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ACCORDING TO THE STAGE'S OF AVASCULAR NECROSIS OF FEMORAL HEAD, TREATED WITH VARIOUS MODALITIES OF SURGERIES

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ABSTRACT

Our study of 48 cases of osteonecrosis of femoral head , treated with various modalities of surgeries at Mamata General, Hospital , Mamata Medical College, Khammam, during the period **June 2011 to October 2013**. Most of the patients were of young age group at an average age incidence of 31 years and the commonest cause was idiopathic. Males were affected more than females with right side predominance. In 21% cases, stage of the disease at the time of presentation is II, in 12% it is stage I, in 25% it is stage III, in 25% it is stage IV and 17% in stage V. In 12.5% of cases disease is bilateral. Pre operative harris hip scores are between 60-69 in 29% of cases, 70-79 in 71% of cases Average time interval between admission and surgery was 3 days. 66.6% (32 cases) had excellent results, 29.2% (14 cases) had good result and 4.2% (2 cases) had fair result. Out of 48 cases followed up, 2 cases had superficial infection and one patient had harvest site infection, one patient had sciatic nerve palsy and 2 patients had greater trochanteric split fracture. The disease called osteonecrosis was discovered in Egyptian mummies, there is a lack of information available in understanding and treating this disease. The word osteonecrosis comes from a combination of two words which mean that part of the bone is no longer alive and cannot regenerate itself due to a lack of blood supply.

Avascular necrosis (AVN), also known as osteonecrosis, aseptic necrosis and ischemic bone necrosis, is a relatively common disease characterized by death of cellular elements of bone or marrow. Most of the people who develop AVN annually are between the ages of 20 and

50 years. The hip (femoral head) is the most commonly affected site for clinically significant AVN.

It is more common in young males. Male: Female ratio is 8:1. In Central India, sickle cell disease has a very high prevalence and is the most common associated condition with osteonecrosis followed by alcohol abuse and corticosteroid use. [1]

Despite growing interest in this condition, there is much yet to learn about its etiology, pathogenesis, and treatment. The most commonly identified are high doses of corticosteroids and chronic, excessive alcohol intake. In most series, approximately 15% of the cases are considered to be idiopathic. It has recently been shown that in approximately 70% of idiopathic cases, subtle coagulopathies are present.

With secondary collapse of the femoral head, disabling hip pain may result in the need for THR.

For non-traumatic AVN, the disease is often bilateral, which further increases the extent of disability. Non-operative treatments include rest, non-weight-bearing exercises, protected weight-bearing, pharmacotherapy, and electrical stimulation. Operative treatments include fusion, osteotomy, hemi-resurfacing, hemi-arthroplasty, debridement and grafting, core decompression with or without grafting, as well as total hip arthroplasty (Shannon and Trousdale, 2004; DeSmet et al, 2005; McKown, 2007).

Objectives of this Study is

1. To review the relevent literature
2. To study the results of various modalities of surgeries for osteonecrosis of femoral head.
3. To determine which is a safe and reliable method in the management of osteonecrosis of femoral head depending upon the stage.
4. To study the effect of this method on hip joint function.
5. To study the operative difficulties encountered.
6. To study the incidence of complications with this method.

Etiology: In many cases of osteonecrosis, the etiology is less clear. In these cases, one can often identify specific factors known to be frequently associated with osteonecrosis, although the exact mechanisms by which they act have not been completely delineated. High doses of corticosteroids and excessive alcohol intake have been identified in nearly 80% of cases of

non traumatic osteonecrosis. [45] In traumatic cases such as hip dislocation and femoral neck fracture, there is a clear cause-and-effect relationship between the insult, mechanical damage to the vessels that supply the femoral head, and the resulting osteonecrosis. [45, 46]

A one-to-one relationship between these factors and this disorder has not been established, because most patients exposed to steroids or alcohol do not develop osteonecrosis. Although the entity of idiopathic osteonecrosis most likely does exist, as we learn more about the etiology of this condition, the number of patients who will be relegated to this category will diminish.

1.Trauma: Femoral neck fracture,dislocation
2.Corticosteroids
3.Alcohol
4.Coagulation disorders: Thrombophilia, hypofibrinolysis
5.SLE and connective tissue diseases
6.Hyperlipidemias
7.Altered RBC: Sickle cell anaemia,thalassemia
8.Organ transplants: Renal,cardiac,liver
9.Dysbarism
10.Liver dysfunction
11.Gastro intestinal disorders
12.Myelo proliferative disorders: Leukemia, gaucher's disease,
13.Radiation
14.Pregnancy
15.Smoking
16.Hyperuricemia
17.Chemotherapeutic agents
18.Hypersensitivity reactions
19.Idiopathic

Pathogenesis [47]

There have been many mechanisms proposed to explain the pathogenesis of osteonecrosis. They can be categorized into six groups:

(a) Direct cellular toxicity, (b) Extraosseous arterial, (c) Extraosseous venous, (d) Intraosseous extravascular, (e) Intraosseous intravascular, and (f) Multifactorial

Direct Cellular Toxicity

Exposure to radiation, chemotherapy, or thermal injuries can cause injury to and death of marrow cells and osteocytes. It has been proposed that corticosteroids and alcohol have direct cytotoxicity. [48, 49]

Extraosseous Arterial: Osteonecrosis that occurs after femoral neck fractures and hip dislocation is a direct result of injury to the arteries and veins that supply a significant portion of the femoral head. Osteonecrosis may be encountered after various surgical procedures about the hip, as well as after forceful manipulation and casting in extreme positions.

Extraosseous Venous: Venous abnormalities and stasis have been shown to occur in all stages of osteonecrosis

Intraosseous Extravascular

Hemorrhage

Paul Ficat [50] observed the presence of intramedullary hemorrhage in the osteonecrotic lesion of core biopsy specimens. **Saito** [51, 52] et al. also reported evidence of old hemorrhage in areas of necrosis without microfractures. They concluded that multiphasic episodes of intramedullary hemorrhages are an important element in the pathogenesis of osteonecrosis.

Elevated Bone Marrow Pressure: Core biopsy specimens from patients with early stages of osteonecrosis have shown histologic changes taking place in the marrow before bony abnormalities appear . This observation has led to the theory that the bone acts like a Starling resistor , in which thin-walled vessels traverse the space within a rigid outer cortex. Any increase in the pressure within this compartment would tend to cause the vessel walls to collapse, thus leading to decreased blood flow.

Cellular Hypertrophy and Marrow Infiltration: There are several circumstances in which this might be implicated in the pathogenesis of the ischemia: corticosteroid therapy, Gaucher's disease, leukemia, or caisson disease or dysbarism.

Bone Marrow Edema: Intraosseous edema is a finding common to osteonecrosis. The role of marrow edema in the pathogenesis of osteonecrosis remains unclear.

Intraosseous Intravascular: Sickle Cell Disease and Dysbarism. This is believed to be related to emboli composed of clumps of abnormal red blood cells or to nitrogen bubbles, which can lodge within vessels and can also accumulate in the fatty marrow surrounding vessels.

Lipid Emboli: The association of hyperlipidemia with gout, alcoholism, and corticosteroid therapy support this.

Thrombosis and Coagulation Disorders: In thrombophilia, there is an increased tendency to form intravascular thrombi, whereas in hypofibrinolysis, thrombi that have already formed are less readily lysed and removed.

Hypersensitivity Reactions: Intravascular coagulation might be a result of mechanisms such as the Schwartzman phenomenon, in which immune complex deposition may lead to vascular damage and ultimately osteonecrosis.

Multifactorial Etiology: Several precipitating factors may act simultaneously or in sequence. [53] Under other circumstances, a specific etiology factor may evoke more than a single mechanism to cause vascular injury. Excess corticosteroid use can cause hyperlipidemias that result in intravascular lipid emboli. These in turn cause intravascular coagulation. In addition, steroids may cause direct cellular toxicity and may lead to abnormalities in marrow fat, thus causing increased pressure on local vessels.

Staging: Several radiographic staging systems are currently used.

Ficat and Arlet classification [39]

Arlet and Ficat, In the 1960s, in France described a three-part staging system, and in the 1970s a fourth stage was added. This form is perhaps the one most widely used now.

- Stage 0 - No pain, normal radiographic findings, abnormal bone scan or MRI findings
- Stage I - Pain, normal x-ray findings, abnormal bone scan or MRI findings
- Stage II a - Pain, cysts and/or sclerosis visible on x-ray, abnormal bone scan or MRI findings, without sub chondral fracture
- Stage III - Pain, femoral head collapse visible on x-ray, abnormal bone scan or MRI findings, crescent sign (sub chondral collapse) and/or step-off in contour of sub chondral bone

- Stage IV - Pain, acetabular disease with joint space narrowing and arthritis (osteoarthrosis) visible on x-ray, abnormal MRI or bone scan findings.

In 1973, **Marcus** [40] et al. identified six stages of osteonecrosis and described the radiographic picture for each. These were correlated with gross and histologic findings as well as with the patient's symptoms and physical examination. Bone scans were not specifically described and MRI was not available at that time. No preradiographic stages were included and no attempt was made to quantitate the size of the lesion.

