Tips and Tricks for Arthroplasty in Elderly Fractures

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PREFACE

Not all books include a preface, as you can combine the information the preface covers into the Introduction. However, some authors like to separate it. This is written by the author of the book, and appears before the Introduction. The preface usually deals with the background to the book. The reason for it being written. It can also include what it doesn't include as well!

DECLARATION

I declare that the thesis entitled "**Tips and Tricks for Arthroplasty in elderly fractures**" has been prepared under the guidance of Dr. JPS Walia, Professor, Department of Orthopaedics, Govt. Medical College and Rajindra Hospital, Patiala.No part of this thesis has formed the basis for the award of any degree previously.

ACKNOWLEDGEMENTS

As this thesis sees the light of day, I find myself at a loss of words to express my thankfulness to Almighty, but for whose gracious and benign blessings, this work would not have been conceived, much less completed. "A teacher affects eternity; he can never tell where his influence stops".
- Henry Adams

It was a matter of great honour to work under the guidance of Dr. JPS Walia, Professor, Department of Orthopaedics, Govt. Medical College and Rajindra Hospital, Patiala. I express my gratitude to my esteemed and revered teacher, elite guide and illuminating supervisor. Without his remarkable vision and meticulous guidance, this effort of mine would not have been possible. He has always showered me with strong support, rational opinions, encouragement and the most required moral support. I shall always remain indebted to him and will always cherish his ever inspiring and encouraging attitude.

No words of gratitude are sufficient to express my sincere regards to my revered teacher and co-supervisor Dr. Avinash Chander Gupta, Associate Professor, Department of Orthopaedics, Govt. Medical College and Rajindra Hospital, Patiala, who has been a continuous flow of knowledge for the subject. But for his abiding altruism and expert guidance, this work would not have been fruitful. His keen interest, competent guidance and constant help in solving my day to day problems, was instrumental in nurturing this project to its present shape. I am indebted to him for his most valuable criticism which has been very well recorded all throughout the preparation of the work.

I bow my head to my parents whose silent blessings are always with me. They have made me what I am and their blessings have given me constant courage to complete this study.

I am also thankful to my loving wife Paramjit without whose support this daunting task would have been impossible for me to achieve and my son Pahul and daughters Annie & Tinny from whom childhood I borrowed time to pursue my studies.

I am thankful to Nanak Documentation for their untiring and patient efforts in providing the present shape to this thesis.

Last but not the least; I owe my thanks to all my patients without whom conducting this study would have been impossible.

Dr. Kuldip Singh Sandhu
Dr Annie Sandhu

CONTENTS

ABBREVIATIONS

AO	Arbeitsgemeinschaft Fur Osteosynthesefragen
DVT	Deep Vein Thrombosis
HA	Hemiarthroplasty
N S	Non-Significant
PHR	Partial Hip Replacement
THA	Total Hip Arthroplasty
THR	Total Hip Replacement
UHR-C	Unipolar Hip Replacement Cemented
UHR-NC	Unipolar Hip Replacement Non Cemented

ABSTRACT

Intracapsular fracture neck femur is a common and grievous injury suffered in elderly people, with osteoporotic bones. It should be managed by internal fixation. Various procedures of internal fixation require rest and recumbency in bed for a long period, so choice of treatment nowadays for elderly is arthroplasty. The present study will include clinical and Roentenographic results obtained with two forms of surgeries namely total hip replacement and bipolar. This study will be conducted on 50 cases of intra capsular fracture neck of femur in elderly people admitted in Rajindra Hospital, Patiala. The outcome of both operative procedures will be compared in regard of duration of operation, operation related complications, need for any secondary operation, morbidity and mortality, cost of procedure and functional results of both procedures.

INTRODUCTION

Although fractures of femoral neck can be seen in all ages and both sex groups. It is more devastating injury commonly sustained by elderly people. The history of the development of a treatment rationale for femoral neck fractures parallels the historical development of orthopaedic surgery itself. Specific milestones have included the principle of reduction by dynamic traction, the importance of anatomic reduction and maintenance in plaster, the development of stable internal fixation devices and finally the development of implant arthroplasty, which led to the era of total joint replacement.

Before the operative management of the fracture neck of femur, when the fractures were managed conservatively, the fracture meant a terminal event in the old and frail patients. Conservative management led to the complications of prolonged immobilization namely bed-sores, DVT, thrombo-embolic phenomena, aspiration pneumonia etc. and there was considerable truth to the phrase "we come into the world under the brim of pelvis and go out through thence of femur".[1]

Ambrose Pare,[2] the famous French surgeon recognized existence of hip fractures more than 400 years ago. But it was Sir, Astley Cooper in 1823 differentiated intra-capsular fractures from extra-capsular fractures.[3] Extra-capsular fractures unite readily because of rich blood supply of fractures surface whereas intra-capsular fractures undergoes nonunion and avascular necrosis because of precarious blood supply. The fracture of the femoral neck gained notoriety and attracted curiosity due its two commonest complications-AVN and Nonunion. In a classic treatise on femoral neck fractures, Speed,[4] branded them "the unsolved fracture". Barnes,[5] added another note of pessimism by calling them "the unsolvable fracture".

The conservative methods which were adopted by Phillips,[6] as a longitudinal and lateral traction to be used in the treatment of femoral neck fractures to eliminate "shortening or other deformity" as well as spica cast which was introduced by Royal Whitman in 1902,[7] were accompanied by problems of immobilization and proved fatal to many ill and elderly patients. Conservative methods were soon replaced by surgical treatment so that patient could be mobilized early. Internal fixation of the femoral neck fractures was started first of all by Von Langenbeck.[8] Several designs of nails followed, ordinary wood screw,[9] triflange nails,[10] cannulated nails,[11] telescoping nails or screws.[12] At present compression screws of various types like dynamic hip screws, multiple threaded pins, screws, garden screws are used for internal fixation.Internal fixation is commonly used in young patients with fracture neck of femur in whom bony union of the fracture is aimed at. But inadequate reduction of the fracture and distraction of the fragments during internal fixation may lead to non-union and AVN. Garden,[13] showed primary displacement and the quality of reduction.After internal fixation there is possibility of non-union, AVN and late segmental collapse of the head, prolonged hospital stay and late weight bearing which in elderly patients can lead to complications of immobilization like bed sores, DVT and thrombo-embolic phenomena etc.Removing the fractured portion of head & neck of femur and substituting it with a prosthesis offers advantage of early mobilization of patients which reduces the period of hospitalization and avoids non-union and AVN seen with internal fixation.

The era of arthroplasty had its beginning, when John Murray Carnochan reported interposing a small block of wood in an attempt to mobilize a patient's ankylosed jaw. Several surgeons had used Inter-positional arthroplasty. Thin platinum plates were attempted by Jules Emile Pean and John Benjamin Murphy reported use of gold foil for covering femoral head. Mould arthroplasty was used by a

Boston Surgeon in 1982,[14] which became forerunner of later designs. The development of an alloy, vitallium (consisting of 30% chromium, 5% molybdenum and 65% cobalt) by Charles Vanable & Walter Stuck which was chemically inert, and strong to meet the prosthesis requirements was a major break-through. J. Austin Tolley Morre & Harold Ray Bohlman,[15] inserted the first endoprosthesis of vitallium after resecting 30 cm of upper end of femur in a patient with recurrent giant cell tumor.Judet Brothers of Paris,[16] developed a new endoprosthesis made of acrylic bound to a chromium steel rod which was a failure due to rapid wear and breakage. Frederick R. Thompson,[17] introduced a chromium-cobalt femoral endoprosthesis with a non-fenestrated intra-medullary stem that curved to fit the upper shaft of femur. Austin-Moore,[15] introduced his "Self-locking" endoprothesis with a wider fenestrated stem.

Since then several modifications of endoprosthesis were designed but, only the Thompson's & Austin-Moore prosthesis stood the test of time.The common complications noted following insertion of "unipolar' endoprosthesis of Thompson or Austin-Moore type are aseptic loosening of stem, Supereo-Medial migration of prosthesis, acetabular erosion and protrusio-acetabuli. The development of acrylic bone cement, Methyl Metha Acrylate by Follacci and Charnley,[18] for stabilization of prosthetic hemi-arthroplasty reduced the incidence of loosening of the stem, although they noted that incidence of acetabular erosion and sepsis were increased by the use of bone cement owing to lack of motion of prosthesis-bone interface.A two- part endoprosthesis or a 'Bipolar' endoprosthesis was designed to reduce the problem of acetabular erosion and according to Bowman et al,[19] the trend was started by Bateman.[20] These implants consist of a femoral component that articulates with snap fit into the high density polyethylene liner of a metallic cup that moves freely within the patient's acetabulum. The design is aimed at reducing the friction and impact force at the

prosthesis-acetabular cartilage that are noted in conventional hemi-arthroplasty by allowing additional motion at the femoral head-polyethylene bearing interface.[21] But several authors, Cabanela & Van Demark,[22] and recently Raja et al observed that bipolar prosthesis offers no advantage over conventional hemi-arthroplasties in elderly patients with the only advantage of potential ease for converting it into a total hip replacement. Hemi-arthroplasty of hip advanced and the attention was centered on the acectabular component specially, when it was diseased by arthritis etc, which led to the era of total hip replacement. Sir, John Charnely,[23] pioneer of total hip replacement first used Teflon for the acetabular cup and later changed it to high density polyethylene.[24] The various merits, demerits, indications and contra -indications of arthroplasty of hip are as follows.[25]

Advantages of prosthetic replacement

1. Immediate weight bearing.

2. Eliminate complications like AVN & Non-union.

3. Reduces the incidence of Re-operation.

Disadvantage

1. Salvage procedures become complicated when there is infection or Mechanical failure.

2. Operation is generally more extensive-with more blood loss, large exposure & greater post-operative mortality rates.

3. Late complication – Septic or aseptic loosening of the stem of the prosthesis, proximal resorption of the femoral neck.

Indications

Absolute

1. A Fracture that cannot be reduced or fixed satisfactorily or severally comminuted.

2. Femoral neck fractures that loose fixation, weeks after operation.

3. Preexisting lesions of hip like AVN of head of femur from previous dislocation or irradiation etc.

4. In Malignancy: Fracture whether traumatic or pathological is candidates for PHR since patients already have a short life expectancy.

5. Patients with uncontrolled Seizures, those undergoing ECT, and with uncontrolled Parkinsonism.

6. Undiagnosed, untreated displaced fracture of femoral neck more than 3 weeks old.

7. Fracture of the neck of femur with complete dislocation of the femoral head.

8. A patient who probably cannot withstand two operations due to other Medical problems.

9. Patients with psychosis or mental Retardation or who are blind as they need rapid mobilization.

Relative

1. Advanced physiological age-generally accepted lower age limit is 70, with a life expectancy of 10-15 years.

2. Fracture dislocation of hip in an elderly individual (pip kin type II).

Contra-Indications

1. Pre-existing sepsis.

2. An active young patient in whom alternative procedures for salvaging femoral head are possible.

3. Several disease in acetabular articular cartilage secondary to osteo-arthritis, Rheumatoid-arthritis or failed internal fixation devices.

The human hip joint is extremely complex on account of the functional demands on it by the body. On account of its complex biomechanics and important function, a stable painless hip is required for normal locomotion.

Although hip surgery dates back to 19th century, but its greatest period of growth and development has occurred in 20th century. An ever growing population of chronic joint disease demanding relief of pain and disability has lead to development of operations such as osteotomy and arthroplasty. The original intent of arthroplasty was to restore motion to an ankylosed joint. This concept has been expanded to include the restoration, as far as possible, of the integrity and functional power of the diseased joint. While resection restores motion, arthroplasty must not only restore motion but also provide stability to the joint.

Total hip replacement is implanting an artificial femoral head and socket to replace the degenerated hip joint that will relieve pain, while preserving motion and stability and correcting deformity, if any.

During the last four decade of its inception, Charnley's low friction arthroplasty, at present remains the best reconstruction procedure. It was major turning point in the history of orthopaedics, since major hip disability could be treated with excellent results.

Total hip arthroplasty has been in constant changes since its inception. Polymethylmethacrylate (bone cement) introduced by Haboush as a mechanism for achieving rigid internal fixation, has lost its popularity due to problems of loosening of stem and cup. Materials involved in fixation of the implant to bone have also evolved. The choices are press-fit, porous coated, and hydroxyapatite coated stems and cups. They are being investigated as ways to eliminate the use of cement and to use bone ingrowths or outgrowths as a means of achieving durable skeletal fixation. These non-cemented implants have proven to be reliable and highly effective in the hands of expert surgeons.

With the development of modular system, a vast array of implants size can be assembled from a modest inventory of individual components. But the durability of modular implant

is of concern and the optimum method for the mating of parts has to be determined.

The results of Charnley's total hip arthroplasty were evaluated by different surgeons using hip score such as Merle d'Aubigne and Postel modified by Charnley, Harris, Lowa, Mayo, Hospital for special surgery etc. The results varied with each score.

So far, no ideal scoring system has been reported for the follow up studies in patients of Indian origin. This follow-up study by using Merle d'Aubigne hip score will make an attempt to report comparative assessment of the widely practiced cemented total hip arthroplasty and bipolar in India.

The study will be useful to the community, as it will throw light on the results and complications of Charnley's low friction arthroplasty in Indian patients. Besides, it will be useful for further improvement in the technique of the low friction arthroplasty. We, in the Department of Orthopaedics, Rajindra Hospital and Government Medical College, Patiala are doing "**Follow-up study of Total hip arthroplasty and Bipolar in intra-capsular fracture neck of femur in elderly people**" – A study of 25 cases each.

SURGICAL ANATOMY OF THE FEMORAL NECK AND HEAD

Anatomically, proximal femur consists of femur head, femur neck and trochantric region of large multiaxial ball and socket type synovial joint, enclosed by thick articular capsule which permits free movements of hip joint. Femoral neck projects superiorly, anteriorly and medially from the upper femoral shaft. It is broader at its base laterally and narrower just below and lateral to the origin of the femoral head. Vascular foramina are present on the antero-inferior aspect of the neck.

The surface of the femoral head is covered with articular cartilage, about 4 mm in thickness over the superior portion and 3mm at the equator. Medial to the axis of the femoral head is fovea centralis, a small area devoid of articular cartilage where the ligamentum teres is attached and articulates with cup like acetabulum.

The fibrous capsule encloses the joint and is attached to acetabular labrum medially. Laterally it is attached to the inter-trochantric line of the femur in front and half way along the posterior aspect of the neck of the bone behind and thickens to form three ligaments of hip joint. At its attachment to the inter-trochantric line in front, some of its fibers, accompanied by blood vessels, are reflected upwards along the neck as bands, called retinacula, supplying the head and neck of the femur.

The internal architecture of the proximal end of the femur has been a subject of considerable investigation, discussion and controversy. Internal trabecular system of the femoral head was first described by Ward, who recognized two groups of trabeculae as under:-

Compression Group

This group arises from the medial portion of shaft upward into the head, which is again divisible into primary and secondary groups.

Tensile group

This arises from the lateral portion of the shaft and curving upwards, ending in the upper portion of the neck and inferior portion of the head.These two systems intersect each other at a right angle. There is a third group which connects these two principle groups.There is structurally weak triangular area in the neck of the femur which is comprised of rather loosely arranged thin trabeculations. This was described by Ward and is known as 'Ward's Triangle' or the 'trigonum internum femoris'. It is well delineated in the aged, particularly in the female with osteoporosis. This area is of importance; as through it majority of the fractures of the femoral neck occur. According to Harty,[26] and Griffin,[27] the calcar femoral is a dense vertical plate of bone extending from the posterior medial portion of the femoral shaft under the lesser trochanter and radiating, laterally forwards the greater trochanter, reinforcing the femoral neck postero-inferiorly. This was considered as the true neck of femur.

Vascular Anatomy

Femoral neck fractures have all the problems associated with healing of intra-capsular fracture elsewhere in the body. The portion of femoral neck which is intra-capsular all of the anterior and posterior two-thirds have no cambium layer in the periosteum that could participate in the peripheral callus formation, so that healing of fracture is dependent on endosteal callus formation alone,[28] unless fracture fragments are carefully impacted, synovial fluid can lyses blood clot formation . Union of the fracture can occur in spite of an avascular fragment, although the incidence of nonunion is increased.Crock,[29] described the blood supply to the proximal end of the femur, which was divided into three major groups:-

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

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

3. Arteries of the ligamentum teres.

The extra-capsular arterial ring is from posteriorly by a large branch of the medial femoral circumflex artery and anteriorly by branches of the lateral femoral circumflex artery. The superior and inferior gluteal arteries also have minor contributions to this ring.These ascending cervical branches arise from the extra-capsular arterial ring and can be divided into four groups (anterior, medial, posterior and lateral). The lateral group provides most of the blood supply to the femoral head and neck.At the margin of the articular cartilage on the surface of the neck of femur, these vessels form a second ring termed the sub-synovial intra articular arterial ring. Once these arteries from the sub-synovial intra-articular ring penetrate the femoral head, they are termed the epiphyseal arteries. The artery of the ligamentum teres is a branch of the obturator or the medial femoral circumflex artery. The functional presence of this artery has been variably reported in the literature. Howe and his associates found that, although the vessels of the ligamentum teres did supply vascularity to the femoral head, they were often inadequate to assume the major nourishment of the femoral head after a displaced fracture. Trueta and Harrison,[30] believed that the femoral epiphyseal blood supply in the adult arose largely from the lateral epiphyseal arteries that enter the head postero-superiorly and secondarily from the medial epiphyseal artery entering through the ligamentum teres. Smith demonstrated that extreme valgus reduction or rotation of the capital fragment occluded the vessel in ligamentum teres. In fracture of the femoral neck with displacement, only the vesselsof ligamentum teres remain uninjured, hence the high association of the avascular necrosis of the femoral head

seen in fracture occurring in this area.

Classification of femoral neck fractures:

Sir, Astley Cooper on the basis of capsular attachment was first to classify these femoral neck fractures in treatise of 1822,[31] as intra-capsular and extra-capsular.

