MANAGEMENT OF INTRACAPSULAR FRACTURE NECK OF FEMUR BY HEMIARTHROPLASTY WITH AUSTIN MOORE PROSTHESIS IN ELDERLY - A CLINICAL STUDY.

Submitted By

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MS

in

ORTHOPAEDICS

Under the guidance of

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2011

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LIST OF ABBREVATIONS USED

AMP - Austin Moore Prosthesis

CCF - Congestive Cardiac Failure

CVA - Cerebro Vascular Accident

COPD - Chronic Obstructive Pulmonary Disease

CRIF - Closed Reduction and Internal Fixation

CVS - Cardio Vascular System

DM - Diabetes Mellitus

DOA - Date of Admission

DOD - Date of Discharge

DOS - Date of Surgery

ER - External Rotation

FFD - Fixed Flexion Deformity

HDPE - High Density Polyethylene

ORIF - Open Reduction and Internal Fixation

ROM - Range of Movements

RBS - Random Blood Sugar

RTA - Road Traffic Accident

SPNAIL- Smith Peterson Nail

ABSTRACT

Background and objectives

In this clinical study 66 cases of intracapsular fracture neck of femur in elderly patients above the age of 65 years irrespective of sex treated by hemiarthroplasty using Austin Moore's Prosthesis, in the Department of Orthopaedics at Shri B. M. Patil Medical College Hospital And Research Centre, Bijapur were followed up and functional results were analysed with the objectives, to study the age and sex incidence of fracture neck of femur, quality of life after hemiarthroplasty, morbidity and mortality associated with the procedure, and associated complications.

Methods

66 cases of fracture neck of femur in elderly patients above the age of 65 years treated by hemiarthroplasty using Austin Moore Prosthesis in the Department of Orthopaedics at Shri B. M. Patil Medical College Hospital and Research Centre Bijapur, between October 2008 to April 2010.

The cases were followed up for 6 months and the short term functional results were analysed by using modified Harris hip scoring system.

Results

Most of the patients were in the age group of 65 to 89 years with mean average age of 71.7 years. Females were predominant. Majority of the fractures were of Garden Type IV radiologicaly. In 93.9 percent cases the mode of injury was trivial trauma. Among the associated medical conditions hypertension , diabetes mellitus were common. Some of

the complications observed were superficial infection of the wound, and posterior prosthetic dislocation.

There were 30.3% excellent results, 45.5% good results, 21.2% fair results and 3% poor results.

Interpretation and Conclusion

The success of hemiarthroplasty no doubt depends on preoperative planning and proper attention to surgical details to achieve the optimum biomechanical stability.

The poor results (3%) were due to moderate to marked pain in the hip or thigh after hemiarthroplasty. We conclude that hemiarthroplasty for fracture neck of femur is a good option in elderly patients. The mortality and morbidity are not high, operative procedure is simple, complications are less disabling . Early functional results are satisfactory.

Key words : Unipolar - Hemiarthroplasty - Femoral neck fracture – Austin Moore Prosthesis.

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1. INTRODUCTION

Hip fractures are devastating injuries that most commonly affect the elderly and have a tremendous impact on both the health care system and society in general. Despite marked improvements in implant design, surgical technique and patient care, hip fractures consume a potential proportion of our health care resources.[1]

Fracture neck of femur has been recognized since the time of Hippocrates and is a common orthopaedic problem in elderly. Various methods of treatment have been employed since ages. But the problem remains an enigma unsolved till today.[1] The prolonged immobilization in elderly will jeopardize the life span of patient and further complicates the problem. This forces one to totally abandon the complete immobilization to achieve a bony union, or to resort early ambulatory procedures by surgery.

The blood supply to the neck and head of the femur is extensive, intricate and complicated.[2] Healing process mainly depends on the good blood supply. This further handicaps the treatment of these fractures and the healing process is always in doubt. Under such circumstances one has to decide whether the prolonged immobilization has to be employed to achieve the bony union or quick ambulation by hemireplacement arthroplasty, to achieve fair degree of function.

It is a known fact that the hip is a weight bearing joint and has to perform many functions. A successful operation at the hip joint should provide painless, stable hip with wide range of movements. But none of the accepted procedures have been able to achieve this goal fully. The patient also needs to go through in many instances, multiple surgical procedures and a prolonged rehabilitation in order to preserve his original joint.

Hemireplacement arthroplasty by using vitallium or stainless steel as popularly practiced by Austin Moore's produced fairly good results.[3,4,5] This clinical study presents the short term results of prospective randomised trial of hemiarthroplasty for the treatment of displaced femoral neck fractures in the elderly. Outcomes at 6 weeks, 3 months and 6 months were analysed by modified Harris hip scoring system and by radiographs taken during follow up.

2. AIMS AND OBJECTIVES

The aims and objectives of our study are to assess the results of primary hemireplacement arthroplasty of hip for intracapsular fracture neck of femur in the elderly patients by Austin Moore Prosthesis and to study complications of hemireplacement arthroplasty.

3. REVIEW OF LITERATURE

Femoral neck fracture has been recognised since the time of Hippocrates (460-377 BC).[6] The first description of hip fractures was by a French Surgeon Ambroise Pare in 1564.[7] He did not clearly distinguish between a fracture and dislocation of hip. However Sir Astley Cooper gave a clear description of fracture of the neck of femur and other fractures and dislocation about the hip.[7]

In 1822, in his book titled "A treatise on dislocations and fractures of joints" he has clearly delineated the differences between intracapsular and extracapsular fractures. He believed that non-union of intracapsular fractures was due to loss of blood supply to the proximal fragment and most femoral neck fractures would eventually heal with a fibrous union and that such patients would suffer "permanent lameness".[8,9] He also noted that incomplete fractures would unite by ossification. Astley cooper advocated a regimen of bed rest with affected limb extended and supported by pillows until pain subsided, followed by mobilization with crutches and gradual weight bearing. He did post-mortem examination of patients who died after femoral neck fractures and none of the fractures were united by bone (ossific union).

In 1866, Hamilton and Stimson explained the preferential treatment of internal fixation for fracture neck of femur, quoting surgeries performed by John Ray Burton in Philadelphia in 1834.[8] In 1867, Philips introduced a technique for longitudinal and lateral traction to be used in the treatment of femoral neck fractures to eliminate "shortening or other deformity".[8] In 1876, Maxwell reported successful use of this technique. In 1883 Nicholas Senn advocated closed reduction and impaction of fragments which would cause union of fracture.[10] According to Senn "the only cause for nonunion in case of an intracapsular fracture is our inability to maintain co-

aptation and immobilization of the fragments during the time required for the union to take place".

In 1838, internal trabecular pattern of femoral head and neck was described by Ward[11,12,13] Vascular anatomy of head was described by Crock[14] Mechanism of injury was suggested by Kocher[1] He also advocated excision of head as intracapsular fracture would fail to unite. Whitman and Leadbetter methods of closed reduction were important contributions to the conservative management.[15] In 1902, Whitman advocated careful closed reduction under X-ray control followed by hip spica application. This produced a few satisfactory unions, but extremely high morbidity and mortality.

In 1908, Davis reported use of ordinary wood screws for the fixation of femoral neck fractures.[15] Similar screws were used by Dacosta in 1907, Delbet in 1919 and Martin and Knight in 1920.[16]

The use of autogenous bone peg graft as a method of internal fixation was popularized in America by Albee in 1911.[17] But frequently bone peg graft was broken and non-union developed. Hey Groves[17] in 1916 designed a quadriflanged nail to obtain better fixation but it failed because of unsatisfactory material.[17] The first effective method of internal fixation was introduced in 1931 by Smith Peterson and associates.[18] The triflanged nail now bears his name as S.P. Nail. When properly used succeeds in preventing the rotation and with improved alloy constituted in the nail does not produce any tissue reaction. S-P Nail technique was simplified by the introduction of the cannulated nail by Johannson in 1932 and Westcott in 1934[18] This allowed closed reduction and fixing the fracture over a guide pin using S-P nail. A

side plate was added to the triflanged nail by Thornton in 1937. This ultimately led to the development of a solid nail plate by Jewett in 1941. Telescoping nails or screws which allow gradual impaction at the fracture site were introduced by Schumpelick, Jhontzen and Clawson. In 1945, Virgin and MacAusland introduced Dynamic Compression Hip Screw (DHS).[18]

Moore (1934) enlarged upon the multiple pin principle of Martin and starting with three pins gradually increased to five.[19] He continued to emphasize the need for impaction and devised a punch to accomplish this. Knowels (1936) advocated threaded pins placed as far apart as possible in the head in an effort to obtain "absolute fixation".[20]

Several Modifications have been used like multiple pins, wires, lag screws, cannulated cancellous screws, simple flanged nails, collapsible nails. But none of them so far has been universaly successful under all circumstances.

Inspite of various methods of internal fixation, Brown and Abram[6] (1964) noticed a segmental collapse of femoral head in almost 1/3rd of the displaced transcervical fracture in which there was bony union. The complications occured only where there was a total necrosis of the capital fragment and no appreciable contribution to revascularisation from the arteries of the ligamentum teres.

Different methods used for the treatment of femoral neck fracture depending on the type of fracture and age of the patient are-

a. Osteosynthesis:

A successful osteosynthesis is most satisfactory of all operations of fracture neck of femur whether fresh or old ununited.[1,38] Osteosynthesis closed or open may use either metallic internal fixation or bone grafting or both.

In osteosynthesis, anatomical reduction and rigid internal fixation, with or without grafting is done. This is usually done in younger age group patients with fracture neck of femur.

b. Osteotomy:

To obtain a compression force at fracture site resulting in possible union in ununited fracture of the femoral neck in younger age.[1,38] The following procedures are done:

a) Mc Murray's Osteotomy

b) Dickson's Osteotomy

c) Pauwel's Y-Osteotomy

No matter how carefully these are nailed and stabilized, the procedure has got a failure rate of about 33%. Among 2/3 of cases that healed, there is a possibility, particularly in old people, of late complications such as avascular necrosis and degenerative changes in the form of osteoarthritis, which results in painful hip.

c. Hemiarthroplasty of Hip:

It is dissatisfaction of many surgeons with the above methods of treatment particularly in older people that lead to trail of hip prosthesis as a final procedure in reestablishing a painless, functional and stable hip, thereby escaping the uncertainty of bony union and late onset of osteoarthritis. The rationale of this procedure is based on the observation that the hip functions fairly satisfactorily, following salvage procedure in which an endoprosthesis has been used for various pathological conditions.

3.1 Evolution of Prosthetic Replacement

To create a new joint by interposing a durable substance between the bone ends is an old idea (Aufranc).[21] Many different materials have been used like ivory, silver, gold, tin, steel, synthetic materials like plastic, acrylic H.D.P.E etc.,

Hey Groove's[17] replaced a femoral head with ivory in 1923 and four years later reported that patient lead an active life.

Starting with Glass (Smith Peterson 1925) did work in mould arthroplasty**.** The mould went through several stages in evolution both in shape and material used. Vitallium became the final choice through a trial and error process.[3] Nevertheless it can be regarded as the ideal material with the surface resistance and low friction approaching that of articular cartilage. Smith Peterson in 1938 used the first vitallium mould arthroplasty in the hip in case of bony ankylosis as a result of rheumatoid arthritis.[3]

The Judet brothers introduced acrylic femoral head for the treatment of osteoarthritis in 1954.[24,25] Further more in short stem prosthesis, great stress was put upon the bone, within which it comes in contact. This lead to loosening but failures did not always result. The marvellous initial results following its insertion were not maintained which lead to prosthesis being abandoned.

In 1948, Mcbride overcome some problems of Judet prosthesis by introducing threaded stem which was screwed into femoral neck and locked by means of cross screws.[26,42] He thought that femoral head should not be spherical as this caused pressure to be transmitted to the region of acetabular fossa.

In 1950 Moore[3,31] introduced a self locking cobalt chrome alloy prosthesis, later models have slot in the stem to allow cancellous bone to penetrate and so anchor

the device. Hey – Wood – Waddington (1966)[27] reviewing the use of prosthesis for advanced osteoarthritis, reported that results are similar to those after the use of a cup.

In 1953, Haboush of New York suggested the use of fast setting methyl methacrylate dental cement as a means of fixing the prosthesis firmly to the femoral shaft. In 1954, Thompson[28] advocated primary replacement arthroplasty of the hip for fracture neck of femur because of simplicity of the operation and rapid recovery of the function without necessity for elaborate rehabilitation measures.

Innumerable reports similar to upper femoral prosthesis have appeared since then including those of McKeever[29] (1961) who used stainless steel, Movin (1957) whose prosthesis has a long stem, Kevethe (1957) who used titanium stem, Fitzgerald (1952) used all purpose stainless steel head and neck prosthesis and Lippmani's Crane type (1957). Christiansen described trunnion type of bipolar prosthesis which allowed axial movements between head and neck of prosthesis (flexion and extension) and other movements between prosthesis and acetabulum.[30]

The erosion of bone on the pelvic side (acetabulum) brought attention to resurface the acetabulum. Metal-on-metal total hip arthroplasty described by McKee Farrar[32] (1966) did not prove satisfactory because of friction and metal wear. The credit of modern total hip replacement should go to Sir John Charnley[32,33] (1967). His pioneer work on low friction arthroplasty using high molecular weight polyethylene cup and metallic femoral components revolutionised the management of hip problems.[34,41,42]

The Bipolar prosthesis was first introduced by James. E. Bateman and Giliberty[35] in 1974. The commonly known versions of bipolar prosthesis are

Monkduo pleet, Monk (1976), Hastings Bipolar prosthesis[36,37], Modular Bipolar prosthesis (Biotechnic france) and Talwalkar's Bipolar endoprosthesis[45] (Inor, India).

3.2 Anatomy of Hip Joint

The hip joint is a multi axial ball and socket joint [Spheroidal joint]. The femoral head articulates with the cup shaped acetabulum.[46] The articular surfaces are reciprocally curved and are neither co-existent nor completely congruent. The surfaces are considered spheroid or ovoid rather than spherical.

The femoral head is covered by articular cartilage except for a rough pit for the ligament of the head (ligamentum teres). In front, the cartilage extends laterally over a small area on the adjoining neck. The cartilage is thickest centrally. Maximum thickness is in the acetabulum's anterosuperior quadrant and the anterolateral part of the femoral head.

The acetabular articular surface is an incomplete ring, the lunate surface, broadest above where the pressure of the body weight fall in erect posture. It is deficient below, opposite to the acetabular notch. The acetabular fossa within it is devoid of cartilage, but contains fibroelastic fat largely covered by synovial membrane.

3.2.1 Acetabular labrum:

It is a fibroacartilagenous rim attached to the acetabular margin, deepening the cup. It is triangular in cross section and its base is attached to the acetabular rim with the apex as the free margin. It bridges the acetabular notch as the transverse acetabular ligament, under which vessels and nerves enter the joint.

3.2.2 Fibrous capsule:

It is strong and dense attached above to the acetabular margin 5-6mm beyond the labrum, in front to the outer and lateral aspect and near the acetabular notch to the

transverse acetabular ligament and the adjacent rim of the obturator fossa. Behind, it is attached about 1 cm above the inter-trochanteric crest. Below it is attached to the femoral neck near the lesser trochanter. Anteriorly, many fibres ascend along the femoral neck as longitudinal retinacula containing blood vessels for both the femoral head and neck. The capsule is thicker antero superiorly, where maximal stress occurs, especially in standing. Postero-inferiorly it is thin and loosely attached. The capsule has two layers - inner circular, forming the zona orbicularis around the femoral neck and blending with the pubofemoral and ischiofemoral ligaments, and an outer longitudinal layer. The circular layer is not directly attached to bone.

3.2.3 Synovial membrane:

Starting from the femoral articular surface, it covers the intracapsular part of the femoral neck, then passes to the capsule's inner surface to cover the labrum, ligament of the head and the fat in the acetabular fossa. It is thin on the deep surface of the iliofemoral ligament, where it is compressed against the femoral head. It communicates with the subtendinous iliac (psoas) bursa by a circular aperture between the pubofemoral and the vertical band of the iliofemoral ligament.

3.2.4 Iliofemoral ligament:

It is also known as Bigelow's ligament. Triangular or inverted 'Y shaped. It is one of the strongest ligaments in the body. Its apex is attached between the anteriorinferior iliac spine and the acetabular rim, and its base to the inter trochanteric line anteriorly.

3.2.5 Pubofemoral ligament:

It is triangular with the base attached to the iliopubic eminence, superior pubic ramus, obturator crest and membrane. Distally it blends with the capsule and deep surface of the medial part of iliofemoral ligament.

3.2.6 Ischiofemoral ligament:

It consists of superior ischiofemoral ligaments and the lateral and medial inferior ischiofemoral ligaments, extending from the ischium to the base of the femoral neck on the posterior aspect of the joint.

3.2.7 Ligamentum teres:

It is a triangular flat band with apex attached to the pit on the femoral head and base on either side of the acetabular notch. It varies in length and sometimes being represented only by a synovial sheath.