Kerboul [41] classification (1974)

- The **Kerboul angle**, also known as the "combined necrotic angle," is a system used to quantify the size of a lesion. To calculate, first identify the center of the femoral head. Two lines are then drawn from this point to the borders of the lesion on both AP and lateral radiographs. The sum of the angles on the AP and lateral radiographs is the Kerboul angle. Lesions are classified as small, medium, or large.
- Small: 160 degrees or less
- Medium: 161 - 199 degrees
- Large: 200 or more degrees

In 1987, the Japanese Investigation Committee for Avascular Necrosis described a new roentgenographic classification. [42] It focused on hips with Ficat and Arlet stages II and III, and it grouped them by the type and location of the lesion as well as the amount of articular surface involved.

Steinberg staging system (The University of Pennsylvania staging system) [43]

This system of staging was compared in clinical use to older, non quantitative systems and was found more effective in following the progression or resolution of the condition, evaluating the results of treatment, and establishing a prognosis . It is now generally recognized that the size or extent of the necrotic lesion is an important indicator of prognosis and determinant of the management, and it should be included in staging. Use of this staging system in conjunction with a clinical evaluation as described has enabled us to develop an algorithm that has proven helpful in determining treatment for patients with osteonecrosis.

- Stage 0 - Normal or non diagnostic radiographic, bone scan, and MRI findings
- Stage I - Normal radiographic findings, abnormal bone scan and/or MRI findings
  - A - Mild: < 15% of head affected

- B - Moderate: 15-30%
- C - Severe: >30%

- Stage II - Lucent and sclerotic changes in femoral head
- A - Mild: < 15%
- B - Moderate: 15-30%
- C - Severe: >30%

- Stage III - Subchondral collapse (crescent sign) without flattening
- A - Mild: < 15% of articular surface
- B - Moderate: 15-30%
- C - Severe: >30%

- Stage IV - Flattening of femoral head
- A - Mild: < 15% of surface or < 2-mm depression
- B - Moderate: 15-30% of surface or 2- to 4-mm depression
- C - Severe: >30% of surface or >4-mm depression

- Stage V - Joint narrowing and/or acetabular changes
- A - Mild: Average of femoral head involvement as in stage IV and estimated acetabular
- B - Moderate involvement
- C - Severe
- Stage VI - Advanced degenerative changes

International classification of osteonecrosis of the femoral head (Association Research Circulation Osseus [ARCO]) [44]

- Stage 0 - Bone biopsy results consistent with osteonecrosis; other test results normal
- Stage I - Positive findings on bone scan, MRI, or both
- A - < 15% involvement of the femoral head (MRI)
- B - 15-30% involvement
- C - >30% involvement
- Stage II - Mottled appearance of femoral head, osteosclerosis, cyst formation, and osteopenia on radiographs; no signs of collapse of femoral head on radiographic or CT study; positive findings on bone scan and MRI; no changes in acetabulum.

- A - < 15% involvement of the femoral head (MRI)

- B - 15-30% involvement
- C - >30% involvement

- Stage III - Presence of crescent sign lesions classified on basis of appearance on AP and lateral radiographs.

- A - < 15% crescent sign or < 2-mm depression of femoral head
- B - 15-30% crescent sign or 2- to 4-mm depression
- C - >30% crescent sign or >4-mm depression

- Stage IV - Articular surface flattened; joint space shows narrowing; changes in acetabulum with evidence of osteosclerosis, cyst formation, and marginal osteophytes

Diagnosis: The diagnosis of established osteonecrosis of the femoral head is usually not difficult because the radiographic picture is often pathognomonic. Goal is to make the diagnosis as early as possible, ideally before characteristic changes appear on radiographs. This will allow early treatment with procedures that may help retard or reverse progression of this condition and save the femoral head. This, in turn, requires a familiarity with its etiology, pathogenesis, and clinical features, as well as with the laboratory tests and imaging studies that enable us to make the diagnosis early.

Clinical Features: The signs and symptoms of osteonecrosis are nonspecific. For weeks and perhaps even months after the initial vascular insult, the involved area may be entirely asymptomatic. When symptoms develop, they usually do so gradually. This may be due to a buildup of intraosseous pressure initially and later perhaps to microfractures of affected trabeculae. The pain is usually localized to the inguinal region but may involve the buttock or the upper thigh. Rarely does it radiate as far as the knee. It may be present at rest but is often exacerbated by activity. Later, a limp and a slight decrease in ROM, associated with pain, may develop.

Although both hips are affected in more than 50% of the cases, the involvement is usually not simultaneous. The patient will normally present initially with symptoms on only one side. If the contralateral hip is afflicted, symptoms will usually develop within 3 to 6 months. Approximately 80% of asymptomatic hips with MRI-proven osteonecrosis eventually become symptomatic. The incidence is much less in the case of small lesions. When the asymptomatic contralateral hip of a patient with osteonecrosis on the opposite side appears normal on the initial MRI, there is less than a 10% incidence that this hip will develop

osteonecrosis at a later date. In a small number of cases of advanced osteonecrosis, the patient may develop a positive Trendelenburg sign and have shortening of the limb, due to both collapse of the femoral head and to a limited range of hip motion resulting in a functional shortening.

In approximately 15% of cases of hip involvement, other areas will also develop symptomatic osteonecrosis. These include knees, shoulders, wrists, feet, and, rarely, elbows and facial bones. Accordingly, these areas should be evaluated by history and physical examination. Take a careful history, looking for possible etiologic or associated factors. High doses of corticosteroids and prolonged, excessive alcohol intake are most often implicated, but a number of other factors should also be considered, as discussed earlier.

Laboratary Tests: In most instances, routine laboratory tests are within normal limits. In selected cases, serologic testing can be used to rule out or diagnose other possible causes of hip pain and they may identify certain risk factors. These include sickle cell disease, SLE, hyperuricemia , abnormal amounts of circulating lipids, and subtle coagulopathies.

Abnormalities in coagulation factors have recently been identified in more than 70% of patients with previously diagnosed idiopathic osteonecrosis. They have also been identified in a large number of patients with osteonecrosis in whom other inciting factors, such as alcohol or steroids, are present. It is thus felt that either alone or in combination with other agents, these coagulation abnormalities may predispose to or cause osteonecrosis.

These abnormalities cannot be detected on standard measurements of coagulation, such as prothrombin time, partial thromboplastin time, and bleeding time, which are usually within normal limits. A more complete coagulation profile is therefore required to identify these factors. Thrombophilia may be associated with decreased levels of protein C, protein S, and antithrombin III (AT III); increased resistance to activated protein C (RAP-C); and elevated antiphospholipid antibodies. Hypofibrinolysis may be associated with increased plasminogen activator inhibitor activity (PAI-1), increased lipoproteins, and decreased stimulated plasminogen activator activity. Unfortunately, at the present time these tests cannot be performed in all facilities, and they are expensive.

Plain Radiographs

The most important modality for the diagnosis of osteonecrosis is high-quality anteroposterior and lateral radiographs of both hips. Initially, these will be within normal limits because it takes a period of weeks to months after the initiating event for changes to appear on radiographs. The first changes to be noted are areas of radiolucency and sclerosis within the femoral head, usually in the anterior superior quadrant. These result from bone resorption and new bone formation. If the involved area is small, and if it is not in a region of major weight bearing, spontaneous healing may occur. Once radiographic changes are present , they rarely disappear completely, and the involved area usually be identified by its sclerotic appearance.

Magnetic Resonance Imaging (MRI)

If osteonecrosis is suspected despite normal-appearing plain radiographs, MRI of both hips should be obtained because more than 50% of cases are bilateral. If the diagnosis in one hip has already been established by plain radiographs, then MRI study may be performed on the contralateral hip only. The double-line sign on T2-weighted images is essentially pathognomonic for osteonecrosis.

CT scans usually add little to the diagnosis of osteonecrosis. In selected instances, CT may better visualize a small lesion not easily seen on routine radiographs, and it may demonstrate small areas of articular surface collapse that are not apparent on plain films, may also be used to help quantitate the extent of femoral head involvement.

Technetium bone scans have been used infrequently since the development of MRI.

Modalities of Treatment

Considerable controversy exists regarding the early management of osteonecrosis. Several different procedures have been described, and in general most give results better than non operative or symptomatic treatment. It is, however, difficult to compare the effectiveness of each of these or to determine their specific indications and contraindications. This is because of the many variables included in these studies and the significant differences in techniques, inclusion criteria, radiographic evaluation, outcome measurements, and criteria for determining success or failure. A coordinated series of prospective studies is required to determine the effectiveness and indications for each of these techniques, but this is not yet available.

Medical line of treatment

Certain systemic disorders have been associated with an increased incidence of osteonecrosis. These include coagulopathies, hyperlipidemias, and the presence of specific antibodies. Screen patients with osteonecrosis for the presence of these disorders, with coagulation studies, liver function tests, lipid profiles, and tests for anticardiolipin antibodies and lupus anticoagulant. [45] If definite abnormalities are found, decide whether to treat them and which agents to use.

