"A PROSPECTIVE STUDY OF BIPOLAR HEMIARTHROPLASTY, IN THE MANAGEMENT OF INTRACAPSULAR FRACTURE NECK FEMUR IN ELDERLY"

By

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in

ORTHOPAEDICS

Under the Guidance of
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I hereby declare that this dissertation entitled **"A PROSPECTIVE STUDY OF BIPOLAR HEMI-ARTHROPLASTY, IN THE MANAGEMENT OF INTRACAPSULAR FRACTURE NECK FEMUR IN ELDERLY"** is a bonafide and genuine research work carried out by me under the guidance of **Prof. K.S.PATIL**, Department of Orthopaedics, Jawaharlal Nehru Medical College,Belgaum-590010.

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ABSTRACT

Background and Objectives:

A hip fracture represents a significant cause of morbidity and mortality in all age groups, especially in elderly. The ideal treatment of intracapsular fracture of the proximal femur in elderly has been the replacement hemiarthroplasty, in view of senile osteoporosis, frequent development of nonunion, failure of osteosynthesis and avascular necrosis of the femoral head.

Comparitive studies between unipolar and bipolar hemiarthroplasties have shown that the rate of reoperation reduced to half, the ambulatory capacity and pain relief also were better in patients treated with bipolar hemiarthroplasty as compared to unipolar hemiarthroplasty. The use of a bipolar prosthesis has led to a decrease in the amount of the acetabular cartilage erosion.

The goal of the current study is to assess the functional outcome and quality of life in the patients treated with bipolar prosthesis for intracapsular fracture neck femur.

Methods:

The present One year prospective study was conducted in the Department of Orthopaedics, KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum on 30 patients who sustained an intracapsular femoral neck fracture during the period December 2007 to November 2008.

Patients were followed up at an interval of six weeks, three months and sixth month, and their Functional Outcome was assessed using Harris Hip Score.

Results :

In this study, majority of the patients were in the age group of 55 to 65 years. Males were most commonly affected. Predominantly right side was involved and fall on a slippery floor was the common mode of injury. In majority of the cases , surgery was performed within 4 days of admission. Using Harris Hip Score ,we achieved 83.33% excellent to good results, with an average Harris Hip score of 84.81 points.

Conclusion and interpretation:

After treating 30 patients with intracapsular fracture neck of femur, with Bipolar prosthesis, we feel that, it has a better advantage over Austin Moore prosthesis in terms of stability, mobility, range of motion and functional results.

Keywords :

Intracapsular fracture neck of femur; Harris Hip Score; Bipolar hemiarthroplasty

LIST OF ABBREVIATIONS USED

C V S	-	Cardio Vascular System
C N S	-	Central Nervous System
DOA	-	Date Of Admission
Dc	-	Differential count
DVT	-	Deep Vein Thrombosis
E S R	-	Erythrocyte Sedimentation Rate
Hb	-	Haemoglobin
HBsAg	-	Hepatitis B surface antigen
HIV	-	Human immunodeficiency virus
HTN	-	Hypertension
IP No.	-	Inpatient Number
I.V	-	Intravenous
L	-	Left
OTA	-	Orthopaedic Trauma Association
R	-	Right
ROM	-	Range of movement
R S	-	Respiratory System
RTA	-	Road traffic accidents
Sl No.	-	Serial Number
Tc	-	Total count
T.P.R	-	Temperature Pulse Respiratory Rate

CONTENTS

LIST OF TABLES

LIST OF GRAPHS

LIST OF FIGURES

INTRODUCTION

Femoral neck fractures, recognised since the time of Hippocrates, still remains a vexing clinical problem for orthopaedic surgeons.

Fracture neck of femur are usually sustained by elderly persons from a trivial fall. At one time this fracture was thought to be a terminal event in the life of feeble and fragile individuals. Inspite of earnest work by many in this field, the problem still remains far from being solved, hence rightly labeled as " Unsolved Fracture" by Speed.[1]

It has been predicted that by 2050 the number of hip fractures would triple. As a consequence, proximal femur fractures are a significant cause of morbidity and mortality in all age groups, especially in elderly.[2]

Various methods of treatment have been employed since ages. The prolonged immobilization in elderly, will further lead to decubitus problems and associated complications, and hence surgery was resorted to achieve early ambulation.

It is known fact that the hip is a weight bearing joint performing many functions. A successful surgery at the joint should provide painless, stable hip with wide range of movements.

Several authors have considered replacement of the femoral head as an alternative due to the frequent development of nonunion, failure of osteosynthesis and avascular necrosis of the femoral head.[3,4]

The bipolar prosthesis has a outer metallic head articulating with the acetabulum and second inner small metallic head articulating with High Density Polyethylene (HDPE) lining the inner surface of outer head.

It is so designed that primary articulation would be at the inner bearing of the prosthesis and not at prosthesis – cartilage interface. This design helps in

- Decreasing the amount of the acetabular cartilage erosion.
- Increase in the stability which prevents dislocation.
- Less proximal migration and protrusio acetabuli.
- Increasing the range of motion.
- Increasing the life span of the prosthesis.
- Decreasing the torque forces around the stem which lessens loosening.

The goal of the current study is to assess the functional outcome and quality of life using HARRIS HIP SCORE in the 30 patients with intracapsular femoral neck fracture, admitted to the department of Orthopaedics, K.L.E.S. Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum and treated with bipolar hemiarthroplasty during December 2007 to November 2008.

AIMS AND OBJECTIVE OF THE STUDY

1. To study the results of bipolar prosthesis with respect to pain, mobility and stability.

2. To prevent the complications like acetabular erosion, protrusio acetabuli, loosening and dislocation which are associated with Austin Moore prosthesis .

3. To provide an implant with a longer life span so that the patient does not out live the implant.

REVIEW OF LITERATURE

Ambrose pare, the famous French surgeon recognized the existence of hip fractures more than 400 years ago.[5]

Sir Astley Cooper, was the first to delineate between fractures of femoral neck or intracapsular fractures and other fractures and dislocation about the hip.[6]

In 1867, **Philips** introduced a technique for longitudinal and lateral traction in femoral neck fractures to eliminate shortening and deformity.[7] In 1876, **Maxwell** reported the successful use of this technique.[8] In 1921, **Ruth** advocated closed reduction and maintenance in a "Philips splint" for 8 weeks.[9]

With advent of X-ray in 1902, **Whitman** advocated careful reduction and holding of reduced fractures in a spica cast with 30% union rate.[10,11,12] **Watson** Jones subsequently estimated a union rate of about 40% from this method.[13] In 1927, **Wilkie** used bilateral short-leg casts with a transverse bar for fracture immobilization.[13] In 1911, **Cotton** recommended artificial impaction of fracture fragment by blows from a heavy mallet applied to the padded trochanter before cast application.[14]

The first to have nailed a hip fracture appears to have been **Von Lagenbeck** in 1850.[15] **Konig,** in 1875[16] and **Nicolaysenin** 1897 advocated the use of nails in serious cases.[17] In, 1908, **Davis** reported the use of ordinary wood screws for fixation of femoral neck fractures[18] and **Martin** and **King** in 1920[19].

Hey Groves in 1961 developed a quadriflange nail, to obtain better fixation but it was of unsatisfactory material.[20,21]

In 1931, **Smith Peterson** advocated reduction, impaction and internal fixation using a triflange nail. **Veneable** and **stuck** developed and standardized biocompatible metals in 1937 which increased the success rate of this technique.[22,23,24,25,26]

With introduction of cannulated nail by **Johanmson** in 1932 and Westcot in 1934.[27] Smith Peterson's technique was simplified as in allowed the surgeon to reduce the fracture closed and fix the fracture blindly using the cannulated nail over a guide pin.

Thornton added a side plate to the triflange nail in 1937[28], Jewett developed the solid nail plate in 1941[29]. **Virgin** and **Mac Ausland** in 1945 introduced screw that provides dynamic compression at the fracture site.[30] Telescoping nails or screws which allowed gradual impaction at fracture site, were introduced by **Schumpelick** and **Jantzen** in 1955[31], **Pugh** in 1955[32], **Massie** in 1958[33], **Badgley** in1960[34] and **clawson** in 1964[35].

Moore in 1934[36], and **Gaenslen** in 1935[37], **Telson** and **Ranshoff** in 1935[38] and **Knowles** in 1936[39], used multiple pins for the internal stabilization of femoral neck fractures. **Harmon** in 1944 added a side plate to incorporate these pins. [40]

In 1958, **Deyerele** used a side plate that also acted as a template for pin insertion and allowed the sliding of multiple pins.[41]

The history of hip arthroplasty may be considered in five major steps:

Osteotomy arthroplasty, Inter positioning arthroplasty, Reconstructive arthroplasty, Partial replacement arthroplasty and total replacement arthroplasty.

A) Osteotomy Arthroplasty

A. White	1822
J.R. Barton	1826
Bouvi	1835
Langenbeck	1854
Sayre	1863
Brodhurst	1865
W.Adams	1869
Gant	1872
Pauwell	1935
Mc Murray's	1936
Blount	1943
Moore	1944
Dickson	1947

B) Interpositional Arthroplasty

1. Tissue interpositioning Arthroplasty

Ollier	1885 soft tissue ,
Murphy	1902 Tensor facia lata ,
Lexer	1908 Tensor facia lata
Payr	1910 Tensor facia lata,
Loewe	1913 Skin,

Baer	1918 pigs Bladder,
Robert Jones	1921 gold foil,
Putti	1921,
Campbell	1926,
Mc. Ausland	1929,
Kallio	1957 Skin.

2. Mold (cup) Arthroplasty

Smith – Petersen	1923 Glass ,
Smith – Petersen	1933 Pyrex,
Smith – Petersen	1937 Bakelite,
Smith – Petersen	1938 Vitallium,
Aufranc	1957 Vitallium

C) Reconstructive Arthroplasty

Brackett	1917,
Whitman	1921,
Jones	1921,
Magnuson	1932,
Colonna	1935
Girdlestone	1945

D) Femoral Replacement Arthroplasty

Delbet	1919 Reinforced rubber,
Hey – Groves	1927 Ivory,
Bohlman	1940 Metallic,
Judet and Judet	1943 acrylic,

Thompson	1950 Metallic,
A.T.Moore	1952 Metallic (Fenestrated stem)

E) Total Replacement Arthroplasty

In order to achieve early weight bearing and ambulation, use of an endoprosthesis remains the only viable alternate in elderly persons. Prostheses designed by Austin Moore and Thompson have been used extensively during the last 40 years and results have been gratifying in older, more sedentary individuals who do not stress their hips excessively. But slightly younger and physically active patients tend to develop problems. While few problems occur on the femoral side, Constant friction of the metallic prostheses erodes the acetabular cartilage down to the subchondral bone and pain develops. In some cases, acetabular erosion may be severe as to lead to protrusion and proximal migration of the prosthesis.

Bipolar prostheses was originally devised for the use in case of femoral neck fracture to over come the long term complications of Moore and Thompson type of endoprostheses.

The bipolar prostheses was first introduced be **James E. Bateman** and **Giliberty** in 1974. Other commonly known versions of bipolar prostheses are Monk Duo Pleet (monk 1976), Hastings bipolar prosthesis (Biotechnic, France) and bipolar endoprostheses (INOR, India.).

The bipolar prostheses have 2 layers of movement with an inner lower friction bearing, where a small metallic head articulates with Ultra High Molecular Poly Ethylene (UHMWPE) insert, and an outer stainless steel or

vitallium shell covering polyethylene insert which articulates with the acetabulum. a frictional differential thus exists at the two planes of movement so that most of the motion tends to occur at the inner bearing, and torque required to move the inner bearing is less. A major advancement in the bipolar cup design was making the axis of the metallic and polyethylene cups eccentric so that with loading of the hip the metallic cup rotates laterally rather than medially, and thus avoids impingement of the head on the edge of the cup which causes fracture of the polyethylene-bearing insert and dislocation (**intrinsic stability**) life span of the prostheses.

Due to size and geometry of inner bearing the rim of polyethylene insert impinges on the metallic neck of prostheses after a certain arc of adduction, movement occurs between acetabulum and outer metallic cup of prostheses **(increased range of movement**).

Bipolar prosthesis was designed primarily with the aim of reducing the frictional stresses and thereby decreasing acetabular erosion and stem loosening.[42,43,44] Shock absorbing character of UHMWPE insert also reduces the impact load on the acetabulum during weight bearing (**increase in the life span of the prostheses**).

Description of the implant

The bipolar prosthesis is an intermediate of Austin Moore's and total hip replacement. The provision of a completely mobile head element and the addition of another head surface for motion in the acetabulum creates a compound system. This provides a greater distribution of weight bearing

forces thus minimizing wear and tear changes both on the implant and on the containing tissue.

The bipolar prosthesis (Talwalkar type) has got a stem length of 157mm, thickness of 8mm and the material used for the stem is stainless steel ASIS 316. the stem has got fenestrations which are optimal.

It has got vertical shoulder which fits snugly on the calcar femoral, has a long neck measuring 35mm the neck shaft angle is 125° and the diameter of the neck is 19mm. The size of the femoral head is 26mm. The head articulates with the inner surface of the acetabular cup made up of **High Density Polyethylene (HDPE)** and the outer surface is made up of stainless steel **AISI** -316. The size of the acetabular cup varies from 39 to 51mm.

Simplest of the current available bipolar prosthesis like Indian version and the Monk prosthesis have an Austin –Moore type stem and the small femoral head cannot be detached from the outer metallic cup- **High Molecular Poly Ethylene (UHMWPE)** insert complex. Better and modified versions of the bipolar prosthesis have a modular system with interchangeable stems [Fenestrated , Solid, Straight, Long porous coated, Press fit, Cement compatable], interchangeable small diameter head [Metallic, Ceramic] which allows adjustment of neck length and different sizes of outer metallic cup- High Molecular Poly Ethylene (UHMWPE) insert with press fit locking mechanism over small head [Biotechnic, France].[45]

Modular version of bipolar prosthesis can be easily converted into total hip replacement in case of any complication occurring on acetabular side.In the last 20 years , good clinical results have been reported with the use of

bipolar hemiarthroplasty and its indications have been expanded to include not only femoral neck fractures also for primary treatment of hip degeneration, ankylosed hip, dysplastic hips and failed total hip replacement.[46]

Indications for Bipolar hemiarthroplasty are grouped as:[47]

Stronger Indications

1. A fracture neck femur with posterior communition.
2. Femoral neck fractures that lose fixation several weeks after operation.
3. Some preexisting lesions of the hip - patients with avascular necrosis of the head of the femur, severe rheumatoid or degenerative arthritis of the hip.
4. Malignancy - pathological fracture is best treated with a prosthesis.
5. Neurologic disorders- severe uncontrolled parkinsonism
6. Old, undiagnosed fractures of the femoral neck
7. Fracture of the neck of the femur with complete dislocation of the femoral head.
8. A patient who probably cannot withstand two operations.
9. Patients with psychoses or mental deterioration.

Relative Indications for Hemiarthroplasty

1. Advanced physiological age.
2. Fracture-dislocation of the hip in an older individual.

Bipolar prosthesis is preferred to conventional Moore's prosthesis because of the following reasons:

1. Wide range of movements

2. Intrinsic stability – at the extremes of flexion when joint tends to dislocate, the outer bearing moves in the opposite direction and prevents it
3. Prevents loosening of stem and acetabular erosion
4. Increased life span.

A study in 1978 reported about the stability of Giliberty bipolar hip in three cases. These patients sustained significant skeletal trauma subsequent to surgery and none of them dislocated. They thought the potential for cup movement acts as safety valve in absorbing force that might otherwise dislocate the hip or cause fractures of the femur or the pelvis.[47]

Another study in 1979 reported 65 Gilberty bipolar hip units followed for an average of 19 months showing excellent short- term results clinically.[48]

Another study in 1979 compared 101 Bateman hemiarthroplasties with 160 cemented Thompson hemiarthroplasties and found no significant difference in the results. They also studied the motion at the inner bearing by video roentgenography in thirteen Bateman arthroplasties in nine patients with osteonecrosis of the femoral head following renal transplantation. Although some inner bearing motion did occur in some implants , it was less than predicted, and in several cases it decreased even more between 2 and 4 years post- operatively and conditions of weight bearing.[49]

A study in 1980 used Batemen universal proximal femoral endoprosthesis in acute fractures of the femoral neck and followed 156 patients with an average age of 79 years for 29 months and found no demonstrable advantages over the Moore prosthesis.[50]

A study in 1982 used Batemen bipolar prosthesis in 161 hips and found decreased protrusion and they stated that if significant protrusion is noted infection must be suspected.[51]

Verberne (1983) radiologically studied the movements of the two components of bipolar prosthesis and found that the built-in joint soon lost mobility and at three months was almost completely stiff.[52]

A study in 1983 published their series of 200 patients in whom bipolar endoprosthesis was used. 92% has satisfactory results with a mean Harris hip rating of 87 points and 8% had poor results. The morbidity and mortality rates were also low.[53]

Another study in 1983, used bipolar prosthesis in 161 fractured necks of femur and found no acetabular erosion with a four year follow up.[54]

Another study in 1986, in their series of 44 cases followed for 22 months had mean Harris hip score of 84.2% and with 93.2% patients having minimal or no pain. The range of motion was excellent and morbidity was low.[55]

Another study in 1986 revised three failed hip surface replacement arthroplasties with a bipolar prosthesis and found good clinical function and acceptable radiological appearance. They advocated that this rather straight forward surgical conversion may have a role to play in the interim management of some of these patients.[56]

Another study in 1987, followed 77 femoral neck fractures treated with bipolar endoprosthesis for an average of 51 months post-operatively and found 75% excellent good results with decreased acetabular erosion and protrusion.[57]

Another study in 1987 developed a ceramic bipolar prosthesis composed of bio-inert fine alumina ceramic rather than metal head and used it in femoral neck fractures, femoral head necrosis and osteoarthritic hips with good results.[58]

Another study in 1987, used bipolar prosthesis in 20 elderly patients with unstable intertrochanteric fractures. The fixed the greater trochanteric fragment with wires and used cement. The patients were ambulant with unrestricted weight bearing at an average of 5.5 days post-operatively.[59]

A study in 1987 compared 682 fixed head prosthesis with 319 bipolar prosthesis and found decreased incidence of acetabular erosion and revision. They stated that bipolar prosthesis can be used in younger more active patients where as fixed head design can be used in older patients.[60]

A study conducted in 1987 used AML bipolar arthroplasty for degenerative hip arthritis in 50 patients and found consistently reliable results with few complications and high patient satisfaction rate.[61]

Another study in 1987, followed 100 hips treated with Bateman bipolar prosthesis in 76 arthritic hips and 24 femoral neck fractures. Movement was assessed fluoroscopically both with and without weight bearing. In 80% of the arthritic group it functioned as a bipolar device where as a unipolar device in 75% of the fracture group.[62]

A study done in 1988 compared internal fixation and bipolar endoprosthesis in displaced femoral neck fractures in 34 elderly patients followed for two years and found better functional results in cemented hemiarthroplasty group.[63]

Another study in 1988, radiologically assessed 23 patients treated with Charnley-Hasting bipolar prosthesis for acute displacement of sub capital fracture and found interprosthetic movement in abduction in 82.6% patients.[64]