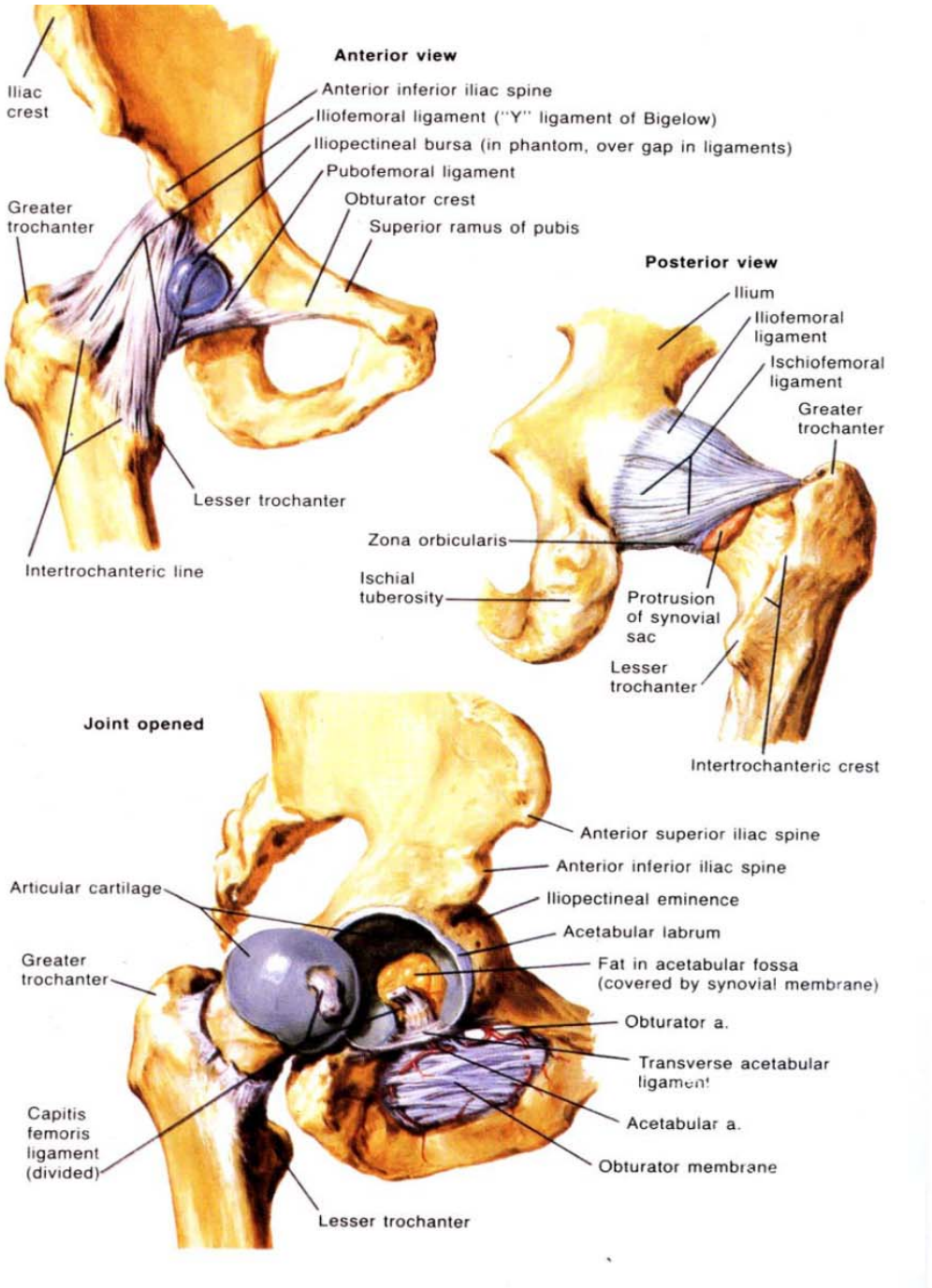
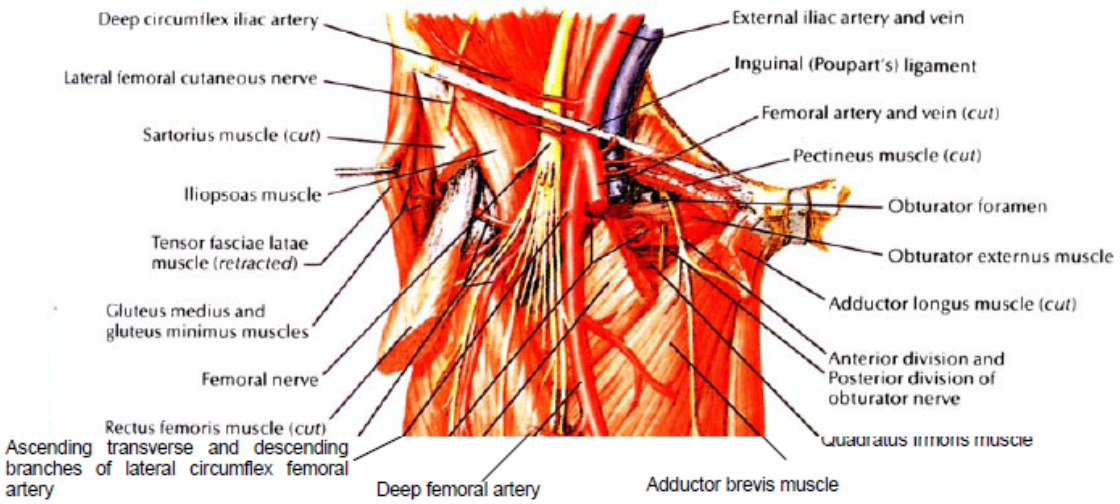


Fig 1: Ligaments of Hip Joint

ANTERIOR VIEW



POSTERIOR VIEW

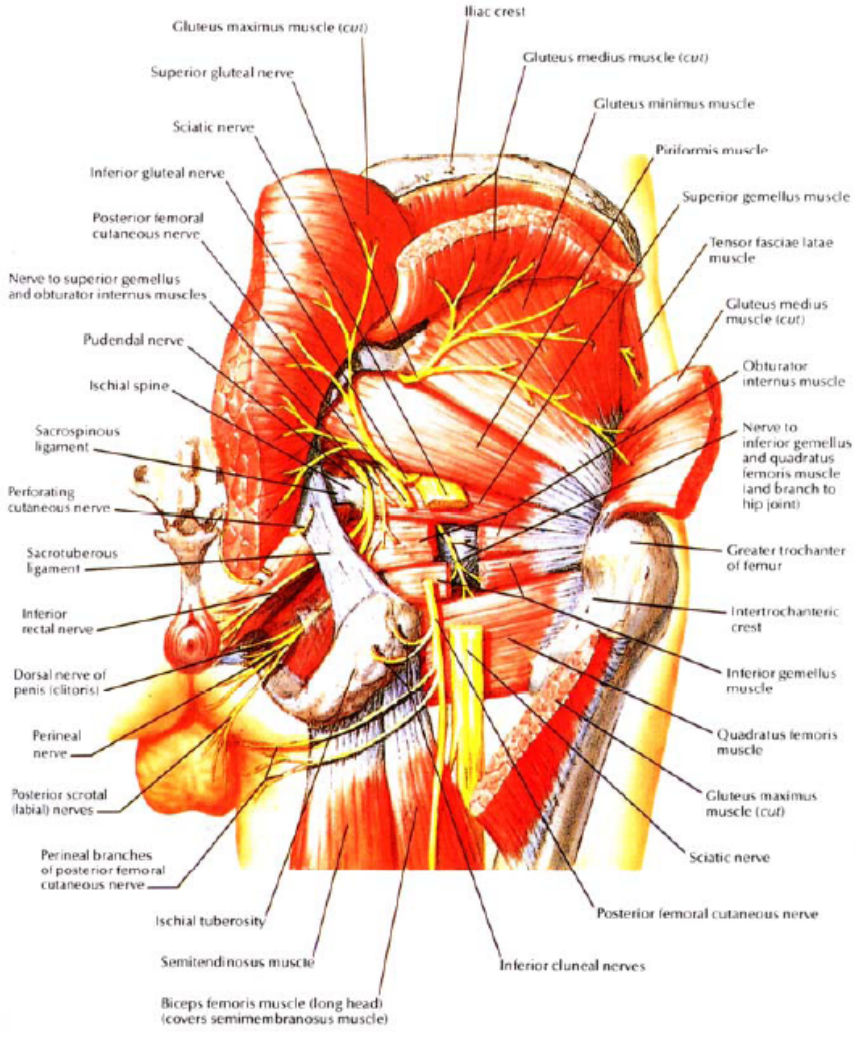


Fig 2: Relations of Hip Joint

3.3 Relations of Hip Joint

Anteriorly: From medial to lateral are:

- Pectineus, which intervenes between the most medial part of the hip and the femoral vein.
- Tendon of psoas major separated from the joint by a bursa and the iliacus muscle lateral to it.
- The femoral nerve is in the groove between iliacus and psoas major with the femoral artery anterior to the psoas tendon.
- The straight head of rectus femoris crosses the joint laterally with a deep layer of the fascial iliotibial tract.

Superiorly: The reflected head of rectus femoris contacts the capsule medially and superolaterally, the capsule blends with the gluteus minimus.

Inferiorly: It is related to the lateral fibres of pectineus and obturator externus tendon.

Posteriorly: It is related to the obturator externus tendon with an ascending branch of medial circumflex femoral artery, which separate the joint from the quadratus femoris. Tendon of obturator internus and the gemelli separate the sciatic nerve from the joint, and the nerve to quadratus femoris lies deep to the obturator internus. It is also related to the piriformis muscle.

3.4 Vascular Supply of Hip Joint: It is supplied by

- Obturator artery
- Medial circumflex femoral artery and
- Superior and inferior gluteal arteries.

3.5 Nerve Supply

Hilton's rule: The nerve that supplies a muscle acting across a joint supplies the joint itself and the skin over the joint . Thus hip joint is supplied by

- Femoral nerve or its muscular branches.
- Obturator nerve.
- Accessory obturator nerve.
- Nerve to Quadratus femoris.
- Superior gluteal nerve.

3.6 Range of Movements

Flexion 90°-100° with knee extended

120° with knee flexed

Extension 10° to 20°

Abduction 30° to 40°

Adduction 30° to 40°

Medial Rotation 30°

Lateral rotation 30° to 40°

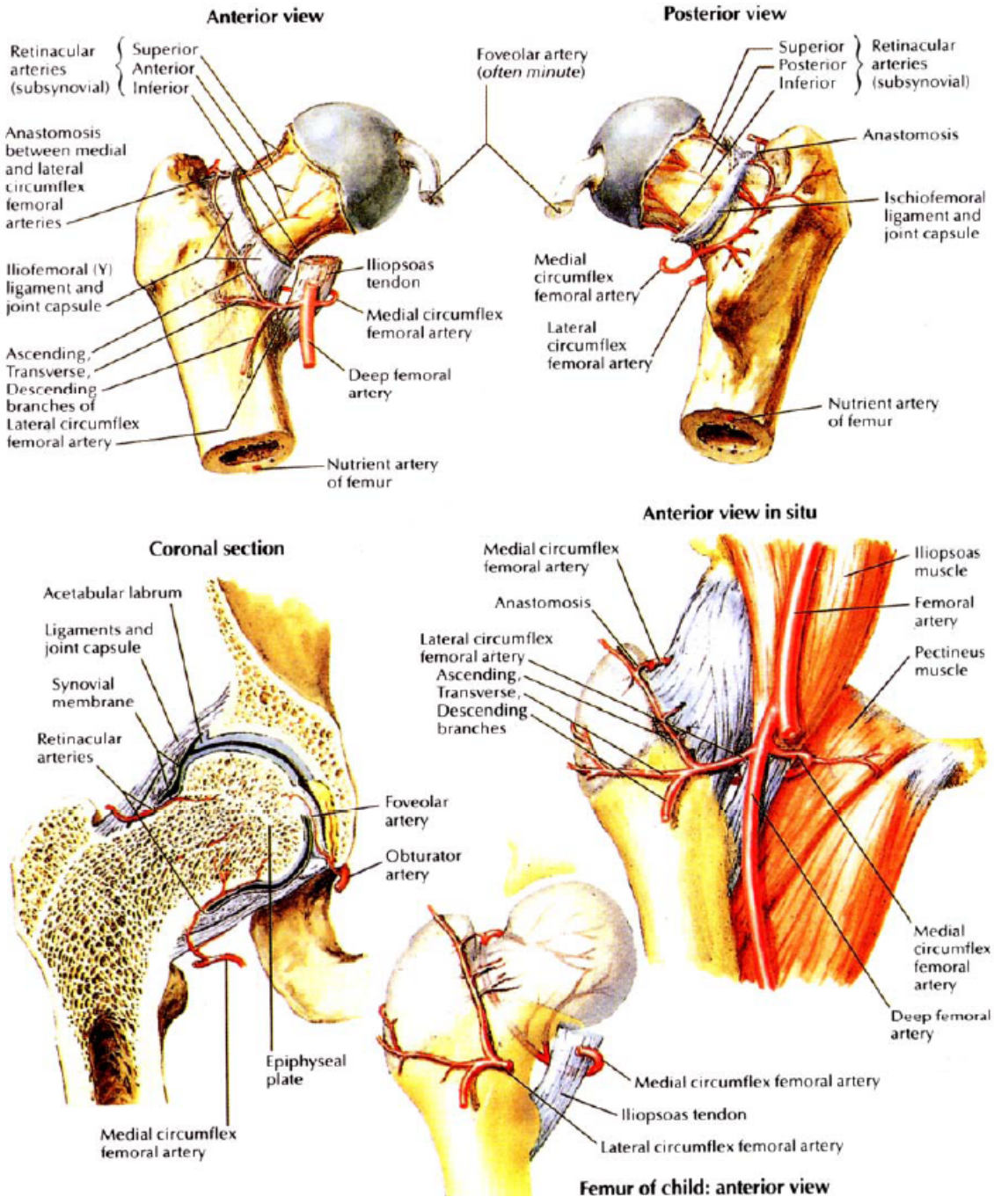


Fig 3 Vascular supply of proximal femur

3.7 KINESIOLOGY OF THE HIP;

Table 1

MOVEMENT	MUSCLES (Prime Movers and Assisted by)	AXIS
Flexion	Psoas major, Iliacus, Pectineus, Rectus femoris, Sartorius, Adductor Longus (in early flexion from full extension)	Along the centre of femoral neck (pure spin)
Extension	Gluteus maximus, Posterior hamstrings	Along the centre of femoral neck (pure spin)
Abduction	Gluteus medius and minimus Tensor fasciae latae, sartorius	Antero-posterior through femoral head
Adduction	Adductors longus, brevis and magnus, Gracilis, Pectineus	Antero-posterior through femoral head
Medial Rotation	Tensor fasciae latae and Anterior fibres of Gluteus, medius and minimus	Vertical axis through centre of femoral head and lateral condyle with foot stationary on the ground
Lateral Rotation	Oburator Externus and Internus, Gemelli, Quadratus femorus, Assisted by Piriformis, Gluteus maximus and Sartorius.	Vertical axis through centre of femoral head and lateral condyle with foot stationary on the ground.
This mechanical axis of the hip is not dynamic relative to the femur. It is stationary during pure spins. It moves relative to its co-articular surface in chordal or arcuate paths during pure or impure wings respectively.		

3.8 Proximal End of The Femur

The Proximal end consists of a head, neck, a greater and a lesser trochanter.

3.8.1 Head: It is slightly more than half a sphere, it faces antero supero medially to articulate with the acetabulum. Its smoothness is interrupted postero inferior to its centre by a small, rough fovea.

3.8.2 Femoral Neck: About 5 cm long, it connects the head to the shaft at an angle of about 127° (113° to 136°).[47] This facilitates movements at the hip joint, enabling the limb to swing clear of the pelvis. The neck is also set up on at an angle of 10^0 to 15^0 anteversion. This twisting and turning presumably represents the developmental response of the femur to the upright position .

The anterior surface of the neck is flat and is marked at the junction with the shaft by a rough intertrochanteric line. The posterior surface is transversely convex and concave in its long axis; its junction with the shaft is marked by the rounded inter trochanteric crest.[11]

3.8.3 Greater Trochanter:

Large and quadrangular, it projects up from the junction of neck and shaft. Its postero superior region projects superomedially to overhang the adjacent posterior surface of the neck, and here its medial surface presents the rough trochanteric fossa. The trochanter's proximal border is level with the center of the femoral head.

3.8.4 Lesser Trochanter:

It is a conical postero medial projection of the shaft at the postero inferior aspect of its junction with the neck.

3.8.5 Internal Structure of the Proximal end:

The apparently fragile but collectively strong lattices of the struts and trusses seen in trabecular bone and skeletal forms such as tubes, H-girders and ridges predate human invention by millennia. Galileo recognized the significance of trabeculation and also asserted that hollow cylinders are weight for weight, stronger than solid rods.

3.8.6 Calcar femorale:

A thin vertical plate, the calcar femorale or as Bigelow (1900) described it as the true neck of the femur.[48] It ascends from the compact wall near the linea aspera into the trabeculae of the neck. Medially it joins the posterior wall of the neck. Laterally it continues into the greater trochanter dispersing into the general trabecular bone. It is thus in a plane anterior to the trochanteric crest and base of the lesser trochanter. The hip prosthesis, rests on the calcar, and its shoulder abuts the calcar femorale and transmits the stress of weight bearing to the shaft via the calcar.

3.8.7 Wolff's Law:

Every change in the form of a bone or of its function is followed by certain definite changes in the internal architecture, which changes in accordance with mechanical loss. In essence, the law states that bony trabeculae are oriented along the line of stress, if the direction of stress changes, the orientation of the trabeculae also changes.