Limited studies have shown a possible role for stanozolol, an anabolic steroid that alters lipoproteins and suppresses clotting factors; nifedipine, a vasodilator; agents that lower circulating lipids; and long-term anticoagulation to treat coagulopathies . Anticoagulation is not a benign form of treatment, and the appropriate dose and duration of treatment has not been established. In general, neither the effectiveness nor the safety of these agents has been determined, nor do we have appropriate guidelines for their use at present.

Protected Weight Bearing

Canes or even crutches are frequently prescribed. Although these may decrease the degree of discomfort in patients who are symptomatic, they have not been shown to alter the natural course of this disorder.

Protected weight bearing may be used empirically as an alternative to surgical management in cases with a good prognosis. These cases include small, asymptomatic lesions and those in regions of relatively low weight bearing, such as the medial aspect of the femoral head. However, it has not been established that limited weight bearing improves the already favorable course in such instances.

Symptomatic management, including protected weight bearing, may be the treatment of choice when the patient's age, general prognosis, and associated medical conditions, or the patient's own wishes, contraindicate surgical intervention.

Sudhir s bhabhulkar: ijo 2003,said that 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.

ELECTRICAL STIMULATION

Various types of electrical stimulation have demonstrated an ability to enhance bone formation and fracture healing. It was thus natural for electrical stimulation to be applied to patients with osteonecrosis, either alone or as an adjunct to other surgical procedures, in the hope that it would stimulate healing of the necrotic regions. [32] Three specific signals have been used: direct current (DC), capacitive coupling (CC), and pulsing electromagnetic fields (PEMF). DC stimulation requires the insertion of an electrode directly into the bony region to be stimulated, and therefore it has been used as an adjunct to core decompression rather than as an independent treatment modality.

Only limited studies have been reported using these techniques . Capacitive coupling, with the specific signal utilized, failed to show any enhancement of the effects of core decompression and bone grafting alone. DC stimulation, despite indications of an early response, did not show a long-term effect. Results with PEMFs, both in individual studies and in a multicenter study, were promising.

Extracorporeal shockwave therapy: Extracorporeal shockwave treatment has shown some promise in treating early disease by promoting angiogenesis and bone remodeling.

In 1996, **Mont, Carbone and Fairbank** concluded that, compared to non operative or symptomatic management, core decompression with or without a bone graft was a safe and effective procedure for the treatment of early stages of avascular necrosis. **Von Stechow and Drees (**2007) stated that osteonecrosis of the femoral head eventually leads to its destruction if it remains untreated.

Eventhough the conservative treatment has a role in the treatment of osteonecrosis of femoral head, they are still in research state.

SURGICAL PROCEDURES

INDICATIONS FOR OPERATIVE TREATMENT

1. Failure of conservative management
2. Patient not willing for conservative management
3. Bilateral involvement
4. Late presentation
5. Lesion in the weight bearing area

INDICATIONS FOR CORE DECOMPRESSION AND FIBULAR GRAFING

1. STAGE I & 2 A of ficat and arlet staging or stage 2 of Steinberg staging
2. Stage 2B of ficat and arlet staging or stage 3 of Steinberg staging
3. Bilateral hip involvement
4. Lesion in the weight bearing area

Osteotomies

Osteotomy is suitable for some small stage threes. Various types of proximal femoral osteotomies have been used in the treatment of avascular necrosis of the femoral head over the past thirty years. The most commonly cited rationale for their efficacy is the biomechanical effect of moving the necrotic segment of the femoral head from the principal weight-bearing area of the hip to an area that bears less weight, and replacing it with relatively normal bone and cartilage. Others have suggested that the beneficial effects of osteotomies are secondary to the procedure effecting a reduction in venous hypertension and intramedullary pressure.

Two general types of osteotomies have been described: varus or valgus osteotomies, usually combined with flexion or extension, and transtrochanteric rotational osteotomies. The varus or valgus osteotomies have been associated with variable rates of success after short-term follow-up of approximately 5 years.

The indications for varus or valgus osteotomies depend on the location and size of the lesion. Osteotomies may be utilized for both pre- and post collapse lesions. Osteotomies work best when the lesions are small or medium sized with a combined necrotic angle of less than 200° or with less than 30% of femoral head involvement. For varus osteotomies, there should be at least 20° of the superolateral femoral head not involved with disease, because this area of cartilage will be shifted into weight bearing after the osteotomy.

A valgus osteotomy requires normal bone and cartilage in the central or medial aspect of the head. Guidelines for when to add a flexion or extension component to the osteotomy are similarly based on the location of the lesion. Extension can be added when the necrotic segment is posterior and flexion can be added if the lesion is anterior.

Valgus osteotomy with flexion and bone grafting is utilized in hips with Ficat Stage III when the osteonecrotic segment is confined to the anterosuperior part of the femoral head (less than 20% posterior involvement). Postoperatively, allow patients toe-touch weight bearing (15 kg)

for 3to4 months or until radiographs show healing of the osteotomy. Partial weight bearing may be continued for 6 months or longer, depending on the rate of healing of the femoral head.

Varus osteotomy with flexion or extension is utilized for small or medium sized lesions with a combined necrotic angle of less than 200°. There should be no radiographic evidence of acetabular involvement, and an arc of at least 20° on the lateral aspect of the femoral head should be free of underlying necrotic bone. The femoral head is moved into abduction and the femoral shaft is brought into adduction and flexion. This brings the necrotic area anteriorly, inferiorly, and medially. Postoperatively, keep the patient at toe-touch weight bearing for 2 months and then advance to a cane until union is visible on radiographs , usually 4 to 6 months after the procedure.

Rotational Osteotomies: Wagner [54]: In 1967, described a double intertrochanteric osteotomy to accomplish this. However, by 1977 he concluded that the clinical results with this procedure were no better than with conventional angulation osteotomies and abandoned it . **Sugioka** **[55,56,57,58]** , In 1973, reported on a different type of transtrochanteric anterior rotation osteotomy. Sugioka's results were quite gratifying. Unfortunately, these results could not be consistently duplicated by other investigators. In some instances, this might be explained by deviation from the specific indications for the procedure, the complicated operative technique, or the postoperative regimen outlined by Sugioka.

In most instances, osteonecrosis involves the anterosuperior aspect of the femoral head, leaving the posteroinferior portion relatively intact. By rotating the femoral head anteriorly, the necrotic segment is removed from the region of major weight bearing and replaced with relatively normal bone and cartilage. Occasionally, rotation posteriorly rather than anteriorly will more effectively accomplish this goal. Varus or valgus can be added to the rotation. The exact plane and alignment of the osteotomy can be determined from a careful measurement of preoperative radiographs.

A critical point is the absolute necessity of maintaining the blood supply to the femoral head by preserving the vascular pedicle of the medial circumflex femoral vessels, which is located beneath the quadratus femoris.

Indications

Rotational osteotomy is indicated for the treatment of early to intermediate stages of osteonecrosis of the femoral head. There must be sufficient normal bone and cartilage in the femoral head so that after rotation the intact segment occupies at least 36% of the weight-bearing surface of the acetabulum

Contraindications

1. Whole-head necrosis,
2. Significant degenerative changes in the femoral head
3. Degenerative changes in the acetabulum, and
4. Poor general health.

DISADVANTAGES

1. Technically difficult
2. Hip joint anatomy will get disturbed
3. Further hip replacement is difficult
4. Chances of non union
5. Chances of Fracture internel fixation failure
6. Deforms femur.

Cancellous and Cortical Grafting through the Neck or Head

Ganz and Buchler [59] a procedure reported by combined this with an osteotomy, similar to that later described by **Scher and Jakim.** [60] Japanese investigators described a technique whereby autogenous iliac crest strut grafts were inserted through a window into the neck and were impacted into position, thus elevating the collapsed femoral head to its former sphericity. The necrotic lesion was partially curetted and the strut grafts were supplemented with cancellous bone. They reported good or excellent results.

Rosenwasser [61] et al. replaced the necrotic bone with cancellous autograft and reported good to excellent clinical outcomes. In the so-called light bulb procedure , the femoral head is approached through a window in the anterior aspect of the femoral neck. The necrotic material is excavated up to the subchondral bone. This cavity is then packed with autogenous cancellous bone harvested from the ilium. Postoperatively, patients remain non-weight-bearing for 6 months.

Another method of introducing bone graft is through a trapdoor made in the articular cartilage of the femoral head. **Meyers** [62,62] et al., described this in detail by who utilized autogenous iliac cancellous bone grafting. Mont et al. combined autogenous iliac cancellous and cortical bone grafting with demineralized bone matrix using this approach. They reported 22 of 30 good and excellent clinical outcomes at a mean follow-up of 4.7 years.

Osteochondral Grafts

The hip is usually dislocated posteriorly, the depressed segment of articular cartilage and subchondral bone is removed, and the necrotic bone is then excavated down to a margin of viable bone. The cavity is first packed with autogenous, cancellous graft taken from the ilium. Osteochondral allograft is then placed over this, restoring the articular surface.