In 1988 another study followed 90 patients for two years for femoral neck fractures treated with bipolar hemiarthroplasty and found 92% excellent to good results weight bearing roentgenograms showing motion at both bearing surfaces.[65]

A study done in 1989 followed 54 hip for an average of 33 months treated with Charnley-Hastings bipolar hemiarthroplasty in displaced subcapital fractures and found 64.8% good or excellent result. The fair or poor results were seen mainly in patients with poor pre-operative mobility and multiple medical problems.[66]

In 1990 another study performed distraction arthroplasty of 18 hips with advanced secondary oeteoarthritis with bicentric femoral head prosthesis. Post operative long axis traction was applied and active assisted movements carried out for 4 weeks. Wide range of painless hip movements were regained and the acetabulum was remodelled domed shape covered by a narrow radiolucent zone backed with dense bone plate.[67]

Another study in 1990 performed 496 bipolar arthroplasties over a period for proximal femoral fractures and compared with a series that used internal fixation and one piece conventional prosthesis. There was significant improvement over internal fixation in reducing morbidity and mortality. It also offered advantages over the one piece prosthesis in terms of fit, decreased acetabular erosion and improved function.[68]

A study done in 1990, performed cemented Batemen bipolar hemiarthroplasties in 128 patients and followed 49 cases for an average of 7 years 5 months. None of the patients developed acetabular protrusion and 88 % had no or slight pain.[69]

Another study in 1990 performad bipolar Bateman hip endoprosthesis in 88 patients with an average age of 75 years and found excellent mobility in 86% and good function in 66% and no visible protrusion or socket wear radiologically.[70]

In 1990 another study used straight long stem Bateman bipolar model in more than 5oo hips and found uniform patient and physician satisfaction. There was biomechanical fixation by a snug fit in the isthmus, three point fixations within the shaft and biological in growth through the fenestration in the proximal neck without stress shielding of the calcar.[71]

Another study in 1990 used Bateman bipolar prosthesis in 47 hips with femoral head ostoenecrosis. Harris hip scores improved from 24.7 pre-operatively to 84.5 post–operatively. Cine-roentgenographically they confirmed that in unloaded mode, inner and outer-bearing motion increased significantly.[72]

In 1990 another study performed bipolar arthroplasty in 1213 hips including a group of 760 osteoarthritic hips. They showed healthy bone preservation of the acetabulum even 15 years after surgery. They also identified a process of floor reinforcement in certain states.[73]

Another study in 1990 assessed 100 patients treated with bipolar hemiarthroplasty for degenerative arthritis and found mean Harris hip score of 78.8 with good to excellent results in 75.8%. Anterior thigh pain was attributed to femoral component loosening.[74]

In 1990 a study used Bateman prosthesis in 286 cases with osteoarthritis (OA) and 114 with rheumatoid arthritis(RA) followed up for an average of 8 years 5 months and found excellent to good results in 92.5%.[75]

Another study in 1990 replaced 478 hips with Bateman bipolar prosthesis and selected 19 cases with postoperative acetabular changes randomly for evaluation. Of the 11 cases with protusio, 6 showed thickening of acetabular wall and 5 showed no changes. In the five patients with subchondral bone also decreased gradually. They suggested that acetabulum tolerates the implant well even with some damage at the time of surgery.[76]

A study in 1990 used Bateman bipolar prosthesis with autology bone graft reinforcement for 21 dysplastic hips and had excellent or good results in 13 hips and fair in eight. All grafts united with no resorbtion or migration.[77]

In 1990 another study used bipolar components for severe periacetabular bone loss around 27 failed total hip arthroplasties with

satisfactory functional results in all patients and bone grafts becoming consolidated into the host pelvis.[78]

Another study in 1990 used bipolar hip arthroplasty in 37 hips with acetabular deficiency including dysplastic osteoarthritis, revision of failed arthroplasty, reconstruction of malunited bony ankylosis and rheumatoid arthritis after bone grafting, confirmed the usefulness of expanded application of bipolar hip arthroplasty.[79]

In 1990 a study reconstructed deficient acetabulum using the bipolar socket in 47 cases with acceptable levels of pain relief and functional gain and mean Harris hip score of 86.[80]

A study in 1991 compared 27 cemented and 26 uncemented bipolar hemiarthroplasties in active patients with displaced subcapital fractures of femoral neck found better results in the cemented group.[81]

A study in 1991 used bipolar prosthesis in femoral neck fractures in 182 geriatric patients and in a retrospective study of 67 surviving patients 25 months post-operatively found results comparable to total hip replacement according to the Harris hip score and the fracture trauma itself often appeared to be a result of the patients pre-existing bad health.[82]

Another study in 1991 studied risk factors influencing mortality after bipolar hemiarthroplasty in the treatment of fractures of femoral neck and found that age, time delay from the admission to surgery, mode of anaesthesia and cerebrovascular diseases had no significant influence on mortality and medical conditions were the most important determinants of survival.[83]

One more study in 1992 used bipolar prosthetic replacement for the treatment of avascular necrosis of the femoral head and satisfactory results in 71 of 83 hips for more than 5 years.[84]

Another study in 1992 successfully treated 3 three patients with recurrent dislocation of total hip prosthesis by conversion to bipolar devices after failure of multiple surgical procedures and treatment even with braces.[85]

A study in 1992 followed 30 cases of bipolar hip prosthesis for 3 years and found motion at both bearing surfaces in all cases without reduction in the range of motion with time.[86]

In 1992 another study performed bipolar endoprosthesis in 201 cases in fractures of femoral neck with a follow up of 57 months found 94% satisfactory results and substantially better clinical roentgenographic results as compared with Moore's prosthesis and results comparable to total hip replacement.[87]

Another study in 1992 compared 32 bipolar with 38 Austin Moore's prosthesis for fracture neck of femur followed for 46 months and found 90.6%excellent to good results in bipolar and 77.8% in Austin Moore group with bipolar prosthesis giving better stability permitting early and easy recovery of hip movement ant weight bearing more rapid rehabilitation and decreased complications especially on the acetabular side.[88]

A study in 1992 performed bipolar hemiarthroplasty in tubercular hips and followed for more than 2 years with gratifying clinical results from the point of abolition of pain, restoration of improved range of useful hip

movements and walking capacity with no evidence of recurrence of tubercular infection.[88]

Another study in 1992 treated 9 patients with ipsilateral hip and knee deformities in advanced rheumatoid arthritis with bipolar arthroplasty and soft tissue releases at knee with follow up of 2 years with gratifying functional results in 8 patients with no increase in acatabular erosion or protrusion with gradual obliteration of subchondral cysts and development of sclerotic area around bipolar metallic cup.[88]

A study in 1992 performed bipolar arthroplasty in 19 hips in ankylosing spondylytis and found that with mean follow up of 33 months the Harris hip score was 82.6 with relief of pain, improved posture and gait and regained useful range of movements.[88]

Another study in 1993 performed bilateral bipolar cemented arthroplasty in a 24 year old women with chronic renal failure who sustained bilateral femoral neck fractures due to a seizure and even 10 years later her hips were asymptomatic.[89]

In 1993 a study performed massive resection in bipolar megaprosthesis for metastasis of trochanteric and subtrochanteric region in 17 ceases total hip arthroplasty in 11 cases with pain relief and post-operative walking ability comparable with both groups but significantly lower dislocation rate with bipolar arthroplasty.[90]

Another study in 1993 compared the effect of femoral component head sizes 22 and 32mm on movement of the 2 component hemiarthroplasty and found predominantly intra-prosthetic movement in the 22mm group.[91]

In 1993 a study compared a hydroxyapatite coated bipolar hemiarthroplasty and uncemented bipolar prosthesis for displaced subcapital fractures and found significantly superior results in the hydroxyapatite group with distal stem fixation and proximal stress shielding.[92]

In 1994 another study performed bipolar arthroplasty in 20 patients with fracture neck femur, avascular necrosis of femoral head, osteoarthritis, protusio acetabuli and Perthes disease with excellent results in 85%. They encouraged squatting within 3 to 4 weeks and have not found any detrimental effects in terms of disassembly or dislocation.[93]

Another study in 1994 treated 8 patients for unstable total hip arthroplasty for recurrent prosthetic dislocation using large inside diameter acetabular cup and bipolar femoral head sized to approximation of the diameter of the normal hip. Joint stability was achieved in all patients at an average of 4.2 years with this bipolar hip.[94]

A study in 1994 treated a 71 year old women with bilateral femoral head fracture (with fracture fragments comprising 35% of the femoral head) with posterior hip dislocation wih bilateral bipolar and endoprosthesis with satisfactory results.[95]

In 1995, a group studied abduction joint motion in 117 bipolar femoral prosthesis under weight bearing loads. 101 prosthesis used in dysplastic

osteoarthritic, rheumatoid revised failed total hip arthroplasty patients moved 81.8% at the inner bearing and 18.2%at the outer bearing while 16 prosthesis used in femoral neck fractures and oseteonecrosis of the femoral head patients moved 49.7% at inner bearing and 50.3% at the outer bearing.[96]

ANATOMY

Skeletal Anatomy

The femoral head is not a perfect sphere, and the joint is congruous only in the weight-bearing position.[97] In 1838 the internal trabecular system of the femoral head was described by Ward.[98] The orientation is along lines of stress, and thicker lines come from the calcar and rise superiorly into the weight-bearing dome of the femoral head. Forces acting in this arcade are largely compressive. Lesser trabecular patterns extend from the inferior region of the foveal area across the head and superior portion of the femoral neck into the trochanter and lateral cortex. The presence of osteoporosis is important, especially in patients being considered for internal fixation, because the ability of osteoporotic bone to hold an internal fixation device is poor, and such bone can affect treatment alternatives. Singh et al[99] used the trabecular pattern seen on x-rays of the upper end of the femur as an index for the diagnosis and grade of osteoporosis. This system is based on the presence or absence of the five normal groups of trabeculae in the proximal femur, as described by Ward.[98]

The **Singh's Index** is an easily learned and applied method of assessing the quality of bone. [99] It is based on the trabecular pattern of the proximal femur.

Grade 6- Normal trabecular pattern with primary compression and tension trabeculae and secondary compression tension trabeculae.

Grade 5- Decrease in secondary trabecular pattern and Ward's triangle becomes prominent.

Grade 4- Secondary trabecular pattern is absent. Primary trabecular pattern is decreased.

Grade 3- A break occurs in the tension trabeculae.

Grade 2- Loss of primary of primary tension trabeculae is complete. Marked reduction in compression trabeculae.

Grade 1 – Only a few compression trabeculae seen.

Grade 3 and below indicate significant osteoporosis. These grades should be determined when considering internal fixation and whether or not weight bearing will be tolerated.

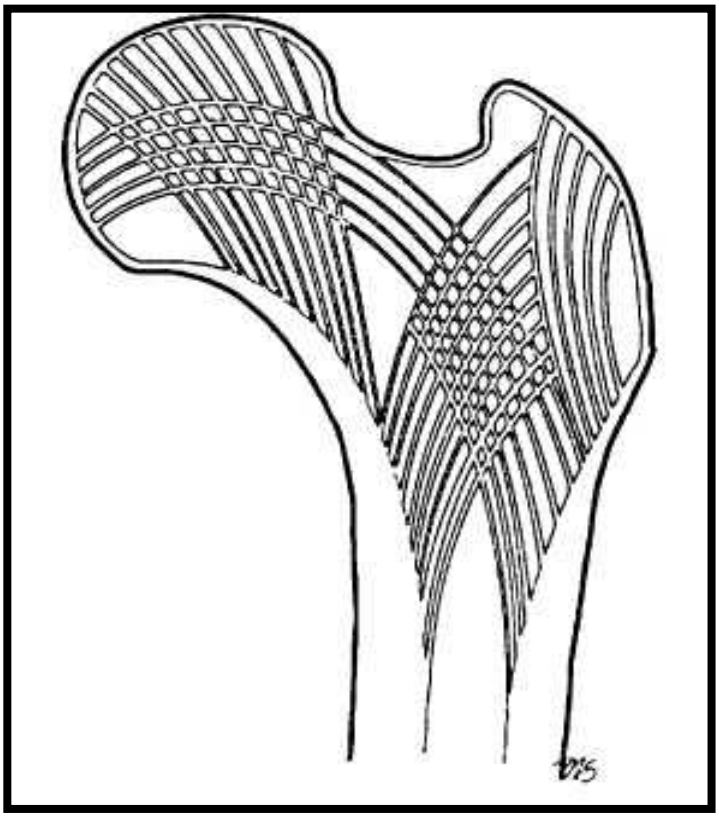

Fig. No. 1: Trabecular pattern of the proximal femur

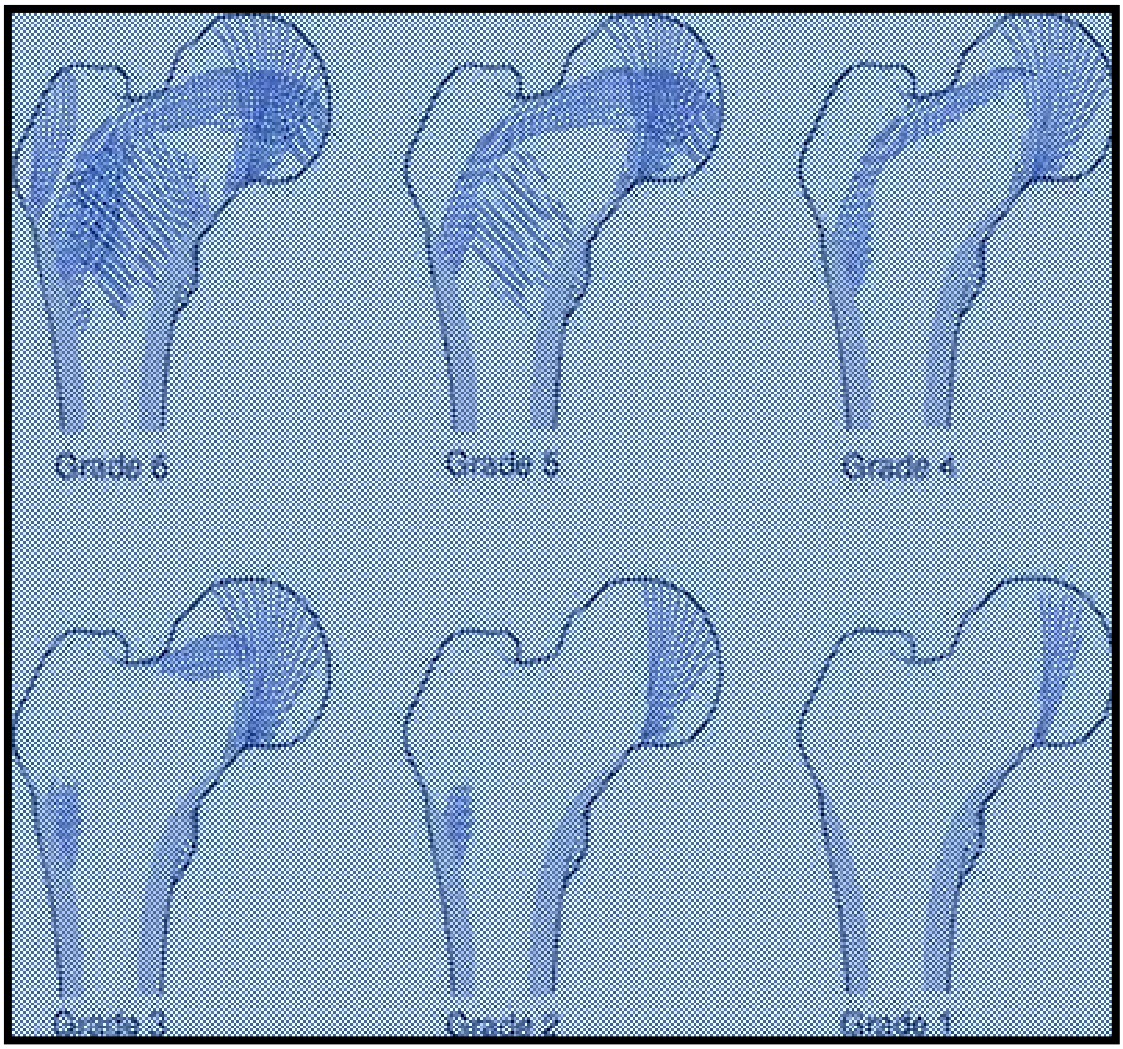

Fig. No. 2: Singh's Index

Singh's index grades osteopenia from normal to severe based on the ordered reduction in trochanteric, tensile, and ultimately primary compressive trabeculae. The grade is determined from a true antroposterior projection of an intact proximal femur.

The calcar femorale is a dense vertical plate of bone extending from the postero-medial portion of the femoral shaft under the lesser trochanter and radiating lateral to the greater trochanter, reinforcing the femoral neck posteroinferiorly.

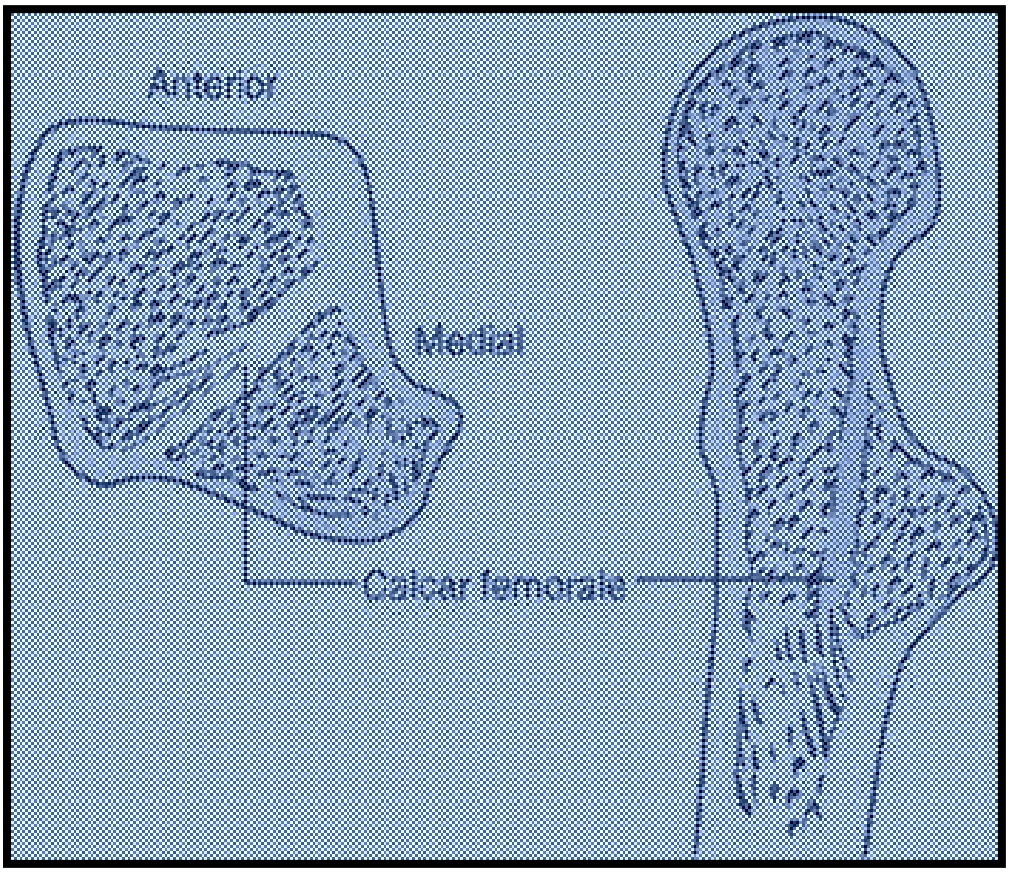

Fig. No. 3: Calcar Femorale

The angle between the axes of the femoral neck and the shaft is referred to as the neck-shaft angle. The neck shaft angle is at birth, average 160° and decreases throughout skeletal growth, reaching an average of 135° in the adult.[36] Noble et al studied 200 femoral radiographs and found an average neck-shaft-angle of 124.7° (range 105.7° to 154.5°).[100]

Anteversion refers to the degree of forward projection of the femoral neck from the coronal plane of the shaft. It is the angle between the intersection of the transcondylar plane and the axis of the femoral neck in the coronal plane. Anteversion is large at birth (averaging 31° to 40°) and then decreases until skeletal maturity is reached.[101-104]

Normally the neck projects 8° anteriorly in the adult, but in a small number of cases, the neck projects posteriorly, and is said to be retroverted or in retrotorsion. The anteversion angle in Caucasians averaged 7.0° in males (range - 2° to 35°) and 10.0° in females (range - 2° to 25°) and in Hongkong Chinese, the average in males was 14.0° (range -4° to 36°) and 16.0° in females (range 7° to 28°).60 Similar measurements have been reported by Kingsley and Olmsted[106] and Rodgers.[107] Anteversion in the Japanese male and female has been reported to be 15°.