3.8.8 Trabecular Pattern:

The cancellous bone of the upper-end of the femur is composed of two distinct systems of trabeculae.[49] In the frontal section these trabeculae are seen to form two arches. One arising from the medial (or inner) cortex of the shaft of the femur and the other taking origin from the lateral (or outer) cortex. The trabeculae forming these arches are called compressive and tensile trabeculae respectively because they are

disposed along the lines of maximum compression and tension stresses produced in the bone during weight bearing. These trabeculae have been divided into following five groups:

a) Primary compressive group: The upper most compression trabeculae extend from the medial cortex of the shaft to the upper portion of the head of the femur run in a slightly curved radial lines. Some of these are thickest and most closely packed.

b) Secondary compressive group: The rest of the compression trabeculae which arise from the medial cortex of the shaft constitute the secondary compressive group. These arise below the principle compressive group and curve upwards and laterally towards the greater trochanter and the upper portion of the neck. The trabeculae in this group are thin and widely spaced.

c) Primary tensile group: The trabeculae which spring from lateral cortex immediately below the greater trochanter group. These trabeculae are thickest among the tensile group curve upwards and inwards across the neck of the femur to end in the inferior portion of the femoral head.

d) Secondary tensile group: The trabeculae which arise from the lateral cortex below the principal tensile trabeculae . The trabeculae of this group arch upwards and medially across the upper end of the femur and more or less irregularly after crossing the midline.

e) Greater trochanter group: Some slender and poorly defined tensile trabeculae arise from the lateral cortex just below the greater trochanter and sweep upwards to end near its superior surface.

In the neck of femur, the principal compressive, the secondary compressive and primary tensile trabeculae enclose an area containing some thin and loosely arranged trabeculae . This area is called "Ward's Triangle".

The trabeculae of the upper end of the femur can be studied by making roentgenograms of the hip region using an exposure sufficient to delineate the macroscopic details of the internal architecture of bones. The thick trabeculae appear as dense continuous lines while the delicate ones are not visible. Thus the areas like Ward's triangle appear empty while rest of the trabeculae are delineated depending on their density.

3.8.9 Singh's Index:

The 'Singh's Index' [50] is the grading of the trabecular appearance in X-ray. There are six grades as follows:

Grade I: Even principal compressive trabeculae are markedly reduced.

Grade II: Only principal compressive trabeculae are found. Others are more or less completely resorbed.

Grade III: Break in the tensile trabeculae opposite the greater trochanter.

Grade IV: Principal tensile trabeculae are reduced. But still can be traced from the lateral cortex to the upper end of the femur.

Grade V: Principal (Primary) tensile and compressive trabeculae are accentuated. Ward's triangle is prominent. Secondary trabeculae are absent.

Grade VI: All the trabeculae groups are visible. Upper end of the femur is completely cancellous.

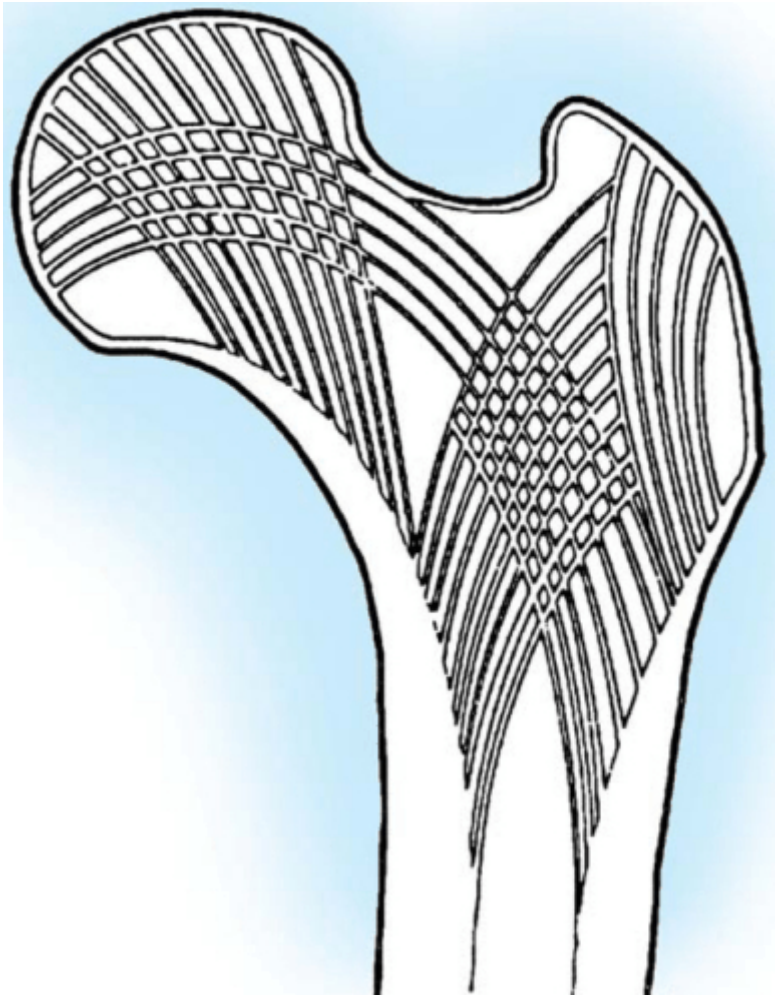


Fig 4. Trabecular System of Proximal Femur

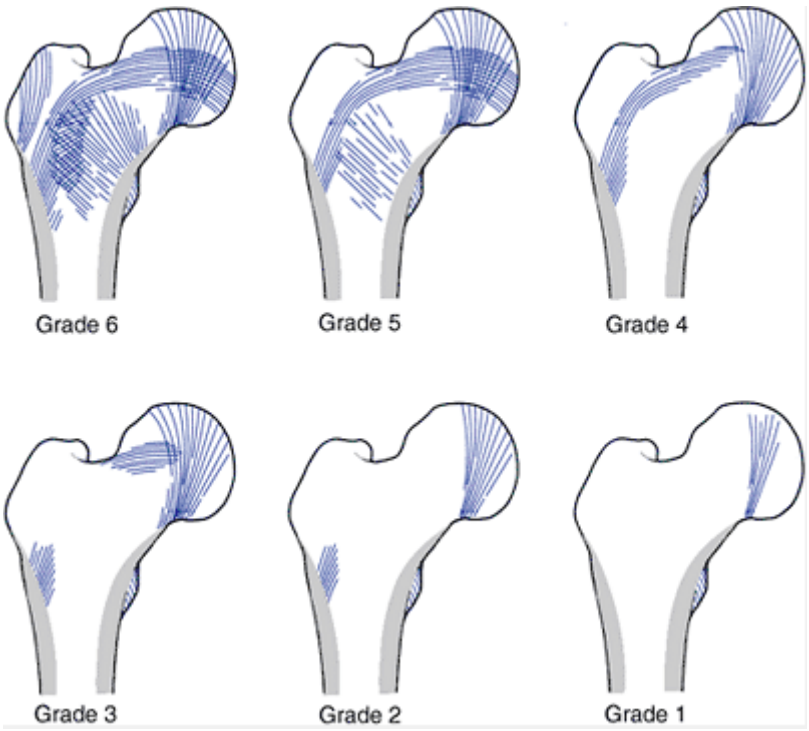


Fig 5. Singh's index for grading of osteopenia

Blood Supply of the Femoral Head:

Crock described the blood supply to the proximal end of the femur, dividing it into three major groups.[2]

a. An extra - capsular arterial ring at the base of the femoral neck.

b. Ascending cervical branches of the arterial ring on the surface of the femoral neck.

c. Arteries of ligamentum teres.

The extra capsular ring is formed posteriorly by a large branch of the medial femoral circumflex artery and anteriorly by a branch from the lateral femoral circumflex artery.[52]

The ascending cervical branches ascend on the surface of the femoral neck in anterior, posterior, medial and lateral groups. Their proximity to the neck surface makes them vulnerable to injury in femoral neck fractures. The posterior group are the most important. Injury to these vessels during surgeries on the hip via the posterior approach increases the risk of avascular necrosis of head of the femur.

As the articular margin of the femoral head is approached by the ascending cervical vessels, a second less distinct ring of vessels is formed, referred to by Chung as the subsynovial intra-articular arterial ring. It is from this ring that vessels penetrate the head and are called the epiphyseal arteries. These are joined by the superior metaphyseal vessels and vessels from the ligamentum teres, which are branches of the obturator and medial circumflex femoral arteries.

Clinical significance of vascular anatomy:

In fracture neck of femur, the intraosseous cervical vessels are disrupted. Femoral head nutrition then is dependent on remaining retinacular vessels and those functioning vessels in the ligamentum teres. The amount of the femoral head supplied by the medial epiphyseal vessels varies from a very small area just beneath the fovea to the entire head.

If the fracture occurs distal to the superior retinacular vessels and the displacement is not too great, both sources of blood supply may remain intact and prognosis is good (less chance of avascular necrosis). Abnormal degree of rotatory movement of the femoral head may destroy its own blood supply as any other form of displacement.

With complete displacement of head, only medial epiphyseal vessels supply the head. In approximately 30% of cases the loss of blood supply is total, the foveolar vessels are insufficient and entire head becomes necrotic.[53] In 70% of cases, the nutrition of the femoral head is partially or wholly preserved by foveolar vessels. When avascular necrosis is partial, it usually involves a large area of the head at the upper outer portion, the region about the fovea remaining viable.[54]

3.9 Applied Biomechanics of hip joint

When the weight of the body above the lower extremities rests equally on two normal hip joints, the static force on each hip is one half of, or less than one third, the total body weight. When, for example, the left lower extremity is lifted as in the swing phase of walking, the weight of the left lower extremity is added to that of the body weight, and the centre of body gravity, normally in the median sagittal plane, is displaced to the left. The abductor muscles exert a counter-balancing force to maintain equilibrium. The pressure exerted on the head of the right femur is the sum of these two forces. Each force is related to the relative length of levers. If the abductor lever is one third that of the lever arm from the head to the centre of gravity, the downward pull of the abductors must be three times the force of gravity to maintain balance. Therefore, the total pressure on the head is four times the superimposed weight. The longer the abductor lever (i.e., the more laterally placed insertion of the abductors), the less the ratio between the levers, the less the abduction force required to maintain balance, and the less the pressure force on the femoral head.[55,56]

The estimated load on the femoral head in the stance phase of gait and during straight leg raising is about 3 times the body weight. Crowninshield, et al.[55,56] calculated peak contact forces across the hip during gait as ranging from 3.5 to 5

times the body weight. When lifting, running or jumping the load may be upto 10 times the body weight.

The forces on the joint act not only in the coronal plane, but as the body's center of gravity (in the mid line anterior to S2 vertebral body) is posterior to the axis of the joint, they also act in the sagittal plane to bend the stem of the prosthesis posteriorly.[57]

During the gait cycle, forces are directed against the prosthetic femoral head from a polar angle between 15 and 25 degrees anterior to the sagittal plane of the prosthesis. During stair climbing and straight leg raising, the resultant force is applied at a point even further anterior on the head. Such forces cause posterior deflection or retroversion of the femoral component.

3.9.1 Co-efficient of Friction:

The low coefficient of friction of a metallic head articulating with a polyethylene cup as a bearing is fundamental to bipolar arthroplasty. The coefficient of friction is the measure of the resistance encountered in moving one object over another.[56] It varies according to the material used, the finish of the surfaces of the materials, the temperature, and whether the device is tested in the dry state or with a specific fluid as a lubricant. Load may be another factor.

3.9.2 Frictional Torque force:

This is produced when the loaded hip moves through an arc of motion. It is the product of the frictional force times the length of the lever arm, that is the distance a given point on surface of the head moves during given arc of motion.[5]

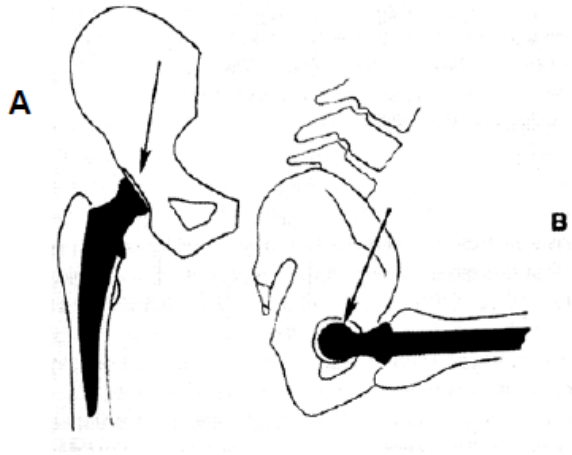


Fig 6

Forces producing torsion of stem. Forces acting on hip in coronal plane (A) tend to deflect stem medially, and forces acting in sagittal plane (B), especially with hip flexed or when lifting, tend to deflect stem posteriorly. Combined they produce a torsion of the stem.

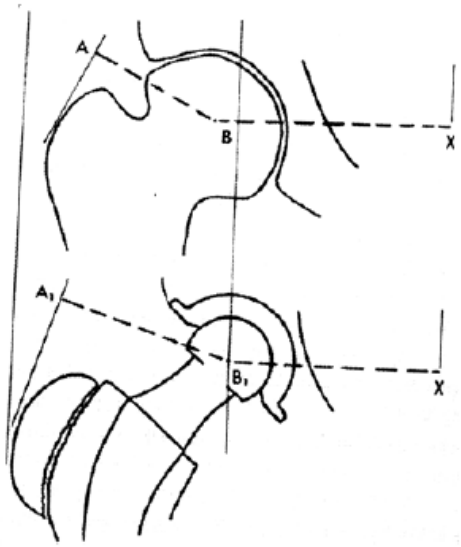


Fig 7

Lever arms acting on hip joint. Moment produced by body weight applied at body's center of gravity, X, acting on lever arm, B-X , must be counterbalanced by moment produced by abductors. A, acting on shorter lever arm, A-B. Lever arm A-B may be shorter than normal in arthritic hip. Centralization of head shortens lever aen B-X, and lateral reattachment of trochanter lengthens lever arm A-B.

Fig 8. An Austin Moore Prosthesis

3.9.3 Neck length and offsets:

The ideal femoral reconstruction reproduces the normal centre of rotation of femoral head, this location is determined by 3 factors.[56]

- Vertical height (Vertical offset) – Restoring this distance is essential to correct leg length. Using a stem with variable neck lengths provides a simple means of adjusting this distance.
- Medial offset (Horizontal offset) – Inadequate restoration of this offset shortens the moment arm of the abductor musculature and results in increased joint reaction force, limp and bony impingement which may results in dislocation.
- Version of the femoral neck (Anterior offset) – Version refers to the orientation of neck in reference to the coronal plane and is denoted as anteversion or retroversion. Retroversion of the femoral version is important in achieving

stability of the prosthetic joint. The normal femur has 10 to 15 degrees of anteversion.

3.10 Fractures of The Femoral Neck

The fracture neck of femur still remain in many ways the unsolved fracture as far as treatment and results are concerned. These have occurred with increasing frequency as longevity has increased.[1]

Femoral neck fractures usually are entirely intracapsular, and common to all intracapsular fractures, the synovial fluid bathing the fracture may interfere with the healing process because the femoral neck has essentially no periosteal layer, all healing must be endosteal. Angiogenic inhibitory factors in synovial fluid also can inhibit fracture repair. These factors, along with the precarious blood supply to the femoral head, make healing unpredictable and non unions fairly frequent.

3.11 Risk Factors

i) **Age :** There is steep rise in the incidence after sixth decade, especially in females. The rate of increase for women is exponential above the age of 60 years. The bodily changes associated with ageing are responsible both for increasing the chances of an individual falling and for weakening the bone to such an extent that even a minor trauma will result in a fracture. Long term physical activity has been shown to reduce the risk of fracture.[1]

ii) **Sex :** A preponderance of female patients is observed in all studies. The relative proportion varies between 1.7:1 (Levine et al., 1970) and 4.5:1 (Parker et al., 1992). Use of supplemental vitamin D3 and calcium has been shown to reduce the risk of hip fracture in elderly women.[1]

iii) **Life style:** Sedentary life style has increased the incidence of hip fractures as evidenced by increased incidence in urban than rural population. According to

Boyce and Vessey physical activity among people between the ages of 15 and 45 years who sustained hip fracture was less than the control group. The most elderly and infirm group of population are often encouraged to become more immobile which increases the risk of falling by exacerbating muscle weakness.

iv) **Race:** Incidence in Negroes is half that among white population. Mexican Americans have risk of one-third of white americans[64] (Bauer et al.). The studies indicate genetic predisposition to fracture neck femur. The highest incidence is seen in caucasian race (Makin and Solomon). All though bone mass has been shown to the greater in black people a lower rate of falling probably more important in the explanation of different relative frequency of fracture hip in black & white.

v) **Season:** A seasonal risk of falling that is higher in summer in Korea and higher in winter in Scandinavia.[64]

vi) **Old fracture:** The risk of second fracture hip is twice the risk of first fracture because of the increased likely hood of falling.[64]

vii) **Geographical variation:** Considerable variation in incidence around the world is related to environmental factors such as climate, diet, life style and degree of industrialisation apart from hereditary factors.

viii) **Nutrition:** Patients who sustain hip fracture have been reported to have reduced skin fold thickness compared with age matched controls and reduced upper arm circumference and low body weight. According to Boston et al. thinner patients are more likely to develop hypothermia in cold weather and this would result in impaired co-ordination and increased tendency to fall.