* Intra-capsular: that is within the capsular attachment

* Extra-capsular: that is outside the capsule attachment

Intracapsular fracture:

This is also called high fracture neck of femur in which proximal fragment often loses part of blood supply, hence union is difficult. This is divided according to level of fracture line in the neck as follows:

1. Sub capital

2. Trans cervical

3. Basal

Pauwel's classification

Pauwel,[32] divided femoral neck fracture into three types based on the direction fracture line across femoral neck in the AP X-Ray projection.

Type-I has a fracture obliquity 0- 30° from the horizontal.

Type-II has a fracture obliquity 30-50° from the horizontal.

Type-III has a fracture obliquity 50- 70° from the horizontal.

Pauwel attributed non-union in type III fracture to the increased shearing force of this vertical fracture.

Garden's Classification

Garden,[13] proposed a classification system based on degree of displacement of the fracture noted on pre-reduction X-rays.

The Garden type-I fracture is an incomplete or impacted fracture. In this fracture, the trabeculae of the inferior neck

are still intact. This group includes the "abducted impaction fracture".

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

A Garden type-III fracture is a complete fracture with partial displacement. The trabecular pattern of the femoral head does not line up with that of the acetabulum, demonstrating incomplete displacement between the femoral fracture fragments.

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

A.O. Classification system

Fractures of the femoral neck are classified as:-

Type BI: - Sub capital with no or minimal displacement.

BI.1. Impacted in valgus of 15 degree or more

BI.2. Impacted in valgus of less than 15 degrees.

BI.3. Non- impacted.

Type B2:- Trans- cervical fracture

B2.1. basicervical fracture

B2.2. midcervical with adduction

B2.3. midcervical with shear

Type B3:- Displaced sub capital fractures

B3.1. moderately displaced in varus and external rotation

B3.2. moderately displaced with vertical transation and

external rotation.

B3.3. markedly displaced.

Whatever classification system is used, impacted fracture must be distinguished from undisplaced fractures of the neck femur. The impacted fracture must be distinguished from undisplaced fractures of neck femur. The impacted fractures are stable and do suggest a conservative or non-operative approach. Undisplaced fractures of the femoral neck are entirely different. There is no impaction and therefore no inherent stability in this fracture. It is believed that almost 100% of these will subsequently displace if they are not internally fixed.

Incidence and Mechanism

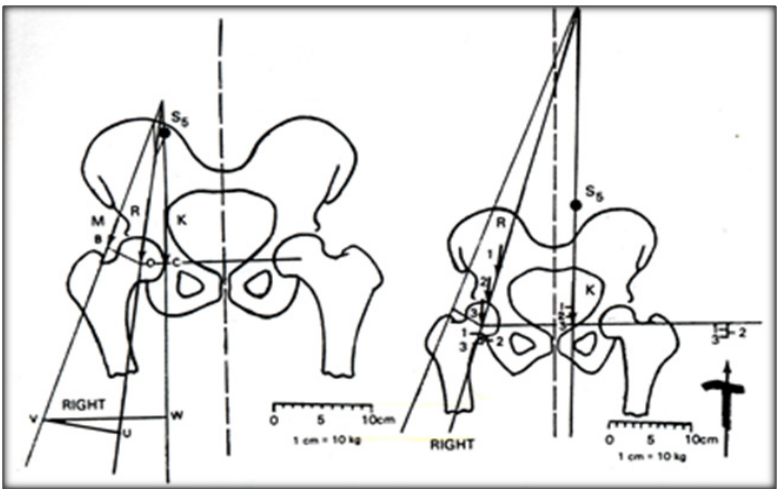
Post-menopausal women are more liable to sustain them owing to senile osteoporosis, in which 90% of hip fractures can result from trivial trauma or even spontaneously and may remain un-detected for weeks.[33] The incidence of these fractures has increased due to increased expectancy of life,[34] and by the year 2050 there will be an increase of 135% from year 2000 with advancement in medical technology.[35] In post-menopausal woman, due to lack of protective effect of estrogen, hip fracture is more common as compared to males in the ratio of M: F 1: 4 to that of simple senile osteoporosis,[36] and fracture of femoral neck presents epidemically in elderly people,[37] as this fracture is relatively rare in young people in which, it occurs due to high energy trauma.[38] Women are even more prone to this injury due to greater osteoporosis secondly to lack of adequate ambulation or antigravity activities as well as decreased hormone levels in postmenopausal age.[39] As per Zuckerman functional outcome score of good (80-100), Chinese people has better functional outcome, with Malasyians as second and Indians as third.[40] Epidemiological studies in Sweden has revealed that 28% risk of fracture neck femur with life expectancy of 14 years in a 75 years old Swedish lady as in contrast to 14% in UK with life expectancy

of 11 years in 75 years old woman.[41]

Despite the tremendous advances made in the field of operative techniques, anesthesia, and manufacture of implants. Fracture of the femoral neck remains an "unsolved fracture" with a variety of treatment options and the ideal rationale still unsettled. The surgeon is faced with Dilemma of whether to go for internal fixation or arthroplasty (total or hemi) especially in elderly patients. It is generally accepted that primary internal fixation be used in young adults, since in them best option is to heal the fracture by osteo-genesis, whereas arthroplasty is the best answer in old people. As the controversy regarding the ideal management of the fracture neck femur still exists, the purpose of the present study is to evaluate our own results of total hip arthroplasty and bipolar cases in intra-capsular fracture neck of femur among elderly people.

The primary aim of treatment should be to perform a surgery that provides to an individual greatest opportunity for early ambulation.[42] This requirement is fulfilled to a great extent by use of primary prosthetic replacement implant with or without cement. This technique allows early ambulation, thus avoids recumbency associated complications. Over the years orthopaedic surgeons has come to recognize the value of primary arthroplasty rather than other methods of fixation in elderly patients.[43] Arthroplasty is free from problems like fracture site nonunion and AVN. Salvage treatment with hip arthroplasty is being increasingly considered for selected older patients with poor bone quality, bone loss, osteoarthrosis or articular cartilage damage,[44] and other use is being extended for fractures.

Mechanism of Hip Joint



Body weight and abductor muscle pull act on the hip joint. Body weight acts through the lever arm from body's center of gravity to the center of the femoral head. The abductor musculature acts on a lever arm extending from the lateral aspect of the greater trochanter to the center of the femoral head. It exerts an equal moment to hold the pelvis level in one leg stance and a greater moment to tilt the pelvis on the same side when walking or running. Since the length of the lever arm of the body weight to the abductor muscle is 2.5:1, the abductor muscles must exert force 2.5 times the body weight to maintain the pelvis level when standing on one leg. Thus, the expected load on the femoral head in the stance phase of gait is equal to the sum of the forces created by the abductors and the body weight and is at least 3 times the body weight. Various experiments measuring forces about the hip joint using instrumented prosthesis have recorded contact forces of up to 3 times the body weight during single – limb stance phase of gait, increasing to up to 10 times the body weight during lifting, running or jumping.

The ratio of the two lever arm is important in the generation of the total forces acting on the hip joint. The shorter the horizontal distance from the center of gravity of the body to the hip joint, the less the muscle force is required to balance it. Conversely, the greater the horizontal distance from the hip joint to the center of the gravity, the more muscle force is required. These forces act not only in the coronal plane, but also act in the saggital plane. These forces are increased when the loaded hip is flexed, as when arising from the chair, ascending or descending stairs or lifting. Rotational stability of the stem can be increased by increasing the width of the proximal portion of the stem to better fill the metaphysis, retaining a longer segment of the femoral neck and having a rounder, rectangular cross- section of distal portion of the femoral stem.

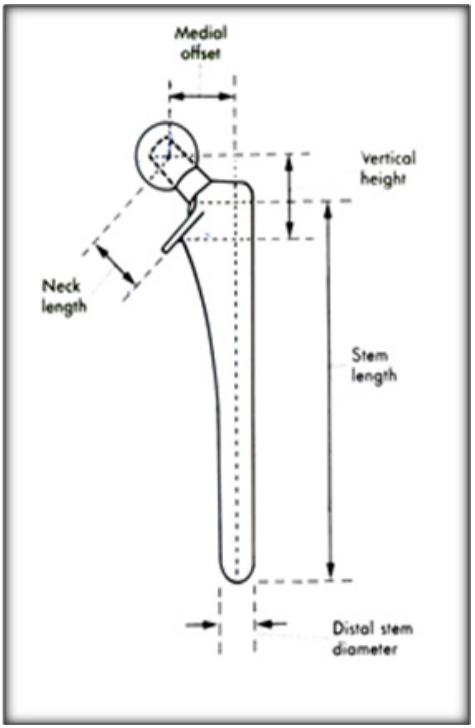
Centralization of head and lengthening of abductor lever arm

Charnley's concept of total hip arthroplasty was to shorten the lever arm of the body weight by deepening the acetabulum (centralization of the femoral head) and to lengthen the lever arm of the abductor mechanism by reattaching the osteotomized greater trochanter laterally. This greatly reduced the force exerted by the abductor musculature to counter balance the body weight. The abductor lever arm is shortened in arthritis to as high as 4:1. Changing surgically the lever arms to 1:1 reduces the total load on the hip by as much as 30%.

However, the principle of centralization has given way to preserving as much subchondral bone in the pelvis as possible. Also, the abductor lever arm can be altered relative to the offset of the head to the stem in case an osteotomy of the trochanter is not done.

Offsets: Ideal femoral reconstruction reproduces the normal center of rotation of the femoral head. This location is determined by three factors:

1. Vertical height (vertical offset)
2. Medial offset
3. Anterior offset (version of femoral neck)



Vertical height of the femoral head is measured as the distance from a fixed point, such as the lesser trochanter, to the center of the head. Restoring this distance is essential for correcting leg length. Using stems with variable neck length adjusts this distance.Medial offset is the distance from the center of the femoral head to a line through the axis of the distal part of the stem. Inadequate restoration of this offset shortens the moment arm of the abductor musculature and results in increased joint reaction force, limp and bony impingement. Conversely, an increase in the offset results in increased stresses with in the stem and cement mantle that may lead to stem fracture

or loosening. Medial offset is primarily a function of stem design. Most of the femoral stem is produced with the neck shaft angle of 135 degree. Normal anterior offset (version) is 10-15 degree of ante version. A stem fixed in retroversion can lead to posterior dislocation of the head.

REVIEW of LITERATURE

Old age brings with it a whole range of medical problems and weakened osteoporotic bones. Fractures can result from trivial trauma or even spontaneously as is true in case of a fracture neck femur which may remain undetected for weeks.

Ambrose Pare,[2] the famous French surgeon recognized existence of hip fractures more than 400 years ago. The history of management of this mysterious fracture have included management by "Skilful neglect", reduction by dynamic traction, anatomic reduction and maintenance in plaster, use of stable internal fixation devices and finally the development of implant arthroplasty.

Phillips,[6] introduced a technique of longitudinal and lateral traction to be used in the treatment of femoral neck fractures to eliminate "Shortening or other deformity. Internal fixation of the femoral neck fractures were started first of all by Von Langenbeck.[8] Seen obtained higher rate of union of femoral neck fractures in dogs using internal fixation and made the following statement" The only cause for nonunion in case of intra-capsular fracture is to be found in our inability to maintain co-aptation and immobilization of the fragments during the time required for bone union to take place." Royal Whitman in 1902,[7] advocated careful reduction and holding of the reduced fragments in a spica cast. Cotton recommended artificial impaction of fracture fragments by blows from a heavy mallet applied to the padded trochanter before cast application.

Internal fixation of femoral neck fracture gained momentum during the early twentieth century and various internal fixation devices were developed. Smith-Peterson,[10] using a triflange nail reported a series of open nailing in which he advocated reduction, impaction and internal fixation and was the fore-runner for the later designs. Smith-Peterson technique

was simplified by the introduction of cannulated nails by Johansson in 1932, which allowed the surgeon to reduce and fix the fracture closed. Telescoping nails or screws,[11] which allow gradual impaction of the fracture site was introduced by Schumpelick and Jantzen,[12] and popularized in a modified form as the sliding compression screw.

The era of arthroplasty had it beginning when John Murray Carnochan reported interposing a small block of wood in an attempt to mobilize a patient's ankylosed jaw. Inter-positional arthroplasty was tried by a variety of materials by several surgeons around the globe - John Benjamin Murphy tried fascia lata as interposing material, William S. Baer described the utilization of chromatised sub-mucosa of a pig's bladder and Robert Jones of Liverpool reported use of gold foil for covering femoral head.

A Boston Surgeon, Smith-Peterson,[13] reported the technique of "mould arthroplasty" with glass cups as the inter-posing material for arthroplasty of hip. Discouraged by how easily by glass cups broke, he tried Bakelie, a form of celluloid.

The search for an implant material strong & chemically inert for prosthetic use ended with the development of an alloy, vitallium by Charles Venable and Walter Stuck. J. Austin Tolley Moore & Harold Ray Bohlman,[15] inserted the first endoprosthesis of vitallium after resecting 30cm of upper end of femur in patient with recurrent giant cell tumor.

Judet Brothers of Paris,[16] development a new endoprosthesis made of acrylic bound to a chromium steel rod which was a failure due to rapid wear and breakage. Frederick R. Thompson,[17] introduced a chromium-cobalt femoral endoprosthesis with a non-fenestrated intra-medullary stem that curved to fit the upper shaft of femur. Austin-Moore,[15] introduced his "Self-locking" endoprothesis with a wider fenestrated stem.

Mahoney et al,[45] published his follow up study of 92 cases on immediate Moore prosthetic replacement in intra-capsular

fractures. The selection of cases was made on the basis of morphology of the fracture and depending upon the age. All these cases represented displaced intra-capsular fractures, either sub-capital or high Trans cervical, usually of unstable type. The patients were usually over sixty five years of age. 85% of the survivors had satisfactory results and failures were seen in 15% of cases.

Harold Bolton,[46] in his study of 88 patients had suggested that the immediate replacement arthroplasty was the method of choice in very old patients with fractures of the femoral neck. For the first nineteen patients he used stamm's prosthesis but later he used Austin Moore prosthesis. He found Austin Moore prosthesis better.

Hinchey et al,[25] studied 288 cases of fresh fractures neck femur treated by primary prosthetic replacement of head of femur using Moore prosthesis with a 1 to 8 years follow up. Modified Watson-Jones approach was used in all cases. 225 cases were followed up with excellent result in 118 cases, good in 46, fair in 24 and poor in 37 cases.

Anderson et al,[47] published a review of 356 operations of femoral head prosthesis. He used both Moore's prosthesis as well as Thompson prosthesis. The average age for the whole series at the time of operation was 65.7 years. Excellent to good results were shown in 87.5% of cases with Moore Prosthesis and 82.4% of cases with Thompson Prosthesis after placing cement in the femoral shaft. Two patients could not be saved and on postmortem examination showed petechial hemorrhages on the visceral pleura and histological examination showed massive pulmonary fat embolism.

Mears and Cruses,[48] evaluated the use of acrylic cement in anchoring the endoprosthesis in hemi-arthroplasties. 192 prosthesis were inserted. 115 cemented and 77 uncemented. On follow-up they noticed that 11. 7% of the uncemented prosthesis became loose compared to 6.10% of cemented prosthesis. They recommended the use of Methylmethaacrylate

for anchoring the stem of prosthesis but that its use should not be a routine.

Evarts,[49]published the role of endoprosthesis as primary treatment of femoral neck fractures. He stated that age alone is not an absolute indication. He recommended endoprosthesis as treatment in high sub captial fractures, pathological fractures, secondary avascular necrosis and nonunion of fracture neck femur.

Narayan et al,[50] in his study of 61 patients of endoprosthetic replacement, for fracture neck of femur between May 1997and Dec. 2002 that were followed –up prospectively. 29 patients were treated with total hip replacement and 32 were treated with bipolar arthroplasty. The period of follow up ranged from 24 months to 90 months, with a mean of 58.5 months. The mean Harris Hip Score for the bipolar group was 86.93 and for the total hip group were 83.82.

Dorr et al,[51] in a randomized, controlled trial that have compared internal fixation, with either total hip replacement or hemi-arthroplasty have demonstrated inferior results for internal fixation, with re-operation rates ranging from 18% to 47%. The reported rates of acetabular erosion have ranged from 0% to 26% for bipolar designs and from 2.2% to 36% for unipolar designs. The major early complication of total hip arthroplasty is dislocation. At the time of the final follow-up, the hemi-arthroplasty group had significantly greater hip disability, represented by higher oxford hip scores (p=0.033) and shorter self-reported walking distances (p=0.039), than the total hip arthroplasty group did.

Ravi Kumar et al,[52] in a randomized, prospective study of octogenarians, who had sustained a displaced fracture of the femoral neck, reported that the rate of acetabular erosion at two years postoperatively was 2.2% for hips that had been treated with a unipolar prosthesis and 0% for hips that had been treated with a bipolar prosthesis. However, Soreide et al reported an acetabular protrusion rate of 26% for patients

older than seventy five years of age who had been managed with a bipolar Christiansen prosthesis. The lowest dislocation rates (2%) were reported for total hip replacement, using the transgluteal approach in patients who had sustained a displaced intra-capsular fracture of the femoral neck. These findings suggest that total hip arthroplasty is superior to hemi-arthroplasty for the treatment of mentally competent, independent, and active patients. Both groups experienced functional deterioration post-operative as compared with pre-operative levels. However patients in THR group have less deterioration and maintained their walking distances.

Baker et al,[53] in their prospectively randomized study, 81 patientswho had been mobile and lived independently before they hadsustained a displaced fracture of the femoral neck were randomizedto receive either a total hip arthroplasty or a hemi-arthroplasty.The mean age of the patients was 75 years. Outcomewas assessed with use of the Oxford hip score, and final radiographswere assessed.After a mean duration of follow-up of three years,the mean walking distance was 1.17 miles (1.9 km) for the hemi-arthroplastygroup and 2.23 miles (3.6 km) for the total hip arthroplasty group,and the mean Oxford hip score was 22.3 for the hemi-arthroplastygroup and 18.8 for the total hip arthroplasty group. Patientsin the total hip arthroplasty group walked farther ($p = 0.039$)and had a lower (better) Oxford hip score ($p = 0.033$) than thosein the hemi-arthroplasty group. 20 patients out of 32 living patients in hemi-arthroplasty had radiographic evidence of acetabular erosion at time of final follow up. None of hips in hemi-arthroplasty group dislocated where as in 03 patients in THR dislocated. In hemi-arthroplasty group, 02 patients were revised to THR and 03 additional hips had acetabulur erosion severe enough to indicate revision. THR conferred superior short term clinical results and fewer complications as compared to hemi-arthroplasty in this study.