The femoral head is egg or barrel shaped.[105] This lack of roundness is greater in the male than in the female with a flattened area over its superior lateral surface. The average femoral head bony diameter in Caucasian males was 46mm and 43 mm in females and 45mm in Hong Kong Chinese males and 40mm in females.[106] Noble et al found that the average femoral head diameter was 46.1mm (range 35 to 58mm).[100]

The average neck length was 35.5mm (rnage 30 to 41.1mm) studied in 200 femoral specimens by Noble et al.[100]

Growth and Development of the Upper Femur

The embryonic femur is formed in cartilage and is present in the six-week embryo. At seven weeks of fetal age, ossification begins in the diaphysis and then extends proximally and distally. By the end of the first year of life, the secondary ossiciation centre. For the feoral head, is present. Another ossification centre appears during the fourth year, from which the greater trochanter arises. An ossification center appears in the lesser trochanter between the ages 13 and 14. All secondary centers fuse with the shaft at about the eighteenth year.[107]

LIGAMENTOUS ANATOMY

The hip joint is a constrained ball-and-socket joint. The head rotates within the acetabulum and is incompletely covered. The depth of the acetabulum is supplemented by the fibrous labrum, which makes the joint functionally deeper and more stable (Fig. 43-10). The labrum adds more than 10% to the coverage of the femoral head, creating a situation that keeps the head more than 50% covered during motion.[108-112] It takes more than 400 N of force just to distract the hip joint.[113] The capsule of the hip is strong and extends from the rim of the acetabulum to the intertrochanteric line anteriorly and the femoral neck posteriorly. The longitudinal fibers are supported by spiral capsular thickenings termed ligaments.

Anteriorly, the iliofemoral or Y ligament originates from the superior aspect of the joint at the ilium and anterior inferior iliac spine. It runs in two bands inserting along the intertrochanteric line superiorly and just superior to the lesser trochanter inferiorly.

The inferior capsule is further supported by the pubofemoral ligament, which takes its origin from the superolateral superior ramus and inserts on the intertrochanteric line deep to the Y ligament

Posteriorly, the capsule inserts on the femoral neck just inferior to the head medially and extends to the base of the greater trochanter laterally. The ischiofemoral ligament within the capsule posteriorly originates at the junction of the inferior posterior wall with the ischium. It runs obliquely lateral and superior to insert on the femoral neck with the capsule (Fig. 43-11B).[114-115] In

addition to these ligaments, the short external rotators lie on the posterior capsule, providing additional support.

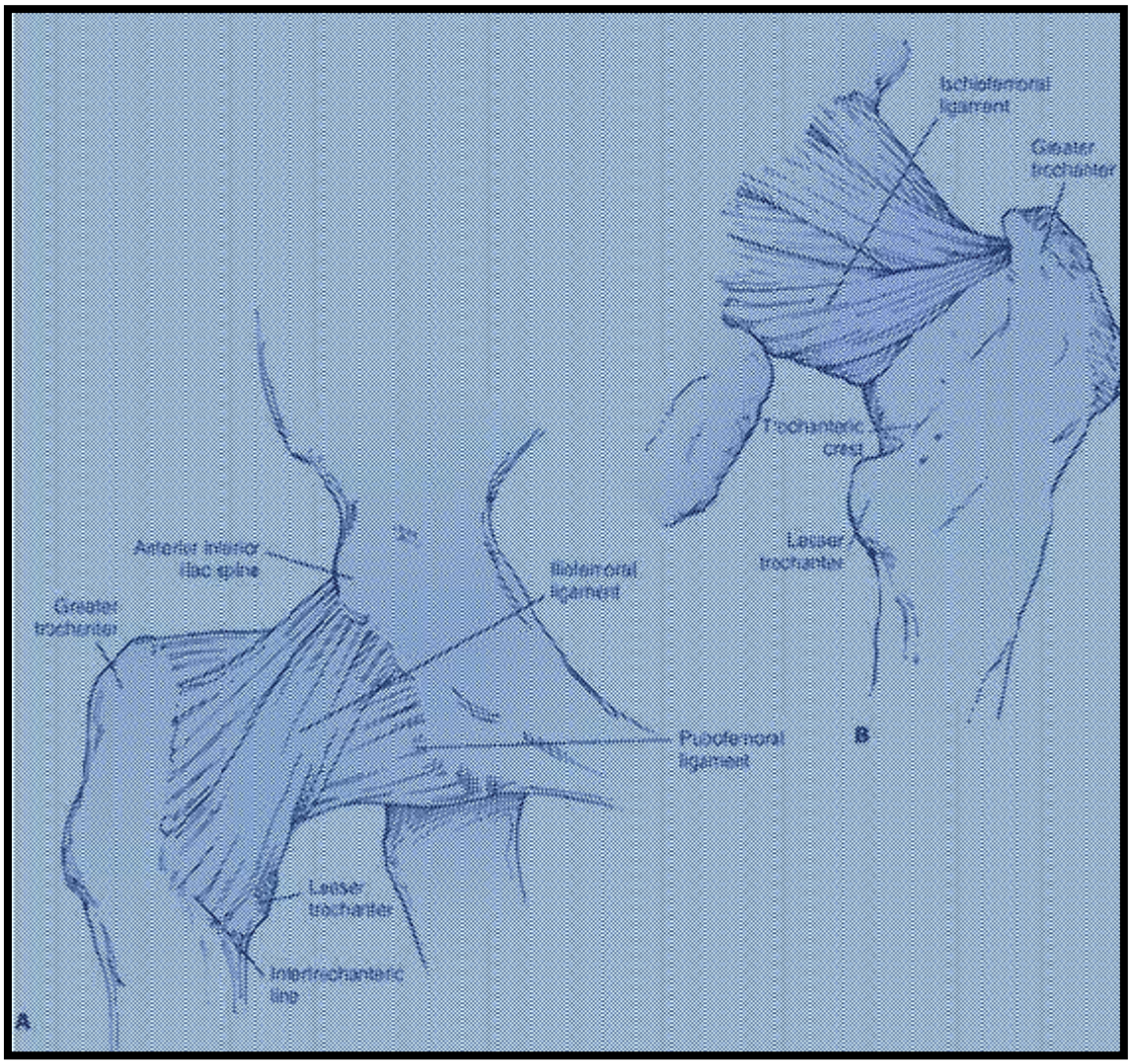

Fig. No. 4: The capsule of the hip joint

VASCULAR ANATOMY

The hip joint capsule is a strong fibrous structure that encloses the femoral head and most of its neck. That portion of the neck that is within the capsule has essentially no cambium layer in its fibrous covering to participate in peripheral callus formation during the healing process.[116] Therefore, healing in the femoral neck area is dependent on **endosteal union** alone. Unless the fracture fragments are impacted,

synovial fluid can lyse blood clot formation and thereby destroy another mode of secondary healing by preventing the formation of cells and scaffolding that would allow for vascular invasion of the femoral head.

Crock [117] described the arteries of the proximal end of the femur in three groups:

(a) an extracapsular arterial ring located at the base of the femoral neck;

(b) ascending cervical branches of the extracapsular arterial ring on the surface of the femoral neck; and

(c) the arteries of the round ligament.

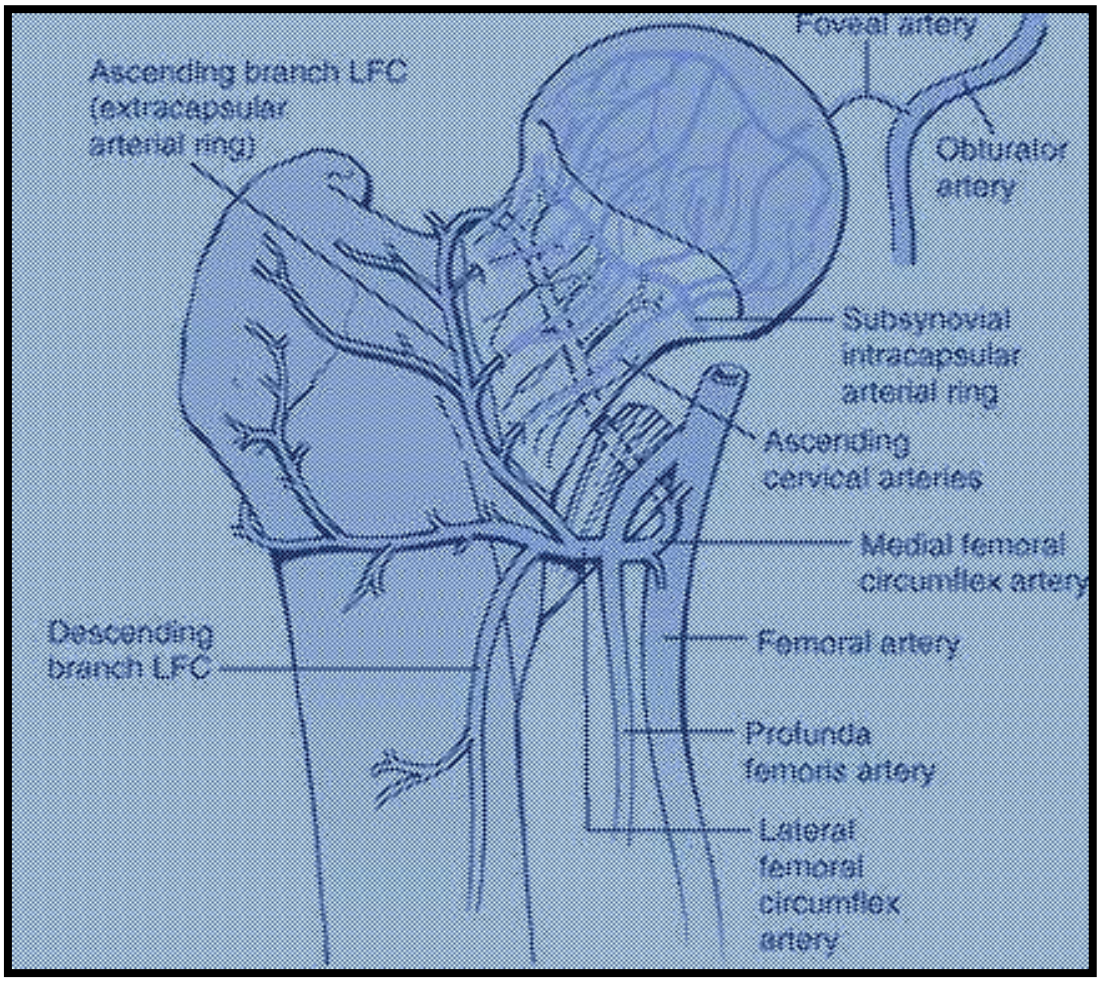

Fig. No. 6: Blood supply of head and neck of femur

The extracapsular arterial ring is formed posteriorly by a large branch of the medial femoral circumflex artery and anteriorly by branches of the lateral femoral circumflex artery .

The ascending cervical branches arise from the extracapsular arterial ring. Anteriorly, they penetrate the capsule of the hip joint at the intertrochanteric line, and, posteriorly, they pass beneath the orbicular fibers of the capsule. The ascending cervical branches pass upward under the synovial reflections and fibrous prolongations of the femoral head from its neck. These arteries are known as **retinacular arteries of Weitbrecht**.[118] The proximity of the retinacular arteries to bone puts them at risk for injury in any fracture of the femoral neck.

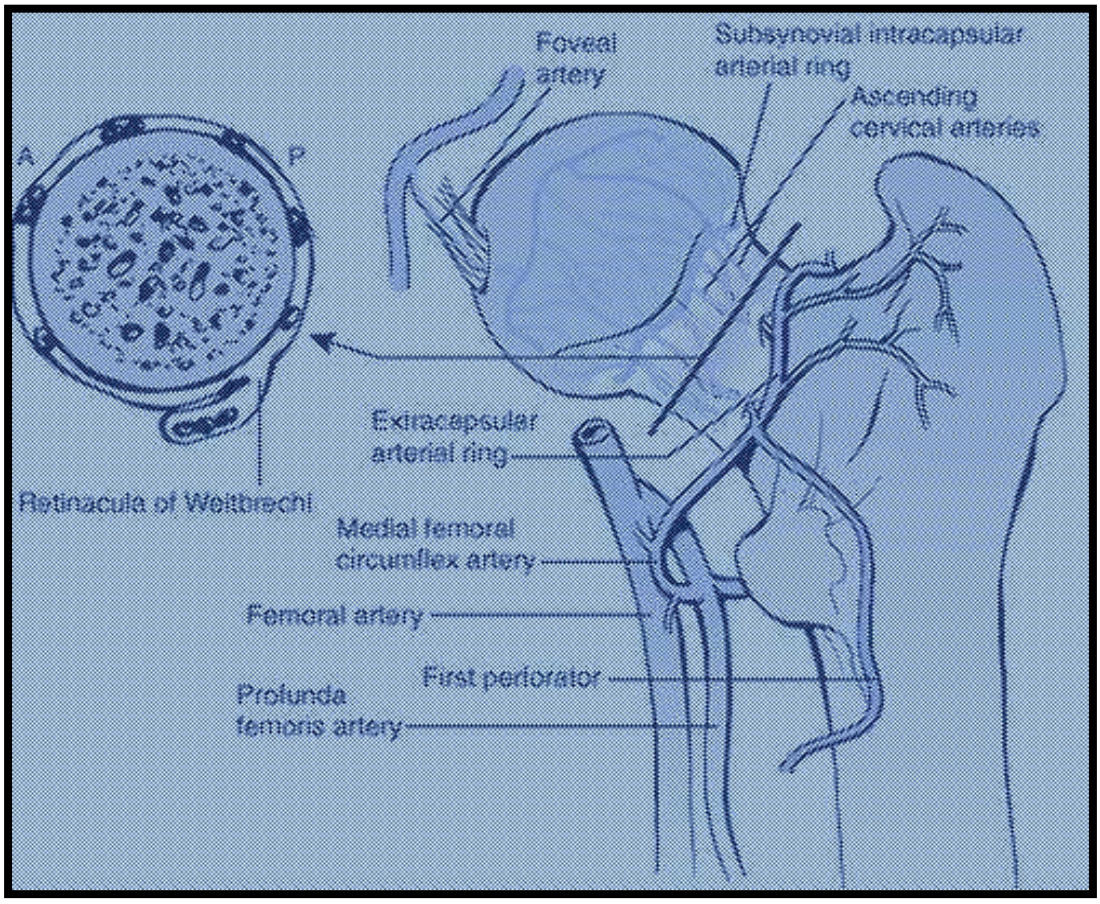

Fig. No. 5: Blood supply of the head and neck of femur

As the ascending cervical arteries traverse the superficial surface of the femoral neck, they send many small branches into the metaphysis of the femoral neck. Additional blood supply to the metaphysis arises from the extracapsular arterial ring and may include anastomoses with intramedullary branches of the superior nutrient artery system, branches of the ascending cervical arteries, and the subsynovial intra-articular ring.

In the adult, there is communication through the epiphyseal scar between the metaphyseal and epiphyseal vessels when the femoral neck is intact.[118] This excellent vascular supply to the metaphysis explains the absence of avascular changes in the femoral neck as opposed to the head.

BIOMECHANICS

The hip functions as a ball-and-socket joint, allowing a wide range of motion while remaining well constrained. Much of the stability of the hip is derived from its role as the fulcrum about which the large muscles that surround it act. These muscular actions tend to force the femoral head into the acetabulum, taking advantage of its depth.

The capsule is loose compared to other joints, allowing for greater motion in multiple directions.

The acetabulum opens facing obliquely anteriorly and inferiorly. The articular cartilage, which resembles a horseshoe, is thickest laterally and peripherally.[121-122] This coincides with descriptions of the loading pattern of the acetabulum as being primarily peripheral.[123]

The femoral head forms approximately two thirds of a complete sphere. The articular cartilage of the head is thickest on the medial and central surfaces. The position that the head takes within the acetabulum is affected by the normal anteversion of the femoral neck on the shaft of 12 degrees and by the neck-shaft angle, which averages 125 degrees.[124] The neck-shaft angle allows freedom of motion by providing offset of the femur from the pelvis. Variation in the neck-shaft angle is common and can affect the loading pattern of the hip. Likewise, deviation in anteversion affects the position of the head within the acetabulum.

The forces through the hip vary greatly during even simple activities and are caused primarily by the force of the muscles acting about the joint. During double leg stance, because few muscles are necessary for balance, the joint reaction force is approximately one third of body weight. This is in contradistinction to normal gait, in which the joint reaction force can reach six times body weight.

Rydell, using a femoral prosthesis with a strain gauge, made considerable contributions regarding the forces acting on the femoral head. He showed that standing on one leg generated a force 2.5 times body weight on that hip. In one-leg support, with a cane in the opposite hand, the force across the hip was reduced to body weight. At rest with two-leg support, there was a force of about half the body weight across each hip joint. Running was noted to increase these forces to 5 times body weight. He also found that lifting the leg from a supine position with the knee straight produced a force of 1.5 times body weight across the hip joint.[125]

MECHANISM OF INJURY

Most patients with femoral neck fractures have sustained a low-energy injury. Only a few injuries involve major (high-impact) trauma .

Kocher suggested two mechanisms of injury in femoral neck fractures.

The **first** is a fall producing a direct blow over the greater trochanter .

