Hip Arthroplasty For Salvage Of Failed Treatment Of Intertrochanteric Hip Fracture

Essay

Submitted for the fulfillment of the master degree in
orthopedic surgery

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2009

ACKNOWLEDGEMENT

First of all thanks to **GOD** *for helping me to achieve this work..*

I would like to express my deep respect and gratitude to ***Prof. Dr.*** **Ahmed Morrah**, *Professor of orthopedic surgery, Faculty of Medicine, Cairo University, for his kind and sincere supervision, generous advise derived from his wide experience and continuous encouragement throughout the preparation of this essay and his precious time and effort he generously gave to me to make this work more valuable..*

It is my pleasure indeed to express my appreciation to ***Prof. Dr.*** **Hisham Mosbah**, *Assist. Professor of orthopedic surgery, Faculty of Medicine Cairo University, for his great support and kindness, he has always inclined to teach me and give me helpful advises for performing this work.*

I would like to thank ***orthopedic department in Faculty of Medicine Cairo University*** *where I learned and received precious literatures in orthopedic surgery as helping me and giving me experience in my practice life .*

Contents

List Of Abbreviations

AO	Arbeitsgemeinschaft fuer Osteosynthesefragen
AP	Antroposterior
ASIF	Association For The Study Of Internal Fixation
ASIS	Anterior Superior Iliac Spine
AVN	Avascular Necrosis
DHS	Dynamic Hip Screw
EMG	Electromyogram
ORIF	Open Reduction And Internal Fixation
PSIS	Posterior Superior Iliac Spine
S-ROM	Sivash-Range of Motion
THA	Total Hip Arthroplasty
THR	Total Hip Replacement

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Introduction

Patients with failed internal fixation of a hip fracture have marked pain and disability. These patients may present treatment challenges. In younger patients with failed intertrochanteric fracture fixation with a satisfactory hip joint, treatment typically involves revision internal fixation with or without osteotomy or bone grafting. In older patients with poor remaining proximal bone stock or a badly damaged hip joint, conversion to hip arthroplasty can restore function effectively and reduce pain ***(Haidukewych and Berry, 2005)***.

Arthroplasty type selection should take into account the status of the joint and the patient's age and activity level. The conversion of failed femoral neck fracture treatment, intertrochanteric fracture treatment, or hemiarthroplasty to total hip arthroplasty is possible with a high degree of success ***(Buly and Robert, 2004)***.

Total hip replacement (THR) has been applied principally to the treatment of degenerative and inflammatory arthropathies of the hip. Another application of THR is for the salvage of failed prior hip surgeries. It is termed conversion THR. The indications for conversion arthroplasty include (1) Failure of arthrodesis or ankylosis of the hip; (2) Failure of previous femoral osteotomy; (3) Previous acetabular fracture; and (4) Failure of internal fixation of previous hip fractures. Each indication for conversion THR has its own unique technical challenges, considerations for implant selection, clinical results, and complications ***(Barrett et al., 2001).***

Hip arthroplasty dramatically alleviated pain and improved function in the majority of these patients, for whom other salvage techniques would have been difficult or had been tried and had failed. The operation allowed most patients to regain function that otherwise had been lost, which is the hallmark of an effective salvage procedure. Despite the technical challenges associated with the performance of hip arthroplasty in these patients, there was a surprisingly low rate of serious orthopedic complications and the prostheses were durable ***(George et al. 2003)***.

The complications associated with hip replacement in patients with previous proximal femoral fracture fixation occurred more frequently than in patients who had not had undergone previous fracture fixation; in addition, intraoperative surgical difficulty was significantly greater in those patients who had undergone previous surgery for hip fracture. However, Total hip replacement is a satisfactory salvage procedure for failed fracture treatment despite the increased incidence of operative difficulty and increased incidence of complication ***(Tabsha et al., 1997)***.