Blomfeldt et al,[54] studied120 patients with a mean age of 81 years (70 to 90) with anacute displaced intra-capsular

fracture of the femoral neck.They were randomly allocated to be treated with either a bipolarhemi-arthroplasty or total hip replacement. Outcome measures included peri-operative data, general & hip specific complications, hip function and health quality life. The patients were reviewed at four and 12 months intervals. The duration of surgery was longer in the total hip replacementgroup (102 minutes (70 to 151)) versus 78 minutes (43 to 131)($p < 0.001$), and the intra-operative blood loss was increased460 ml (100 to 1100) versus 320 ml (50 to 850) ($p < 0.001$),but there were no differences between the groups regarding anycomplications or mortality. There were no dislocations in eithergroup. Hip function measured by the Harris hip score, which was significantlybetter in the total hip replacement group at both follow-upperiods ($p = 0.011$ and $p < 0.001$, respectively). The health related quality of life measures was in favor of THR group but did not reach statistical signifanctly. These results indicate that THR provides better function than bipolar as soon as one year post-operative without increasing complication rate.

Squires et al,[55] compared the outcome of the total hip replacement with hemi-arthroplasty in the mobile and socially independent patient with displaced fractures of femoral neck and made note of caution, that there is a higher rate of dislocation when using the total hip arthroplasty. There is no definite conclusion as to the more appropriate treatment for less mobile population. Gerhard cautioned that the better outcome results obtained with the total hip replacement should be assessed in concern with the troubling higher rate of dislocation and deep and persisting infection. Preoperative ambulatory status also correlated well with outcome. Of patients walking independently before injury, 30.8% of patients had a good outcome as compared to only 14.2 % of patients who had to rely on aided ambulation. So, pre-fracture mobility is often a predictor for short term complications. As an extension, long term mortality was also found to co-relate well with pre-morbid ambulation as a facet of multi-factorial

causation. Hemi-arthroplasty is a good option for fracture neck of femur in elderly with 66% of patients obtaining satisfactory results.

Parker,[56] studied of 3154 consecutive patients with fracture neck of femur, 908 patients were treated by hemi-arthroplasty; 4.8% required revision surgery within the first year for dislocation (1.7%), peri-prosthetic fracture (1.2%), loosening (0.8%) and infections (1.2%). Pain and mobility in patients who undergo hemi-arthroplasty are inferior to total hip replacement in short term and long term. A meta-analysis reported a mean dislocation rate of 6.9% following total hip replacement for a fracture of neck femur. The 6.6 years survival rate of THR for fracture neck of femur is 96.6% according to Swedish joint registry.

Sayaana et al,[35] in his study of 65 to 80 years old individuals, managed with internal fixation, or THR or HA for treatment of displaced fracture of neck of femur. THR is an option to manage this fracture in old frail dementiated individuals, but some co-morbidity poses a significant surgical dilemma. HA should an ideal choice in individuals with many co-morbidities & shorter life expectancy. Out of 55812 THR recorded in England and Wales National joint registry in year 2005, 746 operations was performed for fracture neck of femur i.e. 1.3% of hip replacement. In Norway out of 10000 incidence of hip fracture per annum, only 654 THR are performed for fracture neck of femur. The opinion regarding the use THR is divided. However in Sweden and Norway, THR is more widely used in management of fracture neck of femur. There is increasing evidence that THR is superior surgical management option in 65-80 years old, active lucid ambulant patient with dislocated fracture neck of femur.

Hunter,[57] made a comparison of the use of internal fixation and prosthetic replacement for fresh fracture neck of femur. In this study, 200 cases were taken. In 100 cases prosthetic replacement was done and in 100 others internal fixation

done. He found that mortality and morbidity was higher in prosthetic replacement group as compared to internal fixation group.

Naidu and McQueen,[58] in their follow up study on hemi-arthroplasty of the hip evaluated the effectiveness of the treatment in various hip conditions. A total in 169 hemi-arthroplasty of the hip performed at the Medical College of Georgia were taken up for study. Hips were evaluated by Harris' hip evaluation method. The patients were divided into various diagnostic groups. The hips with idiopathic avascular necrosis followed by the hips with fresh fracture showed the best overall results. The results were not as good when the acetabulum was damaged, but acetabuloplasty was beneficial in these patients. The hips with rheumatoid and degenerative joint disease did poorly with hemi-arthroplasty.

Gingras et al,[59] published a comparative study of cemented versus non-cemented prosthesis. He had illustrated a favorable trend when the endoprosthesis is cemented in the treatment of fresh femur neck fractures. There is no difference of morbidity and mortality between the two groups. In cemented prosthesis, fixation of the prosthesis to femur gets improved. Pain and loosening are far more less in cemented group. In cemented pain was found in 8 percent of cases while in non-cemented in 28 percent. Incidence of loosening was 18 percent in cemented and 69 percent in non-cemented.

Taine and Armour,[60] used primary total hip replacement for independently mobile making patients of 65 year or above. A total of 163 cases, operated on over a period of four years were reviewed. Only seven revision operations were required out of 57 patients who were interviewed after an average of 42 months after replacement, 62% had excellent or good results as assessed by the Harris hip score. It was concluded that total hip replacement is the best management for a select group of patients with fracture neck femur and further prospective studies were indicated.

Dorr et al,[61] conducted a prospective study of displaced femoral neck fractures with patients randomized into three groups: cemented total hip replacement (THR), cemented hemi-arthroplasty (UHR-C), and non-cemented hemi-arthroplasty (UHR-NC). Eighty-nine patients were treated for displaced (Garden Type-4) fracture with prosthesis; 39 patients had THR, 37 had UHR-C and 13 UHR-NC. No difference was found in the level of pain, ambulation between the THR group and the UHR-C group, except for active community ambulators, who demonstrated decreased endurance capability when treated with UHR-C. The patients treated with UHR-NC had increased pain and decreased ambulation and required assistive devices. The most significant complication was dislocation, which occurred in 7 patients with THR and 2 with UHR-C.

Gebhard et al,[62] reported a series of 166 acute nonpathologic displaced femoral neck fractures in elderly patients treated with either unipolar hemi-arthroplasty (122 operations, 77 cemented, 45 uncemented) or total hip arthroplasty (THA), 44 operations all cemented. The average age (75.2 years of age in the THA group, 76.2 years of age in the hemi-arthroplasty group), anesthesia risk classification, in-hospital mortality, early complications and dislocation were comparable in each treatment group. In an average long-term follow-up of 56 months, pain, walking, and function scores were higher with THA than with cemented or uncemented hemi-arthroplasty. Revision rates were 2.2% after THA, versus 7.9% for cemented hemi-arthroplasty and 13% for uncemented hemi-arthroplasty. He stated that hemi-arthroplasty be recommended for occasionally active patients and THA for healthy active patients.

Gregory et al,[63] studied a series of 46 patients with 45 displaced sub capital femoral fractures of the age group between 65 and 79 years who were treated with total hip replacements. Mean Harris hip score of 33 patients reviewed at 3 years was 83. 6-months mortality was 9 percent. Postoperative mobility was

well maintained and there was no evidence of deep sepsis or loosening.

Nehrer et al,[64] studied 120 patients who underwent total hip replacement after suffering from fractures of the femoral neck: 61 patients did not have any previous surgery, 59 patients had joint preserving surgery, results showed that the primary stabilizing operation to preserve the joint did not have any negative effect on the survival probability of the total hip replacement in comparison to primary implantation. If the joint preserving primary intervention fails, total hip replacement is a good choice for secondary surgery.

Ekulund et al,[65] observed 162 total hip arthroplasties in people of 80 years age group & older, for one year. In 80% of the patients, no complications were recorded during the first year. Three patients died within the first three months of surgery. Two developed deep infections (12.2%). The dislocation rate was 9.2% (15/162). After one year, 88% (112/127) of the patients who could be observed had good or excellent results. They concluded that total hip arthroplasty in the elderly is a reasonably safe method and yields good functional results.

Hui et al,[66] compared the re-operation rate after internal fixation for minimally displaced or impacted intra-capsular fractures of the femoral neck in patients aged 80 years and above with that in similar patients aged 65 to 79 years. They also compared the results of internal fixation with those of hemi-arthroplasty for displaced intra-capsular fracture in an age-and sex-matched group of elderly patients. They found that a significantly greater proportion of the old patients treated by internal fixation required re-operation than either the younger group or the age-matched group treated by hemi-arthroplasty. They recommended that internal fixation may not be the best treatment for elderly patients with minimally displaced or impacted fractures.

Warwick et al,[67] reviewed the records of 56 patients in whom a hemi-arthroplasty, carried out for a femoral neck fracture, had been revised to a total hip replacement. The mode of failure was femoral loosening in 21, acetabular erosion in 26 and both in 5, loosening tended to occur earlier than acetabular erosion. The median time to the onset of symptoms was 12 months and to revision 33 months. There were 38 major operative or postoperative complications at revision in 27 of the patients (48%).

Broos,[68] made an analysis of 778 unstable fractures of the femoral neck, Garden type III or IV in 736 patients over 70 years of age they have been treated surgically. 447 patients were treated with hemi-arthroplasty and 301 patients with total hip replacement. The complications noted after prosthetic replacement were dislocation (2%) requiring an early revision arthroplasty and deep infection (<1%).

Parker et al,[69] conducted a study of 455 patients aged over 70 years treated by either hemi-arthroplasty or internal fixation. Internal fixation had a shorter length of anesthesia (36 minutes versus 57 minutes), lower operative blood loss (28 ml versus 177ml). In internal fixation group 90 patients required 111 additional surgical procedures while only 15 additional operations were needed in 12 patients in the arthroplasty group. At one, two and three years after injury there was no difference with regard to pain and mobility in both groups. Limb shortening was common after internal fixation. They recommended that displaced fractures in the elderly should generally be treated by arthroplasty but internal fixation may be appropriate for those who are very frail.

Rogmark et al,[70] made a prospective, randomized study of 68 patients aged 70years or older, with displaced cervical hip fractures. The patients were randomized to internal fixation with hook pins,[36] or primary arthroplasty,[32] (total or partial) and followed for 2 years. In the internal fixation group, 15/36 was considered failures, as compared to 1/32 in the

arthroplasty group. The mean 2 years cost for a patient with internal fixation was US$ 21,000 and for one with primary arthroplasty US$ 15,000. They concluded that primary arthroplasty is a cost effective treatment and considering the very much higher failure rate after internal fixation-leading to increased suffering for these patients, primary arthroplasty stands out as the best method for displaced fractures of the femoral neck.

In a study by Mishra et al,[71] Fifty-one consecutive socially independent and mentally alert patients of average age of 74 years with displace sub capital fractures were treated by primary THR, from April 1997 to March 2000, at a single hospital. This study had a mean follow-up of 33 months (range 20-54). This study had the lowest reported dislocation rate (2%) and an acceptable 1-year mortality rate of (6%) confirming the place of primary THR in treatment of these select patients with a displaced hip fracture.

Mabry et al,[72] reviewed 99 patients who had been managed with total hip arthroplasty with use of a cemented Charnely acetabular component and a cemented Charnley monoblock femoral component for the treatment of a femoral neck nonunion retrospectively in age group of sixty-eight years. The rate of component survival, free of revision or removal for any reason was 93% at ten years and 76% at twenty years. It was concluded that total hip arthroplasty is an effective method for the treatment of nonunion of the femoral neck and provides satisfactory long-term results.

Healy and Iorio,[73] studied 186 displaced fractures of the femoral neck in elderly patients who were treated surgically with internal fixation (in 120 patients), hemi-arthroplasty (in 43 patients), and total hip arthroplasty (in 23 patients). One hundred twenty patients with displaced fractures treated with internal fixation were compared with 66 patients with displaced fractures treated with arthroplasty. Arthroplasty was associated with more independent living and was more

cost-effective than internal fixation. They concluded that total hip arthroplasty was the best treatment for displaced fractures of the femoral neck in elderly patients in this series.

Patel et al,[74] reviewed a retrospective study of 50 Muller straight stem total hip replacements performed for femoral neck fracture over a 10 year period. In 25 radiographs available for review there were no cases of radiological loosening? None of replaced hips required revision surgery. Two patients had suffered early dislocations and there were three major medical complications. The mean Merle D'Aubigne-Postel score was 15.1. They concluded that total hip replacement in the right hands provides good results for the treatment of displaced intra-capsular fracture neck femur.

Hardas et al,[75] evaluated the prognosis among different age groups in elderly patients aged 65yrs and above treated for hip fractures. Replacement arthroplasty, either hemi-arthroplasty or total hip replacement was found to be ideally suited for the elderly population as a primary procedure to tackle the problem of fixation failure, non-union and AVN. THA is advocated in cases where life expectancy is significant and when acetabular disease is present.

Richard et al,[76] performed controlled trials at 2yrs post operatively have shown that a primary total hip replacement is superior to internal fixation for the treatment of displaced femoral neck fracture. They evaluated one hundred and two patients (mean age, eighty years), who had acute displaced femoral neck fracture, were randomly allocated to be treated with total hip replacement or internal fixation. The mortality rate was 25% in both groups. At the forty-eight-months follow-up evaluation, number of hip complications was 4% in patients treated with total hip replacement and 42% in those treated with internal fixation ($p < 0.001$) and the re-operation rates were 4% and 47%, respectively ($p < 0.001$). The total hip arthroplasty group had no additional hip complications or re-operation between the 24 to 48 months follow-up visits. In

the fixation group, the percentage of re-operation increased from 4% to 47% during the same period. The hip function was significantly better and the decline in health-related quality of life was less pronounced in arthroplasty group than it was in the fixation group at the four, twelve, and twenty-four-months follow-up evaluation.

AIMSAND OBJECTIVES

We intend the study of 50 cases of intra-capsular fracture neck of femur treated with total hip replacement and bipolar (25 cases each) in Department of Orthopaedics, Rajindra Hospital, and Patiala with the following aims:

1. To assess the time required for unprotected weight bearing.
2. To compare cost of surgeries
3. To assess the relief of pain so that the patient is able to carry out the activities of daily life.
4. To assess the functional status of the patient.
5. To assess the restoration of range of movements at hip.
6. To assess the stability of hip.
7. Any need for secondary surgeries

The assessment of patient in relief of pain, functional status, and range of movements at hip i.e. 3,4,5 has been evaluated using Merle'D Aubigne and Postal hip rating system, described by Salvati et al,[77] and stability of hip has been assessed in terms of dislocation.

MATERIAL AND METHODs

The present follow-up study (non-randomized) has been conducted on 50 cases of intra-capsular fracture neck of femur above the age of 60 years admitted in department of orthopedics Government Medical College and Rajindra Hospital, Patiala. Out of 50 cases which were selected intra-operatively of Garden type III and IV, 25 will be those in whom cemented bipolar prosthesis will be used while in other 25 total hip replacement will be done and this is to be decided by the operating surgeon either to do PHR or THR depending upon the status of acetabulum, pre-fracture mobility and morbidity as well as general condition of patient. The fracture type has not been included in allocation of procedures.

Patients will be given first-aid in the form of skin traction, analgesics, suturing of wound if any, and antibiotics. Patients will be immunized against tetanus, and shock if present, will be treated. Radiographic examination will be done to assess the type of fracture and displacement.

In the ward, history will be recorded on Performa attached. General physical examination and local examination will be noted. Patient will be investigated for operative and anaesthesia purposes. Any associated medical problems will be taken care of before the patient is taken up for surgery. Pre-operative counseling of patients and his relatives regarding the method of treatment, prognosis will be done and informed consent will be taken.

PREOPERATIVE PLANNING

This aspect is important in choosing appropriate implants and anticipating unusual needs during surgery. In the absence of pelvic obliquity or hip contracture, discrepancy in true leg lengths and in apparent leg lengths on the two sides will be the same. In case they differ as restoring equality in true leg length will result in the patient feeling that the newly operated

leg is either too long, or too short. On AP radiograph of pelvis with both hip joints, mark the "U body" or tear drop at medial-inferior aspect of quadrilateral plate on both sides and connect them. This tear drop line is reference line. Next mark the tip of the lesser trochanter on both sides. Measure vertical height from this point on lesser trochanter to the reference line. The difference in the two sides is the true leg length discrepancy, which will be equalized if there is no fixed pelvic obliquity. If there is, then apparent length discrepancy will be equalized. Using prosthesis X-ray template, locate the desired position of the acetabular component, maximizing bony containment mark the center of rotation on X-ray, then mark a point above the acetabular center of rotation at a distance equal to the amount of additional leg length desired. Choose the femoral component of sufficient size to fill the canal. The template has the mark designating the center of rotation of femoral head with various neck lengths/ head size. Choose the one that will lie on the point above the center of rotation of the acetabulum. Mark the neck resection on the radiograph and measure the distance of the neck cut above the top of the lesser trochanter.

PRE-OPERATIVE REGIME

Patients were shaved of all hair from nipple to toes both anteriorly and posteriorly. Prior to surgery they were made to have a thorough wash with soap and water. Nails were cut shorts. Salt water enema was given 1 night before. Preoperative prophylactic injectable antibiotic were started on all patients from 12 hours prior to surgery and continued till 5 days postoperative. These were then switched over to oral antibiotics. All patients were started on cefuroxime 750 mg after test dose every 12 hourly. Injection amikacin 500 mg also given 12 hourly. Dose was adjusted according to the body weight and renal function of the patient.Fresh sterilized gowns and gloves were kept for each case. Instruments were autoclaved thrice and Operation Theatre was fumigated. The operation theatre door was closed, not to be opened before the operation was completed. All operating surgeons and

staff nurses scrubbed for ten minutes and double mask and gloves were used for surgery. The 750 mg cefuroxime was also given intra-operative. Urinary catheter was introduced in all patients just prior to surgery.

PRE-OPERATIVE PLANNING

Pre-operative planning provides enough information to treating surgeon and forces him to think in three dimensionally to avoid various complications. This gives better functional outcome as well as patient satisfaction.