Another explanation is that bone strength is preserved in those patients with a larger body weight.

ix) Smoking and Alcohol are known risk factors.

x) Medications: Patients with some medications that may affect bone strength sustain a hip fracture. Corticosteroids reduce bone strength on prolonged use. Thyroxine increases bone turnover and causes osteoporosis. Sedatives, tranquillizers, anticonvulsants and antihypertensive drugs are also known risk factors.

xi) Medical conditions : Many medical conditions have been associated with increased risk of falls, bone weakness and hip fracture. Few examples are cardiac arrhythmias, CCF, Parkinsonism, CVA, anemia, malignancy, Paget's disease, etc.

3.12 Aetiology

The intracapsular fracture is due to interplay of three factors.

a) Pre-existing diseases, which may either influence the chances of falling or contribute to bone weakness.

b) The fall itself, and

c) The age of the patient which influences the degree of bone loss and tendency to fall.

d) The aetiology of fracture neck femur is multifactorial. The most common situation is an episode of minor trauma in an ageing patient whose bones have been weakened by a combination of post-menopausal and senile osteoporosis.

The aetiology appears to be related to the risk of falling, protective neuromuscular responses to fall and bone strength apart from genetic factors. The tendency to fall increases with age and is dependent on many factors such as poor

vision, decreased muscle power leading onto sluggish reflexes, vascular diseases and co-existing musculoskeletal pathology.

According to Alffram, 79% of fractures were caused by trivial or no trauma. In the presence of severe osteoporosis or other bone weakness spontaneous fracture may occur[66] (Sloan and Holloway). Hip fractures are rare in road traffic accidents, dislocations being more common.

Normal protective mechanisms to fall such as putting out one's arms is impaired by degenerative changes in elderly leading to reduced pace of neuromuscular transmission.

3.13 Bone Factors

Studies suggest that femoral neck fractures should be considered as fractures through pathological bone secondary to either osteomalacia or osteoporosis.[60,62] Osteoporosis is the single most important aetiological factor in femoral neck fractures. Cummings in a prospective study of over 9,000 females found an association between reduced bone density and increased risk of fracture. Aitkin in 1984 demonstrated that 84% of patients with femoral neck fractures had mild to severe osteoporosis.[65] Patients with hip fractures have bone that is more osteoporotic than age and sex controls as documented by iliac bone biopsy, metacarpal index, Singh's index and lumbar spine radiographs.[63]

Not only does osteoporosis play a role in the aetiology of femoral neck fractures, it also plays an important role in their treatment. Porotic bone leads to marked comminution of posterior cortex and decreased quality of internal fixation secondary to inability of the bone to hold internal fixation devices hence greater incidence of non-union (Arnold et al).[20]

3.14 Other Bone Factors

In addition to osteoporosis and osteomalacia many other factors have been implicated in the aetiology. Ferris et al.[63] (1989) suggested that the site of fracture is related to the length of femoral neck. A shorter femoral neck is associated with extracapsular fracture, whereas a longer femoral neck is associated with intracapsular fracture and osteoarthritis of hip.

Kent et al[62,63] (1983) found large hydroxyapatite crystals at the site of fracture. The inference was that the development of these crystals at the site of greatest shear may predispose to fracture independent of bone density. Dodds et al.[63] (1990) have found depressed enzyme activity in cortical osteoblasts, suggesting that local factors may be important in rendering the femoral neck prone to fracture.

3.15 Mechanism of Injury

a) The type of trauma that is associated with most fracture neck of femur (more than 90%) is a fall from a standing position.[64] The exact relationship between the fall and the fracture is a matter of some debate even today. In his treatise on proximal femoral fractures, Sir Astley Cooper gave clear description of how these injuries can be caused. "The most frequent cause of intracapsular fractures is slipping on the edge of pavement and the force is transmitted perpendicularly with the femoral neck as a lever. The fall is the consequence of the fracture not its true cause". This description of a torsional strain on a loaded femur is quoted by Stebbing (1926). Under the torsional strain the axially loaded femur will always break at its weakest point and where it will be under greatest strain, i.e. that point running almost horizontally to the neck of femur. This description is valid even today.

b) Vehicular trauma or fall from a substantial height is less common. These fractures are thought to be due to axial loading of the thigh while the hip is abducted. Loading from this high energy trauma fractures a femoral neck of normal density.

c) Neuromuscular conditions except for Parkinson's disease are more frequently associated with intertrochanteric fractures than femoral neck fractures.

Kocher suggested two mechanisms. The first is a fall producing a direct blow over the greater trochanter. This mechanism was confirmed by Linton (1949). The second mechanism is lateral rotation of the extremity as described by Cooper. In this mechanism head is fixed by anterior capsule and iliofemoral ligament while neck rotates posteriorly. Posterior cortex impinges on the acetabulm resulting in buckling.

Urovitz et al.[61] (1977) have suggested cyclical loading which produces micro and macro fractures. Forces within physiological limits have been shown to produce fractures in osteoporotic bone. It is suggested that a stress fracture of this type becomes complete following minor torsional injury that precedes the fall that the patient identifies with the fracture.

3.16 Classification

Any system of classification of fractures is useful only if it considers the severity of bony lesion and serves as a basis for determining the type of treatment used, the chance of achieving a stable rigid surgical fixation and the likely outcome of treatment. In intracapsular fracture neck of femur, classification system should aid in prediction of the risks of nonunion and avascular necrosis.

3.16.1 Anatomical classification:

The first anatomical classification of fracture neck of femur was done by Sir Astely Cooper in 1823.[62] He classified them into.

a) Intracapsular and

b) Extracapsular fractures

Intracapsular fracture are again classified as

1) Subcapital fracture : Fracture line immediately beneath the head along the old epiphyseal plate.
2) Transcervical fractures : Fracture line passing across the femoral neck between the femoral head and the greater trochanter.

Before the advent of effective internal fixation, impaction was the most important prognostic factor, whether occurring at the time of injury or being produced subsequently by the attending clinician. Consequently early systems of classification stressed the presence of impaction or displacement of intracapsular fracture. This is best exemplified by Waldenstrom in 1924[68] who classified them into

1. Impacted abduction fracture (valgus)
2. Impacted adduction fracture (varus) and
3. Non-impacted fractures.

3.16.2 Pauwel's classification:

Based on the fracture line and the angle of inclination with horizontal plane Pauwels (1937) classified subcapital fractures into three types.[68]

Type I - Fracture line is less than 30° from the horizontal.

Type II - Fracture line is between 30°-70° from the horizontal

Type III - Fracture line is > 70° to the horizontal

As a 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.

3.16.3 Garden's Classification:

He believed that the various types of femoral neck fractures represent different stages of the same displacing movement. In his classification, the direction of medial or compression trabeculae rising superiorly into the weight bearing dome of the femoral head is used to indicate the degree of rotation of the fracture in the anteroposterior radiograph.[68,69]

Garden Stage 1 = The fracture is incomplete, with the head tilted in posterolateral direction. This is an impacted fracture.

Garden Stage 2 = The fracture is complete, but there is no displacement.

Garden Stage 3 = The fractures are complete and partially displaced.

Garden Stage 4 = Fracture fragments are completely displaced and the trabecule of the femoral head realign themselves with the trabeculae within the acetabulum.

3.16.4 A.O. Classification:

A.O. classification of fracture neck of femur is based on modification of Pauwel's grading with further subdivision into subcapital, transcervical, basicervical and midcervical.[56] In this system the fractures of the femoral neck are classified as

Type B1. Subcapital with no or minimal displacement

Type B2. Transcervical

Type B3. Displaced sub capital fracture.

Each of these types is further identified.

Tvpe B1:

Type B1.1 impacted in valgus of 15 degrees or more.

Type B1.2 impacted in valgus of less than 15 degrees.

Type B1.3 non-impacted

Type B2:

Type B2.1 Basicervical

Type B2.2. Midcervical with adduction

Type B2.3 Midcervical with shear

Type B3:

Type B3.1 moderately displaced in varus and external rotation

Type B3.2 moderately displaced with vertical translation and external rotation

Type B3.3 markedly displaced

Type B3 have the worst prognosis.

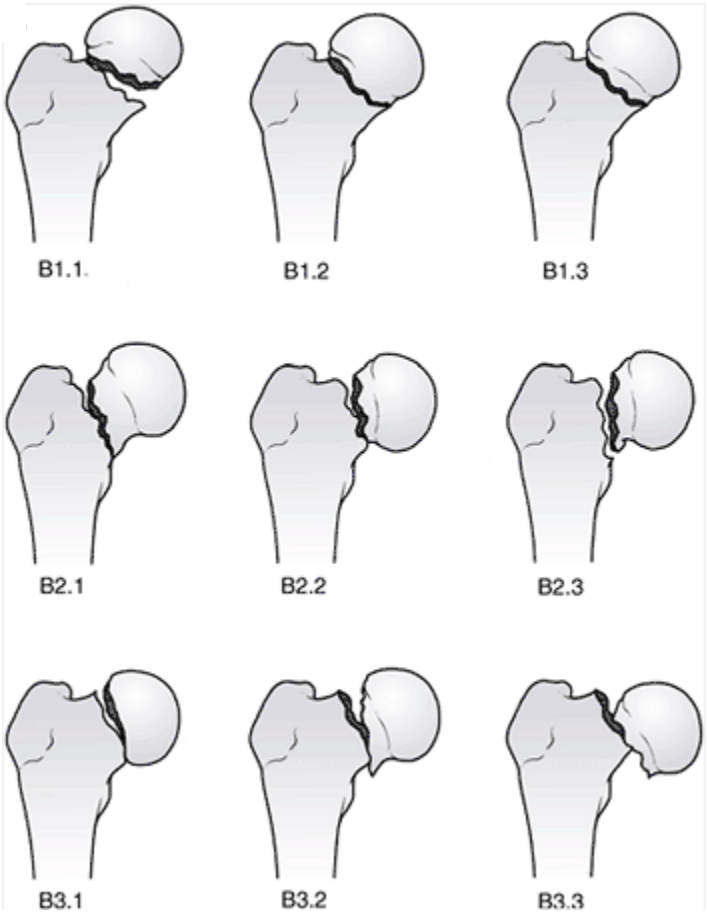


Fig 9. OTA Classification of femur neck fracture.

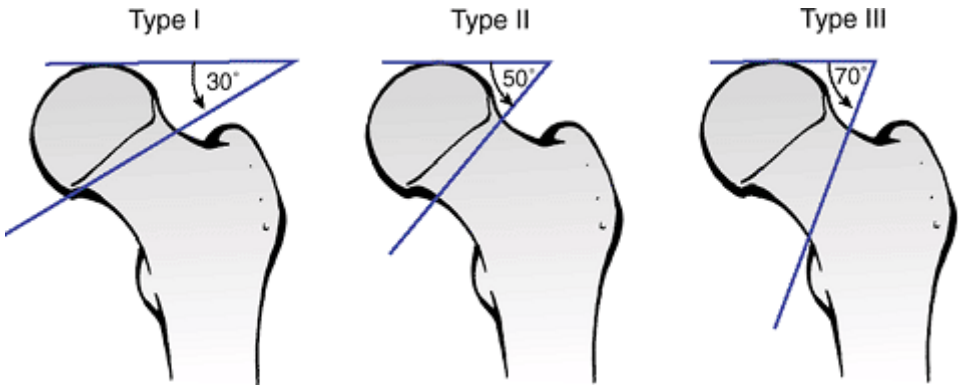


Fig 10. Pauwels classification of femoral neck fractures.

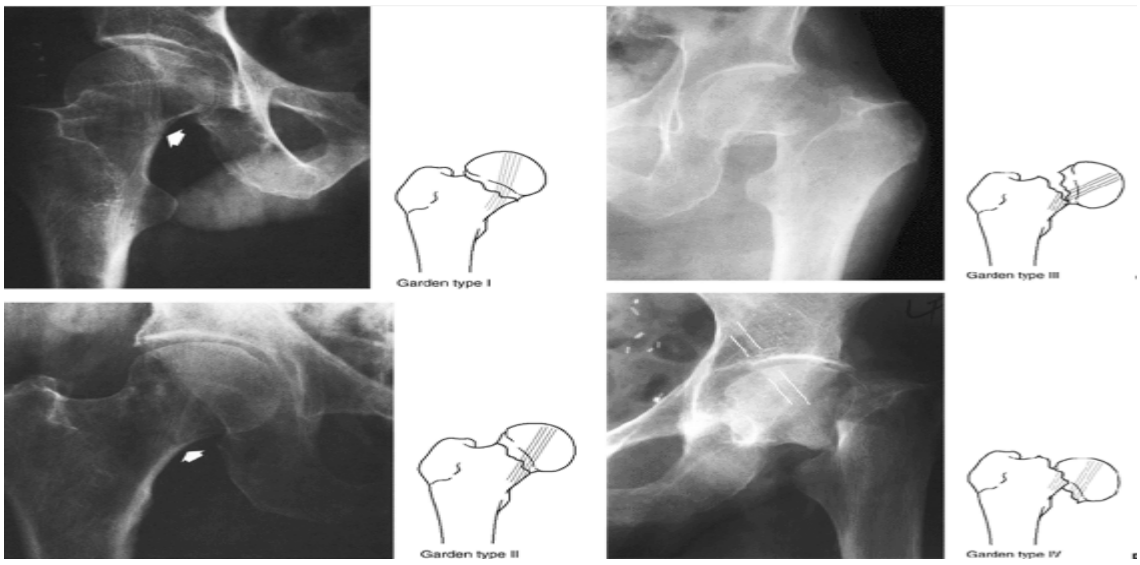


Fig 11. Garden classification of femoral neck fractures.

COMPLICATIONS

Non-union:

Non-union is reported to be true after undisplaced fracture, but occurs in 20-30% of displaced fractures. As age advances the rate of non-union increases sharply. Factors that have been incriminated as causes of non-union are: 1. Vascular anatomy and fracture anatomy 2. Intracapsular nature of fracture 3. Absence of cambium layer of periosteum 4. Poor surgical technique 5. Comminution of posterior cortex due to osteoporosis 6. Age of the patient. 7. difficulty in reduction of fracture and maintaining reduction.

In displaced fracture of neck of femur retinacular vessels are damaged in addition to disruption of intramedullary supply and proximal fragment will be devoid of blood supply. Since the shearing stresses act in fractures with a vertical inclination fractures fails to unite. Phemister emphasized that lack of cambium layer of periosteum in femoral neck makes it vulnerable for non-union. Union has to depend entirely on endocallus and creeping substitution. Synovial fluid bathes the fracture site and hematoma does not form. Also synovial fluid contains angiogenesis inhibiting factor which prevents neovascularisation across the fracture.

Inadequate reduction or poor internal fixation technique was the cause of non-union in a series reported by Fielding et al. Barnes et al, reported increased incidence of non-union in elderly with severe osteoporosis. More than 60% of patients with posterior cortical comminution developed non-union in a series reported by Banks. Posterior cortical comminution associated with varus leads to 100% non-union.

Avascular necrosis:

Aseptic necrosis is one of the two important complications of femoral neck fracture. Aseptic necrosis is the actual death of bone secondary to ischemia, an early

phenomenon after fracture neck femur and is a microscopic event. Late segmental collapse is the collapse of the subchondral bone and articular cartilage that overlies the infracted bone. This collapse results in articular incongruity, pain and degenerative joint disease. The collapse occurs late in the sequence of the ischemic event and is recognised as a clinical entity. Not all patients with aseptic necrosis go for late segmental collapse.

Late segmental fracture can occur as late as 17 years after the fracture. In 80% patients it is evident within two years radiographically. Incidence of late segmental collapse varies from 7% to 27%. It occurs in 10-20% of undisplaced fractures and in 15-35% of displaced fractures. Barnes et al. have reported increased frequency in women than in men.

The tender vascular buds during revascularisation of fracture can be repeatedly torn if there is persistent motion at the fracture site owing to poor stabilisation. Moore demonstrated that in a poor reduction the surface area for blood vessels to grow up the remaining neck is decreased so that the incidence of aseptic necrosis and late segmental collapse is increased when the fracture is poorly reduced.

Smith demostrated that excessive rotation about the longitudinal axis or excessive valgus at the time of reduction may obstruct the remaining blood supply in the ligamentum teres. Fielding and Lowell mention that insertion of a screw for fixation may rotate the femoral head fragment, thereby obstructing the remaining blood supply in the capsule and ligamentum teres. A nail placed superiorly and laterally in the femoral head may disrupt the lateral epiphyseal vessels and therefore increase the risk of AVN. According to Boyd and George all patients with late segmental collapse develop arthritic changes if the patients bear weight long enough.