The **second** mechanism is external rotation of the extremity . In this mechanism, the head is firmly fixed by the anterior capsule and iliofemoral ligaments while the neck rotates posteriorly. The posterior cortex impinges on the acetabulum, and the femoral neck buckles. This mechanism is compatible with the marked posterior comminution of the femoral neck.

A **third** suggested mechanism is cyclical loading, which produces microfractures and macrofractures .

Forces within physiologic limits have been shown to produce fractures in osteoporotic bone.[126] It has been suggested that a stress fracture of this type becomes complete after a minor torsional injury preceding the fall that the patient identifies with the fracture.

In the case of young individuals who sustain a femoral neck fracture, the resultant trauma is major, usually resulting in a direct force along the shaft of the femur, with or without a rotational component . The increased magnitude of trauma leads to more marked soft tissue devascularization and comminution, which give rise to the increased incidence of treatment failure in young adults. The other mechanism of injury in this age-group is a stress fracture seen in runners and military recruits.

CLASSIFICATION OF FEMORAL NECK FRACTURES

Classification Based on Patient Characteristics

- The elderly individual who complains of hip pain
- Patients with distracting injuries (other fractures such as a femoral shaft)
- Young adult less than 40 years of age with repetitive strain injuries (stress fracture)
- Patients with Paget's disease
- Patients with Parkinson's disease
- Patients with spastic hemiplegia
- Postradiation of the pelvis
- Metastatic disease of bone
- Patients with hyperparathyroidism

Classification Based on Fracture Classifications

The four common classifications of femoral neck fractures are those based on

(a) anatomic location of the fracture[127],

(b) direction of the fracture angle[128], and

(c) displacement of the fracture fragments

Anatomic Location

Some authors classify intracapsular fractures of the neck of the femur anatomically into subcapital and transcervical types [127].

The so-called base of the neck fracture (basicervical) is extracapsular and, therefore, not included in this discussion.

The term subcapital is used to describe fractures that occur immediately beneath the articular surface of the femoral head along the old epiphyseal plate.

Transcervical fractures pass across the femoral neck between the femoral head and the greater trochanter.[129]

Fracture Angle (Pauwels Classification)

Pauwels divided femoral neck fractures into three types based on the direction of the fracture line across the femoral neck.

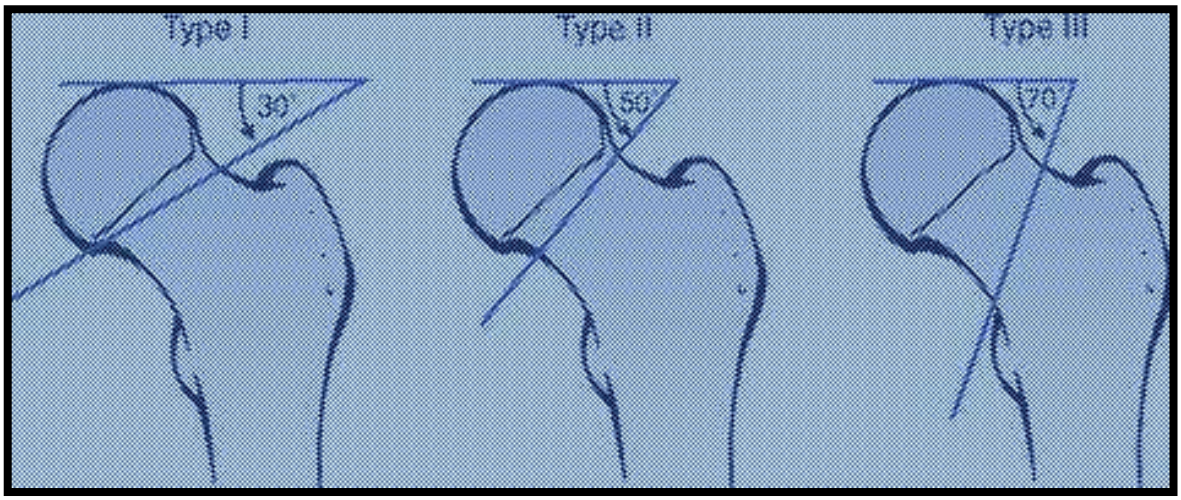

Fig. No. 7: Pauwels Classification

The Pauwels classification of femoral neck fractures is based on the angle the fracture forms with the horizontal plane. As fracture progresses from type I to type III, the obliquity of the fracture line increases and, theoretically, the shear forces at the fracture site also increase.

Type I is a fracture 30 degrees from the horizontal;

Type II, 50 degrees from the horizontal; and

Type III, 70 degrees from the horizontal.

Type I fractures are much more horizontal than type III fractures, which are almost vertical. Pauwels attributed nonunion in type III to the increased shearing force of this vertical fracture.

Fracture Displacement (Garden Classification)

Garden proposed a classification system based on the degree of displacement of the fracture noted on prereduction anteroposterior (AP)x-rays.

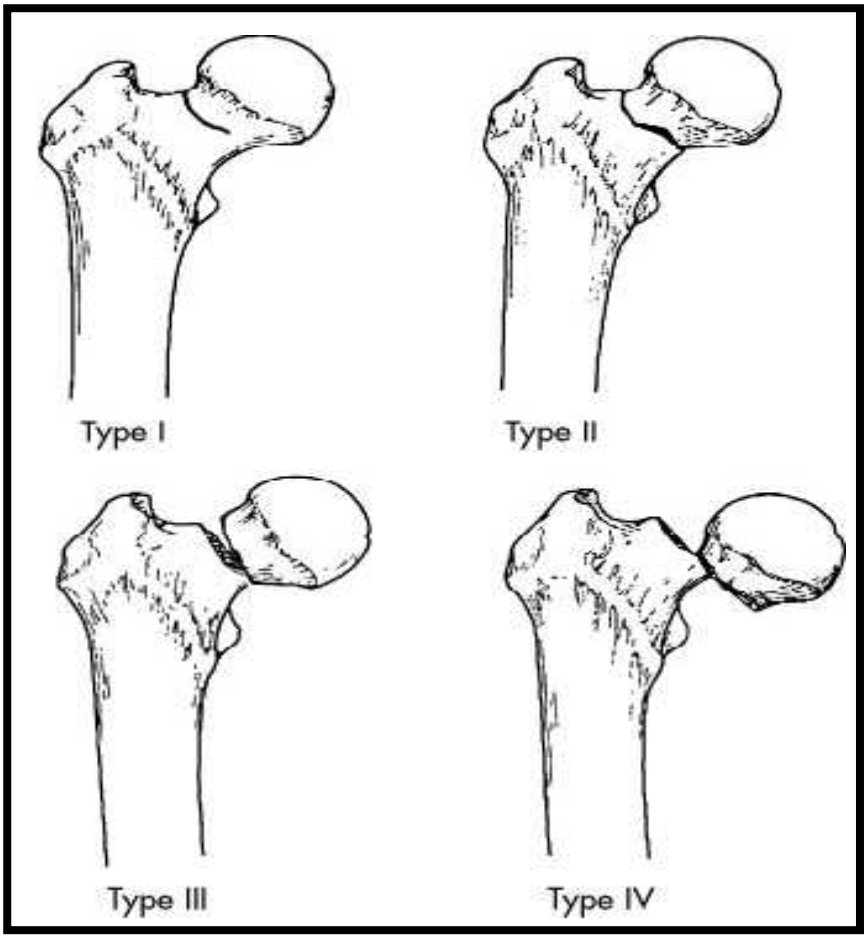

Fig. No. 8: Garden Fracture Classification

Garden I fracture is an incomplete or impacted fracture. In this fracture, the trabeculae of the inferior neck are still intact. This group includes the abducted impaction fracture.

Garden II fracture is a complete fracture without displacement. The x-ray demonstrates that the weight-bearing trabeculae are interrupted by a fracture line across the entire neck of the femur.

Garden III fracture is a complete fracture with partial displacement. In this fracture, there frequently is shortening and external rotation of the distal fragment. The retinaculum of Weitbrecht remains attached to, and maintains continuity between, the proximal and distal fragments .The trabecular pattern of the femoral head does not line up with that of the acetabulum, demonstrating incomplete displacement between the femoral fracture fragments.

Garden IV fracture is a complete fracture with total displacement of the fracture fragments. In this fracture, all continuity between the proximal and distal fragments is disrupted. The femoral head assumes its normal relationship in the acetabulum.

Orthopaedic Trauma Association (OTA) Classification

In the Orthopaedic Trauma Association (OTA) alphanumeric fracture classification, femoral neck fractures are designated type **31B**, in which 31 is the proximal femur group and B the femoral neck subgroup.

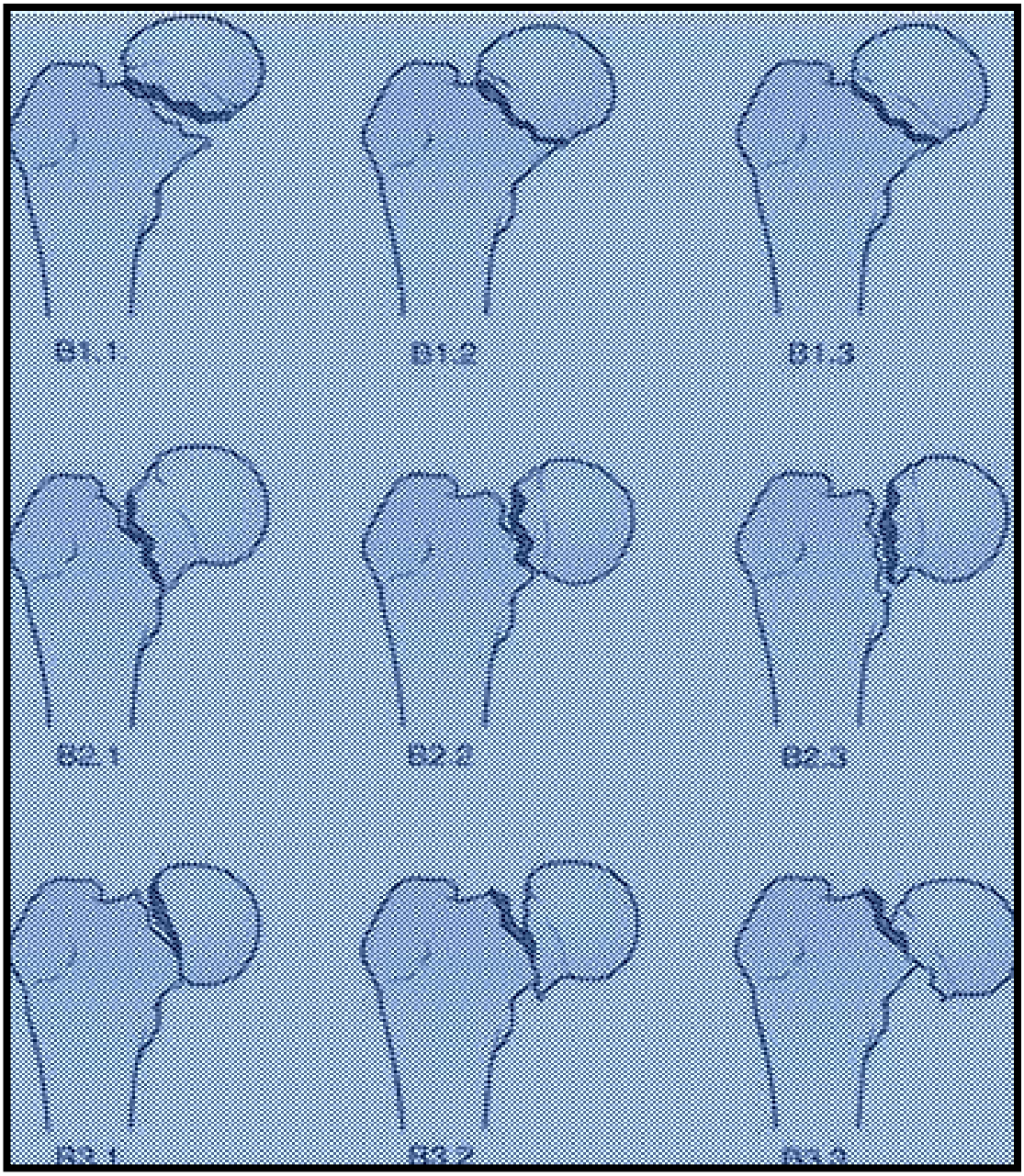

Fig. No. 9: Orthopaedic Trauma Association (OTA) Classification

B1 fractures are subcapital fractures with slight displacement,

1 – impacted in valgus ≥ 15˚

2 - impacted in valgus ≤ 15˚

3 – non impacted

B2 fractures are transcervical fractures

1 – Basicervical

2 – Mid-cervical adduction

3 - Mid-cervical shear

B3 fractures are displaced subcapital fractures

1 – Moderate displacement in varus and external rotation

2 - Moderate displacement with vertical translation & external rotation

3 – Marked displacement

DIAGNOSIS

Stress Fractures and Impacted Fractures

Patients with stress fractures and those with impacted fractures may complain only of slight pain in the groin or referred pain along the medial side of the knee.[130-132] They may be able to walk with a limp and, therefore, delay seeking treatment, thinking that they are suffering only from a muscle problem.[108-109]

Physical examination may reveal no obvious clinical deformity. Only minor discomfort may be produced by active or passive range of motion of the hip, but some muscle spasm usually is associated with the extremes of motion. Percussion over the greater trochanter may be particularly painful. Failure to recognize nondisplaced or impacted fractures may result in subsequent fracture displacement on weight-bearing. If the initial x-rays are normal but pain persists, the patient still should be examined for a suspected femoral neck fracture. In some cases, x-ray, tomograms, MRI, or bone scans may be

required for the diagnosis of these fractures.[111] It allows placement of the patient into the right treatment group of either surgical treatment or early mobilization and discharge.

Displaced Fractures

Patients with displaced intracapsular fractures usually complain of pain in the entire hip region. They lie with the leg in external rotation, abduction, and slight shortening. These patients may not have the extreme deformity that is present in dislocations of the hip or intertrochanteric fractures because of a partially intact capsule.[108-109]

The diagnosis in displaced fractures is easily confirmed by routine x-ray. X-ray evaluation of the fracture type, degree of posterior comminution, and presence or absence of osteoporosis is essential before selection of the treatment regimen.

The use of Buck's traction before surgery is controversial.

The advantages of splinting or relative immobilization of the limb in patients with a fractured hip include:

(a) reduction of the soft tissue injury and preservation of the remaining blood supply to the injured hip;

(b) maintenance of the patient in bed,

(c) pain relief by stabilizing the limb and preventing unnecessary movement at the fracture site.

Proponents of use of a pillow under the ipsilateral knee argue that use of Buck's traction places the limb in a position that decreases the capsular hip volume and may be a source of increased pain

The routine x-ray evaluation of a patient with a hip fracture should include an AP view of the pelvis, a true AP view of the hip with the maximum degree of internal rotation possible, and a cross-table lateral x-ray.[130]

MATERIALS AND METHODS

The present study was conducted in the department of Orthopaedics, KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum, on the patients who have sustained an intracapsular femoral neck fracture during the period of December 2007 to November 2008.

Study design

One year prospective study.

Source of data

Patients treated with Bipolar Hemiarthroplasty for the intracapsular fracture neck femur at the department of orthopaedics, KLES Dr. Prabhakar Kore Hospital and Medical Research Center, Belgaum, Karnataka, were selected for this study.

Sample Size

30 patients with intracapsular femoral neck fractures referred to the department of orthopaedics, KLES Dr. Prabhakar Kore Hospital and Research Centre, Belgaum were selected randomly, for this study.

Sampling procedure

Sample size was calculated by taking 80% of the average of the patients with intracapsular femoral neck fractures treated with Bipolar Hemiarthroplasty at the department of orthopaedics, KLES Dr. Prabhakar Kore Hospital And Medical Research Centre, Belgaum, over a period of last 3 years. Sample will be collected from 1st December 2007 to 30th November 2008 for a period of one year.

Selection Criteria

Inclusion criteria:

1. All intracapsular femoral neck fractures.
2. Age of patient >55 years
3. Failed internal fixation of the fracture neck femur.

Exclusion criteria:

1. Patients not consenting for surgery.
2. Fracture neck femur with acetabular changes
3. Age less than 55 years.
4. Fracture neck femur associated with fractures of the proximal 3rd of shaft femur.

Procedure

The study was approved by the Ethical and Research Committee of Jawaharlal Nehru Medical College, Belgaum. After finding the suitability as per inclusion and exclusion criteria ,patients were selected for the study and briefed about the nature of the study, the interventions used and written ,informed consent was obtained (Annexure–I). The consented patients were enrolled in the present study. Further, descriptive data of the participants like name, age, sex, detailed history, were obtained by interviewing the participants and clinical examination and necessary investigations were recorded on predesigned and pretested proforma (Annexure II).

Pre-Operative Evaluation

As soon as these patients were admitted in the ward, history was recorded and detailed clinical examination was done.

Name:

Age: Age is an important factor to be noted, to select the type of procedure to be done. There could be a difference between the chronological and physiological age. Usually fracture neck of femur occurs at an older age. In the elderly, bone is usually osteoporotic and osteosynthesis may fail due to poor regenerative osteogenic potential of bone. Many a times, it is ideal to replace the head and mobilize the patient early to prevent the complications of prolonged immobilization. The biopolar prosthesis can be used in comparatively younger active patients.

Sex : Fracture neck is common in older females due to hormonal imbalance in the post menopausal age and associated osteoporosis.

Occupation: Occupation has a vital role in selecting hemireplacement arthroplasty. It has got its own limitations as the patient is not allowed to squat for Indian style of toilet or sit cross legged. In view of this we should know whether the patient can adapt to his previous work or should change the occupation. Patients around 45-55 years of age who are active and earning members of the family are advised bipolar prosthesis because of the advantages mentioned earlier and they can return to the job early.

Address: Address was noted to communicate with the patient and for further follow up.

History of Present Illness

The patient usually presented with a history of trivial injury following which he had pain and inability to walk.

Past History

History of any disease like hypertension, diabetes mellitus, tuberculosis or stroke were noted.

History of major cardiac or pulmonary problems is noted.

Any History of previous anaesthesia and its details noted.

History of previous operation on hip, with any evidence of infection, aspirate of the hip was taken and cultured and patient operated only if culture was negative.

History of abnormal gait due to insufficient abductor musculature or neuropathic joint or progressive neurological diseases.

History of drug intake like aspirin, anticoagulants or steroids. Aspirin and anticoagulants were stopped prior to surgery but patients who were dependent on cortisone continued drugs and booster was given during surgery to avoid crisis.

History of fever or burning micturition if present, was treated before undergoing the operation.

With a history of familial bleeding tendencies like hemophilia, factor VIII was maintained preoperatively and 4 weeks post operatively.

Personal History

Whether the patient was a smoker, alcoholic, having vegetarian or non-vegetarian food with a normal or altered bladder and bowel function noted. Whether the patient used Western style or Indian style of toilet was also noted. (There is a high bleeding tendency in alcoholics, so liver profile should be looked for).

Menstrual history was also noted in females.

General Examination

Detailed clinical examination was done regarding the built, nutrition, pallor, cyanosis, icterus, pedal edema, lymphadenopathy, physiological age, psychological status, intelligence, willingness to undergo operation and post operative cooperation of the patient. The temperature, pulse, blood pressure and respiratory rate were also noted.