RADIOLOGICAL PLANNING

This is an important part of the preoperative planning. Surgical decisions such as implant selection, bearing type and mode of implant fixation (cemented versus uncemented) are influenced by age, sex, preoperative diagnosis, activity level and mental status. A systematic assessment of the lumbosacral spine and knee is performed to identify any extra-articular sources for hip pain. Flexion contractures, previous scars and a neurovascular exam are then performed. True and functional LLDs should be carefully evaluated and recorded. Pelvic obliquity can be evaluated by comparing the level of both hemi-pelvises with the patient sitting and standing, and if present, the surgeon should assess whether its origin is suprapelvic, intrapelvic or infrapelvic. In the seated position, suprapelvic obliquity per sists usually secondary to a fixed lumbosacral scoliosis. In contrast, intrapelvic and infrapelvic obliquity resolve in the seated position.

TECHNIQUE

The standard preoperative radiographs for THA includes three radiographs: an anteroposterior (AP) view of the pelvis and an AP and lateral of the affected hip. The AP pelvis view is centered over the pubic symphysis and includes the proximal third of the femur to allow for templating. The AP views are obtained with the patient positioned supine on the radiographic table with the lower limbs in approximately

15°±5° of internal rotation to allow a true AP view of the femoral neck, which has a normal anteversion of 15°±5° A well done AP pelvis view should have neutral pelvic rotation and tilt. To determine the proper pelvic rotation, the pubic symphysis should project on a line through the center of the sacrum and coccyx, and the two obturator foramina should appear symmetrical. The pelvic tilt is estimated by the distance between the upper border of the symphysis and the center of the sacrococcygeal joint. This distance should be 2-3 cm above the superior end of the symphysis in males and between 2-6 cm in females. This distance is increased when the pelvis. Is tilted forward, and the AP view is close to an inlet view. Conversely, this distance is decreased when the pelvis is tilted backwards, and the AP view is close to an outlet view. In patients with a fixed external rotation contracture who cannot internally rotate their hips, a posteroanterior (PA) view of the femur should be obtained. This PA view is obtained with the patient positioned prone on the radiographic table with the contralateral hip elevated to an angle equivalent to the contracture. The most frequently used lateral view of the hip is a modification of the frog-leg (Lowenstein) lateral view and is obtained with the patient positioned supine on the radiographic table with the affected hip externally rotated and the knee and ankle flat on the table. This view is used for locating proximal femoral entry point in the piriformis fossa. Additional Bone quality and the geometry of the proximal femur can be assessed using the indexes of Singh and Dorr. The Singh index is commonly used to assess osteoporosis and is based on the density of trabecular bone of the proximal femur" and the Dorr classification, classifies the geometry of the proximal femoral canal. Both indexes contribute to decision making on implant type and mode of implant fixation.

RADIOGRAPHIC TEMPLATING

1) Magnification: Usually with the X-ray tube at 100 cm from the top of the table and the X-ray tray placed 5 cm below the table, magnification is 20% (± 6%, 2 SDs) as soft

tissues are interposed between the hip and the X-ray plate. Attention should be paid to the patient's body habitus because magnification is directly proportional to the distance between the pelvis and the film. Therefore, increased magnification should be anticipated in extremely obese patients and, conversely, less magnification would be expected in extremely thin patients. If the radiographies are digitized, they must be calibrated before templating. A radio-opaque marker such as sphere which is 25 mm in size or a coin with a known size is usually used as a calibration tool in order to scale the dimensions shown on the radiograph and the digital templates. These markers should be at the same level of the hip joint in the AP plane

2) Landmarks: Various landmarks are used to convert the 2-D picture of X-rays into a 3-D vision during intraoperative. There are : 1) iloischial line (Kohler's line), 2) the base of the teardrop, and 3) the superolateral margin of the acetabulum at the acetabular side; 4) the lesser and 5) the greater trochanter and 6) the medullary canal at the femoral side. The radiographic teardrop (U-figure) is located in the inferomedial portion of the acetabulum, just above the obturator foramen. The teardrop is a consistent radiographic landmark and In close proximity to the center of hip rotation and the acetabular floor. The ilioischial line, or Kohler's line, is drawn from the medial border of the ilium to the medial border of the ischium, and is a useful landmark when assessing the degree of protrusio acetabuli. The superolateral margin of the acetabulum provides a reference for the degree of osseous coverage around the implanted acetabular component.

3) Leg-Length Discrepancy: To assess LLD, a pelvic horizontal reference line is made using the lower margin of the two teardrops and drawing an inter-teardrop line. If the teardrops are not identifiable, a horizontal reference line can be drawn through the distal aspect of the ischial tuberosities or the distal aspect of the sacroiliac joints The LLD at the hip can be calculated as the difference in the vertical distance between

the horizontal reference line and a fixed point on the femur. Fixed points on the femur could be the lesser trochanter, the greater trochanter or the center of the femoral head. LLD may be present at a level distal to the hip joint, such as in case of bony abnormalities (osteotomies or mal-unions) or functional limitations (hip or knee contractures). In this case, LLD should be assessed on a standing AP view radiograph, with the distance measured between the inter-teardrop line and the floor.

4) Acetabular Templating:

a) COR: This is always done to establish the new COR after component implantation. Using the previously described pelvic radiographic landmarks, the template should be oriented to achieve an abduction angle of 40-45 degree in relation to the inter-teardrop line, with the inferomedial border of the cup seated near the iloischial line, or the lateral edge of the teardrop. The superolateral margin of the acetabulum is used as a reference for the coverage of the cup, and final component size should maximize cup coverage while avoiding excessive subchondral Bone resection. The COR should be medialized in order to decrease the moment arm generated by the patient's body weight during the gait cycle, theoretically reducing wear and improving clinical outcomes In cemented cups, a uniform 2-3 mm space should be left for cement mantle Once final acetabular implant size and position have been determined, the new COR of the hip should be marked and compared to the contralateral side for vertical and horizontal symmetry

b) Lateralized Acetabulum: The cup should be medialized as much as possible in order to gain the proposed benefits of improved postoperative hip biomechanics. The cup template should be positioned in the anatomic position, adjacent to the lateral edge of the teardrop and lateral to the ilioischial line.

5) Femoral Templating:

The goal of the femoral templating is to choose an implant that permits adequate fixation and restores offset and leg length. To achieve this result, it is important to consider both the intra-osseous parameters (stem fixation and alignment) and the extra-osseous parameters (offset and leg length). Stem size is best determined on the AP view radiograph, and depends on stem type choice (straight or anatomic), fixation choice (cemented or cementless) and coating choice (proximally coated or fully coated). For a cemented stem, a uniform 2-3 mm cement mantle should be considered. The entry point (piriformis fossa) and the fit of the stem should be assessed on both AP and lateral views. Once the stem size is decided, the template should be positioned inside the femoral canal, along the longitudinal femoral axis, and the COR of the femoral head should be marked. Attention should be paid in cases of coxa vara or coxa valga. Now, the positions of both centers of rotation (femoral and acetabular) should be checked. The vertical and horizontal distances between those points represent the change in limb length and offset that will be obtained. If the two centers of rotation are overlapped, leg length and offset will remain unchanged. If the COR of the femoral stem lies medially to the COR of the acetabular cup, femoral offset will be increased. Conversely, if the COR of the femoral stem lies laterally to the COR of the acetabular cup, femoral offset will be decreased. If the COR of the femoral component lies more proximally than the COR of the acetabular cup, lengthening of the limb will occur conversely, shortening of the limb will be the result if the COR of the femoral component lies more distally than the COR of the acetabular cup. Once the offset and the femoral head COR are determined, the level of the femoral neck cut can be marked. The distances between the proximal corner of the lesser trochanter and theCOR of the femoral head as well as the proposed neck cut level are also determined at this point

POSITIONING OF THE PATIENT

Proper patient positioning is a prerequisite for accurate exposure and intraoperative assessment the pelvic position during acetabular component implantation After induction of epidural anaesthesia. The patient is positioned in the lateral decubitus position on a well-padded hip table In order to secure the patient so the ASIS is perpendicular to the plane Of the floor and not rotated, the pelvis is secured with padded anterior (pubic) and posterior (sacral) post supports. We also cover the anterior pubic post with an inflatable pad, to improve stabilization and protect the skin from excessive pressure. An inflatable shoulder float is placed below the axilla to avoid injury to the axillary nerve and reduce postoperative shoulder discomfort. The back is also stabilized with a posterior thoracic support to prevent any forward or backward rolling of the body. All of the bony prominences are padded. The nonsurgical leg is secured with a belt in a position of slight hip flexion and 90° of knee flexion. A foam rubber pad is also positioned between the knees in order to retain a neutral position of both extremities.

INCISION AND EXPOSURE

The anatomic landmarks for the surgical incision are marked with a skin marker including the proximal, anterior and posterior borders of the greater trochanter and the vastus ridge In cases of overweight patients, wherein the greater trochanter can be difficult to palpate, rotation of the limb can help in identifying it. A straight skin incision begins in the middle of the femur at the level of vastus ridge and extends 1-2 cm proximally over the posterior corner of the greater trochanter for a total incision length of 8-10 cm. Approximately, one-third of the incision extends proximal to the tip of the greater trochanter Distally, the incision follows the axis of the distal femur, whereas proximally follows the direction of the underlying gluteus maximus fibers and is slightly curved in the posterior direction. In obese patients, a longer incision may

be required in order to avoid excessive pressure on the skin edges. An incision shorter than 6 cm should be avoided, as it increases the risk of skin bruising and blistering. After the skin incision is made, subcutaneous tissue is incised and retracted in line with the skin incision. The fascia lata is also incised in the line of the skin incision, between the middle and posterior third of the greater trochanter along the axis of the femur. The gluteus maximus is gently split along its fibers cranially using blunt finger dissection to expose the proximal part of the great trochanter two cotton laps soaked in saline are applied to the skin edges and a Charnley self-retuning retractor is placed deep to the fascial layer while carefully protecting the sciatic nerve. The leg is positioned in neutral extension, and the hip is gently internally rotated with a padded Mayo stand under the foot for support. The trochanteric bursa is then incised and the fat pad behind the great trochanter reflected posteriorly with a surgical lap sponge. The short rotators are exposed with a Cobb elevator. Haemostasis of the deep medial femoral circumflex vessels is achieved with electro cautery. The piriformis is palpated and separated from the inferior border of the gluteus medius with a blunt dissection to create an anatomic interval. Angled at 90°, Hohmann retractor is placed underneath the gluteus medius in this interval and an Aufranc retractor is placed immediately adjacent to the proximal margin of the quadratus femoris below the inferior capsule and the femoral neck. At the junction of the piriformis and gluteus minimus, the piriformis, conjoined tendon And underlying capsule are released as a single layer from the posterior border of the femoral neck, extending distally to the level of the lesser trochanter. A portion of quadrates femurs muscle may be released in the distal portion of this incision. This creates a single soft tissue sleeve that is then tagged with two nonabsorbable sutures for later posterior soft tissue repair. The first suture is through the piriformis tendon and cap sule and the second suture throught the conjoined tendon and capsule. With further flexion, adduction and internal rotation, the femoral head is then dislocated posteriorly. In

difficult cases, placing a bone hook around the femoral neck may help. The limb is then internally rotated 90° The center of the femoral head is marked with electrocautery and the lesser tro chanter is identified. The distance from the lesser trochanter to the center of the femoral head is measured intra-operatively and compared with the preoperative plan. The level of the neck cut level is based on the preoperative plan. The femoral neck osteotomy is performed with a thin oscillating reciprocating saw, starting from the medial calcar towards the great trochanter (Fig. 8.9). Attention must be paid to prevent notching of the greater trochanter or injuring the sciatic nerve. Care should be taken to make sure the saw blade is perpendicular to the long axis of the femur so as to prevent an oblique femoral neck cut. The head is removed using a tinaculum pointed clamp and a twisting motion to disrupt remnant of the ligamentum teres.

COMPONANT PLACEMENT

1) ACETABULUM PREPRATION AND POSITIONING OF THE ACETABULAR COMPONENT:

After the femoral neck cut is completed the leg is returned to a neutral position. The femur is retracted with an angled C-shaped Hohmann retractor over the anterior wall of the acetabulum. A Steinman pin is placed into the supra-acetabular region (ilum) to retract the gluteus medius and minimus superiorly. The inferior capsule is incised to relieve the tension and a wide angled Hohmann retractor is inserted into the posterior wall of the acetabulum between the labrum and the poste rior capsule using a mallet to gain bone fixation. An Aufranc retractor placed initially inferior to the transverse acetabular ligament and moved above the ligament after further inferior capsular release. The acetabular labrum and overhanging peripheral soft tissues are then excised with a long-handled scalpel, the full circumference of the acetabular socket should be exposed. The pulvinar is excised with a long electrocautery tip to prevent bleeding from the ligamentum

teres vessels. Peripheral osteophytes are generally removed after the cup is impacted in its final position using a broad osteotome and a rongeur The acetabulum is initially sequentially reamed in a progressive and concentric manner with an offset handled reamer The initial reamer is roughly 6 mm smaller than template's acetabular cup size and is inserted directly into the wound in order to remove the medial osteophyte and expose the true acetabular floor (medial wall) Then, the surgeon brings the reamer to the desired lateral abduction and anteversion and the periphery of the acetabulum is incrementally (2 mm increments) reamed to the desired size until sufficiently bleeding subchondral bone is exposed throughout the acetabular wall, and good rim contact with the reamer is achieved. The correct arrangement the retractors, and especially the inferior Aufranc retractor, allow for adequate inferior mobilization of the skin (mobile window) and helps placing the reamers horizontally enough to achieve the desired cup position. After acetabular reaming is concluded, a trial shell is inserted and fully seated to verify size, orientation and stability of the cup. The surgeon, especially beginner, should note the position of the trial shell so that the acetabular cup can be inserted in the same position. Screws can be added to increase fixation if is needed. The monoblock cup is of the elliptical shape, the cup is 2 mm wider in the periphery comparing to a hemispherical cup and reaming is performed to 1 mm below the external rim circumference, thus providing a stable rum fit. With a vertically placed medializing impactor, the cup is initially brought medially. It is then impacted axially to the desired orientation. Before press-fitting the cup, its position is checked with an angle guide who rests on the acetabular rim, and fine adjustments can be made with the impaction of a shovel placed on the appropriate positions of the rim. Once optimal orientation is achieved, the cup is press-fit ted with a ball impactor to its final position. In our practice, for a primary total hip arthroplasty, we opt for a medial and inferior placement of the acetabular cup (in line with the plane

connecting the two teardrop signs in the AP pelvis X-ray), in order to restore the normal hip joint center of rotation and biomechanics. The optimal lateral abduction angle of the cup is considered to be 40°-45°, whereas desired cup anteversion is 15%-25°. Nevertheless, cup anteversion should be always considered in combination with femoral anteversion and the goal should be obtaining a combined anteversion of 25° to 35° for men and 30° to 45 for women

2) FEMUR PREPARTION AND POSITIONING OF THE FEMORAL COMPONENT:

After the actabular cup implantation is completed, the Charnley retractor is removed and the femur is 90° internally rotated, flexed and adducted. Two clean laps are used to protect the skin and a third lap sponge is inserted into acetabular shell to protect the polyethylene and shell. The proximal femur is delivered into the mobile window, and exposure is aided with a narrow femoral neck retractor (modified toothed Aufranc retractor) placed on the anterior neck. An Aufranc retractor is placed along the inferior/medial neck below the lesser trochanter and preferably in contact with the modified Aufranc retractor used to lift the femur. A C-retractor is placed anterior to the greater trochanter into the trochanteric fossa superiorly to separate the gluteus minimus and medius muscles which provides exposure to the femoral neck and protects the abductors during subsequent reaming and broaching of the femoral canal. Once the retractors have been placed around the proximal femur, the remaining lateral cortex of the neck is removed with a curved gouge placed at the junction of the femoral neck and the greater trochanter. The femoral canal is subsequently opened with a rasped cylindrical reamer. Care is taken to lateralize the femoral canal during reaming, in order to avoid varus insertion of the stem.

3) REAMING: Sequential reaming of the distal portion of the canal is performed with a straight reamer, until adequate cortical contact is reached. Broaching of the proximal

femur is then carried out, with the broaches inserted with approximately 10°-15° of anteversion and follows the patient's native version. The posterior neck cortex in relation to the epicondyles of the knee with the leg perpendicular to the floor can be used as a reference for determining anteversion. The broach size is then incrementally increased until adequate fit and rotational stability are achieved. A calcar planer is used to remove any excess bone around the neck of the final trial broach once the handle has been detached. A rongeur may also be used at this time to remove any osteophytes located usually at the anterior aspect of the femoral neck. After usertion of the trial neck and a standard head (+0) of the appropriate diameter, the hip is reduced, and cup coverage and combined anteversion of the components are evaluated. In addition, the hip is brought to range of motion to check for impingement and instability After confirming appropriate positioning, the beach is removed and the chosen implant is inserted Irrigation is not performed before the insertion of the prosthesis as a pres-fit stem is used, and autogenous bone should not be removed from the canal Again, care is taken to maintain the desired anteversion during impaction of the stem to its final position. A final femoral head is impacted onto a clean and dry femoral stem taper.

4) REDUCTION AND CLOSURE:

Once the implants have been placed and reduced, the wound is irrigated via pulsed lavage and haemostasis achieved. The short external rotators, including the conjoined tendon and the piriformis tendon, as well as the posterior joint capsule are repaired through two transosseus holes in the greater trochanter and ideally in the site of the native insertions. The sutures are passed through the drill holes with a suture passer and tied in slight abduction and external rotation to allow the posterior tissues to come in close proximity to the femur. The fascia lata is closed with interrupted 0 Vicryl sutures. The wound is closed in layers. A sterile dressing is then placed over the wound, which is wrapped in a hip spica fashion

using an Ace bandage. The final position of the leg is secured using an abducting pillow.

