than 30 years.
Patients not willing for surgery.

On admission to the ward, a detailed history of the patients was taken. This included age, sex, occupation, complaints, associated medical illness. Following this, they were subjected to a thorough clinical examination and general condition was assessed and accordingly corrective measures were taken to correct the general being of the patients.

Routine blood investigations were done for all the patients. Special attention was paid to CRP and ESR and if these were abnormal, surgery was deferred. Standard antero-posterior and lateral X-rays were taken including pelvis with both hips. Analgesics, antibiotics, tetanus toxoid and blood transfusions were given as needed before surgery.

PREOPERATIVE ASSESSMENT :
The physical fitness of the patient undergoing a major surgery was assessed. Physical examination included examination of spine and both lower extremities including opposite hip, both knees and foot.
Trendelenburg test to assess the abductor musculature mechanism was done.
The patients were evaluated according to the modified Harris hip scoring system. [1]
The scores taken into account were of pain, function, range of motion, and deformities. Also a mention of the limb length discrepancy and flexion contracture is made.
Neurovascular status of affected extremity was evaluated. Any occult infections like skin lesions, dental caries and urinary tract infections were identified and treated preoperatively.

The aim of the pre-op planning was to obtain the following results post operatively
1) An acetabular socket located in the anatomical position.
2) Restoration of limb length.
3) Restoration of abductor arm .
4) Radiogram of the pelvis with both hips with proximal half of shaft of femur AP view was taken for all patients.
5) The radiograph was evaluated for: -Centre of rotation of femoral head located in its normal anatomical position .

PREPARATION :
1)Taken an informed consent
2) Shaved the extremity, perineal area, hemipelvis to atleast 10cm proximal to theiliac crest and wash with soap as soon as possible before surgery and cover with sterile towels.
3) Prophylactic antibiotics: A combination of piperacillin and tazobactum was administered the night and morning before surgery and was continued postoperatively for 3 days.
4) Templating was done for the aectabular and femur components. The appropriate acetabular cup size, and anteversion was determined.

IV. RESULTS:

The present study consists of 30 cases of of avascular necrosis of head of femur treated at N. R. I General Hospital,Chinnakakani,treated between July 2014 to November 2016. 4 cases were belong to stage-I of ficat and arlet classification. 6 cases were belong to stage-II of ficat and arlet classification. 10 cases were belong to stage-III of ficat and arlet classification. 10 cases were belong to stage-IV of ficat and arlet classification. The following are the observations made to the available data analysed as follows

TABLE NO-1 AGE INCIDENCE

Age in years	No. of Cases	Percentage
31-40	4	13.3
41-50	13	43.3
51-60	6	20.0
61-70	6	20.0
>70	1	3.377

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In this series 4 (13.3%) patients were between 31 to 40 years,13 (43.3%) patients were between 41 to 50 years, 6 (20.0%) patients were between 51 to 60 tears,6 (20.0%) patients were between 61 to 70 tears, 1 (3.3%) patients were above 70 tears.

The age of the patients ranged from --- years with an average of ---42.6 years.

TABLE NO – 2 SEX INCIDENCE

Sex	No. of cases	Percentage
Male	20	66.6
Female	10	33.3

Out of 30 patients,20 (66.6%) were males and 10(33.3%) were females, showing a male preponderance with the ratio being M:F-2:1

TABLE NO-3 SIDE OF INVOLVEMENT

Side	No of cases	Percentage
Left	15	50.0
Right	08	26.7
Bilateral	07	23.3
Total	30	100

Left side was involved in 15 (50%) patients, the Right side was involved in 8 (26.7%) patients and Bilateral in 7 (23.3%) patients.

TABLE NO-4 STAGING ACCORDING TO FICAT AND ARLET CLASSIFICATION

Stage	No. of cases	Percentage
I	4	13.3
II	6	20.0
III	10	33.3
IV	10	33.3

Out of 30 cases, 4(13.3%) were belong to stage -I of ficat and arlet classification, 6 (20.0%) were belong to stage -II of ficat and arlet classification, 10 (33.3%) were belong to stage - III of ficat and arlet classification, 10 (33.3%) were belong to stage -IV of ficat and arlet classification .