A thorough examination of the hip was done and deformities, contractures, weakness and limb length discrepancies if any were noted.

A detailed systemic clinical examination of C.V.S, R.S, C.N.S and per abdomen and Genito-urinary system was done and if there was anything significant, it was noted and treatment obtained.

Condition of skin around the hip was noted.

Height and weight of the patient was also noted.

A detailed examination of spine, knee and ankle was done to rule out any deformities or contractures. (A flexion contracture of the ipsilateral knee or equines deformity of the foot may require correction before joint replacement of hip).

True hip pain has to be differentiated from sacroiliac pain and lumbar pain, trochanteric bursitis, pubic ramus fracture or intra-abdominal problem by clinical examination.

Per-rectal examination was carried out if required.

Investigations

X-ray of the pelvic with both hips, anteroposterior view was taken with both the lower limbs in 15° internal rotation and lateral view was also taken.

Thickness of the cortex of the femur, width and shape of medullary canal, bone stock, type of fracture (Garden's classification), amount of calcar present, level of femoral neck cut to be made, pre operative size of the head (magnification deducted) and bone stock of acetabulum was noted.

Laboratory investigations

- Complete blood count
- Mini-renal, Blood sugar level
- Urine analysis
- HIV, HBsAg
- Chest X-ray
- Electrocardiogram

Liver function tests, renal function test and analysis of cardiac enzymes were done if required.

Preoperative Treatment

For fresh fractures, Buck's traction with 3 kg weight was applied to relieve the pain and muscle spasm. For fractures older than 1 week and with gross proximal migration, an upper tibial skeletal traction with 5 kg weight was applied till the limb lengths could be equalized.

Preoperative anaesthetic assessment was done.

The following training was given to the patients pre-operatively, so that the same was carried out post operatively like-

- Deep breathing exercises
- Static quadriceps exercises
- Ankle and toe movements
- Active hip exercises (of the normal hip to familiarize the exercise)
- Building of muscle power in the upper extremities.

A written consent of the patient and relatives was taken. Inj. cefotaxime 1 gm I.V was given 8 hours prior to surgery.

Procedure

Under combined SA+EA/SA, patient was put in a lateral position with the affected hip facing upwards. Using Watson-Jones lateral approach, a longitudinal incision beginning 5cm proximal to the tip of greater trochanter and extending 8cm distal to it was taken. The underlying fat and deep fascia dissected and gluteus maximus and tensor fascia lata identified and split. The interval between the gluteus medius and vastus lateralisidentified and their fibres were split to expose the hip joint

capsule. The capsule was incised using a longitudinal ‘T’ shaped incision along the anterosuperior surface of the femoral neck.

If a wider field was desired, the anterior fibres of the gluteus medius tendon were detached.

The femoral head was extracted using head extractor or cork screw. If excess neck was preventing extraction of femoral head, it was nibbled for easy extraction. The remnant of ligamentum teres was excised and any loose pieces of bone (of the comminuted neck) in the acetabulum removed. The cartilage of the acetabulum was inspected for any degenerative changes.

With a bipolar rasp medullary canal of the neck and upper shaft was opened with 10° anteversion and a valgus position.

The femoral neck was cut using a oscillating motor saw in such a way that enough of the calcar remained to support the medial aspect of the prosthesis.

The size of the femoral head removed from the acetabulum was measured using a head gauge. Appropriate size of the prosthesis was seated in the prepared medullary canal with 10° anteversion and a valgus position. The prosthesis was impacted with blows on the shoulder and not on the head.

Muller noted that the center of the head of the prosthesis should be slightly superior to the level of the upper edge of the greater trochanter. If it is too high riding, some more neck should be osteotomized to enable easy reduction of prosthesis and prevent post operative limb lengthening.

The prosthesis need not be reduced with internal rotation as the acetabular component is mobile and traction alone is enough to manipulate and reduce the head into the acetabulum.

The hip was tested for full range of movements intraoperativley and whether it dislocated in a particular position.

The wound was closed meticulously in layers over suction drain maintaining hemostasis throughout the procedure and dressing was applied. Blood loss was assessed and blood transfusion carried out if required.

Postoperative Management

A postoperative removable derotation boot was applied and a pillow was kept in between the two legs so that the leg was in abduction. The foot end of the bed was elevated and regular hourly T.P.R and blood pressure charts were maintained for first 24 hours.

Antibiotic in the form of parenteral cefotaxime 1 gm twice a day was given for first five days and then shifted to tab ceftum 500 mg twice a day for the next 5 days.

Analgesics in the form of parenteral diclofenac sodium 75 mg were administered in the first 24 hours and then shifted to oral analgesics.

The drain was removed depending on the amount of collection, at 48 to 72 hours. Static quadriceps exercises was advised to all the patients as soon as they recovered from the anaesthesia.

All the patients were advised to sit up with back rest from the 2nd postoperative day. Deep breathing exercises were advised. The derotation boot was split and ankle and toe movements started.

A post-operative check x-ray was taken and the valgus seating with 10° anteversion was confirmed. Any limb length discrepancy was noted.

Knee flexion and isotonic quadriceps were started on 3rd postoperative day and patient was mobilized with walkers with partial weight bearing.

Sutures were removed on the 10th day and the patient discharged with a cane in the opposite hand (which was discarded after 6 weeks).

The patient was advised to use a straight, high chair with arms to facilitate getting out of the chair and avoid using a sofa. The patient was advised not to sit or squat on the floor or squat for Indian style of toilet or sit cross legged and patient was advised to use elevated toilet seat. The patient was advised not to adduct or flex the hips excessively or involve in activities that place heavy loads or stresses on the hip.

The patient was advised to carry out the isotonic and isometric quadriceps exercises and exercises to strengthen the muscles around the hip.

The follow up was carried out at 6 weeks, 3 months, 6 months and thereafter if patient returned to the department of orthopaedics with any queries.

The results were evaluated using the Harris Hip rating.53

Harris Hip Rating

Maximum points possible-100

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

Pain relief	44
Function.	47
Range of motion	5
Absence of deformity	4
	100 points

I. Pain (44 Possible)

A.	None or ignores it	44
B.	Slight, occasional, no compromise in activities	40
C.	Mild pain, no effect on average activities, rarely moderate pain with unusual activity, may take aspirin	30
D.	Moderate pain, tolerable but makes concessions to pain, some limitation of ordinary activity or work, may require occasional pain medicine stronger than aspirin	20
E.	Marked pain, serious limitation of activities	10
F.	Totally disabled, crippled, pain in bed, bed ridden	0

II. Function (47 possible)

A. Gait (33 possible)

1.	Limp		
	a. None	-	11
	b. Slight	-	8
	c. Moderate	-	5
	d. Severe	-	0
2	Support		
	a. None	-	11
	b. Cane for long walks	-	7
	c. Cane most of the time	-	5
	d. One crutch	-	3
	e. Two canes	-	2
	f. Two crutches	-	0
	g. Not able to walk (specify reason)	-	0
3.	Distance walked		
	a. Unlimited	-	11
	b. Six blocks	-	8
	c. Two or three blocks	-	5
	d. Indoors only	-	2
	e. Bed and chair	-	0

B. <u>Activities</u> (14 possible)

1.	Stairs		
	a. Normally without using a railing	-	4
	b. Normally using a railing	-	2
	c. In any manner	-	1
	d. Unable to do stairs	-	0
2.	Shoes and socks		
	a. With ease	-	4
	b. With difficulty	-	2
	c. Unable	-	0
3.	Sitting		
	a. Comfortably in ordinary chair for one hour	-	5
	b. On a high chair for half an hour	-	3
	c. Unable to sit comfortably in any chair	-	0
4.	Enter public transportation	-	1

<u>Absence of Deformity</u>

Points (4) are given if the patient demonstrates

A. Less than 30° fixed flexion contracture

B. Less than 10° fixed adduction

C. Less than 100 fixed internal rotation in extension

D. Limb length discrepancy less than 3.2 cm

III. Range of Motion (5 points possible)

(Index values are determined by multiplying the degrees of motion possible in each arc by the appropriate index)

A.	**Flexion**			**(Max possible)**
	0°-45°	X	1	45
	45°-90°	X	0.6	27
	90°-100°	X	0.3	6
	Over 100°	X	0	0
B.	**Abduction**			
	0°-15°	X	0.8	12
	15°-20°	X	0.3	1.5
	Over 20°	X	0	0
C.	**External rotation in extension**			
	0°-15°	X	0.4	6
	Over 15°	X	0	0
D.	**Internal rotation in extension**			
	Any	X	0	0
E.	**Adduction**			
	0°-15°	X	0.2	3
	Over 15°	X	0	0
F.	**Extension**			
	Any	X	0	0
		Total	**100.5 points**	

To determine the over-all rating for the range of motion, multiply the sum of the index values x 0.05

Maximum points possible = 100.5 x 0.05 = 5 points

The Trendelenburg test is recorded as positive, level or neutral.

RESULTS

The present study consists of 30 cases of intracapsular fracture neck femur treated surgically by Bipolar hemiarthroplasty. Following are the observations made.

Table No. 1: Age wise Distribution

Age (Year)	Number	Percentage (%)
55 to 60	09	30
61 to 65	10	33.33
66 to 70	06	20
>70	05	16.67
Total	30	100

Age of all the patients in this study ranged above 55 years. Majority of the patients were in the age group between 55 to 65 years and six patients (26%) were in the age group 66 to 70 years. There were five patients (six percent) in the age group of above 70 years.

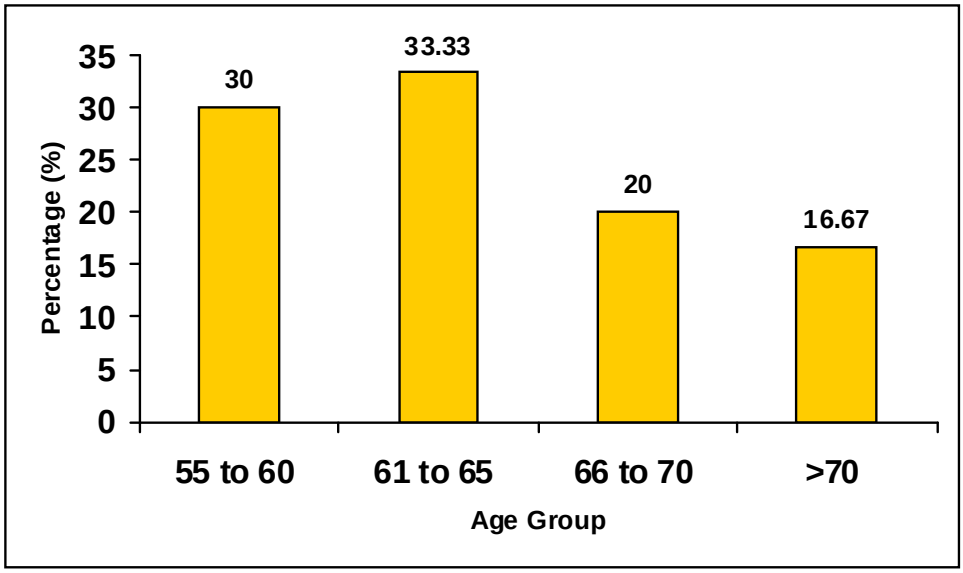

Fig. No. 1: Age wise Distribution

Table No. 2 : Gender Distribution

Gender	Number	Percentage
Male	20	66.66%
Female	10	33.33%
Total	30	100%

In the present study, out of the 30 patients there 10 were females accounting to 33.33% and 20 males patients making up the remaining 66.66%. Male to female ratio was 2:1.

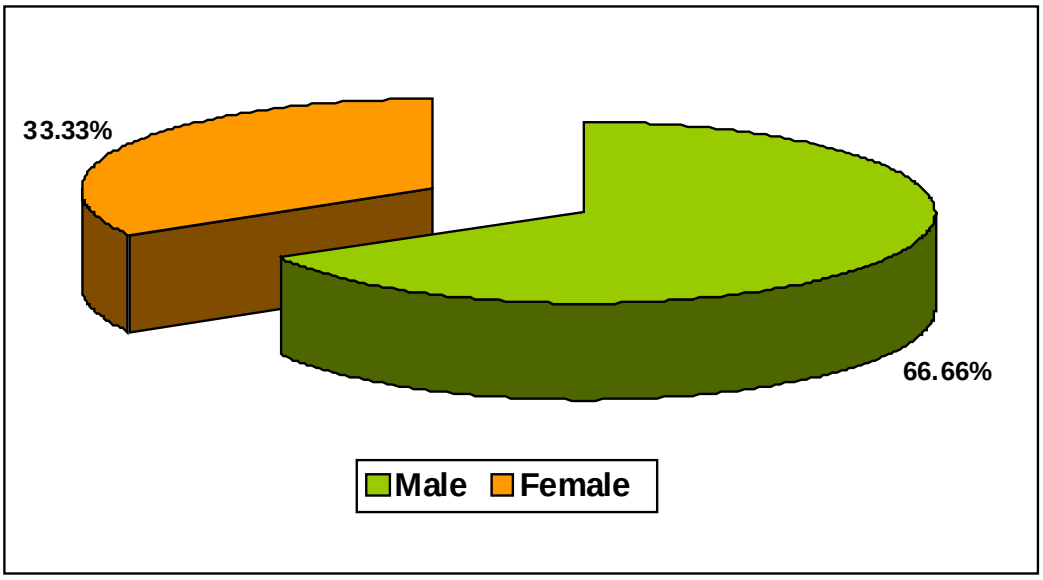

Fig. No. 2: Gender Distribution

Interval Between Injury And Admission :

The average interval between the date of injury to the date of admission to the hospital was 2.3 days with a range of 0 to 21 days.

Interval Between Admission and Surgery:

The average interval between admission to the hospital and surgery was 4.5 days with a range of 0 to 15 days. (The patients were thoroughly investigated and made fit for surgery which led to the delay in few cases).

Duration Of Hospital Stay:

The average duration of hospital stay was 17.4 days with a range of 10 to 30 days. Except for one patient with contralateral distal radius fracture, all were ambulatory with the help of a cane at the time of discharge. The duration of hospital stay is less in our series as the patients were mobilized early.

Table No. 3: Occupational Distribution

Occupation	Number	Percentage (%)
Retired Official	05	16.67
Agriculturist	08	26.67
Businessman	07	23.33
Housewife	10	33.33
Total	30	100

All the 10 females were house wives. Among the males,five were retired from their jobs, eight males were still working in the fields and seven patients were doing business. All the patients went back to their old occupation following the surgery with only a slight limitation in their pre-fracture routine activities.

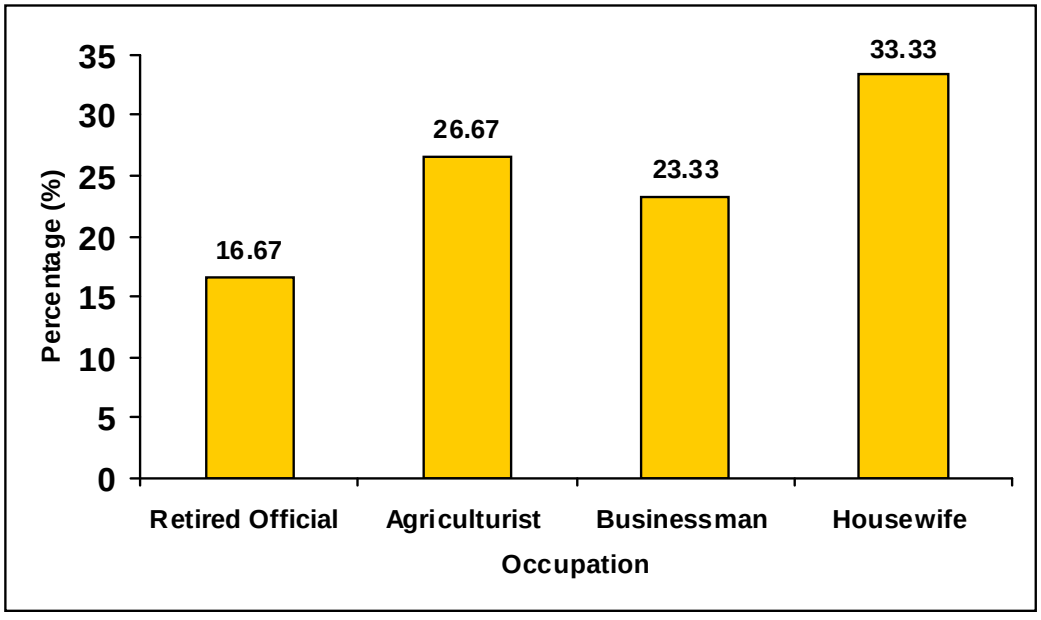

Fig. No. 3: Occupational Distribution

Table No. 4: Nature of trauma

Side	Number	Percentage (%)
Fall on a Slippery floor	12	40
Fall from height	11	36.67
Fall from Bicycle	04	13.33
Road traffic accident	03	10
Total	30	100%

Majority of the fractures occurred due to fall on a slippery floor (40%) and fall from height(36.67%) . Other causes included fall from bicycle(13.33) and Road Traffic Accident(10%) .

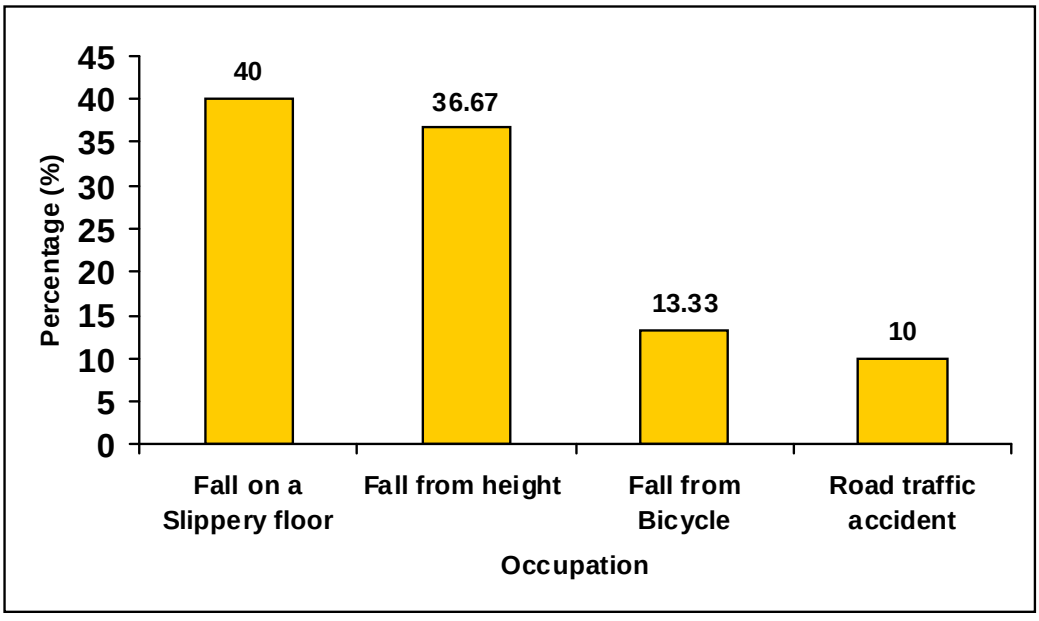

Fig. No. 4: Nature of trauma

Table No. 5: Injury laterality

Side	Number	Percentage (%)
Right	17	56.67
Left	13	43.33
Total	30	100

Right side involvement was more commonly seen than the left in this study group. Right side was involved in seventeen patients making up for 56.67% of the fractures and the left was involved in thirteen patients accounting for 43.33% of the fractures. None of the patients had bilateral fractures.