3.18 Treatment

3.18.1 Treatment of Undisplaced fractures of femoral neck:

Internal fixation with multiple cannulated screws or with a compression hip screw with a small side plate and accessory screws in cases with communition of lateral cortex.[56]

3.18.2 Treatment of displaced Intracapsular fractures of femur

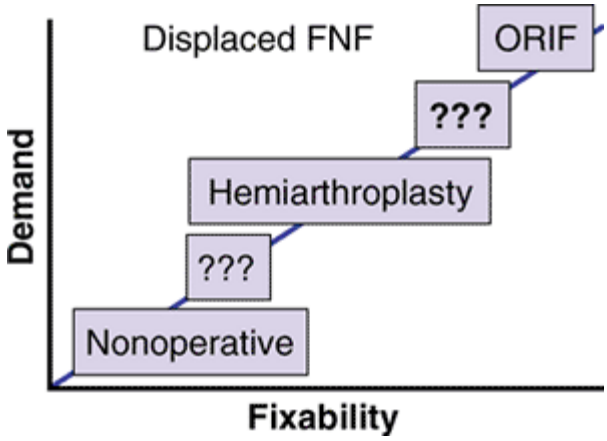


Fig 12. Treatment protocol for management of displaced intracapsular fracture neck of femur

Indications for prosthetic replacement of the femoral head in Intracapsular fractures of femoral neck:[56]

Relative Indications

a) Advanced physiological age: Patient should be 65 years or older with life expectancy of not more than 10 to 15 years.
b) Acutely oblique fracture or Pauwel's type III fractures: These are known for non-union, if head is preserved.
c) Fracture-dislocation of the hip: when the superior weight bearing surfaces is fractured, prosthetic replacement is preferred.

d) Severe osteporosis: where internal fixation results in collapse of the head and loss of position of fixation.

Absolute Indications:

a) A fracture that cannot be satisfactorily reduced or securely nailed.

b) Failed internal fixation several weeks later.

c) Some pre existing lesion in the head - such as avascular necrosis where fracture has precipitated the need for replacement arthroplasty.

d) Old undiagnosed fractures of femoral neck - Untreated, unreduced, unimpacted fracture more than 3 weeks old is better managed with a prosthesis.

e) Pathological fractures of femoral neck with short life expactancy.

f) Fracture neck of the femur with complete dislocation of the head.

g) Patients who are psychotics or mentally ill, who will not cooperate after internal fixation.

h) A patient who probably can not with stand two operations.

i) Malignancy.

j) Neurologic disorders such as patients with uncontrolled epileptic seizures and with uncontrolled Parkinson's disease .

Contra indications:

1) Preexisting sepsis is an absolute contraindication for prosthetic insertion.

2) Active young patient with fracture neck of femur.

3) Garden stage I and II fractures.

4) Nonambulatory senile patients.

3.19 Complications of Hemiarthroplasty

3.19.1 Early Complications:

1) Nerve injuries: The sciatic, femoral, obturator and peroneal nerves can be injured by direct surgical trauma, traction, pressure from retractors, extremity positioning, limb lengthening and thermal or pressure injuries from cement. The incidence of nerve injury has been reported to be 0.7% to 3.5% in primary arthroplasties.[56]
2) Vascular injuries are rare however they can pose a threat to the survival of the limb and the patient.
3) Haemorrhage and Haematoma formation : It is common in case of familial bleeding tendency, recent salicylate use, anti coagulant therapy, liver disease, paget's disease, gaucher's disease and hemophilia. More common with posterior approach.
4) Bladder injuries and urinary tract complications.
5) Limb length discrepancy: Most often the limb that is operated on is lengthened. Lengthening may result from insufficient resection of bone from the neck, use of a prosthesis with a neck that is too long, or from changing the centre of rotation of the acetabulum.

6. Dislocation and Subluxation : Factors contributing are

i) Previous hip surgery ii) Posterior approach

iii) faulty positioning of implant iv) Impingement of the femur on the pelvis

v) Inadequate soft tissue tension vi) Weak abductor muscles .

vii) Extremity positioning in postoperative period

viii) soft tissue interposition.

7) Fractures : Fractures of femur can occur during insertion of implant. Post operative femoral fractures may be due to stress fractures caused by increased use of limb after surgery, stress raisers and trauma.

8) Infection: Risk factors are diabetes, rheumatoid arthritis, sickle cell anaemia, urinary tract infections and prolonged operative time. Infection rate was almost 3 times higher in the posterior approach than the anterior approach .

9) Thromboembolism this is the most serious complication of hemiarthroplasty. Risk factors are previous episode, venous surgery and varicose veins, prior orthopaedic operations, advanced age, malignancy and heart failure.

3.19.2 Late complications:

1) Heterotopic ossification: It is more commonly associated with excessive bone resection and soft tissue dissection.[69]

2) Implant loosening: It is the most serious long term complication

3) Acetabular protrusion: This is assessed by measuring medialisation of acetabular line compare with normal or immediate post operative radiograph.

4) Acetabular erosion : It is determined by measuring the change in the thickness of acetabular cartilage .

5) Painful prosthesis : Salvatti[71,72] (1972) and Coates (1975) feel that the principle late complication of endoprosthetic replacement is pain . Gringras[73] (1980) and Whittaker[74] (1974) report that the hip pain may be present with prosthetic loosening or with distal or proximal migration of the prosthesis.

4. MATERIALS AND METHODS

The present study includes 66 cases of intracapsular fracture neck of femur in elderly patients above the age of 65 years irrespective of sex treated by hemiarthroplasty using Austin Moore's prosthesis in the Department of Orthopaedics at BLDEA shri B M PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTRE between October 2008 to April 2010. The clearance has been obtained from ethical committee.

The study was carried out to evaluate the immediate and early results of hemiarthroplasty for intracapsular fracture of neck of femur in elderly.

Exclusion criteria : 1) Patients less than 65 years of age. 2) Patients unfit for surgery 3) Patients admitted for reoperation. 4) Patients not giving written consent for surgery. 66 cases treated by hemiarthroplasty were followed up for 6 months. At the end of 6 months following surgery the functional results after hemiarthroplasty are analysed .

Once the patient was admitted to the hospital, all the essential information was recorded in the proforma prepared for this study. They were observed regularly during their hospital stay till they get discharged. They were asked to come for follow up regularly to the out patient department. Those who did not come were reminded by post. Five patients who could not come answered the necessary questions through post. The follow up summary was recorded in the follow up chart of the proforma.

Preoperative Management

Patients were admitted to the ward. Detailed history was taken with particular emphasis on mode of injury and associated medical illness. In depth, clinical assessment was carried out in each case.

In all patients preoperatively Buck's traction with appropriate weight was applied, to the fractured lower limb, with the aim of relieving pain preventing

shortening and to reduce unnecessary movements of the injured limb. Oral or parental NSAIDs were given to relieve the pain.

Anteroposterior radiographs of pelvis with both hips were taken for all the patients, keeping the fractured limb in 15^0 internal rotation to bring the neck parallel to X-ray film.

Routine blood investigations, blood grouping and typing, urine routine, RBS, serum urea, creatinine, HbsAg, HIV, chest x-ray, ECG, were done in all cases. Necessary and adequate treatment was given for those associated with medical problems such as anaemia, diabetes, hypertension, IHD, COPD, asthma, etc. were evaluated and treated before taking them to surgery.

Certain therapeutic exercises were taught preoperatively to the patients which had to be continued postoperatively, such as deep breathing exercises, static quadriceps exercises, ankle movements. Patients as well as the attenders were explained about the surgery and its risk factors and written consent for the surgery was taken for all patients. Intravenous antibiotics and tetanus immunisation were given an hour before the surgery. The limb was prepared from nipple to knee including perineum and back.

Surgical Procedure

All surgeries were performed on an elective basis using standard aseptic precautions under spinal anaesthesia.

4.2.1 Position of the patient:

Lateral position with the patient lying on the unaffected side. The skin over the hip was scrubbed with povidone-iodine. The lower extremity from the groin to the toes was drapped in sterile towels separately to enable easy manipulation of the limb during surgery.

4.2.2 Approach: For all patients posterior approach(Moore's Approach) was used in our series .

Moore's Approach (Southern exposure)

From a point 10 cm distal to posterior superior iliac spine and extended distally and laterally parallel to the fibres of gluteus maximus to the posterior margin of the greater trochanter and then directed about 10 cm parallel to the femoral shaft. Deep fascia was exposed and divided in the line with the skin incision as also was the fascia over gluteus maximus, which was then split in the direction of its fibres using blunt dissection. By retracting the proximal fibres of the muscle proximally, the greater trochanter was exposed. Distal fibres are retracted distally and partly divided at their insertion into the linea-aspera in line with the distal part of the incision. The sciatic nerve was usually not exposed. It is protected with finger in the medial part of the wound and was gently retracted out of the way. The gemelli, obturator internus and the piriformis tendon were divided at their insertions after tagging them for easier identification and reattachment.

The posterior part of the capsule thus exposed was incised from distal to proximal along the line of neck of femur and at right angle to it, thus making a T shaped opening in the capsule.

The fractured head and neck of the femur was levered out of the acetabulum and size measured using femoral head guage. The size was confirmed using a trial prosthesis by its suction fit in the acetabulum. The acetabulum was prepared by excising remaining ligamenturn teres and soft tissue. The femoral shaft was rasped using a broach (rasp) and prepared for the insertion of the prosthesis. Femoral neck if long was nibbled keeping 2 to 2.5 cms of calcar above the lesser trochanter.

The prosthesis was then inserted into the femoral shaft in about 5^0-10^0 of anteversion and impacted into the femur. The reduction of the prosthesis was then done using gentle traction of the thigh. In case of cemented procedure, the stem was cemented in place using standard cementing techniques - lavage, cleaning, drying and plugging of the canal. Absolute haemostasis was obtained. After suturing the capsule the external rotators were sutured, the wound was closed in layers over a sanction drain, which was removed at the first change of dressing after 48 hours.

4.3 Postoperative Management

In case of spinal anaesthesia, foot end elevation was given depending on the patients postoperative blood pressure. Every half an hour blood pressure, pulse rate, temperature, and respiratory rate were monitored for the first 24 hours.

Whenever necessary, postoperative blood transfusion was given. Intramuscular analgesics were given as per patients compliance, intravenous antibiotics were continued for 5 days.

Buck's skin traction was continued for 24 hours with both the lower limbs kept in abducted position, with a pillow in between both the legs. Drain removal was done after 48 hours. Check radiograph was taken after 48 hours. Patients were made to sit up on the second day, standup with support (walker), on the third day, and were allowed to full weight bear and walk with the help of a walker on the fourth postoperative day depending on his/her pain tolerance and were encouraged to walk thereafter. Sitting cross-legged and squatting were not allowed.

Suture removal was done on the ninth or eleventh postoperative day. The patients were assessed for any shortening or deformities if any and discharged from the hospital. Patients who had infection and bedsores were treated accordingly before discharging them from the hospital.

Patients were followed up at an interval of 6 weeks, 3 months, and 6 months and functional outcome was analysed by modified harris hip scoring system. At each follow up radiograph of the hip was taken for radiological analysis.

4.4 Follow Up

At the time of discharge the patients were asked to come for follow up after 6 weeks and for further follow up at 3 months and 6 months. Some patients were reminded by post. The patients who turned for follow up or whose details could be collected were finally taken up for the assessment of functional results.

At follow up, detailed clinical examination was done systematically. Patients were evaluated according to Harris hip scoring system for pain, limp, the use of support, walking distance, ability to climb stairs, ability to put on shoes and socks (in our study for some patients ability to cut toenail was enquired) sitting on chair, ability to enter public transportation, deformities, leg length discrepancy and movements. All the details were recorded in the follow up chart. The radiograph of the operated hip was taken at regular intervals, at each follow up.

Harris hip scoring system

Total functional outcome was graded as following depending on the total Harris hip score[83]

Poor : Harris hip score less than 70.

Fair : Harris hip score between 71-80.

Good : Harris hip score between 81-90

Excellent : Harris hip score between 91-100

OBSERVATIONS AND RESULTS

In our study, 66 cases of intracapsular fracture neck of femur were treated with hemiarthroplasty with Austin Moore prosthesis between October 2008 and April 2010.

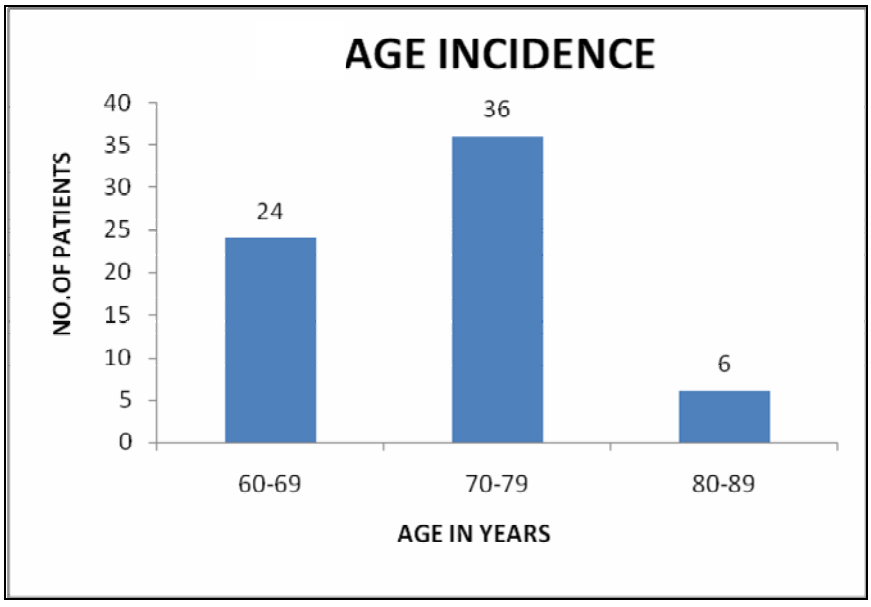
1. AGE INCIDENCE

The average age of the patient in our series was 71.7 yrs with a range of 65 - 89 yrs

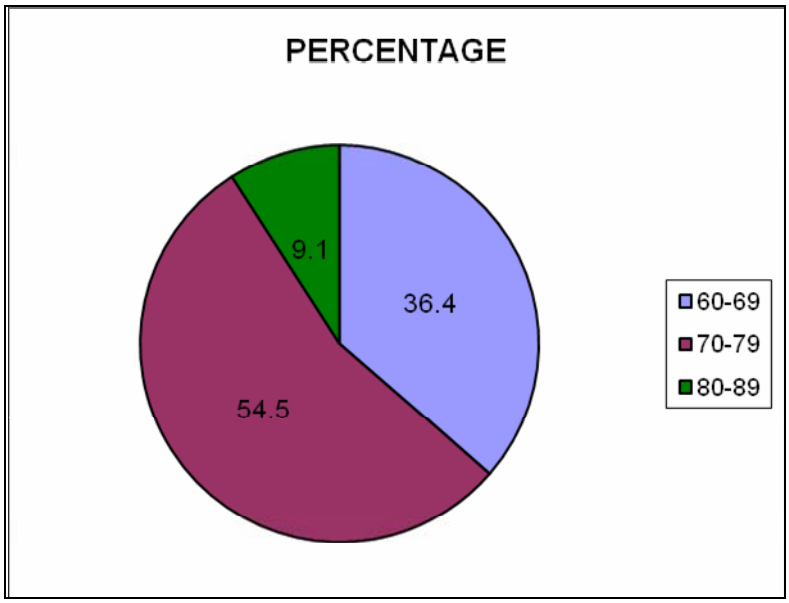
TABLE 2: AGE INCIDENCE

AGE (in years)	NO.OF PATIENTS	PERCENTAGE
60-69	24	36.4
70-79	36	54.5
80-89	6	9.1

GRAPH – 1 A



GRAPH – 1 B



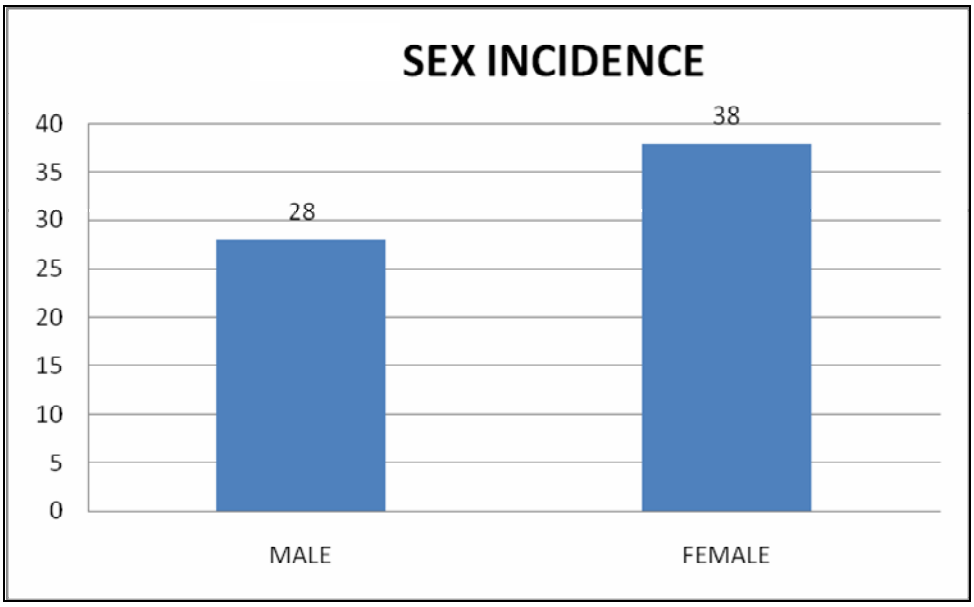
2. SEX INCIDENCE

There were 28 males and 38 females

TABLE-3 : SEX INCIDENCE

SEX	**NO.OF PATEINTS**	**PERCENTAGE**
MALE	28	42.4
FEMALE	38	57.6
TOTAL	**66**	**100**

GRAPH – 2 A



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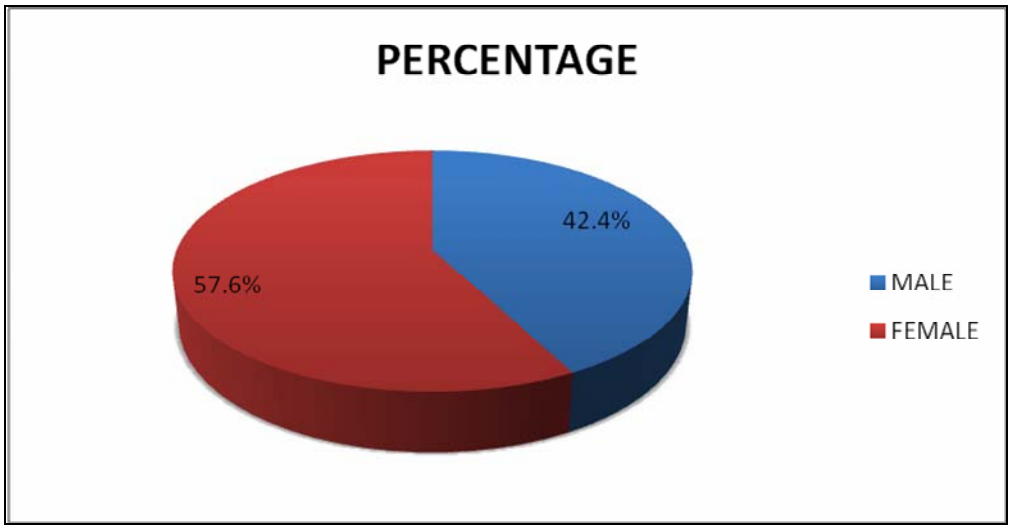