Unless the risks are too high, the vast majority of hip fractures are best handled with operative intervention. If the initial treatment has not been successful, total hip arthroplasty is usually the most predictable salvage procedure. However, compared with primary total hip arthroplasty, conversion procedures are fraught with difficulties and pitfalls ***(Jan et al., 2003)***

Aim of the work

The aim of this essay is to discuss causes of failed fixation of intertrochanteric fracture and salvage this failure by conversion to total hip arthroplasty and discussing its technical problems and difficulties and how to overcome these problems.

Applied Anatomy of the Hip Joint

Surface landmarks around hip joint :

The bony landmarks provide initial guidance to the incisions and orientation of the pelvis for the various approaches to the hip. Anteriorly, the prominent anterior superior iliac spine (ASIS) marks the anterior limit of the iliac crest and serves as an attachment for the sartorius muscle and the inguinal ligament. Posteriorly, the iliac crest ends at the posterior superior iliac spine (PSIS), which is defined by a superficial skin dimple. Laterally, the greater trochanter is most easily defined at its posterior superior corner, or tubercle, medially, the femoral artery can be palpated below the inguinal ligament in the femoral triangle at a point midway between the ASIS and symphysis pubis ***(Waiselewski, 1997).***

The hip joint, made up of the head of the femur and the acetabuium is perhaps the best example of a diarthroidal ball and socket joint in the body unlike the shoulder joint, the hip is multiaxial. The hip, however, is modified in several ways to increase its stability. As a result of these modifications, the hip is less mobile than the shoulder and shows less freedom of movement. The articulation of the hip occurs between the cup shaped acetabulum of the innominate, or pelvic bone and the smooth, globular head of the femur. The depth of the acetabulum is increased by the triangular rim of fibrocartilage called the acetabular labrum. which forms an incomplete ring around the margin of the socket. The labrum actually turns into the acetabular cavity and embraces the head of the femur. The stability of the hip is largely the result of the shape of the head of the femur and the deep acetabular socket into which the femoral head fits. Stability is also effected by the powerful and dense ligaments, especially those located in front of the joint ***(McMinn, 1994).***

The proximal part of the femur bone through its head constitutes with the acetabulum the hip joint. This joint is synovial ball and socket which provides a particular high degree of stability and a remarkable range of mobility. The stability of the hip joint is due to the adaptation of the articular surface of the femoral head to the concavity of acetabulum, while the wide range of the hip joint movement is due to the fact that the femur has neck which is much narrower in its diameter than the diameter of the head ***(Hoaglund, 1980).***

Bony Anatomy of The Proximal Femur

1. The Proximal Femur :

The proximal femur includes the head, neck, lesser and greater trochanters, and proximal femoral metaphysis.

The head of femur:

The head of femur is spherical in shape. So it adapts the concavity of the articulating acetabulum ***(Hoaglund et al, 1980).***

The hemispherical femoral head diameter averages 46 mm (range 35 to 58) and joins the femoral neck at the sub-capital sulcus. The neck-shaft angle averages 135 (range 105 to 155 with wide variability) ***(Hanssen, 1996).***

The head of femur is entirely intracapsular and its articular surface is more than half a sphere, this surface is covered by articular hyaline cartilage except the non-articulating convexity of the head which excavated into a pit called "fovea" which receives the ligamentum teres whose other end attaches to the transvers ligament of the acetabulum. The globular head is fixed to the neck of femur which is an upward extension of the shaft, it projects superiorly, anteriorly and medialy from the upper femoral shaft. The head covers the neck more anteriorly than posteriorly and more superiorly than inferiorly. The expanded base of neck is delineated anteriorly by intertrochanteric line and posteriorly by intertrochanteric crest ***(Hoaglund et al, 1980).***

The femoral head is covered by articular cartilage that is thick centrally and thin peripherally, conversely the acetabular cartilage is thicker peripherally. The opposing surfaces are regularly and reciprocally curved, and at any given time only 2/5th of the femoral head occupies the acetabulum. The labrum serves to convert the bony acetabulum into a true hemisphere as well as deepening it thus increasing joint stability ***(Last, 1981).***