TABLE NO-5 ETIOLOGY OF PATIENTS STUDIED

Etiology	No of patients	Percentage
Idiopathic	23	70.0
Post traumatic	4	13.3

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Steroid induced	5	16.7
Total	30	100.0

The analysis of patients for the etiology of Avascular necrosis showed that 70.0% of the patients developed Avascular necrosis of hip joint without any known cause (idiopathic), 16.7% of patients developed Avascular necrosis secondary to corticosteroid, and secondary to post trauma 13.3% patients developed Avascular necrosis of the hip joint.

V. EVALUATION OF RESULTS

The evaluation of results was done by using the new method reported by **W.H. Harris, 1969**. The rationale of this new method of evaluation is as described. Pain and functional capacity are the two basic considerations. They constitute the indications for surgery in the vast majority of patients with hip problems, and hence receive heaviest weightings. In specific cases, correction of deformity or restoration of motion may be of prime importance but such cases are uncommon. Based on this reasoning a point scale with a maximum of 100 points is used with the following maximum possible scores:

TABLE: 6

Pain	44
Function	47
Range of motion	05
Absence of deformity	04
Total	100

TABLE:7 Grading of operated hip by Harris hip assessment scores:

Grading	**Score**
Excellent	90-100
Good	80 -89
Fair	70-79
Poor	<70

The **gradations of Pain (44)** because of its subjective nature are inevitably imperfect but the following gradations have proved workable and satisfactory.

Amount of Pain		**Description Points Allotted**
None		44
Slight	Occasional or awareness of pain of low grade No compromise of activities	40
Mild	No-effect on average activities Rarely moderate pain on un-usual activities; may take aspirin.	30

Moderate	Tolerable makes concessions to pain, Some limitation of ordinary activities but Able to work regularly; may require analgesic stronger than aspirin, occasionally	20
Marked	Severe pain at times but ambulatory Serious limitation of activities; Takes analgesics stronger than aspirin frequently.	10
Disabled	Severe pain even/ forces in bed Crippled by pain, bedridden.	0

Function (47) is broken down into daily activities (14) and gait (33). The following selected functional activities give a satisfactory profile.

Function Daily	**Activity Points Allotted**
Stairs	
Foot over foot without banister use	4
Foot over foot using banister use	2
Stairs in any manner	1
Unable to do stairs	0
Transportation	
Able to enter public transportation	1
Sitting	
Comfortable in any chair for one hour	5
Comfortable in a high chair for one-half hour	3
Unable to sit comfortably in any chair	0
Shoes and Socks	
Puts on socks and ties shoes with ease	4
Puts on socks and ties shoes with difficulty	2
Unable to puts on socks or tie shoes	0

Gait (33) presents a problem in assessment, excluding pain, which is considered separately, gait can be characterized in terms of support, limp, and distance that can be walked.

Description	**Points Allotted**
Limp:	
None	11
Slight	8
Moderate	5
Severe	0
Support:	
None	11
Single cane for long walks	7
Single cane most of the time	5
One crutch	3
Two canes	2
Two crutches	0
Unable to walk (specify reason)	0
Distance:	
Unlimited	11
Six blocks	8
Two or three blocks	5

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Indoor only 0

Absence of Deformity

Four (4), Are given if the patient demonstrates any of the following:

1. < 30° of fixed flexion deformity,
2. < 30° of fixed adduction deformity,
3. < 10° of fixed internal rotation in extension,
4. Limb length discrepancy < 3.2 cms.

Range of Motion

Flexion (*140 degrees)
Abduction (*40)
Adduction (*40)
External rotation (*40)
Internal rotation (*40)

To determine the overall rating for range of motion, multiply the sum of the index values x 0.05. Trendelenburg's test is recorded as positive, level, or neutral.

TABLE:8 Rating of outcome of CORE DECOMPRESSION in patients studied

Rating	No of patients	Percentage
Excellent	08	80.0
Good	01	10.0
Poor	01	10.0
Total	10	100

The outcome after Core Decompression was excellent in 80.0% of the study group. About 10.0% of the study group had good outcome and 10.0% of the study group had poor outcome .