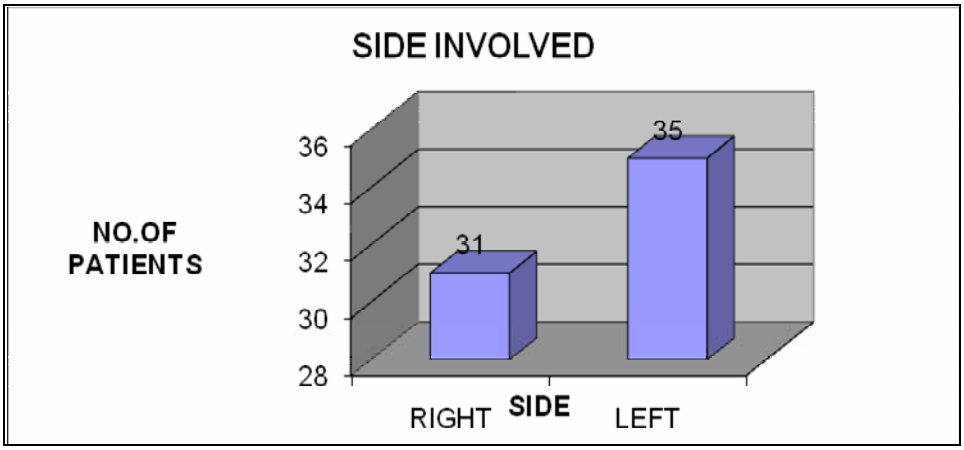
3. SIDE INVOLVED

31cases had fracture of right side while 35 cases had fracture on the left side.

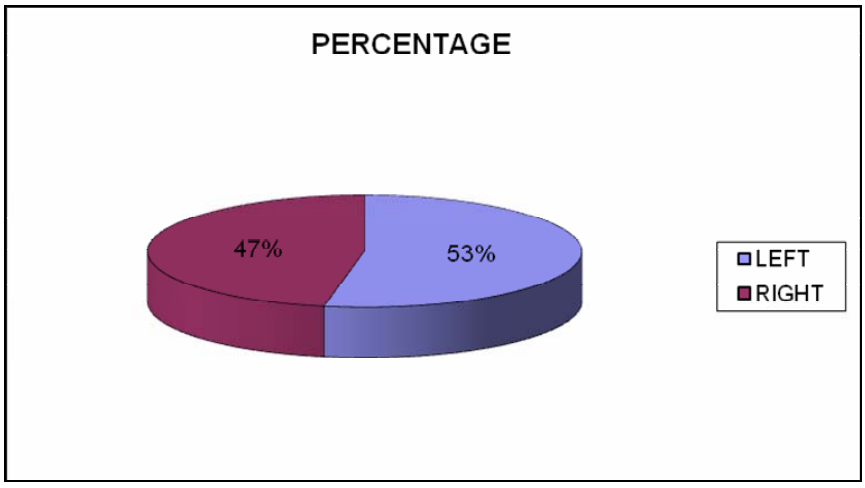
TABLE 4: SIDE INVOLVED

SIDE	NO.OF PATEINTS	PERCENTAGE
RIGHT	31	47
LEFT	35	53
TOTAL	**66**	**100**

GRAPH – 3A



GRAPH – 3 B



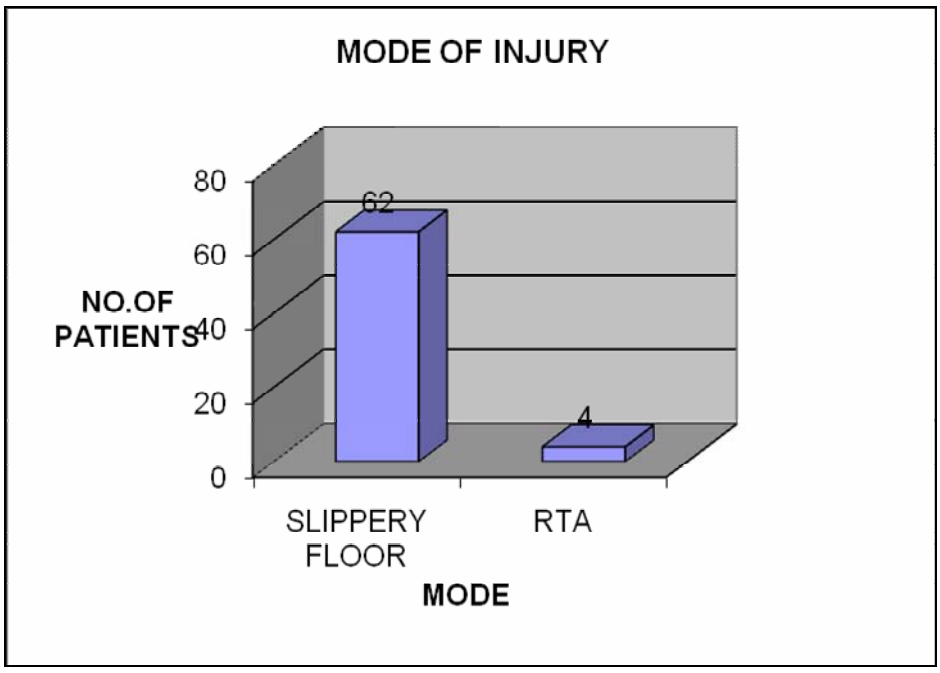
4. MODE OF INJURY

4 patients gave history of road traffic accident while rest 62 were due to trivial injury

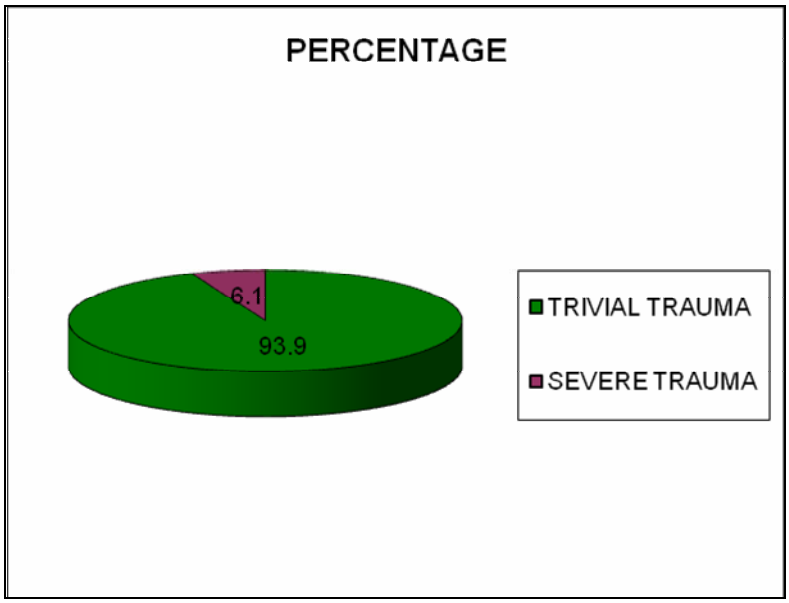
TABLE 5: MODE OF INJURY

MODE	NO.OF PATEINTS	PERCENTAGE
FALL ON SLIPPERY FLOOR	62	93.9
RTA	4	6.1
TOTAL	**66**	**100**

GRAPH – 4 A



GRAPH – 4 B



Majority of cases in our series sustained fracture due to trivial trauma.

A.Trivial 62 cases[93.9%]

B.Severe 4 cases[6.1%]

According to many authors, it is observed that trivial trauma appears to be commonest etiological factor. It is probably due to post menopausal osteoporosis in the elderly females.

5. TYPES OF FRACTURE

All fractures were classified according to Garden's classification, there was no case of type I and type II fractures. 24 cases [36.4%] of type III and 42[63.6%] cases of type IV fractures were present in our series.

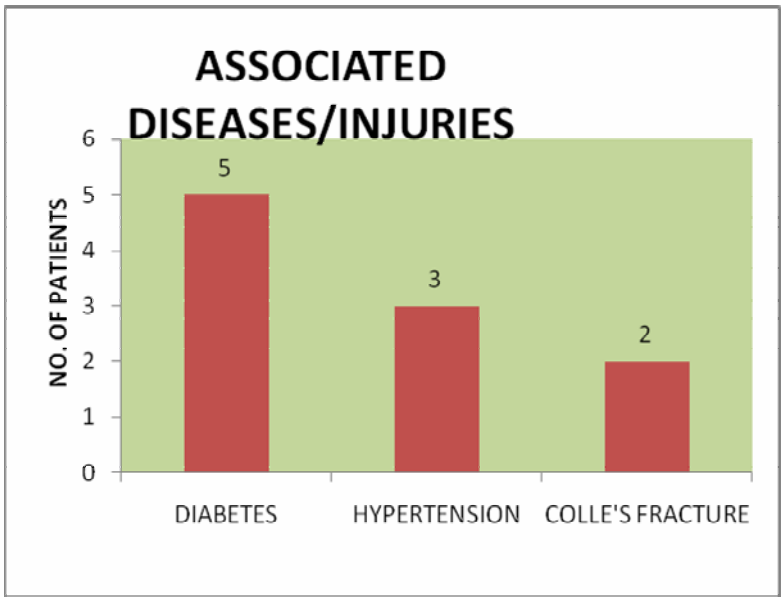
TABLE 6: TYPE OF FRACTURE:

GARDEN'S TYPE	**NO.OF PATEINTS**	**PERCENTAGE**
III	24	36.4
IV	42	63.6
TOTAL	**66**	**100**

TABLE 7: ASSOCIATED DISEASE:

DISEASE	**NO.OF PATEINTS**	**PERCENTAGE**
DIABETES	5	7.6
HYPERTENSION	3	4.5

GRAPH – 5



7. ASSOCIATED INJURIES

In our series, 2 patients had a fracture of distal third of radius[colle's]of ipsilateral side due to fall on outstretched hand, which was treated with closed reduction and pop cast application.

2 patients-3.1%

8. SIZE OF PROSTHESIS

The size of the prosthesis used varied from 43mm to 51mm. Of which 43mm was the most commonly used size[39.4%] followed by 45mm[30.3%]. In females the sizes used were from43mm-49mm with 43mm and 45mm used most commonly. In males the sizes used were from 43mm-51mm,43mm was used most commonly.

TABLE 8: SIZE OF PROSTHESIS:

HEAD SIZE IN (mm)	NO. OF MALE PATIENTS	NO.OF FEMALE PATIENTS	TOTAL
43	12	14	26
45	7	13	20
47	3	10	13
49	5	1	6
51	1	0	1
53	0	0	0

9. COMPLICATIONS DURING SURGERY

There was difficulty in reduction of prosthesis in the acetabulum in 4 patients[6.1%]

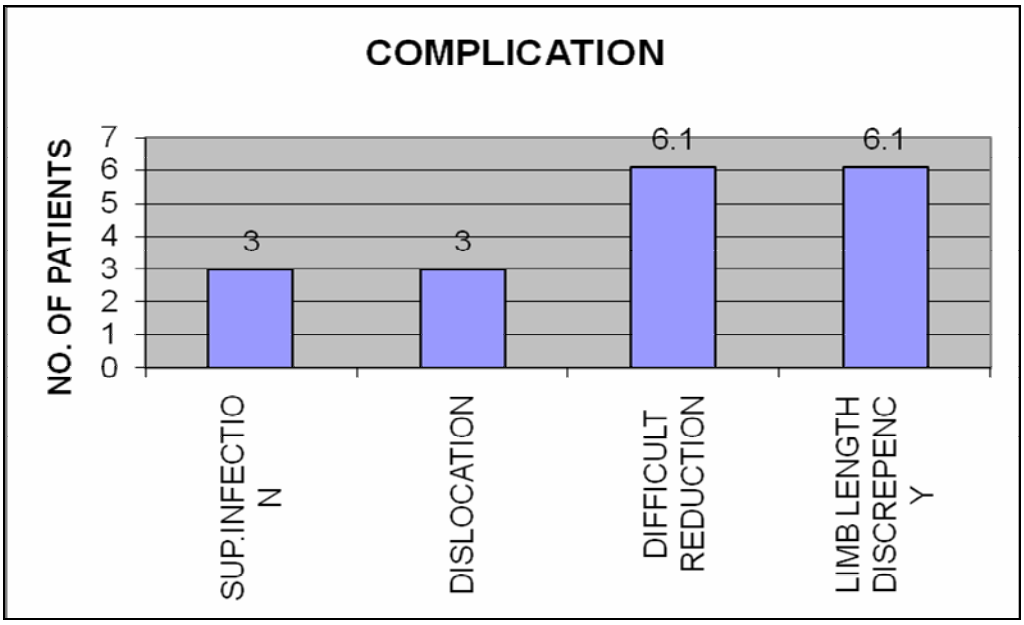
10. POSTOPERATIVE COMPLICATION

There was superficial infection in 2 patients(3%). Limb lengthening of 1 cm in 4 patients(6.1%) and dislocation of prosthesis in 2 patients(3%).

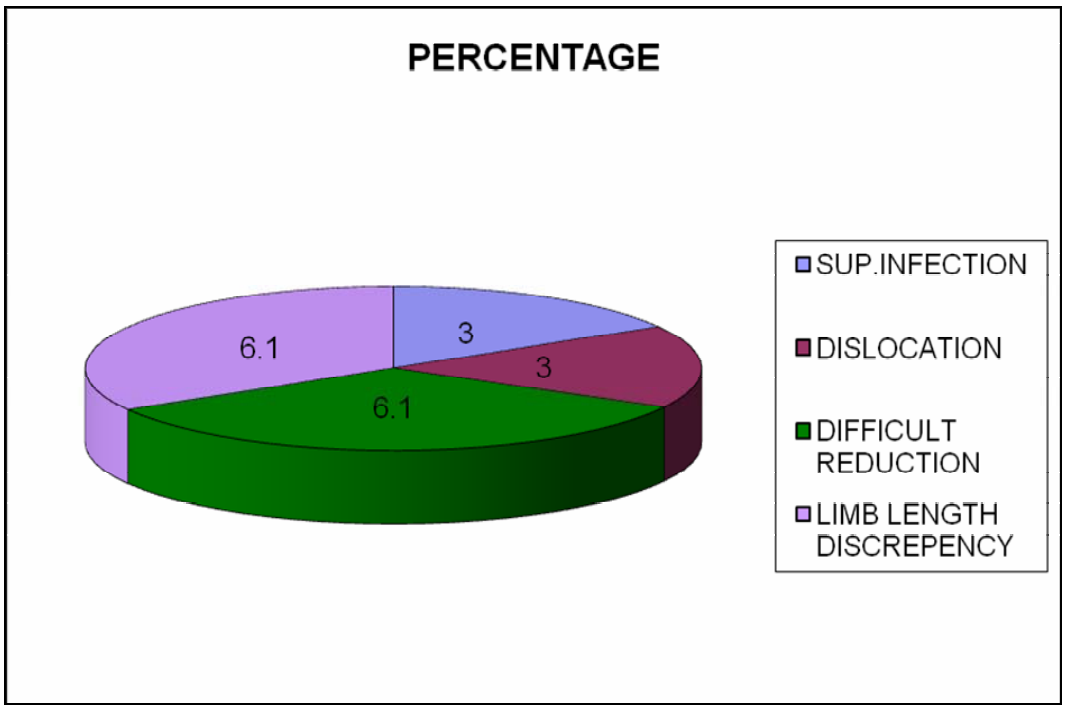
TABLE 9: COMPLICATIONS

COMPLICATION	NO.OF PATEINTS	PERCENTAGE
SUP.INFECTION	2	3
DISLOCATION	2	3
LIMB LENGTH DISCREPENCY	4	6.1
DIFFICULT REDUCTION	4	6.1