INTRA-OPERATIVE ASSESMENTS

1) LIMB LENGTH EQUALIZATION

The process of preserving limb length or restoring LLD during total hip begins with preoperative templating. The perpendicular distance between the proximal corner of the lesser trochanter and the inter-teardrop line is measured for both sides and any difference noted represents the LLD that needs to be restored. The results should always be compared to the clinical limb length measurements performed during patient evaluation. After templating for the acetabular and femoral components the vertical distance between the centers of rotation of the acetabular cup and the femoral stem represents the change in limb length that will be obtained. This could be either lengthening (if the femoral component's center of rotation is more proximal than that of the acetabular cup) or shortening of the limb (if the femoral component's center of rotation is more distal than that of the acetabular cup). Similarly, if the center of rotation of the femoral stem lies medially to the center of rotation of the acetabular cup, femoral offset will be increased and vice versa. The distances between the proximal corner of the lesser trochanter and the center of rotation of the femoral head (lesser trochanter center [LTC]), as well as the level of the femoral neck osteotomy are also determined. Intra-operatively, the findings of preoperative templating need to be confirmed. After dislocating the hip. The proximal corner of the lesser trochanter is released and exposed, the centre of the femoral head is determined and the distance between these two points is measured and compared to the LTC distance measured during preoperative templating, to evaluate for accuracy of preoperative measurements. The level of the neck osteotomy is also marked. Once the surgeon has proceeded with neck osteotomy, after reaming and broaching of the femoral canal

and with the final broach in place, a trial femoral neck and a femoral head of the appropriate diameter are inserted. The selection of a neck with a standard or an extended offset depends on the findings of preoperative templating with a general goal of using the midrange of available neck lengths. Moreover, a femoral head with the largest possible diameter accommodated by the acetabular cup is preferable (up to 36 mm), as it is well established that a greater head/neck ratio increases range of motion and stability of the implant.

2) STABILITY

After inserting the selected femoral neck and a +0 head, the LTC distance is determined again. If there is a difference with the LTC measured before the neck osteotomy, then a femoral head of longer or shorter length is inserted. The hip joint is reduced and the surgeon assesses soft tissue tension, range of motion and stability.

Soft tissue tension can be evaluated with three tests: 1) Drop kick test 2) Shuck test 3) Impingement test

1) Drop kick test: When the hip is brought to extension, the knee should remain in flexion. If the knee is extended with this maneuver, then soft tissue tension is too tight.

2) Shuck test: Involves telescopic distraction of the femoral head from the acetabulum, which should only allow for a few millimeters of translation Range of motion is then evaluated and any restriction, particularly in internal or external rotation, is indicative of tight soft tissue tension. The presence of gross instability is also assessed.

3) Impingement test: This is performed by adducting and internally rotating the hip and assessing for hip stability and range of motion before impingement occurs. As noted earlier, if any modifications are deemed necessary after these tests, fine adjustments can be made by using different neck and head offsets and lengths. Once optimal hip biomechanics is achieved, the chosen femoral stem and head are inserted, the

hip is reduced and the surgeon proceeds with closure Careful repair of the posterior capsule with the technique described earlier is critical for enhancing hip stability after total hip arthroplasty.

OPERATIVE PROCEDURE

Surgery will be done under general or spinal anesthesia depending upon the choice of anesthesiologist.

Approach: Posterio-lateral window approach

Incision: 6-8 cms curved incision over posterior one third of greater trochanter. Posterior margin of gluteus medius identified and retracted to develop plane between gluteus medius and piriformis. Short external rotators are exposed by swab dissection and stay sutures passed. Short external rotators released and secured. Capsular exposure done by placing Homan's retractor under gluteus minimus and capsule divided in L shaped fashion. Hips dislocated posteriorly by flexion and external rotation.

Hemiarthroplasty:

Once the head and neck fragment has been removed, the medullary canal of the femur is readily accessible. The canal is rasped with a reselected, appropriately sized broach and trial prosthesis is inserted. The implant's transverse support flange should seat itself on the upper femoral fracture line cortex after only minor bone trimming. Following an acceptable trail fit, the head is re-dislocated and a permanent prosthesis is cemented into femur at proper level. After re-attachment of short rotators to the greater trochanter, the wound is closed over drains in usual manner and post-operative blood loss will be measured in the form of drain output.

Total Hip Replacement:

Approach: Modified Gibson approach

Incision: In this a curved incision was given starting about 10 cm distal to the posterior superior iliac spine, extending

it distally and laterally parallel with the fibers of gluteus maximus till the posterior margin of greater trochanter and then vertically downwards for about 15 cm parallel to the femoral shaft. After dividing the superficial and deep fascia in the line of the incision by blunt dissection, separation of fibers of gluteus maximus was done. The small rotators were cut near their insertions and the capsule incised in T-shaped manner after internally rotating the limb. Hip was dislocated by flexing, adducting, and internally rotating the limb.

PREPARATION OF THE ACETABULAM

The acetabulam was prepared by excising the ligamentum teres and removing the articular cartilage with acetabular reamer till raw cancellous bleeding bone was exposed. Acetabular cavity was packed with a sponge after checking the fitting of the acetabular component.

REPARATION OF FEMRAL NECK

Femoral neck was removed so that only about ¾ inch of calcar femoral remains. The medullary cavity was then reamed using the rectangular chisel and the rasp. Fitting of the trial femoral prosthesis was then done and the medullary cavity was packed with a roll gauge.After changing the gloves, bone cement was mixed with monomer till it becomes doughy. Sponge packing was removed from the acetabular cavity, cement placed and the acetabular cup was pressed over it till the cement was set. Excess of cement was nibbled out. Bone cement was then similarly prepared for the femoral component. The roll gouge pack was removed, and cement was put into the medullary cavity with the help of cement gun, after which the femoral component was hammered in.After the cement was set and excess of cement nibbled away, the femoral component was reduced into the acetabular cup. The movements of the hip joint were then tested and stability noted. The wound was closed in layers after achieving complete homeostasis and putting in a suction drain. The suction drain was removed after 48 hours and post-operative blood has been measured in

the form of drain out-put. Stitches were removed on the 10th or 12th postoperative day and the patient was made to stand and walk using support in the form of crutches or walking frames, 5 days after the operation.

Then patient was discharged from the ward with special instructions to prevent flexion, adduction and internal rotation of hip joint as follows:

1. Not to squat
2. To used English type latrine for defecation
3. Avoid sleeping with affected hip up
4. To keep pillow between the thigh at night
5. Strict use of walker while walking
6. To have an attendant while walking.

Regular quadriceps, hamstring and abduction exercise of hip were advised to keep up the muscle power and movement around the hip joint.

Patients were allowed to continue using walking frames or crutches up to 4 weeks after the operation.

Results were evaluated using Merle'd Aubigne and Postal hip rating system, described by Salvati et al,[77] criteria as below:

Pain:

0 All the time, unbearable, strong medication

2 All the time but bearable, strong medication occasionally.

4 None or little at rest. Pain with activities.

6 When starting, then better; or after a certain activity.

8 Occasional and slight pain.

10 No pain.

(b) Walking:

0 Bed ridden

2 Wheel Chair, transfer activities with walker

4 No Support –house bound

One support –less than one block

Bilateral support less than three blocks

(Markedly restricted)

6 No Support less than one block

One support-up to five blocks

Bilateral support –unrestricted limitedly.

(Moderately restricted)

8 No support-limp

One support – no limp

(Mildly restricted)

10No Support or appreciable limp

(Unrestricted)

(c) Muscle Power and motion

0 Ankylosis with deformity

2 Ankylosis with good functional position

4 Muscle power-poor to fair, are of flexion less than 60°, restricted lateral and rotational movements.

6. Muscle power fair to good, are of flexion up to 90° fair lateral and rotatory movements. (Fair lateral movement: Both abduction and adduction 10° each. Fair rotatory movement: Internal rotation 10° and External rotation 20°)

8 Muscle power good or normal, are of flexion over 90°, good lateral and rotatory movements, (Good lateral movement: 20 each. Good rotatory movement: Internal rotation 20° and

External rotation 40°)

10 Muscle power normal, motion normal or almost normal.

(d) Function

0 Completely dependent and confined.

2 Partially dependent

4 Independent Limited Housework, shops limitedly.

6. Most house work, shops freely, desk type work.

8 Very little restriction can work on feet.

10 Normal activities.

Based upon the sum total of scores of above four evaluations, the results will be assessed as: Excellent : Score 32 or more

Good	:	24 to 31
Fair	:	16 to 23
Poor	:	15 or less

Anesthesia Used

Spinal, epidural, combined spinal and epidural and general anesthesia was used during operation and an average one unit of blood was required in each case with use of cautery.

Period between Operation and Partial Weight Bearing

Partial weight bearing started on 5th post-operative day with walker or crutches.

OBSERVATION AND RESULT

The present follow-up study (non-randomized) was based on 50 cases of intra-capsular fracture neck femur admitted to the Department of Orthopaedics, Govt. Medical College and Rajindra Hospital, Patiala. Elderly patients who had intra-capsular fracture neck of femur from the year 2009-2011 had been included in this follow-up study of Total Hip replacement and Bipolar (25 cases each). Patients who were having pre-existing sepsis, neuropathic arthropathy, weak abductors and other rapidly progressing diseases were excluded from this study. Total Hip replacement and Bipolar had been done in these cases and following observations were made:

Table 1: Showing Distribution of Age for PHR

Age in years	No of cases	%age
61-70	14	56%
71-80	7	28%
>80	4	16%
Total	25	100

The age varied from 61 years to more than 80 years. The maximum number of cases was in the 7th decade (56%) and minimum in 9th decade (16%) with an average age of 70.64 years.

Table 2: Showing distribution of age for THR

Age in years	No of cases	%age
61-70	14	56%
71-80	7	28%
>80	4	16%
Total	25	100

The age varied from 61 years to more than 80 years. The maximum number of cases was in the 7th decade (56%) and minimum in 9th decade (16%) with an average age of 67.4 years. (p value : NS)

Table 3: Age and sex distribution for PHR

Age (in yrs)	No. of Patients		%age
	Male	Female	
61-70	6	8	56%
71-80	3	4	28
>80	1	3	16%
Total	10	15	100

Table 4: Age and sex distribution for THR

Age (in yrs)	No. of Patients		%age
	Male	Female	
61-70	6	8	56%
71-80	3	4	28%
>80	1	3	16%
Total	10	15	100

There were 10 (40%) males and 15 (60%) females with a male: female ratio of 0.4: 0.6. (p value : NS)

Table 5: Showing cases with side affected for PHR

Side	No. of Cases	%age
Right	14	56%
Left	11	44%
Total	25	100

Right side was involved in 14 (56%) cases while left side in 11 (44%) cases.

Table 6: Showing cases with side affected for THR

Side	No. of Cases	%age
Right	10	40%
Left	15	60%
Total	25	100

Right side was involved in 10 (40%) cases while left side in 15 (60%) cases.

Table 7: Showing cases with various mode of injury IN PHR

Mode of injury	**No. of Cases**		**Total**	**%age**
	Male	**Female**		
Fall from cycle	1	-	1	4%
Slipping on floor	5	12	17	68%
Road traffic accidents	1	-	1	4%
Stumbling while walking on the floor	3	3	6	24%
Total	10	15	25	100

It has been found that trivial trauma such as slipping on floor or stumbling while walking on ground, fall from bed or cycle amounted for maximum number of cases. 23 cases (92%) having the role of senile osteoporosis as the major factor causing fracture.

Table 8: Showing cases with various mode of injury in THR

Mode of injury	**No. of Cases**		**Total**	**%age**
	Male	**Female**		
Fall from cycle	2	-	2	8%
Slipping on floor	6	9	15	60%
Road traffic accidents	-	-	-	-
Stumbling while walking on the floor	2	6	8	32%
Total	10	15	25	100

It has been found that trivial trauma such as slipping on floor or stumbling while walking on ground, fall from bed or cycle amounted for maximum number of cases. 23 cases (92%) having the role of senile osteoporosis as the major factor causing fracture.

Table 9: Duration of injury before operation for PHR

Time	No. of Cases	%age
Up to 1 week	22	88%
1 to 3 wks	2	8%
> 3 wks	1	4%
Total	25	100

Majority of 22 cases (88%) were operated within the first week following injury.

Table 10: Duration of injury before operation for THR

Time	No. of Cases	%age
Up to 1 week	21	84%
1 to 3 wks	3	12%
> 3 wks	1	4%
Total	25	100

Majority of 21 cases (84%) were operated within the first week following injury.Amongst the old cases, the maximum duration was 1 month. The delay in reporting for the definitive treatment was found to be due to the intervention by indigenous bonesetters. At times operation was delayed for a few days in the hospital because of the reason that the patients were not fit for anesthesia due to some associated medical causes like diabetes and hypertension.

All the cases were operated as planned elective surgery.

TYPE OF FRACTURE

Garden's classification has been used for fracture neck of femur and type of fracture has been matched as per tables:

Table 11: Type of fracture (garden) PHR

Fracture (Garden type)	No. of Cases	%age
I	-	-
II	-	-
III	12	48%
IV	13	52%
Total	25	100

Table 12: type of fracture (garden) THR

Fracture (Garden type)	No. of Cases	%age
I	-	-
II	-	-
III	12	48%
IV	13	52%
Total	25	100

In both groups, most of the cases 13 (52%) belonged to the type IV fractures, whereas only 12 (48%) of the cases were Garden type III fractures. None of the case was with impacted fracture (type I and II).

In two groups, the difference was statistically non-significant(p value >0.05).

Table 13: Pre-op patients showing shortening for PHR

Shortening	No. of Cases	%age
Less than 2 cm	23	92%
2 – 2.5 cm	2	8%
Total	25	100

Majority of the patients (92%) with intra-capsular fractures of neck of femur had less than 2 cm of shortening. There was shortening of 2 cms and 2½ cm in two cases.

Table 14: Pre-op patients showing shortening for THR

Shortening	No. of Cases	%age
Less than 2 cm	22	88%
2 – 2.5 cm	3	12%
Total	25	100

Majority of the patients (88%) with intra-capsular fracture neck of femur had less than 2 cm of shortening. There was shortening of 2 cms to 2½ cm in three cases.

Table 15: Post-Operative Blood Loss in PHR

Blood loss in ml	No. of Cases	%age
60-80	09	36%
80-100	13	52%
100-120	2	8%
120-140	1	4%

Average blood loss in PHR group found to be 85 ml.

Table 16: Post-Operative Blood Loss in THR

Blood loss in ml	No. of Cases	%age
60-80	02	8%
80-100	08	32%
100-120	12	48%
120-140	03	12%

Average blood loss in THR group found to be 108 ml.(p value: NS)

Table 17: Duration of Operation in PHR Group

Duration in min	No. of cases	%age
40-50	05	20%
50-60	15	60%
60-70	03	12%

70-80	02	08%
80-90	0	00%

So, average operating time for PHR found to be 52 minutes

Table 18: Duration of Operation in THR Group

Duration in min	No. of cases	%age
40-50	01	4%
50-60	05	20%
60-70	07	28%
70-80	10	40%
80-90	2	08%

So, average operating time for THR found to be 74 minutes. (p value : NS)

Table 19: Hospital stay of PHR

Days	Total cases
10-12	21
13-14	3
15-16	1

Average hospital stay of PHR found to be 11.6 days

Table 20: Hospital stay of THR

Days	Total cases
10-12	1
13-14	22
15-16	2

Average hospital stay of patients for THR cases found to be 13.2 days.(p value : NS)

Table 21: Unprotected Weight Bearing For PHR

Weeks	Total cases
3-4	22

4-5	3
5-6	0

Average period for unprotected weight bearing for PHR cases found to be 3.3 weeks

Table 22: Unprotected Weight Bearing For THR

Weeks	Total cases
3-4	4
4-5	18
5-6	3

Average period for unprotected weight bearing for THR cases found to be 4.3 weeks. (p value : NS)

Table 23: Follow up for Phr

Duration (months)	No. of Cases	%age
12-18	2	8%
18-24	23	92%

The patients were evaluated at the time of discharge, every month up to one year and every six months. The patients were followed up for a maximum of 22 months, with maximum number of cases in 18-24 months follow up period and average duration of follow-up was for 21.4 months. Only 2 cases left after a follow-up period of one and half year.

Table 24: Follow up for THR

Duration (months)	No. of Cases	%age
12-18	3	12%
18-24	22	88%

The patients were evaluated at the time of discharge, every month up to one year and every six months. The patients were followed up for a maximum of 22 months and the maximum number of cases in 18-24 months follow up period

and average duration of follow-up was for 20.8 months. Only 03 cases left the study at one and half year. (p value : NS)

Table 25: Comparison of Cost

	BIPOLAR	**THR**
Cost of implant (in Rs)	18000	18000
Cost of medicines (in Rs)	2500	2500
Avg. hospital stay	11.6 days	13.2 days
Total cost	20500	20500

During this study, the cost of Bipolar and THR is comparable about Rs 20500/- including cost of implant, medicines but having prolonged hospital stay in THR. (p value : NS)

Table 26: Comparison of Pain in PHR

Salvati pain score	**Post-operative days**								
	1	7	15	30	60	90	180	1 yr	>1 ½ yr
0	2	-	-	-	-	-	-	-	-
2	23	3	1	-	-	-	-	-	-
4	-	22	4	3	-	-	-	-	-
6	-	-	20	16	4	-	-	-	-
8	-	-	-	6	21	2	-	-	-
10	-	-	-	-	-	23	25	25	25

Table 27: Comparison of Pain in THR

Salvati pain score	**Post-operative days**								
	1	7	15	30	60	90	180	1 yr	>1 ½ yr
0	4	1	-	-	-	-	-	-	-
2	21	24	4	2	-	-	-	-	-
4	-	-	21	4	1	-	-	-	-
6	-	-	-	19	20	3	-	-	-
8	-	-	-	-	4	22	3	-	-
10	-	-	-	-	-	-	22	25	25

The Salvati pain grade of 0 i.e. unbearable and relieved with strong medication was reported in 02 patients (8%) on 1st post–operative day in PHR as compared to 04 patients (16%) in THR group. During more than one and half year follow–up, there was no significant difference in the both groups (p value: NS). O2 cases in PHR and 03 cases in THR left at more than 11/2 yrs.