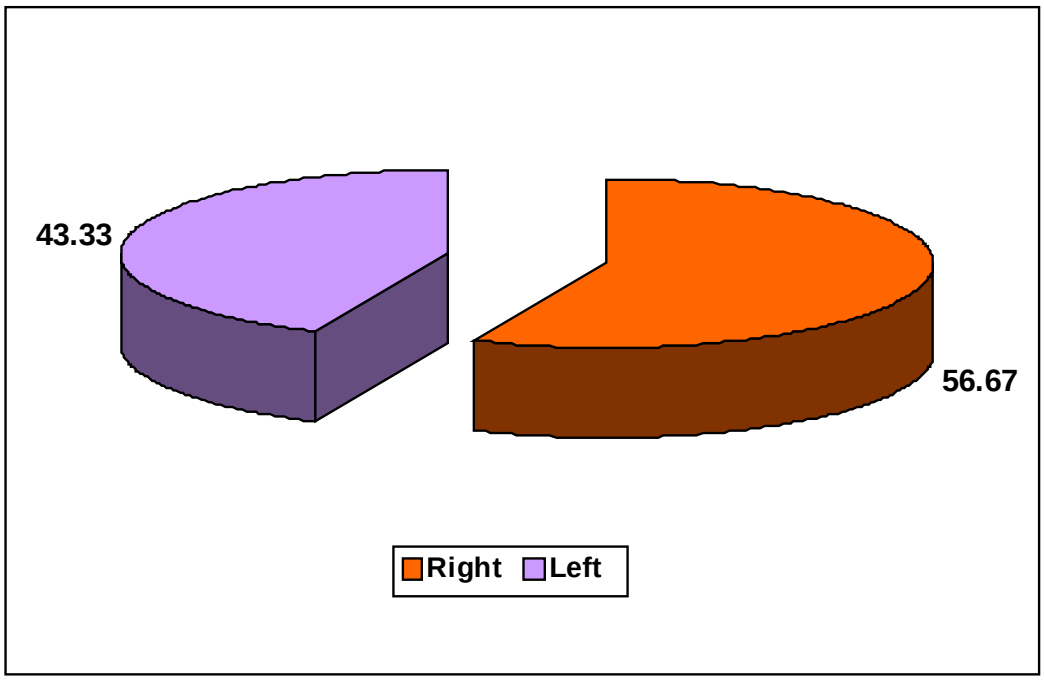

Fig. No. 5: Injury laterality

Table No. 6: Garden fracture type

Garden Type	Number	Percentage (%)
III	10	33.33
IV	20	66.67
Total	30	100

Out of the 30 fractures, majority were type IV fractures(20 patients) accounting for 66.66%. Remaining 33.33% (10 patients) were type III fractures.

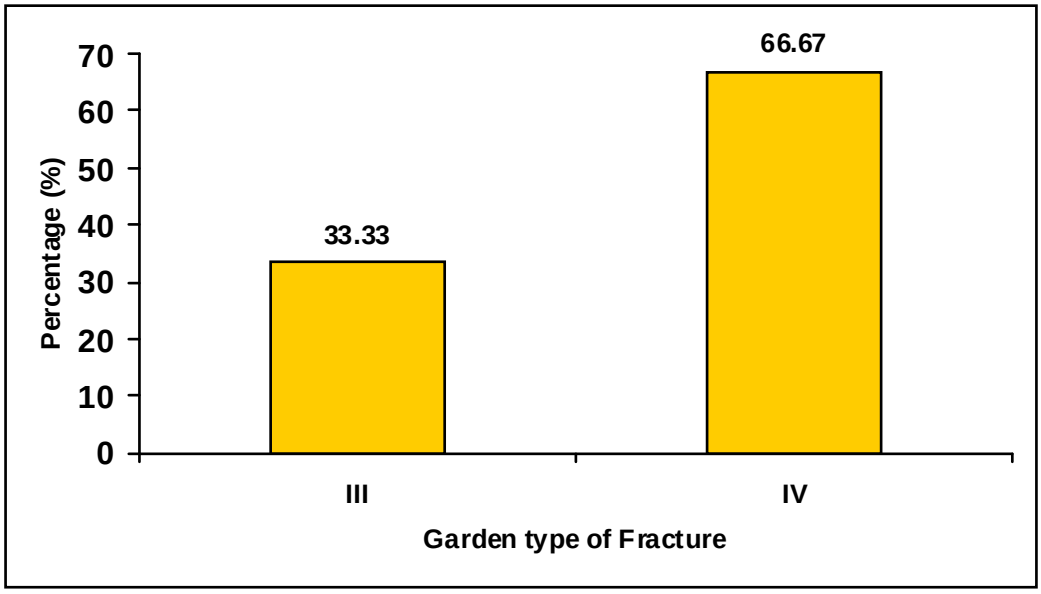

Fig. No. 6: Garden fracture type

Table No. 7: Type of Anaesthesia

Garden Type	Number	Percentage (%)
Combined (SA+EA)	18	60
SA	12	40
Total	30	100

18 patients (60%) were operated under combined(spinal and epidural) anaesthsia and 12 patients (40%) were operated under spinal anaesthesia.

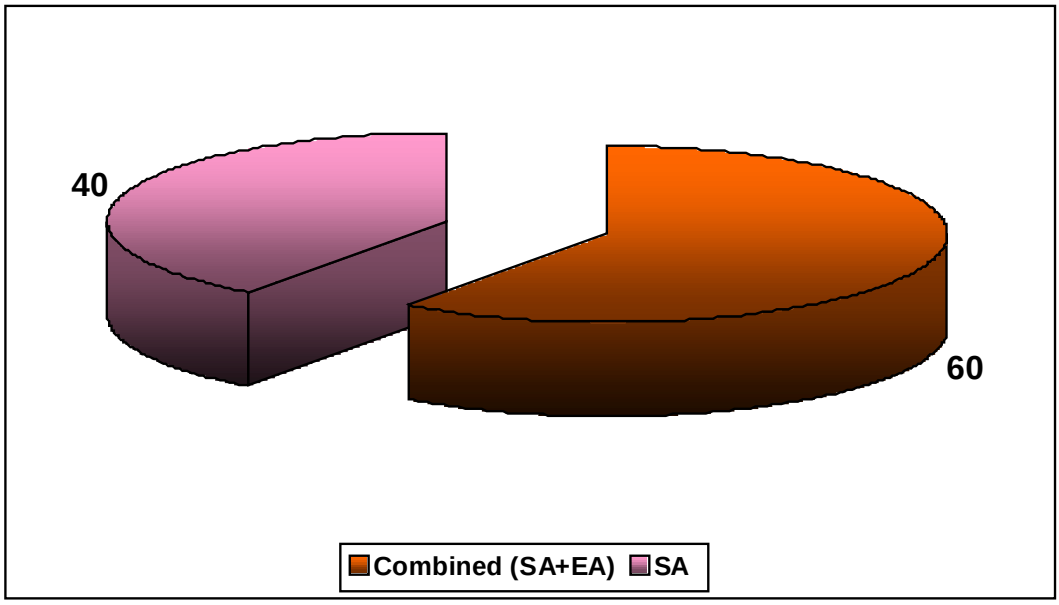

Fig. No. 7: Type of Anaesthesia

Table 8: Sizes of Prosthesis used in this study

Head size in mm	No. of Patients		
	Total	Males	Females
39	02	0	02
41	04	0	04
43	05	02	03
45	13	12	01
47	03	03	0
49	02	02	0
51	01	01	0
Total	30	20	10

The size of the prosthesis used in this study ranged between 39mm to 51mm.

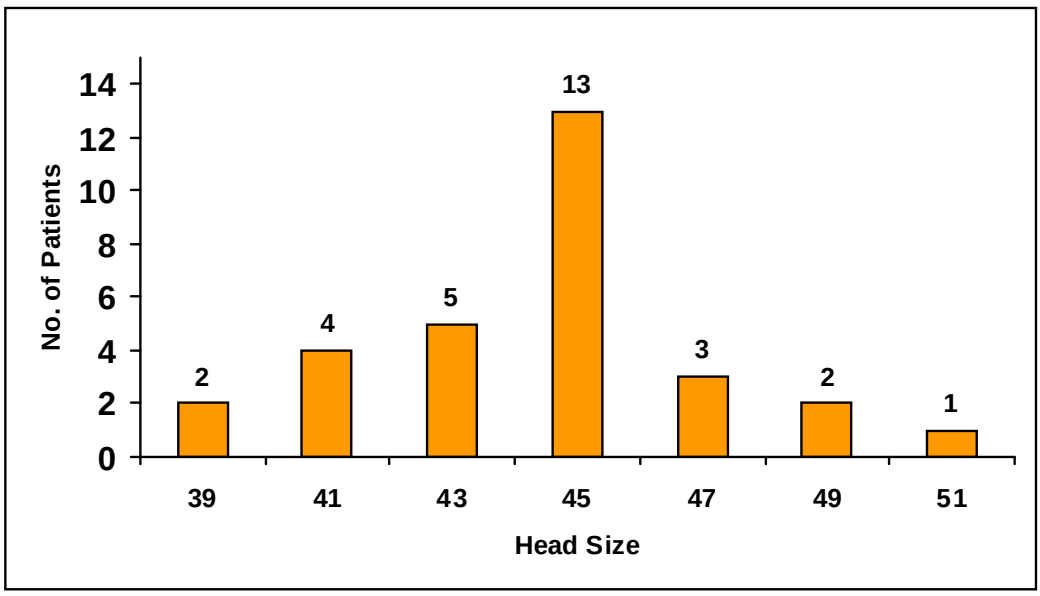

Fig. No. 8: Sizes of Prosthesis used in this study

Table No. 9 : Sizes of Prosthesis used in males (n=20)

Size in mm	No. of patients (males)	Percentage (%)
43	02	10
45	12	60
47	03	15
49	02	10
51	01	5
Total	20	100

Among males, prosthesis sized 45mm was used in 12 (60%) patients. Three (15%) patients required 47mm sized prosthesis and two patients (10%) each required 43mm and 49 mm size of prosthesis. Only one (5%) patient required 51mm sized prosthesis.

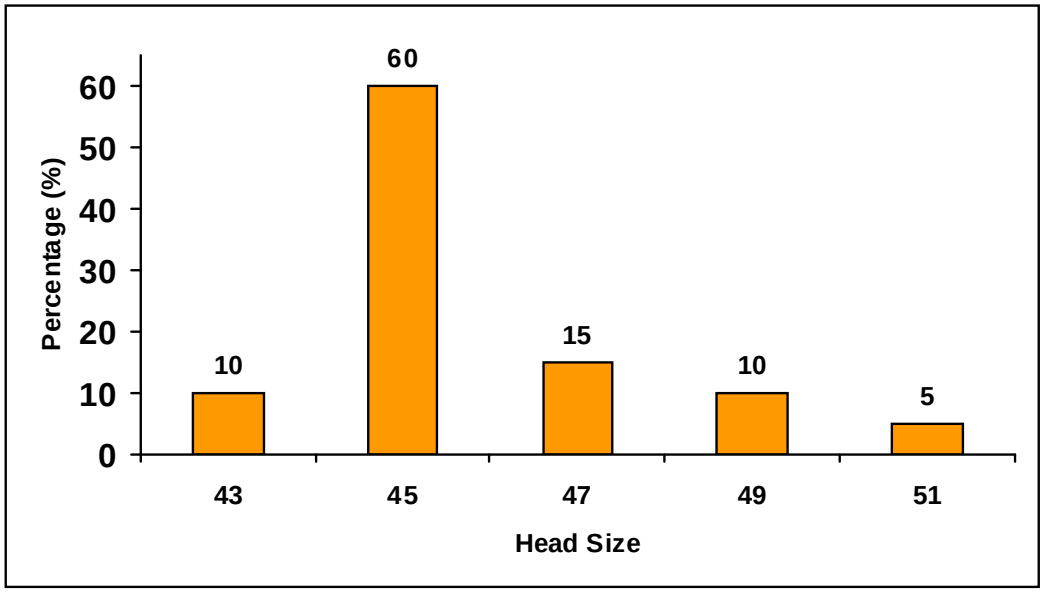

Fig. No. 9: Sizes of Prosthesis used in males

Table No. 10 : Sizes of Prosthesis used in females (n=10)

Size in mm	No. of patients (males)	Percentage (%)
39	02	20
41	04	40
43	03	30
45	01	10
Total	10	100

Among females the prosthesis sized 41mm was used in four (40%) patients. Three (30%) patients required 43mm sized prosthesis and two (20%) patients required 39mm size of prosthesis. Only one patient required 45mm sized head.

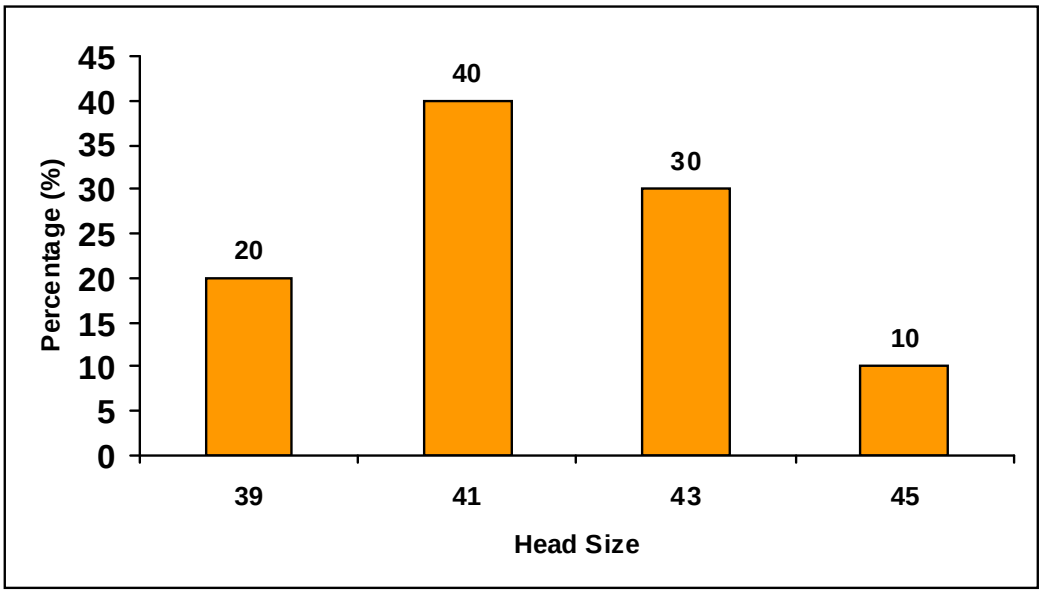

Fig. No. 10: Sizes of Prosthesis used in females

Table No. 11: Intra-op Complications

Time (Weeks)	Number	Percentage (%)
Bone Cement used	05	16.67
Difficulty in reduction of prosthesis	01	3.33%

Bone cement was used in five patients (16.67%) as the bones were osteoporotic. We faced difficulty in reduction in one patient (3.33%) .

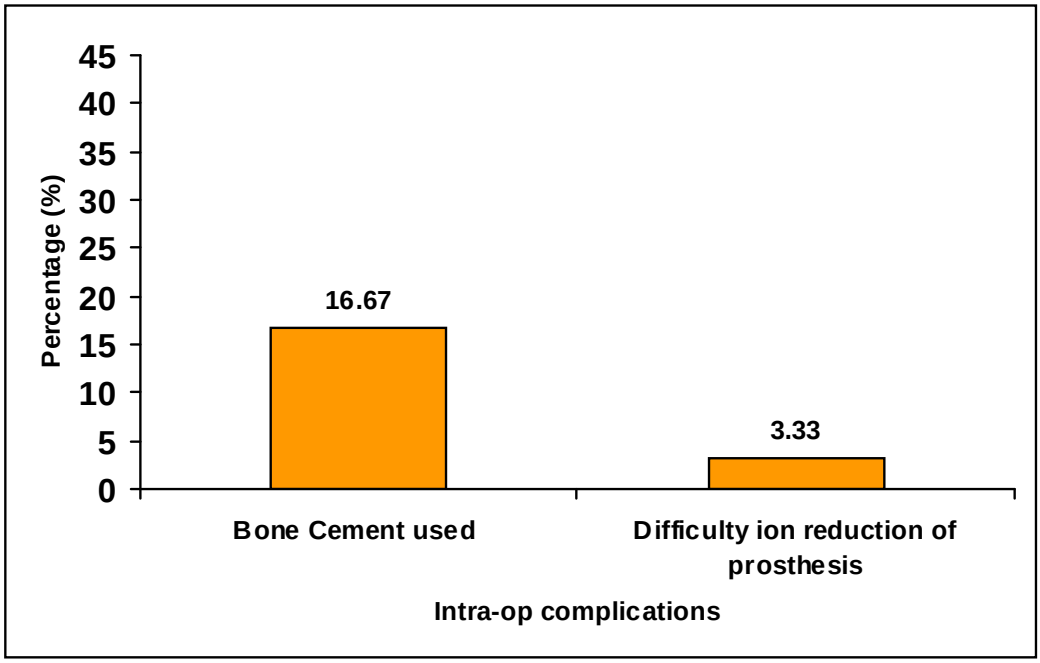

Fig. No. 11: Intra-op complications

Table No. 12: Post-op Complications

Time (Weeks)	Number	Percentage (%)
DVT	01	3.33
Superficial infection	02	6.67
Lengthening (1-2 cm)	03	10

Three patients (10%) had limb lengthening of 1cm. Two patients (6.67%) had superficial infection which was treated with I.V antibiotics according to the culture and sensitivity report of the the pus . One patient (3.33%) developed deep vein thrombosis after 7 days, which was treated successfully with subcutaneous heparin for 10 days after monitoring PT and PTT.