Meyers [63] **and Convery** reported good and excellent clinical outcomes in 8 of 9 Ficat stage III hips with a mean follow-up of 3 years (range, 1 to 9 years). There are no long-term reports of this procedure.

Technical difficulties

1. Difficult to obtain a properly fitting osteochondral allograft , because these grafts must be obtained from the donor within hours of the implantation and cannot be stored for prolonged periods.
2. It is necessary to have an almost exact match in size between the donor femoral head and the head that is to receive the tissue.
3. Risk of infection
4. Graft-donor mismatches that can lead to rejection.

Muscle-Pedicle Bone Grafts

There are multiple methods of utilizing muscle-pedicle bone grafts . The rationale for all of these procedures is that the muscle-pedicle bone graft will bring a blood supply to replace that lost by the necrotic tissue that is removed. **Meyers** [62] et al., first described this technique, and used it in posttraumatic osteonecrosis.

Free Vascularized Fibular Grafting: During the past few years, there has been increasing interest in the role of free vascularized fibular grafting (FVFG) as a treatment for osteonecrosis of the femoral head. Only a few centers have significant experience with this technique, but they have reported encouraging results. This procedure is technically

demanding, is ideally performed by two teams operating simultaneously, and requires assistance of a well-trained microvascular surgeon. Considerable experience is required before optimal results can be anticipated, and initially one should allow several hours for the procedure. The complication rate is significant, even in experienced hands, and stress fractures of the tibia have been reported. At the present time, it is difficult to determine if this procedure yields better results than simpler techniques, and if it does, how much better. The specific indications for it have yet to be established.

The major disadvantages of this procedure are associated with the need to harvest the patients' own fibula and perform the microvascular anastomosis. The few studies which have addressed this issue indicate that it may be . However, other studies indicate that equal or nearly equal results can be obtained with simpler procedures such as a nonvascularized tibial or fibular allograft or with cancellous grafting alone . If these can be substantiated by other investigators, it might be more difficult to justify free vascularized fibular grafting as it is now performed except in selected circumstances. [64] Long-term results suggest that FVFG is a viable option for the treatment of advanced osteonecrosis of the femoral head.

Complications

The majority of complications with this procedure are related to donor site morbidity . In a study by **Vail and Urbaniak**[64] 24% of the lower legs were found to have donor site complications. These complications included a sensory deficit in 11.8% of the limbs, motor weakness in 2.7%, pain at the ankle in 11.5%, and pain at other sites in the leg in 8.9%. Two percent of the limbs had a contracture of the FHL. Other complications included superficial wound infections, transient deep peroneal nerve paralysis, and injury to a branch of the superficial peroneal nerve.

CUP ARTHROPLASTY: Prior to the development of THR, cup arthroplasty was often considered the standard reconstructive procedure for patients with late stages of osteonecrosis, degenerative arthritis, and other arthritides. The postoperative regimen was lengthy and complicated, the results were inconsistent, and even relatively good results were generally not completely satisfactory by today's standards. Accordingly, conventional cup arthroplasty was essentially abandoned with the advent of THR.

SURFACE REPLACEMENT ARTHROPLASTY: Surface replacement arthroplasty (SRA) was popularized in the 1970s as an alternative to conventional THR. It was thought to

be especially suited for the young adult. Several different designs were available, and a number of procedures were performed in patients with osteonecrosis. Despite the theoretical advantages of this approach, the clinical results were unacceptable, with a high 5-year failure rate.

HEMISURFACE REPLACEMENT ARTHROPLASTY : Hemisurface replacement, also known as cup hemiarthroplasty, is a direct descendant of cup arthroplasty, which was originally conceived by **Smith-Petersen.** [66] It is a viable treatment option for patients with osteonecrosis of the femoral head when bone quality is adequate and when acetabular cartilage is relatively normal. It preserves bone stock, affording potential for easy revision. With normal transfer of stress to the proximal femur, proximal bone loss due to stress shielding may be mitigated. Cartilage durability is enhanced by optimizing contact of the hemispherical bearing to the acetabular cartilage. An added advantage of this technique is that the larger ball size ensures greater joint stability than with THA.

Indications: Hemisurface replacement is best indicated in patients with.

1. Adequate bone stock and
2. Relatively intact acetabular cartilage (Ficat stage III and early stage IV).
3. For young and physically active patients as a way to postpone the need for THR.

Contraindications: Patients with advanced osteonecrosis in which both sides of the joint are severely damaged are not candidates for hemisurface replacement.

FEMORAL ENDOPROSTHETIC REPLACEMENT

The rationale for using a femoral endoprosthesis rather than a THR for osteonecrosis once again stems from the fact that initial changes are in the femoral head and not the acetabulum. The early procedures used solid press-fit femoral components that employed neither cement nor bone ingrowth for fixation of the stem into the femoral canal. The heads were sized rather crudely to the acetabulum because the importance of an exact fit was not realized at that time. The long-term results with these prostheses when used in younger patients with osteonecrosis were generally poor, although some good to excellent results did occur.

TOTAL HIP REPLACEMENT: Although THR is by far the most commonly used procedure for the treatment of patients with advanced stages of arthritis and other disorders of the hips, there has been a certain reluctance to advise this procedure for patients with AVN.

This is because these patients are much younger than patients with degenerative joint disease at the time that arthroplasty is required, and it is generally accepted that the survivorship for THR in young patients is less than in older patients.

Patients with osteonecrosis seem to have a higher complication rate and earlier incidence of failure than patients of a similar age but with other disorders of the hip. In five reports published between 1981 and 1984 on THR arthroplasty in younger patients, the mean incidence of revision was 13%, and results were rated as good to excellent in 81% with a 5-year follow-up .

Salvati and Cornell [67], reviewed their experience with THR in patients with osteonecrosis from 1972 through 1975, and stated that the failure rate in osteonecrosis was four times greater than in osteoarthritis.

More recent literature indicates improved results at short- and medium-term follow-up times with more modern components and techniques. **Piston** [68] et al.,In 1994, reported on 35 hips with AVN treated with porous-coated THR . They encountered one femoral and two acetabular revisions, for an overall revision rate of 6%. There was, however, significant remodeling in six hips and osteolytic reactions in six others. **Garino and Steinberg** [69], In 1997, reported on 123 THAs in patients with osteonecrosis. The authors concluded that using modern techniques and components in THR arthroplasty can give excellent results over a period of 2 to10 years, even in young patients with osteonecrosis. They felt that this procedure was the treatment of choice when reconstructive surgery was required.

RESECTION ARTHROPLASTY: Resection arthroplasty, also referred to as a Girdlestone pseudarthrosis, was used as a primary arthroplasty for both septic and nonseptic hips prior to the advent of THR. Today it is used most frequently as a salvage for the failed and usually infected THR or endoprosthesis.

Under certain selected circumstances, however, it can be used as a primary arthroplasty.

1. In the patient with end-stage osteonecrosis whose pain and disability require some type of operative intervention, but in whom prosthetic replacement or THR is contraindicated.
2. To treat the osteonecrotic hip complicated by sepsis, and the patient in whom THR arthroplasty has a high potential for complications and failure.
3. Patients with chronic recurrent septicemia,

4. Patient on renal dialysis, and

5. Idividuals with active sickle cell disease may fit into this category.

6. Individual who is felt to be too unreliable to take proper precautions following THR, such as the chronic alcoholic, drug abuser, and mentally retarded.

7. Individual who is confined to a bed/chair existence due to neurologic or medical problems and who simply needs pain relief and satisfactory motion rather than stability and the ability to ambulate.

8. Definitive procedure or as an intermediate step, such as in the case of infection, until a THR can be safely performed.

A resection arthroplasty will eliminate sepsis if present, provide pain relief, give a good ROM, and not deteriorate with the passage of time. At the same time, the joint will be unstable, the limb will be an average of 1to1.5 inches short, and most patients will require both a shoe lift and the use of at least one cane or possibly two crutches for ambulation.

ARTHRODESIS: In the patient with significant pain and disability, who is no longer responsive to conservative management, and in whom prosthetic replacement or THR is contraindicated but stability of the hip rather than motion is required, arthrodesis rather than resection arthroplasty might be considered. Most of the indications described for resection arthroplasty also apply to hip fusion. This procedure might also be considered in the large, young, active man who desires a single permanent procedure rather than a THR with the need for more than a single revision during his lifetime. Before embarking on this procedure, the individual must be fully aware of the possibility that the attempt at fusion may not be successful, and of the permanent limitations that a fusion will impose. At times the use of a pantaloon spica as a trial will help the patient make an informed decision.

Contraindications

- pathology in the knees,
- lumbar spine, or contralateral hip.

Because of the known high incidence of bilaterality of osteonecrosis, it is essential that involvement of the opposite hip be ruled out prior to embarking on a fusion. If, despite these precautions, osteonecrosis does develop in the contralateral hip, THR can be performed with a satisfactory outcome. The incidence of nonunion in osteonecrosis is somewhat higher than in patients with other disorders because of the necrotic bone present in the femoral head.