Table 28: Comparison of Functional Status in PHR

Salvati functional score	Post-operative days							
	7	15	30	60	90	180	1 yr	>1 ½ yr
0	25	23	-	-	-	-	-	-
2	-	2	23	2	-	-	-	-
4	-	-	2	21	-	-	-	-
6	-	-	-	2	2	-	-	-
8	-	-	-	-	23	-	-	-
10	-	-	-	-	-	25	25	25

Table 29: Comparison of Functional Status in THR

Salvati functional score	Post-operative days							
	7	15	30	60	90	180	1 yr	>1 ½ yr
0	25	24	1	-	-	-	-	-
2	-	1	24	21	-	-	-	-
4	-	-	-	3	18	-	-	-
6	-	-	-	1	4	-	-	-
8	-	-	-	-	3	23	-	-
10	-	-	-	-	-	2	25	25

Almost all cases were confined to bed up to 7th day in both groups (partial weight bearing on 5th day). But during further follow-up, up to 23 patients (92%) were partial dependent in PHR as compared to 24 patients (96%) were partial dependent in THR, with one patient having dislocation being confined to bed up to 6 weeks. All the 25 patients (100%) were having full functional

status in PHR as compared to 23 cases (92%) in THR at 180 days. O2 cases in PHR and 03 cases in THR left at more than 11/2 yrs.

Table 30:Motion Chart in PHR

Salvati Motion score	**Post-operative days**							
	7	15	30	60	90	180	1 yr	>1 ½ yr
0	-	-	-	-	-	-	-	-
2	2	-	-	-	-	-	-	-
4	23	22	-	-	-	-	-	-
6	-	3	21	5	-	-	-	-
8	-	-	4	20	23	0	-	-
10	-	-	-	-	2	25	25	25

Table 31: Comparison of Motion in THR

Salvati Motion score	**Post-operative days**							
	7	15	30	60	90	180	1 yr	>1 ½ yr
0	-	-	-	-	-	-	-	-
2	3	1	1	1	-	-	-	-
4	22	21	5	3	1	-	-	-
6	-	3	19	18	2	-	-	-
8	-	-	-	3	20	2	-	-
10	-	-	-	-	2	23	25	25

At 90th day, 23 cases (92%) in PHR were having motion status grade 8 as compared to 20 cases (80%) in THR. During further follow-up on 180th day all patients in PHR were having normal power and motion as compared to 23 cases (92%) in THR group. O2 cases in PHR and 03 cases in THR left at more than 11/2 yrs.

Table 32: Salviti hip score for PHR

Duration	Salvati Hip Score				Total
	<15 Gp I	16-23 Gp II	24-31 Gp III	>32 Gp IV	
At discharge	-	17	8	-	25
One month	-	-	25	-	25
03 months	-	-	22	3	25
06 months	-	-	5	20	25
1 year			1	24	23
At 1½ year				25	25
More than 1½				23 (02 cases left)	23

Out of 25 patients in this study, 17 cases (68%) had shown fair results and 8 cases (32%) good results at the time discharge. 22 patients (88%) had shown good results, 3 patients (12%) had shown excellent results at 03 months of follow-up. After an interval of one and half year 25 cases (100%) had shown excellent results.

Table 33: Salviti Hip Score For THR

Duration	Salvati Hip Score				Total
	<15 Gp I	16-23 Gp II	24-31 Gp III	>32 Gp IV	
At discharge	1	9	15	-	25
One month	1	-	24	-	25
03 months	-	1	15	9	25
06 months	-	-	7	18	25
One year			2	23	23
At one and half year			2	23	25
More than one and half year				22(03 cases left)	22

Out of 25 patients in this study, at time of discharge 01 case had shown poor results due to dislocation, whereas 9 cases fair, 15 cases had good results. At 03 months 01 case had fair, 15 cases good and 09 cases had shown excellent results, but at 06 months 07 cases (28%) had shown good results and 18 cases (72%) excellent results. At an interval of one and half year 02(8%) cases had good and 23 cases (92%) had shown excellent results. In two groups, the difference was statistically non-significant.

(p value >0.05).

COMPLICATIONS for PHR

02 patients developed urinary tract infection which was successfully managed by catheter removal and proper antibiotic coverage.

No patients had developed superficial wound infection at stitch site. 01 patient develops leg length discrepancy of 2 cm which was managed by giving shoe raise.

COMPLICATIONS for THR

02 patients developed urinary tract infection which was successfully managed by catheter removal and proper antibiotic coverage. 01 patient had developed superficial wound infection at stitch site which was managed successfully by conservative treatment.

01 patient develops paralytic illeus and that patient was managed conservatively.

01 patient had developed traumatic dislocation and that was managed by closed reduction and traction for 6 weeks.

02 patients had developed leg length discrepancy of 2 cm which was managed by giving shoe raise.

Table 34: General complications for PHR

Complications	No. of Cases	%age
No complication	23	92
Pleurisy	-	-
Broncho-pneumonia	-	-
Cardiac failure	-	-
Pulmonary embolism	-	-
Coronary occlusion	-	-
Fat embolism	-	-
Paralytic illeus	-	-
Urinary infection	2	8
Total	25	100

Table 35: General Complications for THR

Complications	No. of Cases	%age
No complication	22	88
Pleurisy	-	-
Broncho-pneumonia	-	-
Cardiac failure	-	-
Pulmonary embolism	-	-
Coronary occlusion	-	-
Fat embolism	-	-
Paralytic illeus	1	4
Urinary infection	2	8
Total	25	100

In two groups, the difference was statistically non-significant. (p value >0.05).

Table 36: Local complications for PHR

Complications	No. of Cases	%age
No complication	24	96
Superficial wound infection	0	0
Deep wound infection	0	0
Heterotrophic ossification	0	0
Dislocation (traumatic)	0	0
Loosening of cup	0	0
Loosening of femoral stem	0	0
Deep vein thrombosis	0	0
Common peroneal nerve palsy	0	0
Femoral fracture	0	0
Vascular injury	0	0
Leg length discrepancy	1	4
Mortality	0	0

Table 37: Local complications for THR

Complications	No. of Cases	%age
No complication	21	84
Superficial wound infection	1	4
Deep wound infection	0	0
Heterotrophic ossification	0	0
Dislocation (traumatic)	1	4
Loosening of cup	0	0
Loosening of femoral stem	0	0
Deep vein thrombosis	0	0
Common peroneal nerve palsy	0	0
Femoral fracture	0	0
Vascular injury	0	0
Leg length discrepancy	2	8
Mortality	0	0

In these two groups, the difference was statistically non-significant. (p value >0.05).

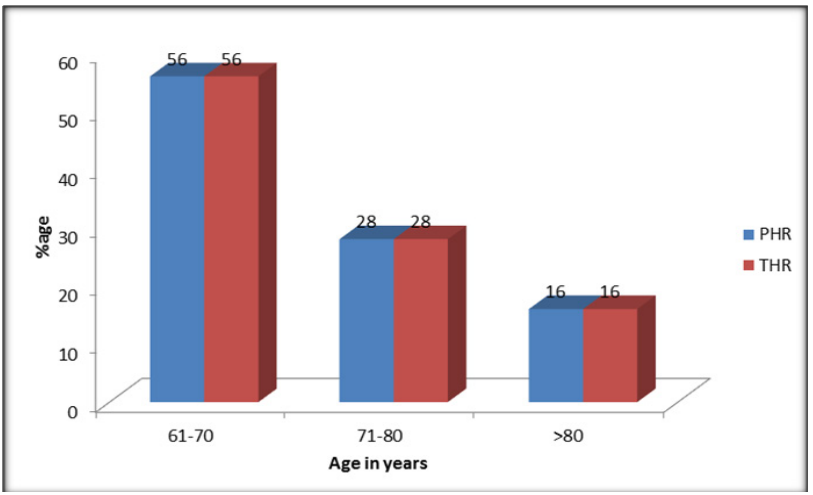
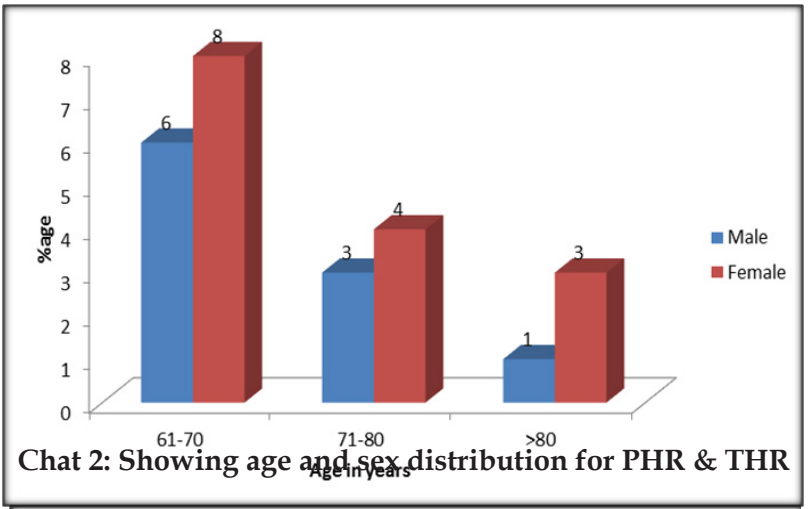
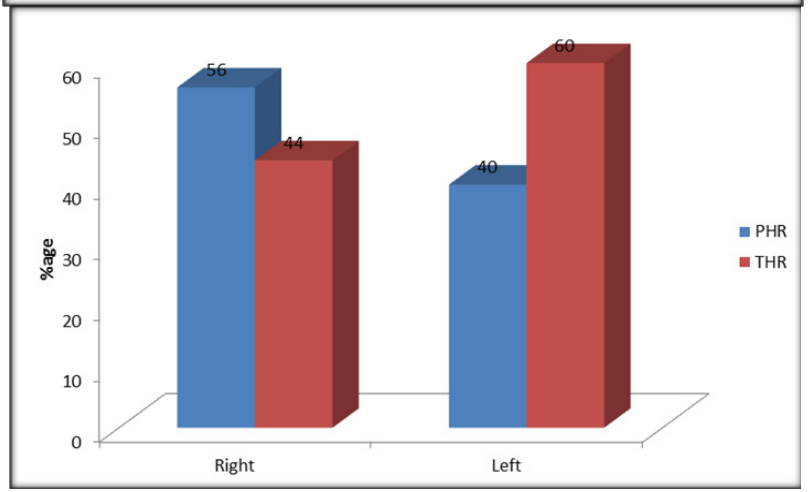


Chart 1: Comparison of Age for PHR & THR



Chat 2: Showing age and sex distribution for PHR & THR



Chat 3: Comparison of sides for PHR & THR

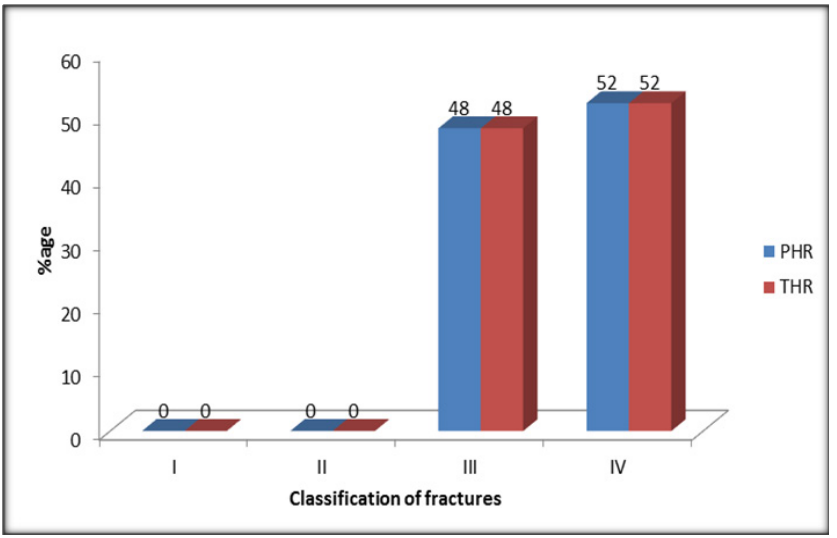


Chart 5: Comparison of Hospital stay for PHR & THR

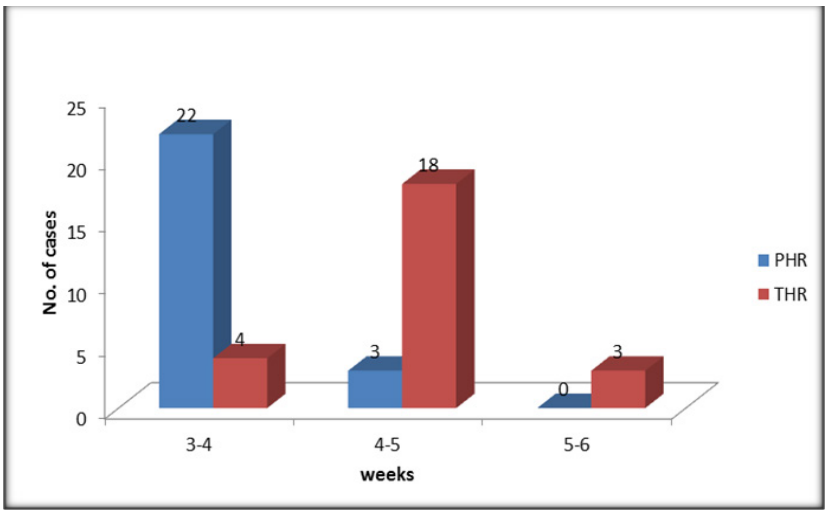


Chart 6: Comparison of unprotected weight bearing for PHR & THR

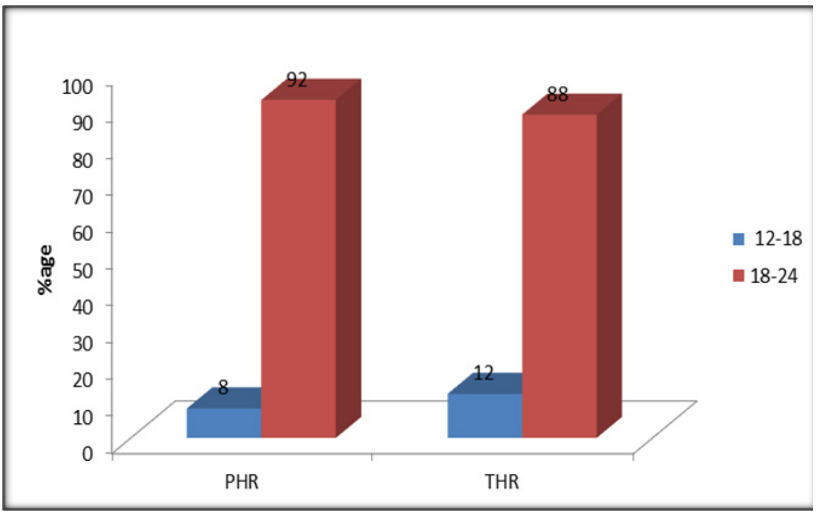


Chart 7: Comparison of follow-up for PHR & THR

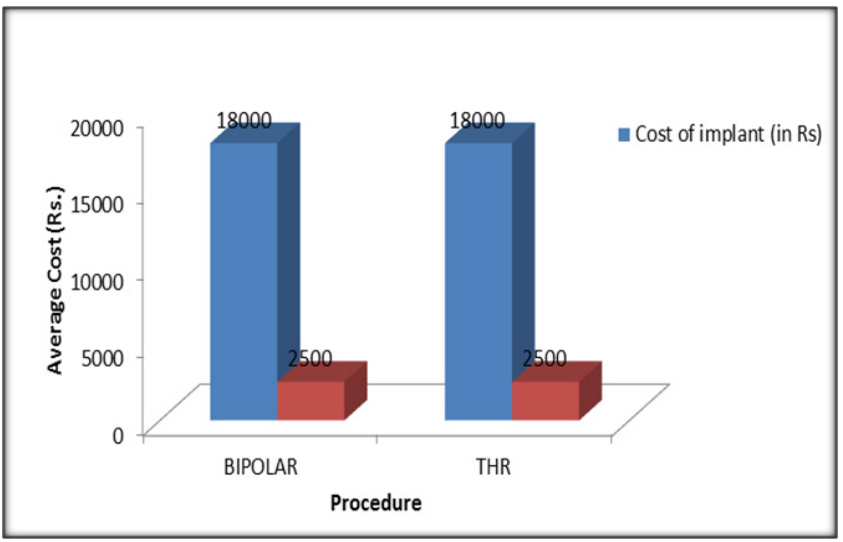


Chart 8: Comparison of cost for PHR & THR

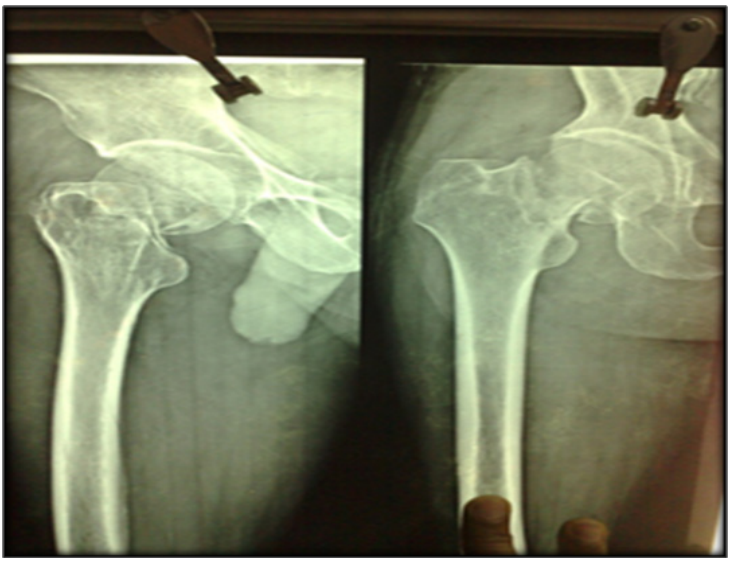


Figure 1: Pre-Operative

Figure 2: Post –Operative

Figure 3: post-op standing

Figure 4: postop sitting

Figure 5: Pre-Operative

Figure 6: Post –Operative

Figure 7: Post-op sitting

Figure 8: Post-op standing

Figure 9: Pre-Operative

Figure 10: Post –Operative

Figure 11: post op standing

Figure 12: Post-op sitting

Figure 13: Pre-Operative

Figure 14: Post –Operative

Figure 15: Post -op standing

Figure 16: Post-op standing

Figure 17: Pre-Operative

Figure 18: Post –Operative

Figure 19: Post-op standing

Figure 20: Post-op standing

Figure 21: Pre-Operative

Figure 22: Post –Operative

Figure 23: Post-op sitting

Figure 24: Post-op standing

Figure 25: Pre-Operative

Figure 26: Post –Operative

Figure 27: Post -op Sitting with Scar

Figure 28: Post-op standing

DISCUSSION

In the developing world, fracture neck of femur have always presented a great challenge to orthopaedic surgeons and even today remain the 'unsolved fracture' as far as treatment and results are concerned. With increasing life expectancy each decade, our society is becoming a geriatric society with significant number of hospitalized and nursing home patients suffering from femoral neck fracture and their sequalae.