GRAPH – 6A



GRAPH – 6 B



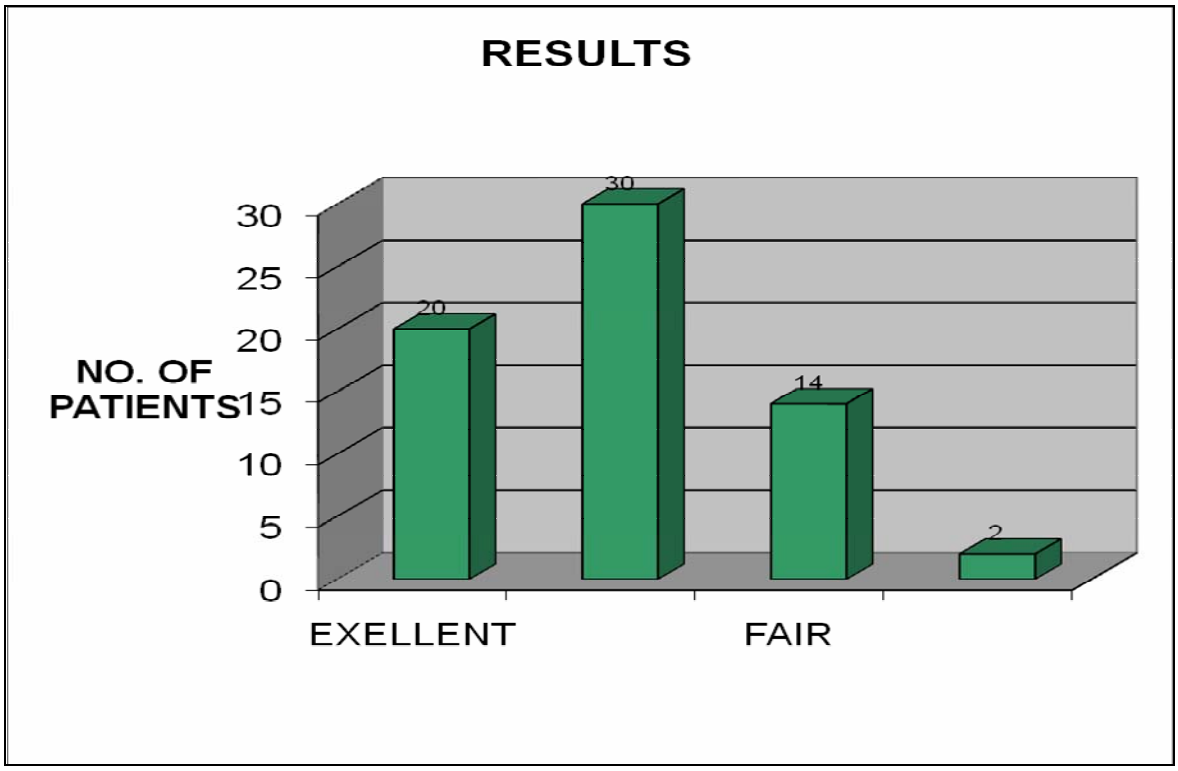
10. RESULTS

The results were evaluated according to Harris Hip Rating system.

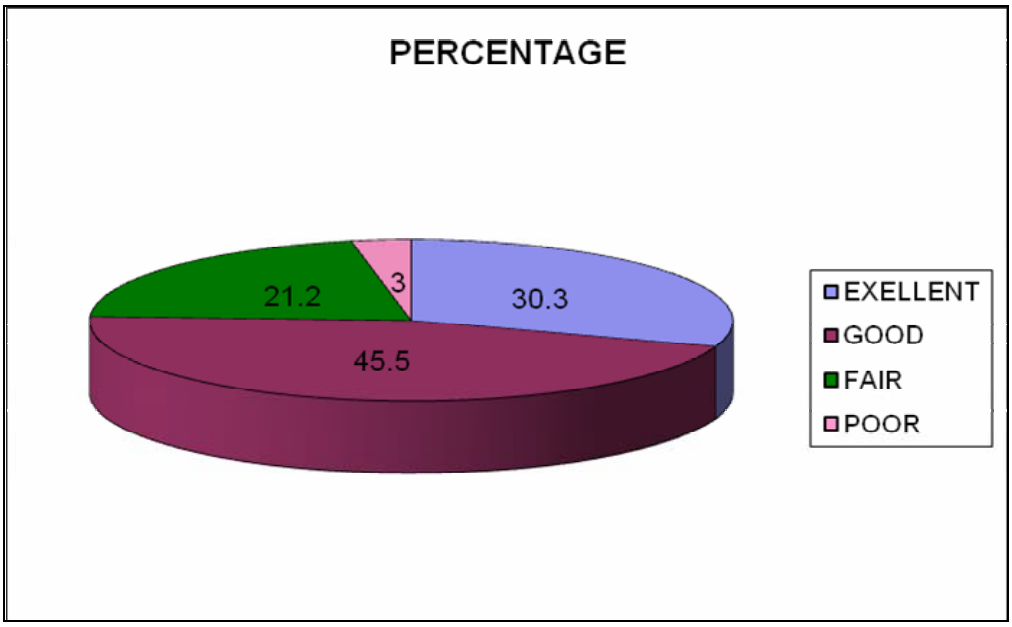
TABLE 10 : RESULTS

HARRIS HIP SCORE	NUMBER OF PATIENTS	PERCENTAGE
EXCELLENT	20	30.3%
GOOD	30	45.5%
FAIR	14	21.2%
POOR	2	3%

GRAPH –7A



GRAPH –7B



6. DISCUSSION

In our study, 66 cases of intracapsular fracture neck of femur were treated with hemiarthroplasty with Austin Moore Prosthesis in elderly patients of both the sex. The observations were made and results were analysed. The study was also compared with studies of other authors. Various aspects of the procedure have been observed and discussed in detail.

1. AGE INCIDENCE

The average age in our series was 71.7% yrs with a range of 60-89 yrs, with a majority of patients in the 70-79 yrs age group. The average age in the reported series is as follows: Jensen[75](1975)-77.2 years, long and knight[76](1980)-79yrs and Nipatasaj[77](1995)-68.4 yrs.

The age incidence in our series is similar to the reported series but it is on the lower side, we feel probably it is due to the early onset of senile osteoporosis in this region.

2. SEX INCIDENCE

In this series, it was observed that the male to female ratio was 28:38, the female being 57.6%, in the literature ,a lot of variation is reported, female being more common than male. According to Riska[78](1971) females were 90.8%, Jensen[75](1975) females were 84%, Long and Knight[76](1980) females were 65.38% and nipatasaj[77](1995) females were 62.20%.

Fracture neck of femur is common in older females due to hormonal imbalance in the post-menopausal age and associated osteoporosis.

3. SIDE INVOLVED

35 cases(53%) had fracture on the left side while 31 cases (47%) had fracture on the right side. Similar observations have been made in various studies. But no

specific reason have been given for the more frequent involvement of the left hip in the reported series

TABLE 11

AUTHOR	RIGHT	LEFT
Present Study	47%	53%
Hinchey and Day[79]	49%	51%
Nipatasaj77	46%	54%

4. COMPLICATIONS

INTRAOPERATIVE COMPLICATIONS:

There was a difficulty in reduction in 4 patients (6.1%) and limb lengthening of 1 cm in 4 patients (6.1%). Muller noted that the centre of the head of the prosthesis should be at the level of 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 post operatively limb lengthening.

However with Austin Moore Prosthesis minimum of 0.5mm of calcar should be retained, so that collar of implant should rest on the calcar.

POST OPERATIVE COMPLICATION

Infection:

In the present study, superficial infection was encountered in 2 cases(3%), both healed with antibiotics given according to culture and sensitivity. There was no case of deep infection or late sepsis. In the reported series infection rates were-

TABLE 12

Author	Superficial infection	Deep infection
Present Study	3%	Nill
Anderson[80]	1.4%	0.7%
Hinchey[79]	2.43%	1.76%
Riska[78]	3.26%	1.64%
Jensen[75]	4.7%	Nill
Niptasaj[77]	3.66%	Nill

So our incidence of superficial infection were quite similar to those reported in the literature.

DISLOCATION:

In the present study,there was a dislocation of prosthesis in 2 patients(3%) on 4th postoperative day,which was successfully reduced under general anaesthesia on the same day.The dislocations which occurred in our study were due to improper position of the implant(excessive antiversion and varus) and inability to control post operative positioning. Salvatti et al.[72] (1974) believed that excessive postoperative flexion or rotation with hip adducted is the main cause for dislocation of the prosthesis and they also observed that dislocation was commonly caused while shifting the patients from the operation theatre to the ward

In 1998 John E. Kenzora et al[83] noted that all 6 dislocation in their series followed after posterior approach. Dislocation is a well known complication of posterior approach. However in our series number of dislocations are not great enough to reach statistical significance.

TABLE 13 : Reported incidences of dislocation of the prosthesis after primary prosthetic arthroplasty.

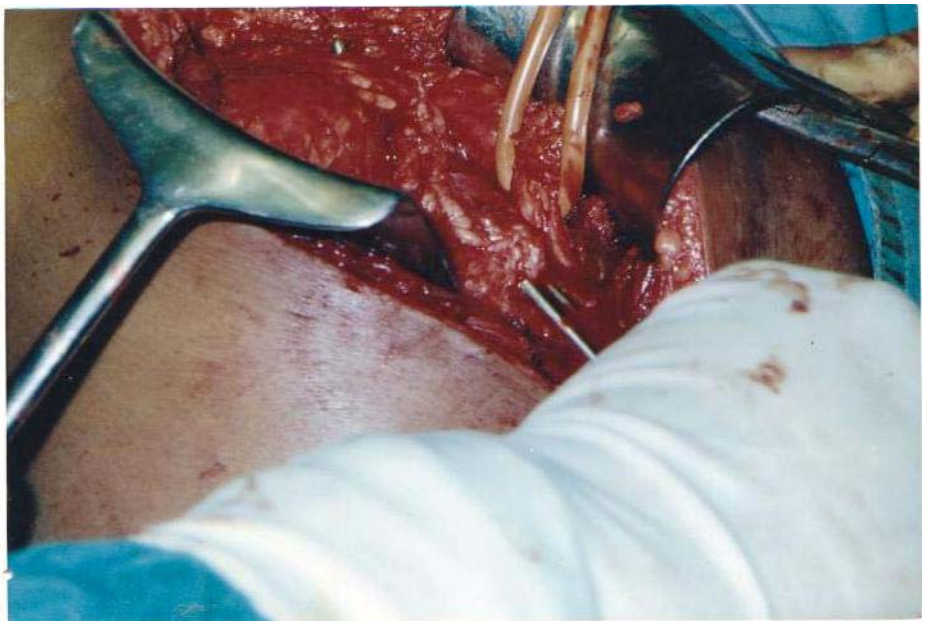
Investigator	Percentage
Salvatti et al (1973)	2.8
Chan & Hoskinson (1975)	8
Saraf & Saxena (1978)	2.4
Jhonson & Cr others (1975)	3
Bavadekar & Manelkar (1987)	0.9
Jack Moshein (1990)	1.8
John E Kenzora(1998)	3.2

Factors associated with dislocation included too much of antiversion or retroversion of the prosthesis, posterior capsulectomy, inability to control post operative positioning, improper sized femoral head and infection

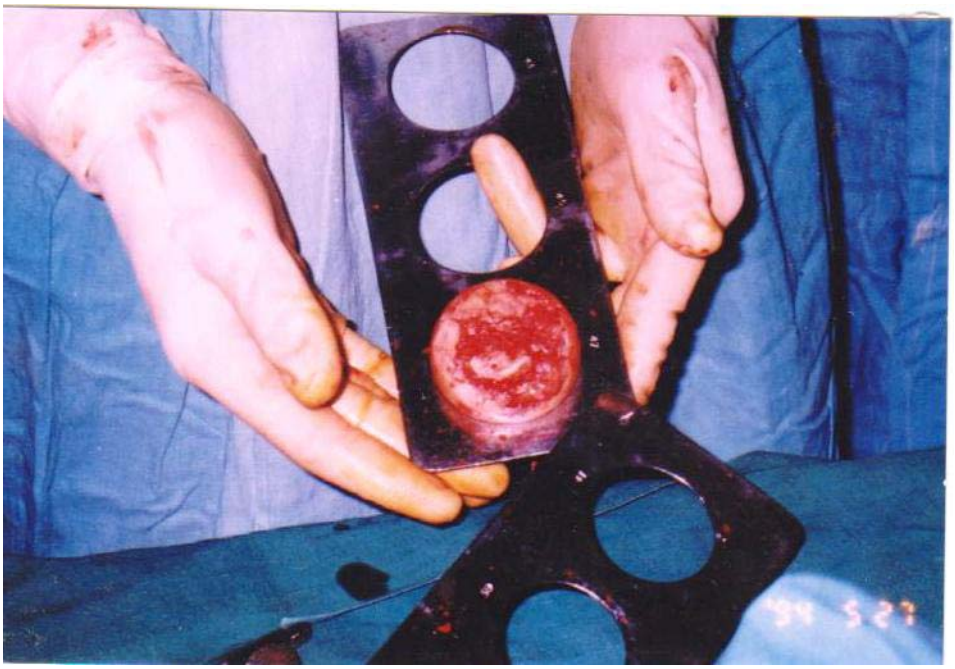
Lower limb being painted with betadine solution

Moore's Incision

Basic instruments required for hemiarthroplasty with AMP



Deep Exposure



Measuring Head using a Head Gauge

Prosthesis reduced in acetabulum

Patient being mobilised with a walker

5. RESULTS

In the present study of 66 cases of intracapsular fracture neck of femur managed by hemiarthroplasty with Austin Moore Prosthesis,we have excellent result in 20 cases(30.3%), good in 30 cases(45.5%), fair in 14 cases(21.2%) and poor in 2 cases (3%).Hinchey and Day[79] (1964) observed that the poor results were due to preexisting medical conditions and pain following hemiarthroplasty. Don King (1964) agrees with Hinchey and Day and feels that delayed weight bearing (due to medical problems) is the cause of poor results.

We too in our series observed that the poor results are found in those patients who had moderate to marked pain following hemiarthroplasty. Saraf and Saxena[76] (1978), Bavadekar and Manelkar[75] (1987) and Arwade[15] (1987) attributed the poor results to complications during or following surgery.

In the reported series-Anderson[80](1964) had satisfactory result in 87.5%; Hinchey[79](1964) had excellent to good result in 72.88%,fair in 10.68% and poor in 16.44% of cases; Jensen[75](1975) had excellent to good in 52%,fair in 43% and poor in 5% of the cases; Nottage[81](1990) had an average Harris Hip Score of 77 points for Austin Moore Prosthesis group;Marcus[82] (1992) had an average Harris Hip Score of 76 points; Nipatasaj[77](1995) had excellent to good results in 77.42% fair in 11.29% and poor in 11.29% of cases.Our results are quite similar to the above mentioned series.

Excellent Results

Pre op X-ray

Post op X-ray after 6 months

Standing

Stair climbing

CASE NO : 11

Good Results

Preop X-ray

Post op X-ray after 6 months

Sitting on chair

Walking

CASE NO :39

Poor Results

Preop X-ray

Post op X-ray after 6 months

Walking

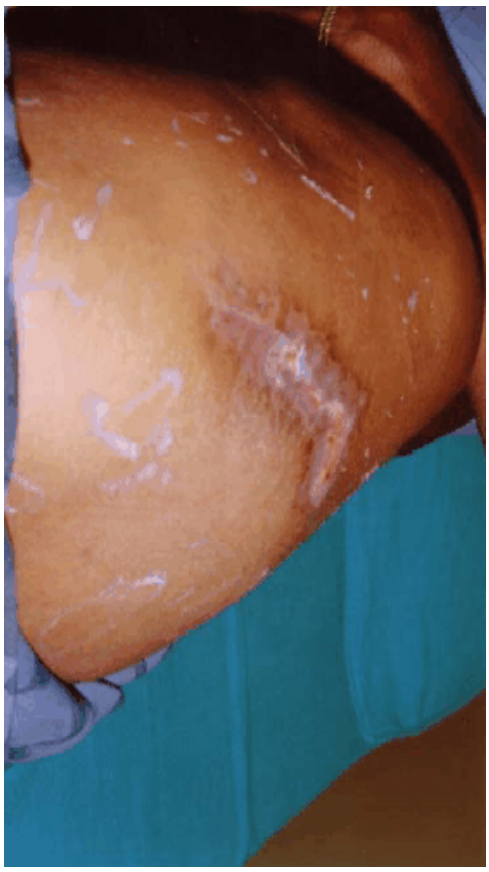
Sitting on chair

CASE NO :59

COMPLICATIONS

Posterior dislocation of the prosthesis

CASE NO:9



Superficial infection

CASE NO:33

SUMMARY

1) 66 cases of intracapsular fracture neck of femur treated with hemiarthroplasty with Austin Moore Prosthesis were studied.
2) Average age of the patient was 71.7 yrs.
3) Incidence of femoral neck fracture was higher in females 57.6% Left side was more commonly involved.
4) Trivial trauma was found to be the commonest cause of injury (93.9%)probably because of senile osteoporosis.
5) Intraoperative complications include difficulty in reduction in 4 cases(6.1%).
6) Post operative complication include dislocation of prosthesis in 2 cases(3%), limb lengthening in 4 cases (6.1%) and superficial infection in 2 cases(3%).
7) Patients were followed at 6 weeks, 3months and 6months interval.
8) Excellent to good results were found in 75.8%, fair in 21.2% and poor in 3%.
9) Early mobilization and weight bearing on the injured limb is possible.
10) Prosthetic replacement avoids the problem of avascular necrosis and non-union.
11) Austin Moores Prosthesis is cost effective, procedure is simple and provides good results.
12) Hemiarthroplasty in cases of intracapsular fracture of neck of femur in individuals of waning years is rational step.