CORE DECOMPRESSION

Arlet and Ficat: during the early 1960s, used core decompression to examine the pathologic changes in femoral heads of patients who were suspected of having AVN. This procedure caused a decrease in the abnormally elevated intraosseous marrow pressures and frequently produced immediate relief of preoperative pain. Subsequently, this approach was used as a therapeutic rather than a diagnostic procedure. It is presumed to work by decreasing the abnormally high intraosseous pressures present in osteonecrotic lesions, by opening up channels for vascular ingrowth, and by stimulating the natural processes of repair.

Investigators do not completely agree as to the safety or the effectiveness of this procedure. **Ficat and Arlet**, In 1985**,** reported on 133 hips in stages I and II treated with core decompression. They noted good and very good results • in 90% of hips clinically and in 79% of hips radiographically. **Camp and Colwell** , In 1986, , said that sixty percent of hips treated before collapse failed either radiographically or clinically, and all hips treated after collapse were considered clinical failures. Four patients sustained postoperative fractures.
Most studies report a low incidence of complications and results significantly better than with symptomatic management. In an extensive review of the literature published in 1996, **Mont** et al. satisfactory results were found in 64% of hips treated by core decompression, compared with only 23% of hips treated nonoperatively. In the hips treated before collapse, good results were obtained in 71% with core decompression and 35% treated nonoperatively. The best results were achieved at centers doing the greatest numbers of procedures.

INDICATIONS

1. Stage I of ficat staging
2. Stage IIa of ficat staging
3. Stage I, II of Steinberg staging

CORE DECOMPRESSION AND FIBULAR GRAFTING

Phemister, In 1949 described the use of tibial strut grafts for the treatment of post-traumatic osteonecrosis. The technique was later modified by **Bonfiglio** and **Bardenstein** and **Boettcher** et al. Initial results were favorable. **Buckley** et al. described the results after core decompression combined with tibial autografts and fibular autografts or allografts. They reported successful clinical outcomes in 18 of 20 hips (90%) that had precollapse disease, stage I or II.

In long term follow up studies, excellent results were reported in patients treated prior to femoral head collapse, provided that the grafts were well placed.

1. It is relatively simple
2. Requires no special equipment or expertise;
3. It is a short procedure
4. With little blood loss
5. It has been performed by some on an outpatient basis;
6. If done carefully, the complication rate is extremely low;
7. Protected weight bearing is required for only six to twelve weeks;
8. It can be done bilaterally under the same anesthetic when indicated
9. Does not require a delay of three or more months for the second hip as with some other procedures;
10. It does not compromise a future arthroplasty if required.
11. It is effective in hips treated prior to collapse, especially in those with smaller lesions, medium lesions.

Bio mechanics of core decompression and fibular grafting: Rationale is that removing necrotic bone decompresses the rigid osseous chamber, thereby improving blood flow and preventing additional ischaemic events. The theoretical advantage of core decompression is based on the belief that the procedure relieves intraosseous pressure caused by venous congestion, thereby allowing improved vascularity and possibly slowing the progression of the disease.

Femoral head decompression that may interrupt the cycle of ischemia and intraosseous hypertension; removal of the sequestrum that could inhibit revascularization of the femoral head; filling of the surgically created defect with cancellous graft, periosteum and a viable cortical strut, to support the subchondral area with callus formation and restructuring of the core of the femoral head . Grafting of the defect with fresh cancellous bone introduces a scaffold for repair and remodelling of subchondral bone. Insertion of cancellous bone into channel speeds up reossification by osteoinductive and osteoconductive properties of bone graft.

COMPLICATIONS: The reported complication rate ranges from 0% to 18%. The most common complication is a fracture. **Camp and colwell** [28] reported one of the highest complication rate (15%), surpassed only **Saito**[52] et al,(18%). In contrast , the complication

rate in the study by Carlos J. Lavernia is only 0.67%. Experience and volume may play a major factor in the success rate of this procedure. Studies that report worse outcome have multiple surgeons performing the procedure.

- Pertrochanteric fracture following minimal trauma if the point of penetration chosen is too low, are all possible, but not very frequent. It occurs if core is drilled below the trochanteric ridge. In **Steinberg** 2001, study on core decompression and fibular grafting, stated that five complications occurred after 406 procedures including two fractures that resulted from falls during the first postoperative month.

- Donor site morbidity.
- Infection of the harvest site.
- Infection of the surgical site.
- Uncontrolled bleeding from the osteotomy site .
- Injury to the peroneal vessels,
- Atrophy of flexor halluces longus.
- Pneumonia.
- Pulmonary embolism &Deep vein thrombosis.

Fifty cases of Steinberg stage I –VI of osteonecrosis of femoral head in adults were treated by various modalities of surgeries during the period from June 2011 to October 2013 in MGH hospital, MMC Khammam.

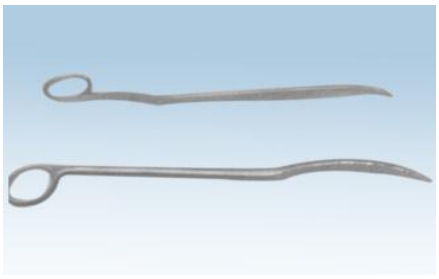
- There were 32 males and 16 females with age group ranging from 20-50 years.
- 28 patients presented with disease of right hip, and 15 of left hip and 5 of both hips.
- Out of 48 cases 10 cases are stage I , 6 cases are stage II, 12 cases are stage III disease, 12 cases are stage IV and 8 cases are stage V.
- In 20 cases cause not found, multifactorial in 12 cases, alcoholism is seen in 12 cases, steroid usage in 4 cases.
- The time interval between injury and reporting time has ranged from a minimum of 3 months to 1 year.

Instruments

1) Michele Trephine 2) Osteotome 3) Guide wire 4) Cannulated drill

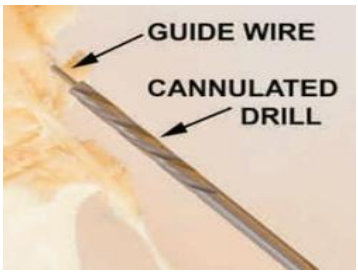
5) Levers 6) Retractors 7) Mallet

Micheletrephine



Levers

Osteotome



Bone Holder

Langenback's

retractor

Operative Procedure

Position of patient

With the patient supine on a hip fracture table, thorough scrubbing of the operative limb was done with savlon, betadine and spirit and the part was draped in sterile towels. The hip approached through a 2 to 3 cm mid lateral longitudinal incision centered over the sub trochanteric region using image intensification as a guide. Superficial and deep fascia cut. Bleeders are ligated with cautery. It is very important to keep the leg internally rotated 15 degrees, so that the entry point into the lateral metaphysis is not too anterior. Fascia lata split the in the direction of its fibers. The vastus lateralis is then split at the proximal meta physeal flair with a periosteal elevator in the direction of it's fibres.

Entry Point: Using image intensification, flare of the greater trochanter identified . A 3.2-mm threaded guide pin placed between the lateral cortex of the inferior portion of the greater trochanter and the distal portion of the lesser trochanter at the point where the bone begins to flare laterally. The tip of the guide pin directed to the center of the diseased portion of the bone. MRI and plain films reviewed to help locate the optimal position for the guide pin.

Reaming: Then the lateral femoral cortex opened with a conical reamer or cannulated drill, to a diameter of 10 mm. An 8 mm Michele trephine inserted over the guide wire and

manually advanced to within approximately 5 mm of the articular surface. Care taken not to perforate the joint. The necrotic segment can be identified because of the sclerotic bone encountered and the resistance to advancement of the trephine. The trephine slowly advanced, in stages, into the lesion, removing bone from the trephine with an obturator as soon as significant resistance is met and further progression of the trephine ceases. Instrument should not be striked with a mallet. On occasion, it is difficult or impossible to remove all of the necrotic specimen from the proximal portion of the femoral head using the trephine. In such cases, the last few millimeters of bone removed with either a cannulated or a solid drill. If histology examination is necessary, a coring reamer used.

COMMON ERRORS

- The lateral cortical window too distal
- The cortical bone is much thicker and the distal window increases the risk of post operative fracture.
- Cortical window too far anterior.
- If the is in the anterior half of the femur, it is impossible to go through the neck and insert the core device into the anterior half of the femoral head.
- Failure to control coring depth.

SURGICAL TECHNIQUE FOR FIBULAR GRAFTING

The ideal area for harvesting of a fibular graft is the middle third of the fibular shaft. The patient is supine on a fracture table. Thorough scrubbing of the operative limb was done with savlon, betadine and spirit and the part was draped in sterile towels. A longitudinal incision is made just posterior to the crest of fibula. Superficial and deep fascia cut. Soleus(posteriorly) and the peronei(anteriorly) are released subperiosteally and retracted. In the middle third, flexor hallucis longus is detatched from its insertion on the posterior aspect of fibula. Incise the periosteum. The fibula removed subperiosteally from distal to proximal to avoid injury to muscles. A number of perforating blood vessels may be encountered; these vessels must be coagulated or ligated. Facilitate removal by making the distal transverse cut first. Dissection was done carefully circumferentially around the fibula, avoiding injury to the peroneal vessels. Two small, blunt retractors placed anteriorly and posteriorly to protect the muscles.