TABLE:9 Rating of outcome of HEMI ARTHROPLASTY in patients studied

Rating	No of patients	Percentage
Excellent	08	80.0
Good	02	20.0
Total	10	100

The outcome after Hemiarthroplasty was excellent in 80.0% of the study group. About 20.0% of the study group had good outcome.

TABLE:10 Rating of outcome of TOTAL HIP REPLACEMENT in patients studied

Rating	No of patients	Percentage
Excellent	09	90.0
Good	01	10.0
Total	10	100

The outcome after Total hip replacement was excellent in 90.0% of the study group. About 10.0% of the study group had good outcome

VI. CONCLUSION :

Avascular necrosis (AVN) primarily affects the axial skeleton and hip joints. The other joints such as humerus, shoulders, ankles and the jaw also can get involved. Patients with avascular necrosis are usually young and more active and problems are related to function, men are usually

affected more than women. Idiopathic osteonecrosis in more common followed by steroid induced and post-traumatic AVN. Total hip arthroplasty is a well documented surgical procedure. It relieves pain and functional disability experienced by patients with moderate to severe arthritis of the hip, secondary to AVN and improving their quality of life.

The outcome of the total hip replacement in AVN of hip joint is determined by many factors including the design of component, the selection of the patients, and the operative technique. The results of the procedure needs long term studies for evaluating the complete effect.

This study suggests that the current generation of uncemented implants used in total hip replacement for arthritis of the hip joint secondary to AVN, provides satisfactory clinical and radiographic outcomes after an intermediate duration follow up. Even though the procedure is not free of complications, the overall functional and clinical outcome had shown good to excellent result.

VII. SUMMARY –

A prospective study was carried out on 30 patients who underwent Core decompression, bipolar hemiarthroplasty,cemented/uncemented ,Total Hip Replacement in Department of Orthopaedics.

This study has shown that, the mean age of patients in the study group was42.30±11.43 years. About 43.3% of the avascular necrosis patients in the study group belonged to 31-40 years age group.

The sex distribution of the study group has shown that, about 76.7% of the patients were Males and 23.3% were females.

The analysis of patients for the etiology of AVN showed that 70.0% of the patient developed AVN of hip joint without any known cause (idiopathic), 16.7% of patients developed AVN secondary to corticosteroid, and secondary to post trauma. 13.3% patients developed AVN of the hip joint.

The analysis of patients for the side which they have undergone total hip replacement has shown that, most (50.0%) of the patients had left hip replacement, 26.7% had undergone right total hip replacement and 23.3% had undergone bilateral total hip replacement.

Majority of the patients (86.7%) had uncemented type of arthroplasty and 13.3% had undergone hybrid type of arthroplasty.

The mean pain score during preoperative period was 10.13±1.96 and during postoperative stage was 42.13±2.03.

The mean functional gait score during preoperative stage was 10.53±6.96and during postoperative stage was 30.33±2.31.

The mean functional activity score during preoperative stage was 5.17±1.62 and during postoperative stage was 11.40±1.07.There was a statistically significant difference between the pre and postoperative scores in the study group.

The mean total score (Harris hip score) during preoperative stage was 32.27±8.11 and during postoperative stage was 92.60±3.16. The difference between pre and postoperative scores was statistically significant.

The mean ROM score of study group during preoperative stage was 2.40±1.25 and postoperative stage was 4.63±0.49. The difference between the ROM scores during pre and postoperative stage was statistically significant.

The type of implant used in the study group. Stryker implant was used in 73.3% and Link implant was used in 26.7% of the study group.

In the study group, most (93.3%) of the patients in the study group had no complications. The common complication in the study group was foot drop in 2 patients which is 6.7%.

Analysis shows the complications of total hip replacement according to type of implants used in the study group. Most (93.3%) of the patients in the study group had no complications. But for 1 patient (12.5%) , used link implant had foot drop and for 1 patient (4.5%), used stryker implant had foot drop.

The outcome after total hip replacement was excellent in 80.0% of the study group. About 20.0% of the study group had good outcome.

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