CONCLUSION

After treating 66 patients with intracapsular fracture neck of femur, with Austin Moore Prosthesis, we conclude that hemiarthroplasty with Austin Moore Prosthesis has proved to be an acceptable method for the management of intracapsular femoral neck fractures. Prosthetic replacement in individuals of waning years for displaced intracapsular femoral neck fractures is a rationale step as period of hospitalization is reduced, early mobilization, weight bearing and return to independence is possible. It avoids the difficult problem of non-union and avascular necrosis.

Austin Moore Prosthesis is cost effective, requires simple procedure, provides good functional result but with hemiarthroplasty squatting and sitting crossed legged is not possible which is important in daily social and religious activities of our societies. So one should think of osteosynthesis whenever possible before opting for this procedure.

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

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PROFORMA

1)	Sl. No	:	I.P. No	:
2)	Name	:	D.O.A	:
3)	Age	:	D.O.D	:
4)	Sex	:	D.O.S	:
5)	Address	:	Results	:
6)	Complaints	:	Duration	:

History of Present Illness

1) History of Trauma :
   a) Trivial Trauma (fall)
   b) Fall from moderate height
   c) RTA
2) Pain : Site, onset, character, severity and relieving factors
3) Ability to walk. Not able to walk / able to walk with support/ able to walk without support.
4) Treatment received : Before reaching the hospital
5) Past history : History of chronic illness, History of prolonged immobilisation
6) Personal and Family History :

   Alcoholic/ non-alcoholic
   Smoker/ non-smoker
   Vegeterian/ Non Vegeterian
   Blader and bowel habits : Normal / altered
   Nature of work :
   Menstrual history (in case of female)

General Physical Examination :

Built	:	Obese / Moderate / Poor
Nourishment	:	Good / Moderate / Poor
Anaemia	:	Present / Absent
Lymphadenopathy	:	General / Local
Clubbing	:	Present / Absent
Jaundice	:	Present / Absent

Cyanosis : Present / Absent

Vital signs : pulse : blood pressure :

Respiratory rate : Temperature :

Other Systems :

1) CVs
2) Respiratory system
3) Abdominal examination
4) Central nervous system

Local Examination :

Gait :

Inspection :

Attitude of limb :
Level of A.S.I.S
Apparent shortening : Yes / No
Swelling around proximal thigh / hip Yes /No
Skin changes
Wasting : Present / Absent

Palpation :

Tenderness on greater trochanter and joint lines :
Trochanteric thickening :
Palpatory Bryants triangle :
Abnormal mobility and crepitus :
Transmitted movements :
Vascular sign of Narath :
Head felt outside the acetabulum

Measurements :

Length of limb	:	Diseased :	Normal :
Total length	:		
Thigh segment	:		
Leg segment	:		
Supra trochanteric	:		

Bryants triangle, Nelaton's line, Shoe makers line

Movements of Hip :	Left active / passive	Right active / passive
Flexion		
Extension		
Abduction		
Adduction		
External rotation		
Internal rotation		
Stability test		
Telescopy		

Any Associated Injuries :

Investigations :

1) X-ray of the proximal third of femur including hip joint.

Anteroposterior view	No.	Report
Lateral view	No.	Report

2) Screening chest X-ray
3) ECG
4) Blood : Hb% Blood urea, FBS, Serum calcium. blood grouping
5) Urine for : Albumin, Sugar and Microscopy
6) Urine for : Culture and Sensitivity
7) Pus (if any) for culture and sensitivity
8) Follow up X-ray No report:

Management :

Conservative / operative

Pre Operative Treatment :

1) Skin traction
2) Analgesics
3) Antibiotics
4) Blood transfusion
5) Others

Operative Treatment :

1) Date of operation
2) Anaesthesia
3) Approach
4) Type of implant
5) Blood transfusion
6) Intra- operative complications
7) Bone grafting

Post Operative Treatment :

1) Antibiotics
2) Analgesics
3) Blood transfusion
4) Skin traction
5) Drain removal date
6) Suture removal on
7) Ambulation in bed after
8) Ambulation with support after

Post Operative Complications :

Immediate : Retention of Urine

Swelling of operated limb

Any other complication

Late : Wound infection : Superficial / Deep

Deep vein thrombosis

Shortening or lengthening

Pulmonary embolism

If died : Cause of death

Summary :

Follow Up of Patient :

Cases were followed up at 6 weeks, 3 months and 6 months, Functional results were analysed by modified Harris hip scoring system.

1) Pain : none (44), slight (40), Mild, (30), moderate (20), marked (10), pain in bed (0).
2) Limp : none (11), slight (8), moderate (5), severe (0)
3) Support : none (11), cane for long walks (7), cane most of the time (5), one crutch (3), 2 canes (2), 2 crutches (0), unable to walk (0).
4) Walking Distance : unlimited (11), 6 blocks (8), 2 to 3 blocks (5), indoors (2), bed and chair (0).
5) Stairs : Without using railing (4), using railing (2), any manner (1), unable (0),
6) Ability To Put On shoes : with ease (4), with difficulty (2), unable (0)
7) Sitting : comfortably for 1 hours (5), half an hour (3), unable (0)
8) Enter Public Transportation : yes (1), No (0)
9) Flexion Contracture : In degrees
10) Leg Length Discrepancy : In cms
11) Absence of Deformity : (all yes = 4, less than 4=0)

    $<30^0$ FFD : Yes or No

    $<10^0$ fixed adduction : Yes or No

    $<10^0$ fixed internal rotation : Yes or No
12) Limb Length Discrepancy less Than 3.2 Cms : Yes or No
13) Total Range of Motion : $211^0 – 300^0$ (5), $161^0 – 210^0$ (4), $101^0 – 160^0$ (3)
    $61^0 – 100^0$ (2), $31^0 – 60^0$ (1), $0^0 – 30^0$ (0)

    Total Harris Hip Score : _____

    Functional Result : _____

CONSENT FORM

SHRI B.M. PATIL MEDICAL COLLEGE,HOSPITAL AND RESEARCH CENTRE,BIJAPUR-586103.

TITLE OF RESEARCH: MANAGEMENT OF INTRACAPSULAR FRACTURE NECK OF FEMUR BY HEMIARTHROPLASTY WITH AUSTIN MOORE PROSTHESIS IN ELDERLY-A CLINICAL STUDY.

PRINCIPAL INVESTIGATOR : **DR.RAVINDRA PRATAP SINGH**

P.G.GUIDE NAME : **DR.O.B.PATTANASHETTY**

M.S.(ORTHO)

All aspects of this consent form are explained to the patient in the language understood by him/her.

I. Informed Part

1.Purpose of study:

I have been informed that this study will test the effectiveness of one particular method of Austin Moore's Hemiarthroplasty in intracapsular fracture neck of femur. This method requires hospitalization.

2. Procedure:

I understand that i will be selected for the present method of treatment after the clinical study of my age, type of fracture, condition of bone seen in radiograph and after study of fitness for anaesthesia and surgery. I will be admitted to hospital immediately. I will have to attend follow-up to OPD regularly. I will be assessed in physiotherapy department also.

3. Risk and Discomfort:

I understand that I may experience some pain and discomfort during the post-operative period and during the period of non - weight bearing ambulation. This condition is usually expected. These are associated with the usual course of treatment.

4. Benefits:

I understand that my participation in this study will have no direct benefit to me other than the potential benefit of treatment, which is planned to heal my fracture in the shortest possible period and restore my function.

5.Alternative:

I understand that the present procedure is an accepted method of treatment just as other standard methods of treatment followed in this hospital. This is one of the ordinarily selected methods of treatment.

6.Confidentiality:

I have been assured that all information furnished to the doctor by me regarding my medical condition will be kept confidential at all times and all circumstances except legal matters.

7. Request for more information:

It has been made clear to me that I am free at all time under any circumstances to touch base with doctor by directly approaching or otherwise to satisfy any query, doubt regarding any aspect of research concerns.

8.Refusal or withdrawl of participation:

It has been made clear to me that participation in this medical research is solely the matter of my will and also that right to withdraw from participation in due course of research at any time.

II Consent by patient

I, the undersigned_____ have been explained by Dr.O.B.Pattanashetty in the language understood by me, the purpose of research and details of procedure that will be implemented on me. I have understand the possible risks and discomforts of surgery and anaesthesia. I have also been explained that participation in this medical research is solely the matter of my will and also that I have the right to withdraw from this participation at any time in due course of medical research.

Signature of the participant/patient:
Date:
Time:

Signature of witness:
Date:
Time:

KEY TO MASTER CHART

M	-	Male
F	-	Female
R	-	Right
L	-	Left
MOI	-	Mode of Injury
RTA	-	Road Traffic Accident
S/F	-	Self fall in the home
A/D	-	Associated disease
A/I	-	Associated Injuries
AGRI	-	Agriculture by occupation
H/W	-	House Wife by occupation
RETD	-	Retired clerk
Colles	-	Colle`s Fracture
HTN	-	Hypertension
DM	-	Diabetes Mellitus
GART	-	Garden’s Type
PS	-	Prosthesis Size
N	-	Normal
INF	-	Infection
DIS	-	Dislocation of Prosthesis
LLD	–	Limb length discrepancy
DR	-	Difficult reduction
FO	-	Follow-up in months

HHS AT 6	-	Harris hip score at 6 months
EX	-	Excellent
GD	-	Good
PR	-	Poor
FR	-	Fair

MASTER CHART

Sl no	NAME	I P NO	AGE	SEX	OCCUPATION	SIDE	MOI	AD	AI	GART	PS	COMPLICATION	FO	HHS AT 6	RESULTS
1	SIDDANAGOUDA	13987	68	M	AGRI	R	S/F	N	N	III	43	DR	6	86	GD
2	SHANTABAI	16716	66	F	H/W	L	S/F	N	N	IV	43	DR	6	68	PR
3	YAMANAWWA	2429	89	F	H/W	R	S/F	N	N	IV	43	N	6	88	GD
4	AMBAWWA	8150	75	F	H/W	L	S/F	N	N	IV	43	N	6	74	FR
5	HABIBSAAB	14874	85	M	AGRI	R	S/F	DM	N	IV	47	SINF	6	87	GD
6	SHAKUNTALABAI	16133	68	F	H/W	R	S/F	N	N	IV	43	N	6	75	FR
7	MALLAMMA	17193	67	F	H/W	R	S/F	N	colles	IV	~~43~~	N	6	85	GD
8	LAXMIBAI	1127	69	F	H/W	R	S/F	N	N	IV	43	N	6	76	FR
9	SHARNAPPA	3036	72	M	AGRI	L	S/F	DM	N	IV	47	DIS	6	77	FR
10	SOMAPPA	2281	66	M	AGRI	L	RTA	N	N	III	47	N	6	87	GD
11	KALLAPPA	4759	75	M	AGRI	R	S/F	N	N	III	43	N	6	95	EX
12	YALLAWA	6862	72	F	H/W	R	S/F	N	N	III	43	N	6	72	FR
13	LAXMIBAI	7112	68	F	H/W	R	S/F	N	N	III	43	DR	6	82	GD
14	YALLAMMA	6682	74	F	H/W	R	S/F	N	N	III	47	N	6	74	FR
15	YESUBAI	7423	75	F	H/W	R	S/F	HTN	N	III	43	N	6	73	FR
16	GIRIJABAI	9219	69	F	H/W	L	S/F	N	N	III	43	N	6	87	GD
17	MANOHAR	9875	70	M	AGRI	L	S/F	N	N	III	49	LLD	6	75	FR
18	LAXMI	13216	77	F	H/W	R	S/F	N	N	IV	47	N	6	86	GD
19	SHANTABAI	17536	78	F	H/W	L	S/F	N	N	IV	43	LLD	6	78	FR
20	ANANDAWWA	17488	72	F	H/W	L	S/F	N	N	III	45	N	6	84	GD
21	GURAPPA	19084	69	M	AGRI	L	RTA	N	N	III	43	N	6	77	FR
22	NINGAMMA	20298	70	F	H/W	L	S/F	N	N	IV	47	N	6	82	GD
23	KASHIBAI	1774	78	F	H/W	L	S/F	N	N	IV	45	N	6	76	FR

24	LAXMAN	4380	81	M	retd.	L	S/F	N	colles	IV	45	DR	6	73	FR
25	MALLAMMA	4538	75	F	H/W	R	S/F	N	N	III	45	N	6	88	GD
26	SIDDAPPA	5884	72	M	retd.	R	S/F	N	N	III	49	LLD	6	75	FR
27	BASAVRAJ	10675	80	M	retd.	R	S/F	DM	N	IV	45	N	6	74	FR
28	ABDULHAMEED	11697	70	M	agri	R	S/F	N	N	IV	43	N	6	85	GD
29	SHANKARGOUDA	12732	66	M	agri	L	S/F	N	N	IV	45	N	6	92	EX
30	SHARDABAI	14495	75	F	H/W	L	S/F	N	N	IV	45	N	6	87	GD
31	BASAMMA	17963	69	F	H/W	R	S/F	N	N	IV	47	N	6	93	EX
32	SUBHASH	17969	71	M	AGRI	R	S/F	N	N	IV	49	SINF	6	91	EX
33	MOTABAI	18787	70	F	H/W	R	S/F	DM	N	III	45	SINF	6	82	GD
34	KONDAYYA	19541	66	M	AGRI	R	S/F	N	N	III	43	N	6	92	EX
35	NINGAPPA	1126	76	M	AGRI	R	S/F	N	N	III	45	N	6	93	EX
36	PRAHLAD	11574	78	M	AGRI	R	S/F	N	N	III	49	N	6	86	GD
37	MONALBI	16975	80	F	H/W	R	S/F	N	N	IV	47	N	6	91	EX
38	NINGAPPA	1126	69	M	AGRI	L	RTA	N	N	IV	43	DR	6	92	EX
39	SANGAMMA	3211	66	F	H/W	R	S/F	N	N	IV	45	N	6	84	GD
40	SIDAPPA	17452	72	M	AGRI	R	S/F	N	N	III	45	N	6	92	EX
41	KRISHNABAI	488	84	F	H/W	R	S/F	HTN	N	III	45	N	6	86	GD
42	GANGABAI	2602	68	F	H/W	L	S/F	N	N	IV	47	LLD	6	93	EX
43	SEETAWWA	5476	75	F	H/W	L	S/F	N	N	1V	45	N	6	82	GD
44	BHIMAWWA	5661	72	F	H/W	R	S/F	N	N	III	47	N	6	93	EX
45	SHIVAMMA	9924	67	F	H/W	L	S/F	N	N	IV	45	N	6	92	EX
46	GANGAMMA	10986	76	F	H/W	R	S/F	N	N	IV	45	DR	6	84	GD
47	BASAVRAJ	11733	70	M	AGRI	L	S/F	N	N	IV	43	N	6	86	GD
48	KALLAPPA	20491	66	M	AGRI	L	S/F	N	N	IV	45	N	6	94	EX
49	DUNDAPPA	21842	68	M	AGRI	L	S/F	N	N	III	43	N	6	83	GD

50	SIDDARYA	22413	70	M	AGRI	L	S/F	N	N	IV	43	DIS	6	93	EX
51	NOORJAHAN	1735	67	F	H/W	L	S/F	N	N	IV	45	N	6	87	GD
52	GOURABAI	5429	66	F	H/W	L	S/F	DM	N	IV	45	N	6	94	EX
53	AYAMMA	5879	74	F	H/W	L	S/F	N	N	IV	47	N	6	88	GD
~~54~~	MEHBOOBI	5765	71	F	H/W	L	S/F	N	N	IV	43	N	6	83	GD
55	BABU	2943	70	M	AGRI	L	S/F	N	N	IV	43	N	6	94	EX
56	SREESHAIL	3046	74	M	AGRI	L	S/F	N	N	IV	43	LLD	6	87	GD
57	SHANKARAPPA	3135	76	M	AGRI	L	S/F	N	N	III	49	N	6	84	GD
58	FATIMA	3789	70	F	H/W	R	S/F	N	N	III	45	N	6	93	EX
59	NEELAWWA	3825	70	F	H/W	R	S/F	HTN	N	III	47	DIS	6	68	PR
60	INDUMATI	2489	66	F	H/W	L	S/F	N	N	IV	43	N	6	93	EX
61	SHANKARAPPA	2589	68	M	AGRI	L	S/F	N	N	IV	51	N	6	88	GD
62	NEELKANTH	2679	69	M	AGRI	L	S/F	N	N	IV	43	N	6	86	GD
63	RADHABAI	2895	70	F	H/W	L	S/F	N	N	IV	45	N	6	91	EX
64	YAMANAWWA	2940	69	F	H/W	L	S/F	N	N	IV	47	N	6	85	GD
65	AHMADSAAB	2945	70	M	AGRI	L	RTA	N	N	IV	43	N	6	93	EX
66	LAKSHMANAWWA	2950	72	F	H/W	R	S/F	N	N	IV	49	LLD	6	85	GD