PREPARATION AND PLACEMENT OF GRAFT INTO THE FEMORAL HEAD

- The graft prepared with a rounded proximal end and tapered distally to be press-fit through the lateral femur up into the head.

- Or it can be split into two, mallet through the core with canal portion along the wall.
- The appropriate placement of the graft confirmed by fluoroscopic imaging with its rounded proximal end within the lesion just underneath the subchondral bone.

SURGICAL TECHNIQUE: ARTHROPLASTY

- Incision
  - make 10 to 15 cm curved incision one inch posterior to posterior edge of greater trochanter (GT)
    - begin 7 cm above and posterior to GT
    - curve posterior to the GT and continue down shaft of femur
- Superficial dissection
  - incise fascia lata to uncover vastus lateralis distally
  - lengthen fascial incision in line with skin incision
  - split fibers of gluteus maximus in proximal incision
    - cauterize vessels during split to avoid excessive blood loss
- Deep dissection
  - internally rotate the hip to place the short external rotators on stretch
  - place stay suture in piriformis and obturator internus tendon (short external rotators)
  - detach piriformis and obturator internus close to femoral insertion
    - reflect backwards to protect sciatic nerve
  - incise capsule with longitudinal or T-shaped incision
  - dislocate hip with internal rotation after capsulotomy

Depending upon the acetabular involvement prosthesis (AMP, Bipolar and Total hip prosthesis) is used.

Austin Moore Prosthesis

Bi-Polar Prosthesis

POST OPERATIVE CARE

Postoperatively, patients are adviced to use two crutches with partial weight bearing for 6 weeks. At the excessive stress and strain to the extremity, such as would be encountered in running and active sports, for 1 year from the time of surgery. If bilateral core decompression is done, patients are instructed in a true four-point gait rather than a partial-weight-bearing gait. They proceed spontaneously to a two-point gait within the first few weeks following surgery.

FOLLOW UP

The patient was called back for follow up on the 6th, 10th and 16th post operative week, thereafter depending on the the X- ray picture at 10 and16 weeks, and functional status of the lower limb further follow up, visits were advised. Advice regarding walking and heavy work was given based on the X-ray picture. A clinical proforma was used to evaluate the patient and keep an accurate follow up record.

CRITERIA FOR ASSESSMENT OF RESULTS

Results are assessed by comparing the pre operative and post operative harris hip score.

HARRIS HIP SCORE

1. PAIN

None or ignores it—44; Slight, occasional, no compromise in activities—40

Mild pain, no effect on average activities, rarely moderate pain with unusual activity;may take aspirin—30

Moderate pain, tolerable but makes concession to pain, some limitation of ordinary activity or work. May require occasional pain medication stronger than aspirin—20

Marked pain, serious limitation of activities—10; Totally disabled, crippled, pain in bed, bedridden—0

2. LIMP

None –11; Slight—8; Moderate—5; Severe—0

3. SUPPORT

None—11; Cane for long walks—7; Cane most of time—5; One crutch—3

Two canes—2; Two crutches or not able to walk—0

4. DISTANCE WALKED

Unlimited—11; Six blocks—8; Two or three blocks—5; Indoor only—2; Bed and chair only—0

5. SITTING

Comfortable in ordinary chair for 1 hour—5; On a high chair for 30 minutes—3

Unable to sit comfortably in any chair—0

7. **ENTER PUBLIC TRANSPORTATION**

Yes—1; No—0

8. **STAIRS**

Normally without using a railing—4; Normally using a railing--2

In any manner—1; Unable to do stairs—0

8. PUT ON SHOES AND SOCKS

With ease—4; With difficulty—2; Unable—0

9. ABSENCE OF DEFORMITY (ALL YES=4; LESS THAN 4=0)

Less than 30 degrees of fixed flexion contracture --yes/no

Less than 10 degrees of fixed abduction—yes/no

Less than 10 degrees of fixed internal rotation in extension—yes/no

Limb length discrepancy less than 3.2 cm—yes/no

10. RANGE OF MOTION (*indicates normal)

Flexion (*140^0)—

Abduction (*40^0)—

Adduction (*40^0)—

Internal rotation (*40^0)—

External rotation (*40^0)—

11. RANGE OF MOTION SCALE

211-300 ^{0}—5; 161-210 ^{0}—4; 101-160 ^{0}—3; 61-100 ^{0}—2

31-60 ^{0}—1; 0-30 ^{0}—0

RANGE OF MOTION SCORE-

TOTAL HARRIS HIP SCORE-

EVALUATION OF RESULTS

90 -- 100 Excellent

80 -- 90 Good

70 -- 79 Fair

60 -- 69 Poor

< 60 Failed

RESULTS & ANALYSIS

In our study, all the 48 cases returned for clinical and radiological examination during follow up. Final assessment was done on follow up. Observation and results are summarized.

The commonest causative factor is idiopathic. Males were affected more than females with right side predominance.

Age of presentation is between 20-30 in 45.8% cases, 30-40 in 45.8% cases, 40-50in 8.4% case ,Cause is not found (idiopathic) in 42%, multifactorial in 25%, alcoholism in 25%, trauma & steroids in 8%.

In 12% cases stage of the disease at the time of presentation is I, in 21% it is stage II, in 25% it is stage III, in 25% it is stage IV and in 17% it is stage V. Pre operative harris hip scores are between 60-69 in 29% of cases, 70-79 in
71% of cases.

COMPLICATIONS

1. Surgical site superficial infection was developed in 8.4% cases which subsided following higher antibiotic therapy.
2. Greater trochanteric split fracture, had occurred in 2 cases (4.2%), which was treated by circlage wiring and Derotation boot .
3. Harvest site infection
4. Sciatic nerve palsy occurred in 2 cases (8.4%), which was due to excess retraction of soft tissue and was treated conservatively by foot drop stop splint.

In our study 66.6% of cases had excellent results, 29.2% had good results, 4.2% of had fair result- Excellent results were due to Good surgical technique ,Good post operative care , Good follow up