Nonunion and avascular necrosis or late segmental collapses are principal complications of this fracture. The surgeon probably has less control over avascular necrosis than nonunion. All that surgeons can do is that early anatomic reduction, impaction of fracture and rigid internal fixation. Even after this much effort by the surgeons, there is no assurance that it will lead to an excellent result. Speed,[4] called the fracture neck of femur as "The unsolved fracture" and Barnes,[5] as "The unsolvable fracture". However, it has been agreed that whenever possible, the treatment should be such which allows early mobilization of patients. This saves the geriatric patients from complications like thromboembolic disease, decubitus ulcerations and pneumonias etc. Ideally one would like to fix the fracture so securely, that the individual could return to his pre-fracture state immediately. This goal is a formidable one because osteoporotic bone does not retain fixation well.

Dissatisfaction with the results of operative fixation of displaced fractures neck of femur resulted in widespread use of prosthetic replacement as primary treatment and numerous approaches to hip joint have been described each being claimed to have advantage over others.

The present study involves follow-up of 50 cases of intra-capsular fractures neck of femur treated by arthroplasty (THR or PHR 25 cases each) in the Department of Orthopaedics, Govt. Medical College and Rajindra Hospital, Patiala from

2009 to 2011. In this study 50 cases were followed-up after the operating surgeon has allocated them to either group depending upon the condition of acetabulum, pre-fracture mobility and morbidity as well as general condition of patient and results has been evaluated and compared with each other.

We have used Moore (southern) approach. Advantage of this approach is that it does not require osteotomy of greater trochanter and abduction function is not compromised. Disadvantage of this approach is that exposure of anterior aspect of acetabulum is difficult and post-operative dislocation is higher with this approach.

In our comparative study, in both groups maximum number cases about the extent of 56% has occurred in the 7th decade & minimum number of cases occurred in 9th decade. The mean age of patients was 70.64 years for PHR and 67.4 years for THR cases. The maximum number of cases occurred in age group of 61-70 years and these cases were matched in age, sex and type of fracture.

In this follow-up study for arthroplasty, PHR and THR were performed about 60% in females in the ratio of 0.4 : 0.6, but as per study of Hameed et al,[36] hip fracture is more common in geriatric females in ratio of 1: 4 as compared to males. So woman are more prone to hip fracture due to senile and post-menopausal osteoporosis due lack of estrogen hormone.[39]

As per Gebhard et al,[62] who studied about 166 patients for arthroplasty in fracture neck of femur and observed that the mean age of patients for THR was 75.2 years in comparison to 76.2 years in PHR. In his average long term follow up of about 56 months, they found that HA is recommended for active patients while THA for healthy active patients. However Taine & Armour (60) in their study of 163 patients found that mean age of patients was about 65 years and concluded that THA is good management for selected number of patients. But Sayaana et al,[35] has reported that there is an increasing evidence for THR is superior management for 65-80 years old

patients.

All cases of our study were classified as Garden's grade III / IV, which has occurred due to trivial trauma in both groups. The trivial trauma composed of about 92% in these senile osteoporotic patients which was as comparable to 90% that has reported by Alfram,[33] in his study.

In our follow up study of 50 cases, there were about 56% of cases with right side involvement for PHR as compared to 60 % involvement of left side in THR. The leg length discrepancy during this study has been reported in only 01 case i.e. 4% cases in PHR while it is reported in 02 i.e. 8% cases in THR. This case has been treated with shoe raise and during follow up no functional ambulatory difficulty was observed in these cases. In this study the average duration of unprotected weight bearing in PHR group was 3.3 weeks whereas in THR group it was 4.3 weeks. The late weight bearing in THR is due to weak musculature and other geriatric limitations like cognitive impairment.

During this study, the Salvati pain score of 0, i.e. unbearable and relieved with strong medication only was reported in 02 patients (8%) on 1st post-operative day in PHR as compared to 04 patients (16%) in THR group. During this follow-up on 90th post-operative day, none of the patients in PHR were having pain with activity, but only 02 patients (8%) having occasional pain and about 23 patients (92%) having no pain and started daily activities of life as compared to THR in which 03 patients (12%) were having pain with activity and 22 patients (88%) were having occasional and slight pain. During more than one and half year follow–up there was no significant difference in the both groups, as compared to difference found in earlier follow-up period. Although the partial weight bearing was started on 5th post-operative day, almost all cases were confined to bed up to 7th day in both groups. But, during further follow-up, up to 23 patients (92%) were partial dependent in PHR as compared to 24 patients

(96%) were partial dependent in THR, with one patient having dislocation being confined to bed up to 6 weeks. At 90th day 23 patients (92%) were having little restriction to activity / work in PHR as compared to THR group in which 18 patients (72%) were having limited house activity and only 7 cases (28%) were having limited restriction of activity. All the 25 patients (100%) were having full functional status in PHR as compared to 23 cases (92%) in THR at 180 days. But at end of study, there was no significant difference in functional status of patients, so a long term follow–up study is required to assess the functional status of patients.

During this study, in PHR at 60th day 20 patients (80%) were having good to normal power, flexion over 90 and good lateral & rotatory movements as compared to 18 cases (72%) in THR having fair to good power, flexion up to 90 with fair lateral and rotatory movements with one patient confined to bed due to dislocation. At 90th day, 23 cases (92%) in PHR were having motion status grade 8 as compared to 20 cases (80%) in THR. During further follow-up on 180th day all patients in PHR were having normal power and motion as compared to 23 cases (92%) in THR group. But at end of study, there was no significant difference in functional status of patients, so a long term follow–up study is required to assess the motion status of patients.

In this follow-up study, the average blood loss in bipolar cases was 85 ml (60-140 ml) as compared to 108 ml in THR cases and the average duration of operation in was 52 min (40-80 min) in PHR as compared to 74 min (40-90 min) in THR.

During this study, while comparing cost of surgery, the cost of THR and Bipolar is comparable about Rs 20500/- in terms of implant and medications, but there is prolonged hospital stay of 13.2 days in THR group as compared to 11.6 days in Bipolar cases.

In our follow–up study, a patient has been followed at an interval of one month for six months and there after six

monthly. All cases are reviewed on every visit, but none of patients has reported any kind of pain or loosening of implant at the end of follow-up. But there is documentation of aseptic loosening as high as about 18%-47% at various follow-up studies.[61] Meanwhile there are reports that pain and loosening are common in cemented arthroplasty which is as low as 2.2% for THR and 7.9% in cases of PHR.

All cases has been followed and evaluated for relief of pain, activity of daily life, functional status as well as restoration of movements at hip by Salvati Hip score,[77] at various intervals. In PHR maximum numbers of cases were followed up for 18-24 months and 02 cases left the study after followed up period of more than one and half year. Average period of follow-up is 21.4 months. All cases at one and half year follow-up have shown excellent results in pain, mobility, qualitative and quantitative function as well as daily activities of life. All cases of THR were followed at same intervals with maximum number of cases between 18-24 months and average duration of follow-up was 20.8 months. Only 03 cases left the study after one and half year follow-up period. At sametime of one and half year of follow-up, 02 i.e. 8% cases has shown good results and 23 i.e. 92% of cases has shown excellent results in pain, mobility, qualitative and quatitative function as well as daily activities of life. But Narayaan et al,[50] in his study of 61 patients which were followed for 24-90 months and documented that Harries Hip score was 83.82% for THR as comparable to 86.93% in bipolar cases. Sayaana et al,[35] in his follow-up study for displaced fracture neck of femur in age group of 65-80 years has shown that opinion regarding THR is divided, but there is increasing evidence that THR is superior in these elderly active ambulant patients. Taine and Armour,[60] in their follow-up study of 163 patients for THR, only 62% has shown excellent results that were assessed by Harry Hip score. Gebhard,[62] followed up 166 patients up to 56 months and documented that pain, walking and functional score was higher for THR than Hemi-arthroplasty, but reported that HA

is recommended for occasionally active patients in comparison to THR for healthy patients. However Ekulund,[65] in his study of 162 arthroplasty patients aged 80 years, 88% cases has shown excellent or good results and recommended that THR is safe in elderly people. Squires et al,[55] concluded that PHR is a good option for fracture neck of femur in elderly people with 66% of patients obtaining satisfactory results. Pain and mobility in patients who undergone PHR are inferior to THR in short term study of Parker.[69] Although some of patients had suffered urinary tract infection in both groups that were managed conservatively. Arthroplasty is associated with more independent living and was cost effective than any kind of internal fixation for fracture neck of femur and it provides satisfactory long term results.

During our follow-up period for PHR, no patient has undergone revision of surgery due to any kind of complications like aseptic loosening or deep wound infection. None of cases of THR has suffered morbid complications which had lead to revision of surgery, but Dorr et al,[61] has reported 18-47% re-operation rate in their study that may be due to acetabular erosion of hip or dislocation and Bakers,[53] in his study of 81 patients about age of 75 years, they reported revision of surgery in 02 cases in PHR and 03 case due to acetabular erosion. However Mabry et al,[72] has reported none of revision of surgery for his patients and documented 93% survival rate for all cases. So a long term follow-up is required to evaluate these results.

In our study, no mortality has occurred in the either group of patients for arthroplasty, because no patients has reported any deep infection or other morbid complications, which is very less as compared to 9% in the study of Gregary et al,[63] in the age group of 65-80 years. But Mishra et al,[71] has reported 6% mortality in his average 33 months follow-up study of 51 patients. Almost all cases of PHR has not suffered any kind of superficial or deep wound infection but in 01 case i.e. 4% cases of THR superficial wound infection has occurred, which

is very negligible as compared to as low as 1.2% in PHR,[69] and as high as 12.2% in THR.[65]

During this study, the stability of hip was also assessed in form of dislocation and found that none of patient in PHR has suffered dislocation as compared to THR in which only one patient has suffered traumatic dislocation, which has been reduced and in follow-up, no difference has been found in pain or ambulatory status in them and no morbid complications has been reported in them.

Pre-fracture morbidity is an often predictor of short term complications as well as long term mortality was found to correlate with pre-morbid ambulation as a facet of multi-factorial causation. As the opinion regarding arthroplasty in elderly people is divided and THR is indicated where life expectancy is significant. However PHR should be an ideal choice for individuals with co-morbidities and shorter life expectancy.

During our more than one and half year follow-up study, no case of PHR has undergone revision of surgery and none of THR has suffered from co-morbid complications. In this study of elderly people 92% of cases in THR has shown excellent results as compared to PHR which has shown 100% excellent results. At end of study, although there was no difference in pain, ambulation, functional status and movements in both groups, but in earlier period of follow-up, there was difference of pain, motion, and functional status of patients in PHR as compared to THR up to 180 days.

In these two groups, the difference was statistically non-significant (p value >0.05).

COMPARISON

Complications	PHR	THR
Average age	70.64	67.4
Sex ratio	0.4-0.6	0.4-0.6
Side involved	Right (56%)	Left (60%)
Trivial injury	92%	92%
Superficial wound infection	0	1
Deep wound infection	0	0
Dislocation	0	1
Mortality	0	0
UTI	2	2
Paralytic illeus	1	0
Limb length discrepancy	1	2
Vascular injury	0	0
DVT	0	0
Loosening of cup	0	0
Loosing of stem	0	0
Nerve injury	0	0
Cardiac complications	0	0
Femoral fracture	0	0
Average hospital stay	11.6 days	13.2 days
Unprotected weight bearing	3.3 weeks	4.3 weeks
Average follow- up period	21.4 mths	20.8 mths
Poor results at discharge	-	1(4%)
Fair results at discharge	17(68%)	9(36%)

Good results at discharge	8(32%)	12(48%)
Excellent results at discharge	-	03 (12%)
Excellent results at one and half year	25 (100%)	23(92%)
Good results at one and half year	-	02 (8%)

SUMMARY AND CONCLUSIONS

The present follow-up study (non-randomized) aimed at assessing clinical as well as functional outcome of primary total hip arthroplasty and bipolar (25 cases each) done for intra-capsular fracture neck of femur in elderly people having Garden type III and IV fractures. 50 patients of both groups having intra-capsular fracture neck femur were selected intra-operatively by operating surgeon depending upon the acetabular condition, pre-fracture mobility & morbidity as well as general condition of patient and treated with cemented total hip arthroplasty and bipolar, through posterior approach from the year 2009 to 2011 in the Department of Orthopedics, Govt. Medical College, Patiala.

1. A follow-up study of 50 cases of intra-capsular fracture neck of femur were selected intra-operatively by operating surgeon depending upon the acetabular condition, pre-fracture mobility & morbidity as well as general condition of patient treated by either cemented total hip replacement or bipolar. The type of fracture has not been considered in allocating the procedures.

2. The age of patients varied from 61 years to 90 year with the average age 70.64 years for PHR and 67.4 years for THR having maximum cases in 7th decade as compared to minimum in 9th decade in both groups.

3. There were male to female ratio of 0.4: 0.6 for both PHR and THR.

4. The left hip was involved in 16 cases (60%) in THR and right side 14 (56%) in PHR.

5. Trivial trauma was found to be the commonest nature of injury (92%) because of senile and postmenopausal osteoporosis.

6. Majority of cases 22 cases (88%) for PHR and 21 cases

(84%) were operated within first week following injury.

7. Majority of cases 24 (96%) for PHR and 21 cases (84%) for THR were not associated with any other injury highlighting the trivial nature of trauma in these cases.

8. All of cases belonged to Garden's type III or IV displaced fractures and fracture type has not been included in procedure allocation to either group.

9. All of cases were operated upon by posterior approach under spinal or epidural or general anesthesia.

10. Abduction pillow was used post-operatively in all the cases.

11. Partial weight bearing was started on 5th postoperative day and patients were discharged with average duration of post-operative hospital stay of 11.6 days in PHR and 13.2 days in THR cases. Regular follow-up was done monthly for one year and then every six months. Patients were followed-up for a maximum of 22 months.

12. The average post-operative blood loss in PHR was 80 ml as compared to 108 ml in THR

13. The average duration of operation in PHR was 52 min as compared to 74 min in THR.

14. Unprotected weight bearing were started on an average 3.3 weeks in PHR cases and on an average of 4.3 weeks in THR cases.

15. Results were evaluated by using criteria of Salvati Hip score and all cases in PHR had shown excellent results in pain, mobility, functional as well as motion status and daily activity of life as compared to THR which had shown excellent results in 92% cases.

16. The average cost of surgery is comparable about Rs 20500/- in both groups, but having prolonged hospital stay in THR cases.

17. Most of the complications have occurred in old age group patients. Two patients in each category developed urinary tract infection which was managed conservatively by antibiotics. No patient in PHR and one patient in THR developed superficial wound infection at operated site, which was also managed conservatively by antibiotic and aseptic dressing. Only one patient THR has developed traumatic dislocation that was managed by closed reduction followed by traction for 6 weeks.

18. In both groups, no patient had undergone revision of surgery due to any of complications like aseptic loosening, dislocation, sepsis and long term follow-up is required to assess the same.

19. One of patient in PHR and 2 patients in THR developed limb shortening of 2 cms for which shoe raise was given, but during follow -up, no difference in pain, mobility, functional as well as motion status has been observed in these cases.

20. Excellent results were obtained in 25 cases (100%) in PHR and 23 cases (92%) in THR at follow-up of more than one and half year. All of these patients were able to perform qualitatively as well as quantitatively their daily pursuits independently and were satisfied with the results.

Thus cemented partial hip arthroplasty is little better, economical and a very useful procedure for primary treatment of intra-capsular fracture neck femur than total hip arthroplasty in an elderly active ambulant cases. These procedures have markedly improved clinical and functional outcome of patients in pain, mobility and range of motion as well as daily activities of life. Prosthetic replacement avoids the problems of avascular necrosis and non-union and recumbency related problems in these elderly patients. Arthroplasty is associated with more independent living, both qualitatively as well as quantitatively and was more cost effective and provide satisfactory long term results.

So, it is summarized that cemented partial hip arthroplasty

is little better and economical than total hip arthroplasty in intra-capsular fracture neck of femur in elderly active and mobile patients.

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Synopsis

INTRODUCTION

Though the fracture of hip were known since the time of Hippocrates, but it was Sir, Astley Cooper who first of all differentiated the intracapsular fracture from extracapsular fracture neck femur (Cooper, 1822), as nonunion is common in Intracapsular fracture as compared to extracapsular where malunion is more common.

Elderly population suffers hip fracture due to senile osteoporosis, in which a trivial fall is cause of 90% of hip fractures (Alffram, 1964). It is a devastating injury, incidence of which has increased because of increased life expectancy (Melton, 1996) and by year 2050 there will be an increase of 135% from year 2000 (Sayana et al, 2008).

In post-menopausal woman, due to lack of protective effect of oestrogen, hip fracture is more common as compared to males in ratio of male to female 1: 4, to that of simple senile osteoporosis (Hamid et al, 1994). Femur neck fracture represents epidemically in elderly people (Melton, 1993), as this fracture is relatively rare in young people.

Anatomic factors

Anatomically proximal femur consists of the femoral head, femoral neck and the trochanteric region of a large multiaxial ball-and-socket synovial joint, enclosed by a thick articular capsule which permits free movement of the hip joint. The round head of the femur articulates with the cup- like acetabulum. The fibrous capsule attaches distally to the neck of the femur only anteriorly at the intertrochanteric line and root of the greater trochanter. Posteriorly, the fibrous capsule crosses without attaching to it and thickens to form 3 ligaments of the hip joint: the Y-shaped iliofemoral ligament

(of Bigelow), the pubofemoral ligament, and the ischiofemoral ligament.