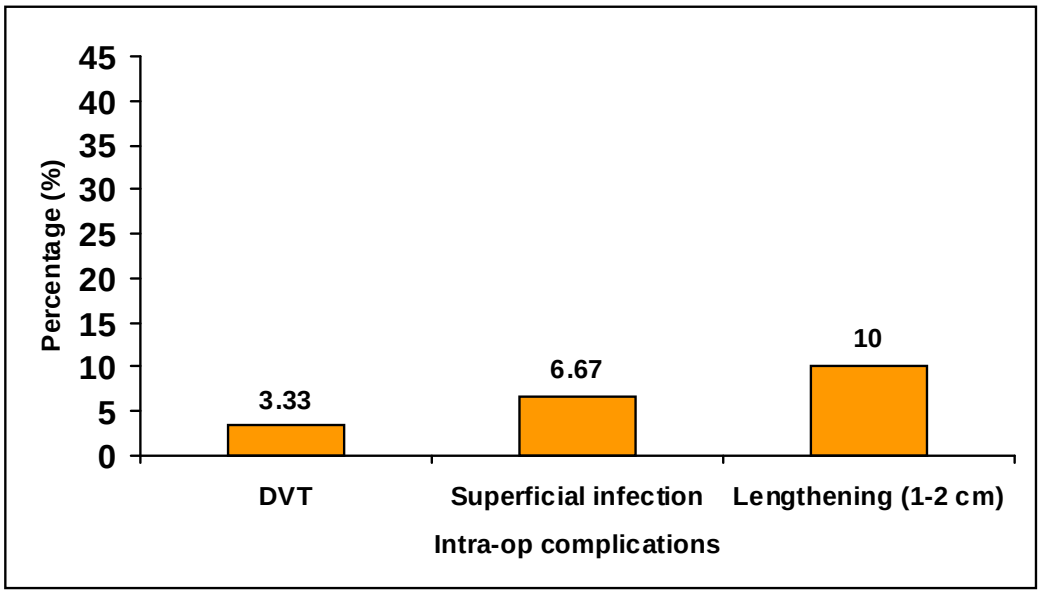

Fig. No. 12 Post-op Complications

Follow-Up Period

All the patients were followed up at 6 weeks, 3 months and 6 months.

Table No. 12: Outcome: Harris hip score

Outcome	Number	Percentage (%)
Excellent	10	33.33
Good	15	50
Fair	03	10
Poor	02	6.67

Harris hip score was used to evaluate the functional results. Using this rating scale at sixth month, based on range of motion**, s**hortening (cm), pain, walking ability, stair climbing and return to work, there were 10 patients (33.33%) with excellent results, 15 patients (50%) with good results, three patients (10%) with fair results and two patients (6.67%) with poor outcome.

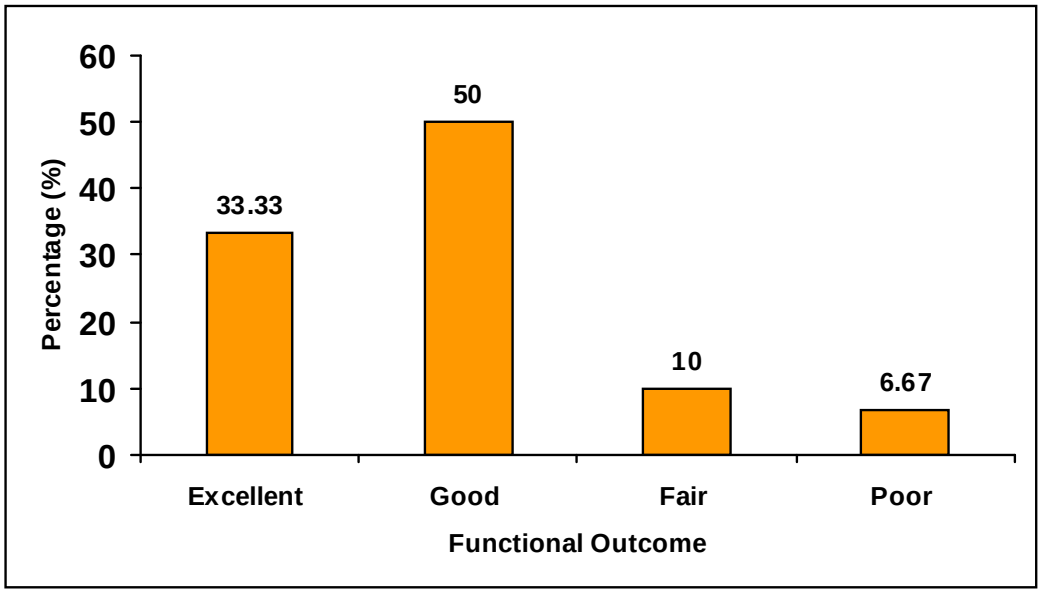

Fig. No. 13 Outcome: Harris hip score

DISCUSSION

In our study, 30 cases of fracture neck of femur were treated with Bipolar prosthesis in age groups above 55 yrs. The results were analyzed and the observations were made. The study was also compared with studies conducted by other authors. Various aspects of the procedure have been observed and discussed in detail.

1. Age incidence

The average age of the patients in our series was 65.83 years with a range of 55 to 93 years with majority of the patients in the age-group 55 to 65 years. The average age in the reported series is as follows. Nottage and Mc Master (1990)[134] 65 years, Garrahan and Madden (1990)[71] 66 years, Gupta et al (1994)[93] 54 years, La Belle et al (1990)[69] 72.5 years, Gallinaro et al (1990)[70] 75 years, Lestrange (1990)[68] 79.7 years. The age incidence in present study is similar to the reported series.

2. Sex Incidence

In this series, it was observed that the male to female ratio was 2:1, the female being 33.33%. In the literature, a lot of variation is reported, female being more common than male. According to Lestrange (1990)[68] 83 females were 81.7%. La Belle et al (1990)[69] 79 females were 87.8%, Gallinaro et al (1990)[70] 37 females were 90%. Nottage and Mc Master (1990)[134] females were 75%.Fracture neck is common in older females due to hormonal imbalance in the post menopausal age and associated osteoporosis. However in this study males population was more involved as compared to females in the 2:1 ratio.

3. Size Of The Prosthesis

The size of the prosthesis used varied from 39 mm to 51mm. In females, the sizes used were 39mm to 45mm with 41 mm (40.9%) being the most widely used, followed by 43 mm (30%). The sizes used in males were 43mm to 51 mm with 45mm (60%) and 47mm (15%) being most widely used.

4. Complications

Bone cement was used in 5 patients (16.67%) as the bone were osteoporotic and the implant was too loose after the seating.

There was difficulty in reduction in one patient (3.33%) and limb lengthening of more than 1cm in 3 patients (10%). Muller[133] noted that the center of the head of the prosthesis should be slightly superior to the level of the upper edge of the greater trochanter. If this aspect is not checked intraoperatively, and more neck is retained, there will be difficulty in reduction and postoperative lengthening.

This prosthesis has a fixed neck length (not modular) of 35mm in all sizes. In short females with head size 39mm, 41mm or 43mm, the neck length is less as compared to a well built male with 49mm head (neck length range 30 to 41.1mm according to Noble et al[100]. So more neck should be osteotomized only in smaller sized prsothesis.

Superficial infection was encountered in two patients (6.67%). Antibiotics were given according to the culture and sensitivity report of the pus. There was no need for Incision and drainage to treat the infection. In the reported series, the infection rates are – Lestrange (1990)[68] 83 2.8%, La Belle et al (1990)[69] 79 – 2.1%,

Nottage and McMaster (1990) [134] deep wound infection was 3.9% and superficial wound breakdown in 3.9%.

One patient (3.33%) developed deep vein thrombosis after 7 days, which was treated successfully with S/C heparin after monitoring PT and PTT. Even though we have not used prophylactic anticoagulants, we have not encountered deep vein thrombosis post operatively probably due to the early mobilization of the patients.

In our series, there was no incidence of dislocation. In the literature Lestrange (1990)[68] has a dislocation rate of 2.4%. The intrinsic stability of the implant probably prevents dislocation.

5. Associated injuries

In our study, two patients had also succumbed colles fracture, one patient in the ipsilateral side and in the other patient the contralateral side was involved. These were managed with closed reduction and Plaster of Paris cast application.

One patient had Fracture of the 7 and 8 rib on the right side following an RTA. This was treated conservatively.

6. Outcome

In our study of 30 cases of intracapsular fracture neck of femur, managed by Bipolar hemiarthroplasty, we have excellent results in 10 cases (33.33%), good in 15 cases (50%), fair in three cases (10%) and poor in two cases (6.67%) with an average score of 84.81 points according to the Harris hip rating system.[135]. Among the three patients with fair results, two were male and one female patient. Among males one was a 58yrs old agriculturist who had anterior knee pain and another a 56 yr old

businessman who was chronic alcoholic and did not fair better due to bad health and associated medical problems. The 70yr old female, who was a housewife didn't fair well due to anterior knee pain. However there was no problem with the operated hips. The two patients with poor results included a male aged 93 yrs and a female aged 72 yrs who did not follow the postoperative protocol , due to old age,and weakness.

We have got excellent to good results in 83.33% of the cases. In the reported series, Giliberty (1983)[43] had 92% satisfactory results with a mean Harris hip rating of 84.81 points, Mannarino et al (1986)[136] had mean Harris hip score of 84.7 points, Lausten et al (1987)[44] found 75% excellent to good results, Bochner et al (1988)[65] had 92% excellent to good results, Lestrange (1990)[68] had 70.8% excellent to good results, La Belle et al (1990)[69] had an average Harris hip score of 80 points, Nottae and Mc Master (1990)[134] had a mean Harris hip score of 83 in the bipolar group and 61 in the Thompson and Moore groups, Hennig et al (1991)[82] found results comparable to total hip replacement according to Harris hip score, Lortat et al (1992)[87] found 94% satisfactory results and substantially better clinical and roentgenographic results as compared with Moore's prosthesis and results comparable to total hip replacement, Surya Bhan (1993)[45] had 90.6% excellent to good results in bipolar and 77.8% in Austin Moore group and Gupta et al (1994)[93] had excellent to good results in 85%. Our results are quite similar to the above mentioned series.

CONCLUSION

After treating 30 patients with intracapsular fracture neck of femur, with Bipolar prosthesis, we feel it has better advantage in terms of stability, mobility, range of motion, and functional results.

There is reduced morbidity and mortality, with excellent to good results in 83.33% and mean Harris hip score of 84.81 points.

In osteoporotic bones or in bones with wide medullary canal where the stem of the prosthesis was found to be loose, we have used bone cement for stabilization of the prosthesis.

The prosthesis is cost effective and provides the patients with a good range of functional movements. We have not encountered any dislocation in our series probably due to lateral approach, better soft tissue balancing and intrinsic stability of the implant. Hence it is a superior implant requiring a simple procedure for fracture neck of femur in elderly patients but one should think of osteosynthesis where possible before opting for this procedure in younger patients.

With increasing periods of follow up , Harris Hip score improved. We do not have a longer follow up to comment about the longevity of the prosthesis.

We feel 30 patients is too small a number to give a statistically significant opinion as the cases were studied for a short period ranging from 3 months to 6 months.

Our early and short term results are encouraging and promising and long term results are awaited.

SUMMARY

This series consisted of 30 cases of intracapsular fracture neck femur treated surgically by Bipolar hemiarthroplasty

In the present study, out of the 30 patients 10 were females accounting to 33.33% and 20 were males making up the remaining 66.66%. Male to female ratio was 2:1.

Age of all the patients in this study, ranged above 55 years. Majority of the patients were in the age group between 55 to 65 years.

The average interval between the date of injury to the date of admission was 2.3 days with a range of 0 to 21 days

The average interval between admission to the hospital and surgery was 4.5 days with a range of 0 to 15 days. The average duration of hospital stay was 14.3 days with a range of 12 to 30 days.

In our study all the 10 females were house wives. Among the males five were retired from their jobs and eight males were still working in the fields and seven patients were doing business. All the patients went back to their old occupation following the operation with only a slight limitation in their routine activities.

The commonest mode of injury occurred due to fall on a slippery floor (40%) and fall from height (36.67%). Other causes included fall from bicycle (13.33%) and Road Traffic Accident (10%).

In this study group, right side (56.67%) was more commonly involved than the left (43.33%).

Out of the 30 fractures, majorities were type IV (66.66%) and remaining (33.33%) were type III fractures.

18 patients (60%) were operated under combined (spinal and epidural) anaesthesia and 12 patients (40%) were operated under spinal anaesthesia.

Among males, 45mm prosthesis was used more commonly (12 patients), accounting to 60%. Among females, 41mm prosthesis was used more commonly (4 patients), accounting to 40%.

Bone cement was used in five patients (16.67%) as the bone was osteoporotic. There was difficulty in reduction in one patient (3.33%).

Three patients (10%) had limb lengthening of 1cm.

Two patients (6.67%) had superficial infection which was treated conservatively.

One patient (3.33%) developed deep vein thrombosis which was treated with subcutaneous heparin.

Harris hip score was used to evaluate the functional results. Using this rating scale , based on range of motion**, s**hortening (cm), pain, walking ability, stair climbing and return to work, the functional outcome was measured. There were

10 patients (33.33%) with excellent results,

15 patients (50%) with good results,

Three patients (10%) with fair results and

Two patients (6.67%) with poor outcome.

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ANNEXURE I

INFORMED CONSENT

TITLE OF THE STUDY: "A PROSPECTIVE STUDY OF BIPOLAR HEMIARTHROPLASTY, IN THE MANAGEMENT OF INTRACAPSULAR FRACTURE NECK FEMUR IN ELDERLY".

PRINCIPAL INVESTIGATOR: Dr. ADARSH SUNDAR

INTRODUCTION AND PURPOSE:

BIPOLAR HEMIARTHROPLASTY is the preferred operative technique all over the globe, for the treatment of Intracapsular fracture neck femur in elderly owning to its good range of movements, early mobilisation and the stability which it provides the subject following surgery.

The main purpose of the current study is to, assess the functional outcome and physical quality of life of these patients with femoral neck fractures treated with BIPOLAR PROSTHESIS, with regard to functional mobility, stability and the range of movements using HARRIS HIP SCORE .

PROCEDURE

Once the patient consents to be in this study, the relevant data is collected as per the proforma, and the final diagnosis is confirmed after correlating both clinical and radiological evidences. The subject is then posted for the proposed surgery after obtaining the fitness for surgery. Following this the patient is operated wherein the fractured femoral neck along with the head is removed which will be

replaced by the BIPOLAR PROSTHESIS of the correct head size taking all aseptic precaution. From day 3 partial weight bearing advised using a walker. Subject discharged on day 10 with a cane in the opposite hand and advised to continue exercises to strengthen muscles around the hip. Follow up of the patient carried out at 6weeks, 3 months and 6 months.

BENEFITS

1.Early mobilisation

2.Avoids all decubitus problems.

RISKS

1. Pertrochanteric fractures during insertion of prosthesis.
2. Dislocations
3. Infection.
4. Heterotrophic ossification.
5. Loosening of the stem due to wide medullary canal.

ALTERNATIVES:

1. CEMENTED BIPOLAR PROSTHESIS - in cases with wide medullary canal/ osteoporotic bones.
2. VOLUNTARY PARTICIPATION/WITHDRAWAL:

Taking part in this study is voluntary. I may choose not to take part in this study, or if I decide to take part I can later change my mind and withdraw from the study. My decision will not change the present or future health care or other services that I receive. The study doctor or the sponsor may stop my participation in this study. I will tell of any important new findings that may change my willingness to continue to take part. If I choose not to take part in the study I will receive the standard treatment for patients with my condition.

COSTS:. Each prosthesis will cost around Rs 4000/- to 5000/-

COMPENSATION: As the subject voluntarily consents to be a part of the study, no compensation will be given.

CONFIDENTIALITY:

All information collected about the subject during the course of the study will be kept confidential to the extent permitted by the law. The code numbers will identify the subject in this research record. Information from this study may be published but the subjects identity will be confidential in any publication.

QUESTION:

If any enquiries in the future or in case of study related injury or illness, you may contact following person.

DR.KIRAN S PATIL,
Professor and Guide,
Department of Orthopaedics,
J.N. Medical College,
Belgaum.
Ph No. 0831-2473777.
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DR. ADARSH SUNDAR
Post-Graduate,
Department of Orthopaedics,
J.N. Medical College,
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Ext. 1779.

CONSENT TO PARTICIPATE IN RESEARCH STUDY:

I voluntarily agree to take part in this study by signing below. I may withdraw at any time. I am not giving up any of my legal rights by signing this form. My signature below indicated that I have read this entire consent form or it has been read to me, and had all my questions answered. I will be given a copy of this consent form.

Signature of the Participant or legally authorized representative.

Participant's Name : …….

Signature :…….

Name of the legally authorized representative: …….

Signature : …….

Witness's Name : …….

Signature : …….

Investigators name and Signature : …….

Date and Place : …….

ANNEXURE II

PROFORMA

"A PROSPECTIVE STUDY OF BIPOLAR HEMIARTHROPLASTY, IN THE MANAGEMENT OF INTRACAPSULAR FRACTURE NECK FEMUR IN ELDERLY".

Sl. No:	IP No:
Name:	Age:
Sex:	Occupation:
Address:	DOA:

Complaints:

Nature of trauma:

1. RTA 2. Sports injuries

3. Fall from height 4. Assault

Mechanism of injury:

1. Direct 2. Indirect

Duration since injury:

1. < 1 Week 2. > 1 Week

Significant past history:

a. History of diabetes, hypertension, asthma, epilepsy: Yes / No

b. Previous history of fractures Yes / No

General physical examination:

a) Pulse Rate: b) Blood Pressure:

c) Respiratory Rate:

Pallor: Yes / No

Cyanosis Yes / No

Icterus Yes / No

Clubbing Yes / No

Pedal edema Yes / No

Lymphadenopathy Yes / No

Respiratory system examination:

Cardio vascular system examination:

Per abdominal examination:

Central nervous system examination:

Presence of any associated injury: Yes / No

If yes specify:

Local examination:

Flexion

Extension

Abduction

Adduction

Internal rotation

External rotation

Circumduction

Measurements:

A. Length of the limb-normal diseased

   a. Apparent length

   b. Total length (True)

   c. Thigh segment

   d. Leg segment

   e. Girth of the limb

B. Shortening above the greater trochanter

	Normal	Diseased
a. Bryant's triangle		
b. Nelaton's line		
c. Chiene's lines		
d. Shoemaker's line		

C. Tests for instability

   a. Telescopic test

   b. Trendelenburg test

Examination of the spine

Kyphosis

Scoliosis

Lordosis

Examination of the knee

Valgus

Varus

Flexion

Recurvatum

Examination of the ankle

Valgus

Varus

Equinus

Calvaneous

Any associated injuries / fractures

Relevant investigations:

a) x-ray pelvis with both hips –ap view Yes / No

b) x-ray of affected hip- lateral view Yes / No

c) blood: Hb%,Tc ,Dc ,ESR. Yes / No

d) urine: albumin ,sugar, microscopy Yes / No

Diagnosis:

Treatment:

First aid:

a) Immobilisation of the injured limb in skin traction: Yes / No

b) Analgesics: Yes / No

Definitive treatment:

a) Relevant investigations and medical fitness for surgery Yes / No

b) Anaesthesia combined SA+EA/Spinal

c) Approach used - Watson Jones lateral approach

d) Bipolar hemiarthroplasty size

e) Antibiotic therapy-

Pre – operative: Yes / No

Post –operative: Yes / No

e) Post-operative Analgesics Yes / No

Complications:

a. Intraoperative:

- Difficulty in reduction Yes / No
- Excessive bleeding Yes / No
- Wrong placement of implant Yes / No
- Occurance of any fracture of the shaft during reduction Yes / No

b. Postoperative:

a) Immediate:

- Bleeding Yes / No
- Infection Yes / No
- Dislocation Yes / No

b) Delayed:

- Chronic infection Yes / No
- Dislocation Yes / No
- DVT Yes/ No

Follow up:

Date:

Serial no. Of follow up:

Time since surgery:

Clinical union:

- Pain at the hip: Yes / No
- Abnormal mobility: Yes / No
- Transmission of movements Yes / No
- Range of movements at the hip joint:

Right

Left

Any revision surgery required: Yes / No

Remarks:

Any other comments:

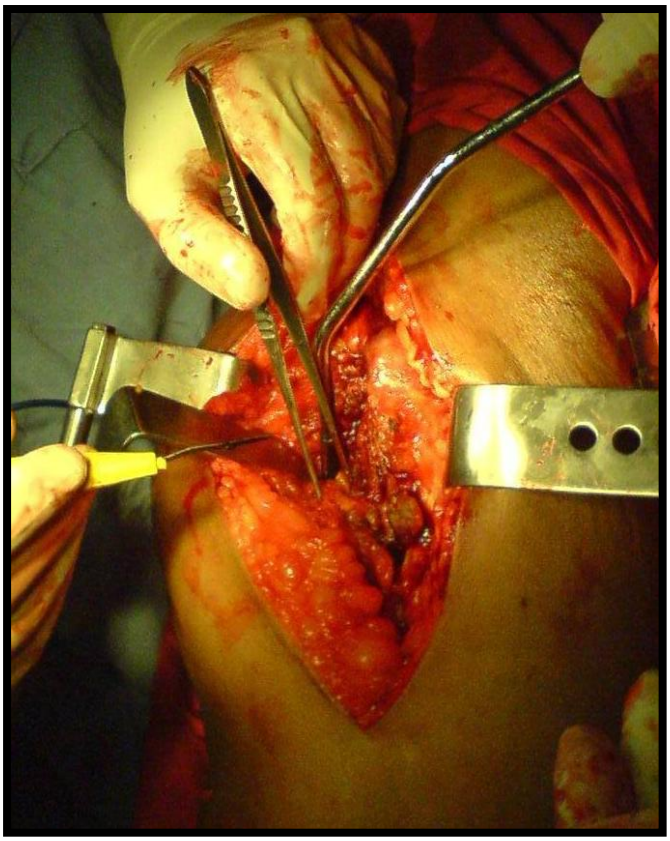
Signature of examiner **Signature of patient** **Signature of Guide**

ANNEXURE III

PHOTOGRAPHS

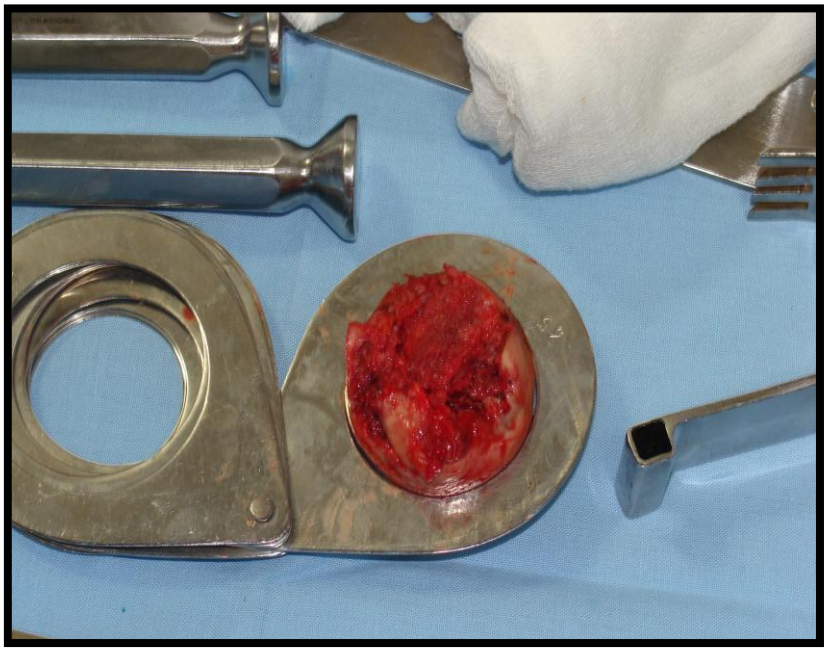
Pre-op X-ray pelvis with both hips AP

Patient Positioning



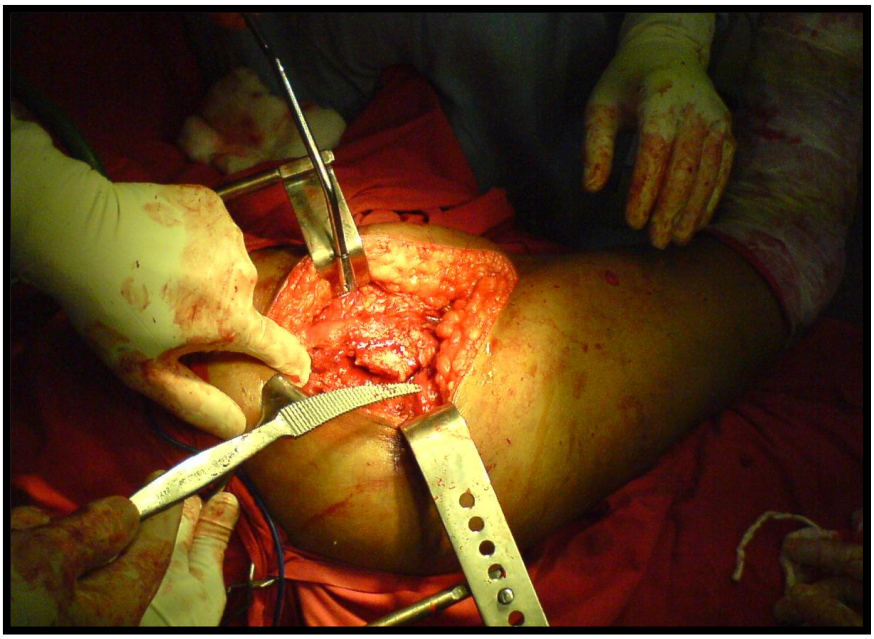
Exposure of the neck

Extraction of the head

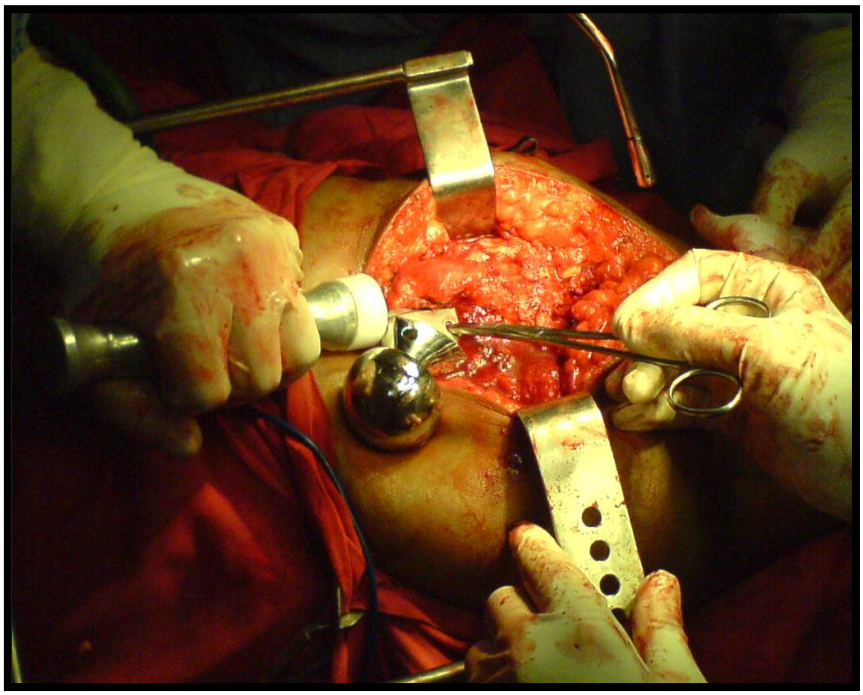


Head sizing

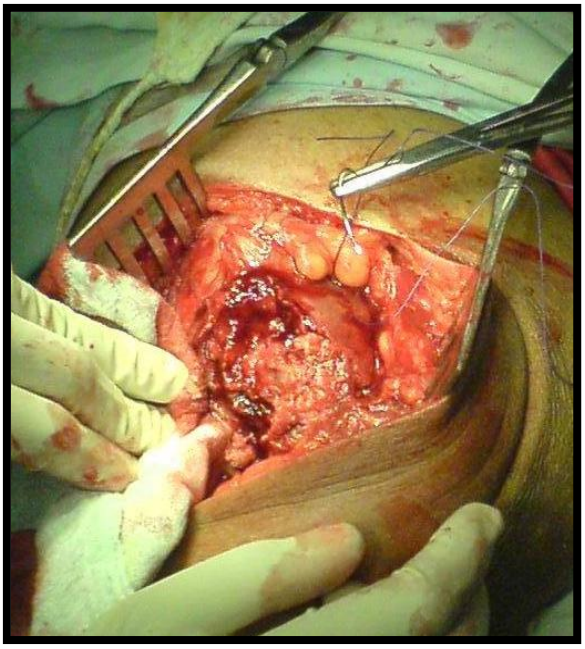
Biopolar prosthesis



Reaming the medullary canal



Seating of the prosthesis



Meticulous soft tissue closure over drain

Meticulous soft tissue closure over drain

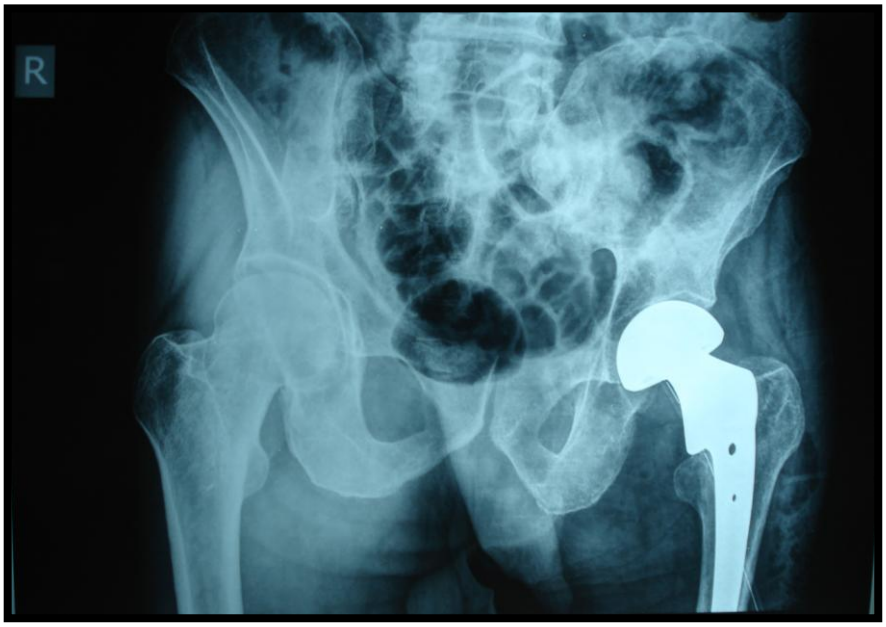
Postoperative X-ray

Post-op day 3 mobilization using walker

Three months follow up with good range of motion

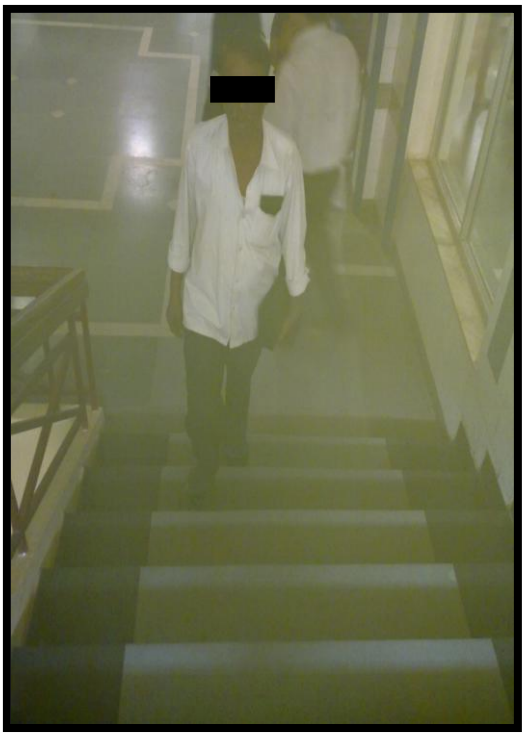
Three months follow up patient climbing stairs

Patient 2: Pre-op X-ray



Patient 2: Post-op X-ray

Patient 2: Post-op Day 10 range of motion



Patient 2: Six months follow up patient climb stairs without assistance

Annexure IV

MASTER CHART

Sl. No.	IP No.	Gender	Age	Occupation	Time since injury (days)	Date of admission	Date of Surgery	Date of discharge	Nature of trauma	Past History	Associated injuries	Garden Classification	Laterality	Implant size (MM)	Anaesthesia	Complications		Functional Results		
																		Harris Hip Score		
																Intra Op	Post Op	6 weeks	3 months	6 months
1	250344	M	89	BS	1	3/12/2007	6/12/2007	19/12/07	Fall from Height	DM,HTN	NAD	IV	R	45	SA+EA	Cement used	Superficial Infection	54.5	64.3	70.3
2	252219	M	56	AGR	0	12/12/2007	14/12/2007	27/12/07	Fall from Bicycle	NAD	NAD	III	R	43	SA	-	-	66.3	71.5	82.5
3	252319	M	56	BS	3	13/12/07	15/12/07	30/12/07	Fall from Bicycle	NAD	NAD	IV	R	45	SA+EA	-	-	67.3	74.5	84.5
4	257206	F	70	HW	2	2/1/2008	4/1/2008	19/01/08	Fall on Slippery floor	HTN	NAD	III	L	41	SA+EA	-	-	61.5	70.5	79.1
5	258096	F	70	HW	3	12/01/08	15/01/08	30/01/08	Fall on Slippery floor	NAD	NAD	IV	R	45	SA+EA	-	-	65.7.1	73.1	80.5
6	260666	M	62	AGR	0	2/2/2008	4/2/2008	15/02/08	Fall on Slippery floor	NAD	NAD	IV	R	47	SA+EA	-	-	62.3	71.5	80.5
7	265471	F	72	HW	2	13/03/08	15/03/08	31/03/08	Fall on Slippery floor	NAD	NAD	IV	L	41	SA	-	-	53.1	58.3	67.3
8	271145	M	58	AGR	1	3/4/2008	2/5/2008	14/05/08	Fall from Bicycle	NAD	NAD	IV	L	45	SA	-	-	61.5	68.5	75.3
9	272986	F	65	HW	21	15/05/08	17/05/08	30/05/08	Fall on Slippery floor	NAD	NAD	III	L	41	SA	-	DVT	67.3	82.5	84.5
10	273726	F	59	HW	3	23/05/08	26/05/08	10/06/08	Fall from Height	HTN	NAD	IV	L	41	SA+EA	-	-	59.3	75.5	82.5
11	276009	M	63	BS	2	8/6/2008	10/6/2008	23/06/08	Fall on Slippery floor	NAD	NAD	IV	R	47	SA+EA	-	-	65.5	78.5	85.5
12	276279	F	68	HW	1	10/6/2008	24/06/08	10/7/2008	Fall from Height	HTN, IHD	NAD	III	L	43	SA		1cm Lenghtening	54.7	86.5	92.5
13	276742	M	93	RT	0	21/6/2008	24/6/2008	07/07/08	Fall from Height	NAD	NAD	IV	R	45	SA+EA	Cement used	-	51.5	65.3	67.1
14	278236	M	65	AGR	6	25/06/08	30/06/08	14/07/08	Fall on Slippery floor	NAD	NAD	III	L	43	SA+EA	-	-	64.3	80.5	86.5
15	278926	M	55	AGR	4	1/7/2008	2/7/2008	14/07/08	Fall from Bicycle	HTN	NAD	IV	R	45	SA		-	67.3	80.5	88.5
16	284925	M	70	RT	1	17/08/08	24/08/08	06/09/08	Fall on Slippery floor	DM,HTN	NAD	IV	R	45	SA	Cement used	Superficial Infection	57.3	83.5	90.5
17	284929	M	59	AGR	2	18/08/08	22/08/08	07/09/08	Fall from Height	NAD	NAD	III	R	45	SA+EA	-	-	67.1	67.3	83.5
18	285336	M	61	BS	0	21/08/08	25/08/08	06/09/08	Fall from Height	NAD	NAD	IV	R	49	SA	-	1cm Lenghtening	67.2	86.5	90.5
19	287017	M	71	RT	2	2/9/2008	6/9/2008	20/09/08	RTA	DM	Colles #	IV	R	51	SA+EA	Cement used		52.5	89.5	90.5
20	287836	F	70	HW	3	9/9/2008	12/9/2008	25/09/08	RTA	NAD	Rib # Rt. 7,8	IV	L	39	SA	difficulty in reduction	-	54.1	92.5	93
21	289915	M	59	BS	1	27/09/08	30/09/08	12/10/08	Fall from Height	HTN	NAD	IV	R	45	SA+EA	-	-	67.3	88.5	94.5
22	292817	F	65	HW	0	8/10/2008	10/10/2008	22/10/08	Fall from Height	NAD	NAD	III	L	43	SA	-	-	67.3	88.5	96.5
23	292934	F	61	HW	1	18/10/08	21/10/08	14/10/08	RTA	NAD	Colles #	IV	L	43	SA	-	-	63.5	90.5	82.5
24	292935	F	65	HW	2	25/10/08	27/10/08	11/11/2008	Fall from Height	NAD	NAD	III	L	39	SA+EA	-	-	56.3	67.3	92.5

Sl. No.	IP No.	Gender	Age	Occupation	Time since injury (days)	Date of admission	Date of Surgery	Date of discharge	Nature of trauma	Past History	Associated injuries	Garden Classification	Laterality	Implant size (MM)	Anaesthesia	Complications		Functional Results Harris Hip Score		
																Intra Op	Post Op	6 weeks	3 months	6 months
25	296156	M	65	AGR	0	14/11/08	16/11/08	30/11/08	Fall on Slippery floor	NAD	NAD	IV	R	49	SA+EA	-	-	67.3	82.5	92.5
26	296201	M	70	RT	0	17/11/08	19/11/08	1/12/2008	Fall on Slippery floor	HTN	NAD	III	L	47	SA+EA	Cement used	-	65.3	88.5	90.5
27	297745	M	69	RT	2	21/11/08	26/11/08	08/12/08	Fall on Slippery floor	NAD	NAD	IV	R	45	SA+EA	-		64.3	82.5	87.1
28	298259	M	71	BS	1	27/11/08	29/11/08	12/12/08	Fall from Height	NAD	NAD	III	R	45	SA	-	2cm Lenghtening	54.5	84.5	89.5
29	298284	M	56	BS	5	28/11/08	2/12/2008	15/12/08	Fall from Height	HTN	NAD	IV	L	45	SA+EA	-	-	64.3	72.3	82.3
30	300180	M	62	AGR	0	16/12/08	17/12/08	29/12/08	Fall on Slippery floor	NAD	NAD	IV	R	45	SA+EA	-	-	64.3	69.5	81.5