CHARTS

TABLE 1: Age Distribution of Patients

Age in yrs	No.of patients	Percentage
20-30	22	45.8
30-40	22	45.8
40-50	04	08.4

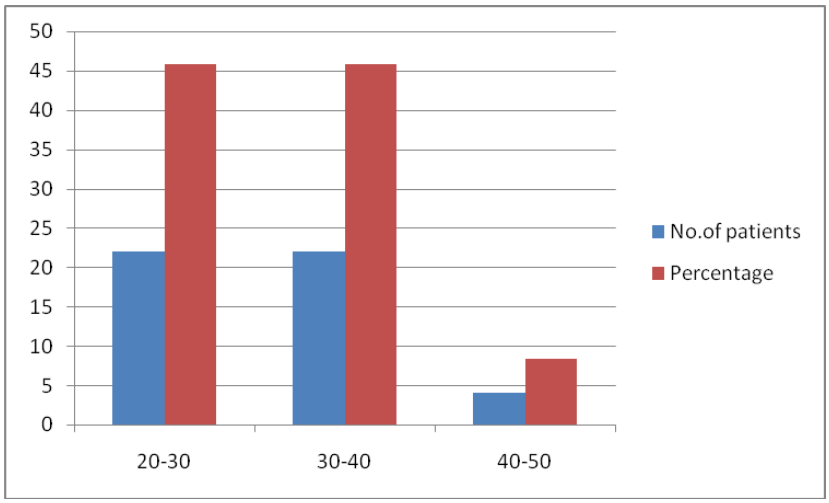


TABLE 2: Sex distribution

SEX	No. Of Cases	%
MALE	36	75
FEMALE	12	25

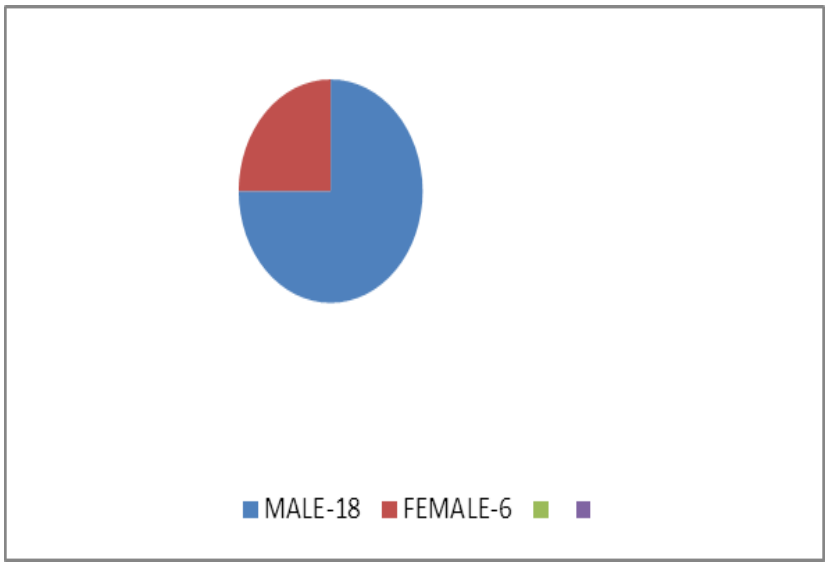


TABLE 3: Side Affected

SIDE	No.of cases	%
RIGHT	34	71
LEFT	14	29

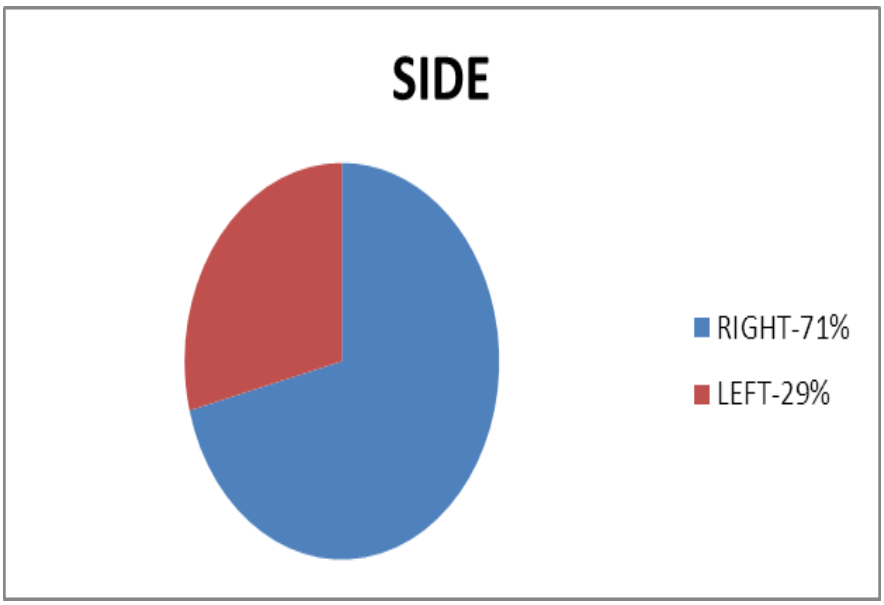


TABLE 4: Stage of Disease

Stage	No.of cases	%
I	06	12
II	10	21
III	12	25
IV	12	25
V	08	17

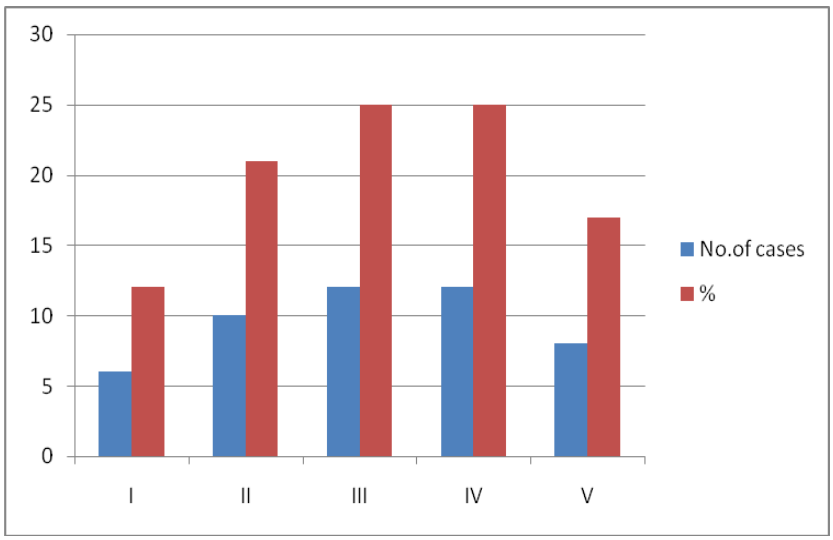


TABLE 5: Etiology (Cause)

Cause	No.of patients	%
IDIOPATHIC	20	42
MULTIFACTORIAL	12	25
ALCOHOL	12	25
STEROIDS	04	08

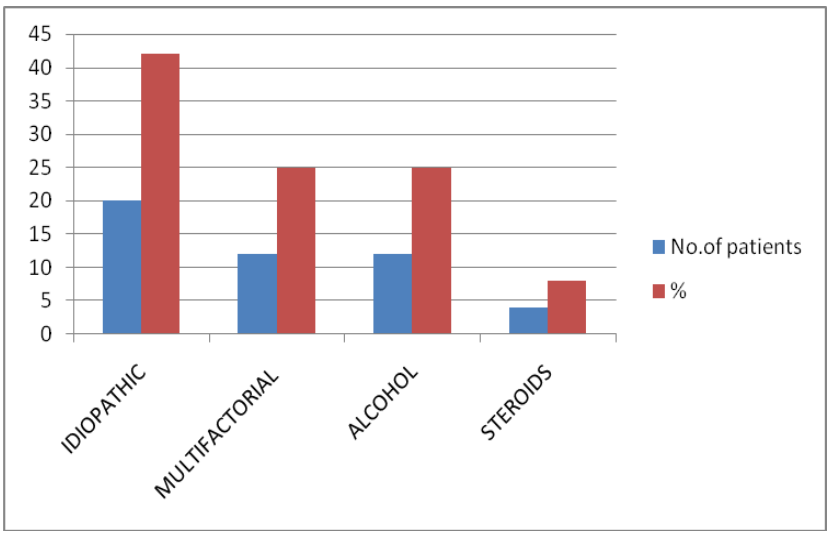


Table 6: Post- Operative Complication.

Complication	No.of patients	%
SUPERFICIAL INFECTION		
HARVEST SITE INFECTION	02	08.4
SCIATIC NERVE PALSY	01	04.2
GREATER TROCHANTERIC SPLIT FRACTURE	01	04.2
	02	08.4

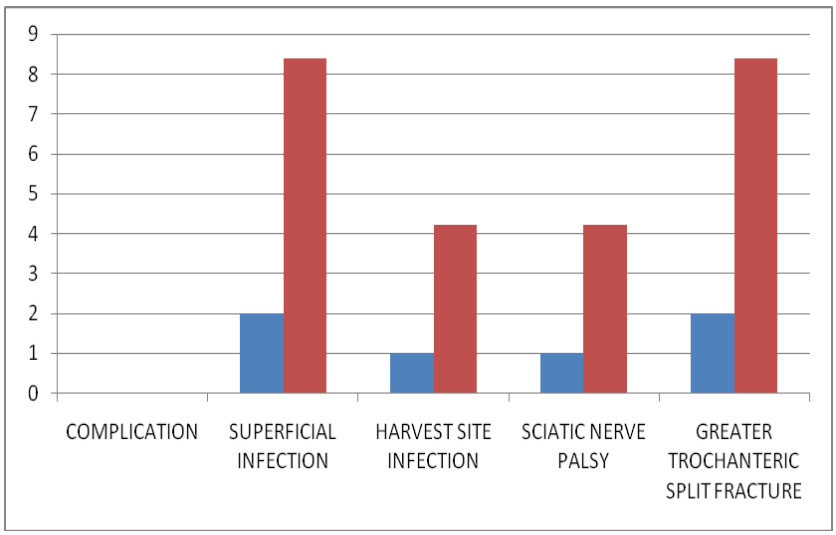


Table 7: Harris Hip Score

RESULT	SCORE
EXCELLENT	90-100
GOOD	80-89
FAIR	70-79
POOR	60-69
FAILED	<60

TABLE 8: Pre- Operative HARRIS HIP SCORE

SCORE	No. of patients	%
70-79	34	71
60-69	14	29

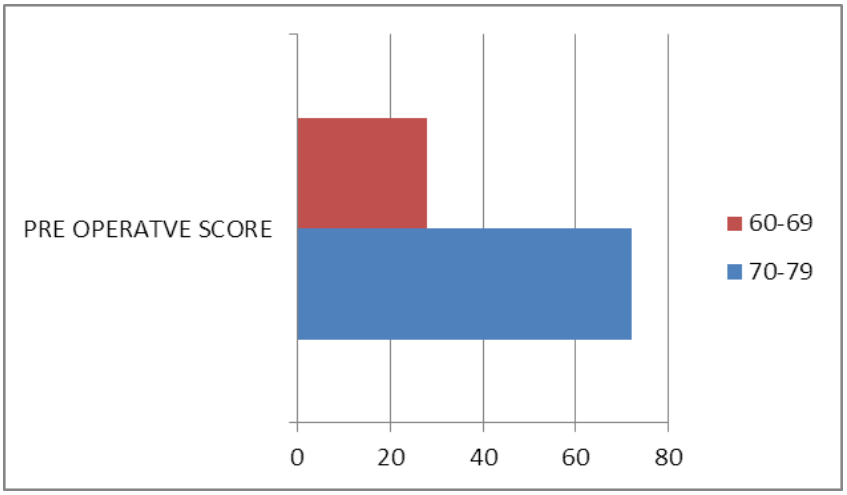


TABLE 9: Post- Operative HARRIS HIP SCORES.