Blood supply to femoral head and neck:

The profunda femoris artery (a branch of artery of ligamentum teres) arising from the femoral artery, gives off medial circumflex femoral artery. This gives off lateral epiphyseal and superior and inferior metaphyseal arteries. The lateral epiphyseal arteries supply the lateral 2/3 of femoral Head. The superior metaphyseal arteries supply the superior aspect of femoral neck and the medial epiphyseal artery supplies the circumfoveal sector of head. Ambrose Pare, a French scientist was the first one to recognize hip fractures in late 1500s (Baumgaertner and Higgins, 2001). Sir, Astley Cooper on the basis of capsular attachment, was the first to classify these fractures in treatise of 1822 (Bick, 1976) as intracapsular and extracapsular.

- INTRACAPSULAR : That is within the capsular attachment
- EXTRACAPSULAR: That is outside the attachment of the capsule.

Intracapsular Fracture:-

This is divided according to level of fracture line in the neck as follows:

1. Subcapital
2. Transcervical
3. Basal

Classification:-

Garden's Classification:-

This is based upon the appearance of hip on the AP radiograph and used to determine the appropriate treatment.

- Stage I : Incomplete fracture of neck (called abducted or

impacted)

- Stage II: Complete without displacement
- Stage III: Complete with partial displacement:fragments are still connected by posterior retinacular attachment: there is malalignment of femoral trabeculae.
- Stage IV: This is a complete femoral neck fracture with full displacement: the proximal fragment is free and lies correctly in a acetabulum so that the trabeculae appear normally aligned.

Subcapital fractures are classified as The Pauwels and Linton

Pauwel's Classification:

Type I: has an obliquity ranging from 0 to 30 degrees

Type II: Has an obliquity ranging from 30 to 50 degrees

Type III: Has an obliquity of 70 to more degrees.

Linton's Classification:

- Stage I : Incomplete fracture
- Stage II: Complete but undisplaced fracture
- Stage III: Complete, partially displaced fracture
- Stage IV: Displaced and totally free fracture

A.O Classification:

The fracture of femoral neck are classified as "B", which are further classified as B1, B2, B3

Type B1: Subcapital fracture with no or minimal displacement. These have further 03 types:

B1: 1: Subcapital fracture in valgus of 15 degree or more.

B1:2: Impacted in valgus of less than 15 degree

B1:3: Non impacted

Type B2: Transcervical Fracture. They have 03 types

B2: 1: Basicervical

B2:2: Midcervical with adduction

B2:3: Mid Cervical with shear

Type B3: Displaced subcapital fracture:

B3: 1: Moderately displaced in varus and external rotation

B3:2: Moderately displaced with vertical translation and external rotation

B3:3: Markedly displaced

Primary aim of treatment should be to perform a surgery that provides to an individual greatest opportunity for early ambulation (Stern and Goldstein, 1977). This requirement is fulfilled to a great extent by use of a primary prosthetic replacement implant with or without cement.

Arthroplasty of the hip may be categorized as a total hip arthroplasty, in which, articular surface of both the acetabulum and femur are replaced.

Hemiarthroplasty involves replacement of the femoral head and neck (unipolar hemiarthroplasty) and replacement of the femoral head and neck with an additional acetabular cup that is not attached to the pelvis (bipolar hemiarthroplasty) or replacement of the surface of the femoral head (resurfacing hemiarthroplasty).

REVIEW OF LITERATURE

Dorr et al (1986) in randomized, controlled trials that have compared internal fixation, with either total hip replacement or hemiarthroplasty have demonstrated inferior results for internal fixation, with reoperation rates ranging from 18% to 47%. The reported rates of acetabular erosion have ranged from 0% to 26% for bipolar designs and from 2.2% to 36% for unipolar designs. The major early complication of total hip arthroplasty is dislocation. At the time of the final follow-

up, the hemiarthroplasty group had significantly greater hip disability, than the total hip arthroplasty group.

Parker (2000) studied of 3154 consecutive patients with fracture neck of femur, 908 patients were treated by hemiarthroplasty; 4.8% required revision surgery within the first year for dislocation, periprosthetic fracture (1.2%), loosening (0.8%) and infections (1.2%). Pain and mobility in patients who undergo hemiarthroplasty are inferior to total hip replacement in short term and long term. A meta-analysis reported a mean dislocation rate of 6.9% following total hip replacement for a fracture neck femur.

Ravikumar and Marsh (2000) in a randomized, prospective study of octogenarians, who had sustained a displaced fracture of the femoral neck, reported that the rate of acetabular erosion at two years postoperatively was 2.2% for hips that had been treated with a unipolar prosthesis and 0% for hips that had been treated with a bipolar prosthesis. The lowest dislocation rates (2%) were reported for total hip replacement, using the transgulteal approach in patients who had sustained a displaced intracapsular fracture of the femoral neck. These findings suggest that total hip arthroplasty is superior to hemiarthroplasty for the treatment of mentally competent, independent, and active patients.

Aharonoff et al (2004) compared the outcome of the total hip replacement with hemiarthroplasty in the mobile and socially independent patient with displaced fractures of femoral neck and made note of caution, that there is a higher rate of dislocation, when using the total hip arthroplasty. Of patients walking independently before injury, 30.8% of patients had a good outcome as compared to only 14.2 % of patients who had to rely on aided ambulation. So pre-fracture mobility is often a predictor for short term complications.

Baker et al (2006) in their prospectively randomized study, 81 patientswho had been mobile and lived independently before they hadsustained a displaced fracture of the femoral neck

were randomizedto receive either a total hip arthroplasty or a hemiarthroplasty.The mean age of the patients was 75 years. Outcomewas assessed with use of the Oxford hip score, and final radiographswere assessed.After a mean duration of follow-up of three years, the author proved that, total hip arthroplasty group had a good Oxford hip score as compared to hemiarthroplasty group.

Narayan and George (2006) in his study of 61 patients of endoprosthetic replacement, for fracture neck of femur between May 1997and Dec. 2002 were followed–up prospectively. 29 patients were treated with total hip replacement and 32 were treated with bipolar arthroplasty. The period of follow up ranged from 24 months to 90 months, with a mean of 58.5 months. The mean Harris Hip Score for the bipolar group was 86.93 and for the total hip group was 83.82.

Blomfeldt et al (2007) studied120 patients with a mean age of 81 years (70 to 90) with anacute displaced intracapsular fracture of the femoral neck.They were randomly allocated to be treated with either a bipolarhemiarthroplasty or total hip replacement. The duration of surgery was longer in the total hip replacementgroup (102 minutes (70 to 151) versus 78 minutes (43 to 131)($p < 0.001$), and the intra-operative blood loss was increased460 ml (100 to 1100) versus 320 ml (50 to 850) ($p < 0.001$),but there were no differences between the groups regarding anycomplications or mortality. There were no dislocations in eithergroup. Hip function measured by the Harris hip score was significantlybetter in the total hip replacement group at both follow-upperiods ($p = 0.011$ and $p < 0.001$, respectively).

AIMS AND OBJECTIVES

We intend to study the result of 50 cases of intra capsular fracture neck femur in elderly patients treated with primary cemented bipolar arthroplasty or total hip replacement arthroplasty, 25 cases each, with following objectives:

1. To compare duration of surgical procedure.
2. To compare the time required for unprotected weight bearing.
3. To compare cost of surgeries.
4. To compare the relief of pain, so that the patient is able to carry out the activities of daily life.
5. Operative related complications.
6. To compare functional status of the patient.
7. Any need for secondary surgeries.

The assessment of patient in relief of pain, functional status, and range of movements at hip i.e. 3,4,5 has been evaluated using Merle'D Aubigne and Postal hip rating system, described by Salvati et al (77) and stability of hip has been assessed in terms of dislocation.

MATERIAL AND METHODS

The present study will be conducted on 50 cases of intracapsular fractures of neck femur above the age of 50 years admitted in the department of Orthopaedics, Government Medical College, and Patiala. Out of 50 cases, 25 cemented bipolar prosthesis and 25 total hip replacements will be done.Patients will be given first aid in the form of skin traction, analgesics and antibiotics. Patients will be immunized against tetanus, and shock if present, will be treated. Radiographic examination will be done to assess the type of fracture and displacement. History will be recorded on the proforma attached. General

physical and local examination will be noted. Patient will be investigated for operative and anaesthesia purposes. Any associated medical problems will be taken care of before the patient is taken up for surgery.

Pre-operation preparation

Preoperative counselling of patient and his relatives will be done. Local preparation of part will be done by shaving and preparing the part. Appropriate broad-spectrum antibiotics will be given pre-operatively and continued for 3-5 days after operation.

Operative management:

Surgery will be done under general or spinal/epidural anaesthesia depending upon the choice of anesthesiologist. Patient will be subjected to either hemiarthroplasty, with cemented bipolar prosthesis, or total hip arthroplasty, through postero-lateral approach depending upon bone quality, personality of fracture, co-morbid medical and requirement of patient.

Postoperative

1. Antibiotics and Anti-inflammatory analgesics will be given.
2. Suction drain removal with post-operative blood loss measured and Ist dressing will be done after 48 hours.
3. Suction drain tip will be sent for culture and sensitivity.
4. Physiotherapy will be started 24 hours after the operation.

The patient will be discharged from the hospital within two weeks of operation and partial weight bearing be started before discharge with the help of walker.

FOLLOW UP

· 1 month interval for 6 months

· 6 months interval for 2 years

CRITERIA FOR EVALUATION OF RESULTS

Method Merle 'd Aubigne and Postal hip rating system, described by Salvati et al (1972) will be used for evaluation for the results as below:

(a) **Pain:**

(0) All the time, unbearable, strong medication

(2) All the time but bearable, strong medication occasionally.

(4) None or little at rest. Pain with activities.

(6) When starting, then better; or after a certain activity.

(8) Occasional and slight pain.

(10) No pain.

(b) Walking:

0 Bed ridden

2 Wheel Chair, transfer activities with walker

4 No Support –house bound

One support –less than one block

Bilateral support less than three blocks

(Markedly restricted)

6 No Support less than one block

One support-up to five blocks

Bilateral support –unrestricted limitedly.

(Moderately restricted)

8 No support-limp

One support – no limp

(Mildly restricted)

10 No Support or appreciable limp

(Unrestricted)

(c) Muscle Power and motion

0 Ankylosis with deformity

2 Ankylosis with good functional position

4 Muscle power-poor to fair, are of flexion less than 60°, restricted lateral and rotational movements.

6. Muscle power fair to good, are of flexion upto 90° fair lateral and rotatory movements. (Fair lateral movement: Both abduction and adduction 10° each. Fair rotatory movement: Internal rotation 10° and External rotation 20°)

8. Muscle power good or normal, are of flexion over 90°, good lateral and rotatory movements, (Good lateral movement: 20° each. Good rotatory movement: Internal rotation 20° and External rotation 40°)

10 Muscle power normal, motion normal or almost normal.

(d) Function

0 Completely dependent and confined.

2 Partially dependent

4 Independent Limited Housework, shops limitedly.

6. Most house work, shops freely, desk type work.

8 Very little restriction can work on feet.

10 Normal activities.

Based upon the sum total of scores of above four evaluation a the results will be assessed as :

Excellent	:	Score 32 or more
Good	:	24 to 31
Fair	:	16t o 23
Poor	:	15 or less

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MASTER CHART – THR

S.No.	Name	CR No.	Age	Sex	Gardens	Involved Side	Type of Arthroplasty
1	Balkinder kaur	25105	75	F	IV	L	Charnley
2	Surinder kaur	21619	65	F	III	L	Charnley
3	Gurnam kaur	8385	65	F	IV	L	Charnley
4	Niranjan singh	10230	75	M	III	L	Charnley
5	Sharda devi	14169	62	F	IV	L	Charnley
6	Baldev Kaur	12699	66	F	IV	L	Charnley
7	Simran kaur	14402	82	F	III	R	Charnley
8	Labh kaur	15965	83	F	IV	L	Charnley
9	Gobind ram	16749	78	M	III	L	Charnley
10	Labh kaur	19453	75	F	IV	R	Charnley
11	Chaman lal	17144	85	M	IV	L	Modular
12	Satwant Kaur	19609	63	F	III	R	Charnley
13	Hari ram	19962	65	M	III	R	Charnley
14	Gurnam kaur	38801	65	F	IV	R	Charnley
15	Kartar singh	14592	65	M	III	L	Charnley
16	Amar singh	17574	62	M	IV	L	Modular
17	Kesar singh	1900	73	M	III	L	Charnley
18	Omvati	23937	72	F	III	R	Charnley
19	Savitri devi	13151	65	F	III	R	Charnley
20	Dalo devi	14243	82	F	IV	L	Charnley
21	Resham kaur	30697	65	F	IV	R	Charnley
22	Mohinder kaur	16419	72	F	III	R	Charnley
23	Ishar singh	15476	65	M	IV	L	Charnley
24	Amarjit singh	28835	64	M	III	R	Charnley
25	Joginder singh	28560	65	M	IV	L	Charnley

Salvati Hip Score							Unprotected weight bearing (weeks)
At discharge	**01 month**	**03 months**	**06 months**	**One year**	**1½ year**	**>1½ year**	
22	28	30	32	32	34	34	4.1
24	28	30	32	34	36	38	3.4
22	26	32	32	34	36	36	3.6
22	28	30	32	34	34	36	3.5
24	28	32	32	32	34	34	3.6
22	28	32	32	34	34	36	4.4
22	26	32	32	34	34	Left	4.2
20	28	30	32	34	34	36	4.2
-	-	18	28	30	30	32	6.0
22	28	28	30	32	32	34	4.1
24	28	30	32	32	34	36	4.4
20	26	30	32	32	34	34	4.3
20	28	30	32	32	34	36	4.2
22	28	32	32	34	34	34	4.4
20	26	30	30	32	34	36	4.6
22	28	30	30	32	34	34	4.5
20	28	32	32	34	34	36	4.3
22	28	30	30	32	34	36	5.0
22	28	32	32	32	34	38	4.6
20	28	32	34	34	36	38	5.1
20	26	28	28	30	30	32	4.5
22	28	28	30	32	34	36	4.6
20	28	30	32	32	34	Left	5.1
22	30	30	32	34	34	36	4.4
20	28	32	32	32	34	Left	4.5

MASTER CHART – BIPOLAR

S.No.	Name	CR No.	Age	Sex	Gardens	Involved Side	Type of Arthroplasty
1	Pritam kaur	20586	63	F	IV	L	Charnley
2	Kartar singh	14592	65	M	IV	L	Charnley
3	Joginder singh	23656	65	M	IV	R	Charnley
4	Sarla Devi	15595	68	F	III	L	Charnley
5	Satwant kaur	10022	64	F	IV	L	Charnley
6	Mindro	7463	88	F	III	R	Modular
7	Niranjan singh	16541	64	M	IV	R	Charnley
8	Seeto devi	15446	68	F	III	R	Charnley
9	Angoori devi	21715	64	F	IV	R	Charnley
10	Lachmi	25202	62	F	III	R	Charnley
11	Bhagwati devi	30193	68	F	IV	L	Charnley
12	Rajiv	27573	65	M	III	R	Charnley
13	Ramji	4983	67	M	IV	L	Charnley
14	Kasturi devi	15702	69	F	III	L	Charnley
15	Shamsher singh	15421	68	M	IV	R	Charnley
16	Mehar singh	19256	82	M	III	L	Charnley
17	Pritam singh	20586	75	M	IV	R	Charnley
18	Keola	219	72	F	III	L	Charnley
19	Joginder singh	23656	78	M	III	L	Charnley
20	Kesar singh	23829	76	M	III	R	Charnley
21	Amarjit kaur	6060	78	F	IV	R	Charnley
22	Gurdayal kaur	9607	74	F	IV	R	Charnley
23	Surjit kaur	10582	73	F	III	R	Charnley
24	Gurdai	9893	85	F	IV	L	Charnley
25	Gian kaur	11640	82	F	III	R	Charnley

	Salvati Hip Score							
	At discharge	**01 month**	**03 months**	**06 months**	**One year**	**1½ year**	**>1½ year**	**Unprotected weight bearing (weeks)**
	20	28	30	32	34	34	38	3.6
	24	30	30	32	32	34	36	3.1
	22	30	30	32	32	34	34	3.2
	20	28	32	32	34	34	36	3.3
	20	26	30	30	32	32	34	3.6
	26	28	30	32	32	34	36	3.4
	22	28	30	30	32	34	36	4.1
	20	26	30	32	34	34	36	4.2
	24	28	30	32	32	32	36	3.6
	22	28	30	34	34	34	36	4.1
	26	30	30	32	32	34	36	3.1
	22	26	28	30	30	32	34	3.5
	20	28	32	32	34	34	Left	3.4
	22	28	32	32	34	34	38	3.2
	24	28	30	32	32	34	36	3.1
	26	30	30	32	32	34	38	3.1
	22	30	30	32	32	34	36	3.2
	22	26	28	32	32	34	38	3.4
	20	28	30	30	32	34	38	3.1
	24	30	30	32	34	34	36	3.2
	20	30	30	32	32	34	Left	3.3
	22	28	30	30	32	32	34	3.1
	24	30	30	32	34	34	36	3.2
	20	26	30	32	34	34	38	3.4
	22	28	30	32	32	34	36	3.4

Contributors

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I have completed graduation (MBBS) and Post-graduation (Orthopedics) from Government Medical College, Patiala and currently working as a consultant Orthopedic surgeon at this prestigious institute of Northern region since past is years. I have done fellowship in trauma from UK (LEEDS) and Balchandani Travel fellowship through NZOA from Government Medical College Jabalpur, MP. I am also an active member of various orthopedic societies like Indian Orthopedic Association, ISKSAA, NZOA, and POA. With a keen interest in Trauma and Arthroplasty, I am guiding and teaching our graduates and post-graduate students. I have also presented papers in various national and international conferences and also published many papers in indexed national and international journals. I have the commitment to the highest standard of quality in state of art content of publishing material.

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