SCORE	No. of patients	%
90-100	32	66.6
80-89	14	29.2
70-79	02	4.2

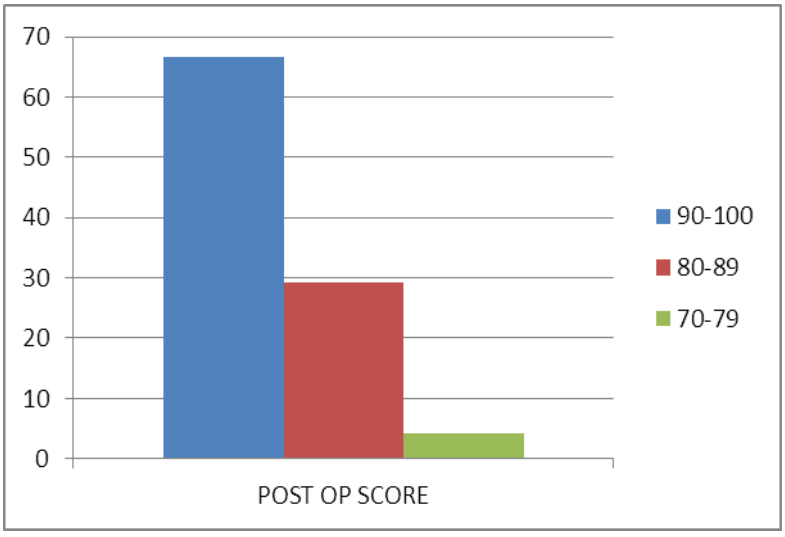


TABLE 10: FINAL RESULTS ACCORDING TO HARRIS HIP SCORE.

RESULT	No. of cases	%
EXCELLENT	32	66.6
GOOD	14	29.2
FAIR	02	4.2

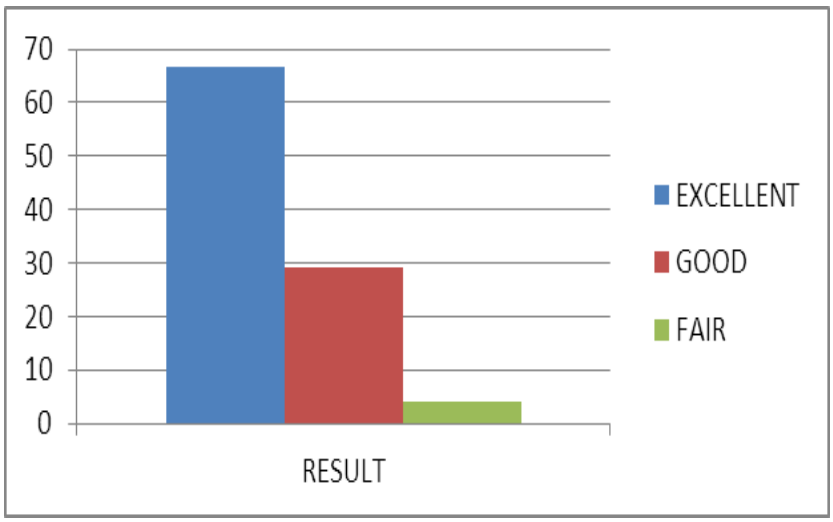
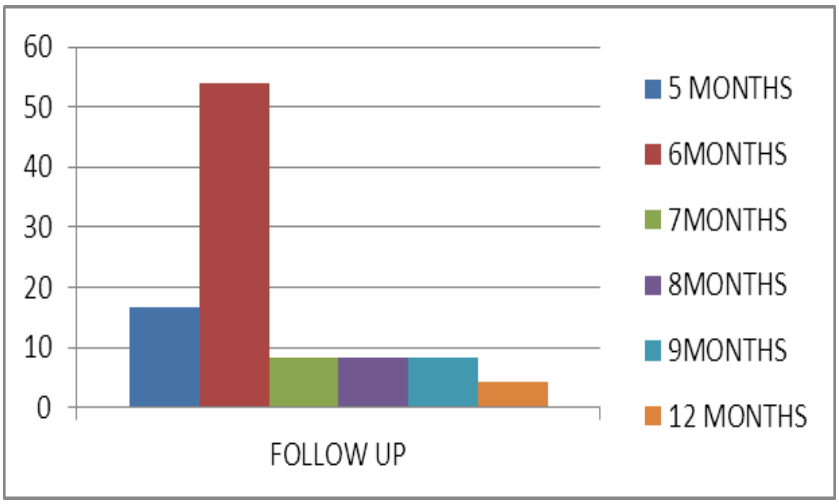


TABLE 11: FOLLOW- UP PERIOD

PERIOD	No.of patients	%
5 MONTHS	8	16.8
6 MONTHS	26	54.1
7 MONTHS	4	8.3
8 MONTHS	4	8.3
9 MONTHS	4	8.3
12 MONTHS	2	4.2



DISCUSSION

In our study 48 patients of osteonecrosis of femoral head of different age groups were selected. The mean age is 31 years. The sex ratio is 3:1(M:F).

Steinberg et al 2001 study, reviewed the results of a prospective study of 406 hips in 285 patients treated by one surgeon with core decompression and bone grafting..
Indications for core decompression and fibular grafting in our study are steinberg stage I, II, III osteonecrosis of femoral head.

- In Steinberg et al 2001 study, all stages are operated by core decompression and fibular grafting.
- In our study patients are followed up for 5 to 12 months.
- Steinberg et al 2001 study, Patients were followed up for 2 to 14 years.
- In our study the outcome was determined by the change in the Harris hip score, quantitative radiographic measurements.

  In Steinberg et al 2001 study, the outcome was determined by the change in the Harris hip score, quantitative radiographic measurements, and need for total hip replacement.
  - In our study patients were not compared to controls.
  - In Steinberg et al 2001 study, these hips were compared with 55 hips in 39 patients treated non operatively and with historic controls.

  - In our study 4 complications occurred.
  - In Steinberg study, five complications occurred after 406 procedures including two fractures that resulted from falls during the first postoperative month.
  - In our study hip replacement was done in, 12 of 48 hips(25%) with Stage IV and 08 of 48 hips (12%) with Stage V.
  - In Steinberg et al 2001 study, 36% of hips (113 hips in 90 patients) required hip replacement at a mean of 29 months: 18 of 65 hips (28%) with Stage I disease; 45 of 133 hips (34%) with Stage II disease; three of 13 hips (23%) with Stage III disease; and 45 of 92 hips (49%) with Stage IV disease. Before femoral head collapse (Stages I and II combined) hip replacement was performed in 10 of 77 hips (14%) with small lesions , 33 of 68 hips with moderate lesions.

Buckley et al. described the results after core decompression combined with tibial autografts and fibular autografts or allografts. They reported successful clinical outcomes in 18 of 20 hips (90%) that had precollapse disease, stage I or II.

In a comprehensive review of the literature published in 1996, **Mont, Carbone and Fairbank** [29] reviewed 42 separate reports involving 2,025 hips and concluded that, compared to nonoperative or symptomatic management, surgical management with or without a bone graft was a safe and effective procedure for the treatment of avascular necrosis.

Steinberg [30] et al (2001) , stated that patients who underwent surgery by various modalities and bone grafting have good functional hips. In patients treated before femoral head collapse, the outcome is significantly better than in patients who received symptomatic treatment.

SUMMARY: In our study 48 cases of osteonecrosis of femoral head were treated with various modalities of surgeries at Mamata General Hospital , Mamata Medical College, Khammam, during the period **June 2011 to October 2013**.

Most of the patients were of young age group at an average age incidence of 31 years and the commonest cause was idiopathic. Males were affected more than females with right side predominance.

In 21% cases, stage of the disease at the time of presentation is II, in 12% it is stage I, in 25% it is stage III, in 25% it is stage IV and 17% in stage V. In 12.5% of cases disease is bilateral.

Pre operative harris hip scores are between 60-69 in 29% of cases, 70-79 in 71% of cases Average time interval between admission and surgery was 3 days.

66.6% (32 cases) had excellent results, 29.2% (14 cases) had good result and 4.2% (2 cases) had fair result. Out of 48 cases followed up, 2 cases had superficial infection and one patient had harvest site infection, one patient had sciatic nerve palsy and 2 patients had greater trochanteric split fracture.

CONCLUSION

Considering the number of cases operated and the good results obtained with surgical treatment of osteonecrosis of femoral head, it is justifiable that osteonecrosis should be operated by various modalities of surgeries depending upon the stage of presentation.

Surgery is a method with lot of advantages

1. Core decompression is relatively simple , requires no special equipment or expertise; It is a short procedure with little blood loss. Protected weight bearing is required for only six to twelve weeks; It can be done bilaterally under the same anesthetic when indicated.
2. Arthroplasty is indicated in later stages of avascular necrosis of femoral head where retention of head is not useful, maximum pain relief is possible and early post operative ambulation can be initiated.

Hence the functional results are very good if the patients follows the post operative instructions carefully. The procedures are well tested and results are good in all series and avoid complication.

Surgery is well recommended for all stages of osteonecrosis of femoral head. In conclusion, surgery is the best treatment option to relieve pain and with near normal hip function, complications are few and avoidable.

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