The neck of femur:

The neck of femur joins the shaft superiorly by the greater trochanter and inferiorly by the lesser trochanter. Groves and ridges on the surface indicate the attachment of retinacular fibers reflected from the attachment of hip joint capsule to the articular margin of the head, these fibers hold down the arteries to the head. The femoral neck is broader at its base laterally and narrower just below and lateral to the origin of the femoral head, the femoral neck is flattened in antero-posterior plane. Vascular foramina are present on the anterior inferior aspect of the neck ***(Fig.1) (Last, 1981).***

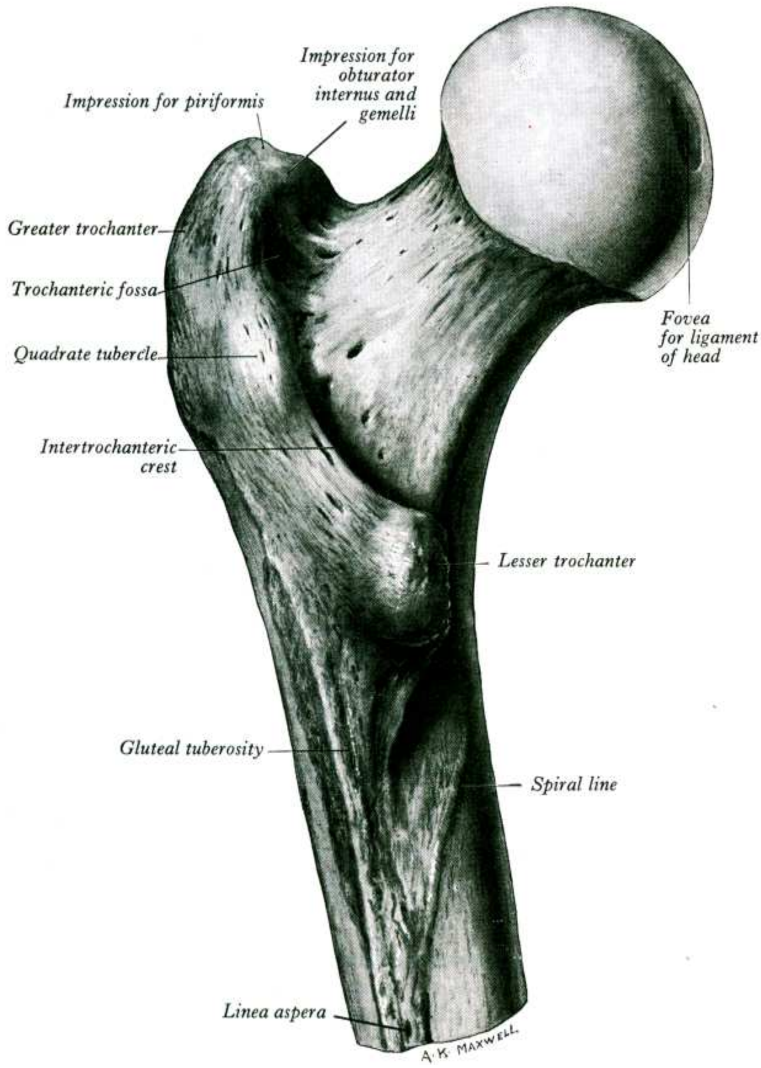

Fig.(1): *The proximal part of left femur : posterior aspect.* ***(Quoted from Gray's anatomy, 2000).***

Anteversion:

Femoral neck anteversion is defined as the angle between an imaginary transverse line that runs medially to laterally through the knee joint and an imaginary transverse line passing through the center of the femoral head and neck. In adults the femur is twisted so the head and neck of the femur are angled forward between 15 and 20 degrees from the frontal plane of the body ***Fig.(2) (Cibulka 2004)***.

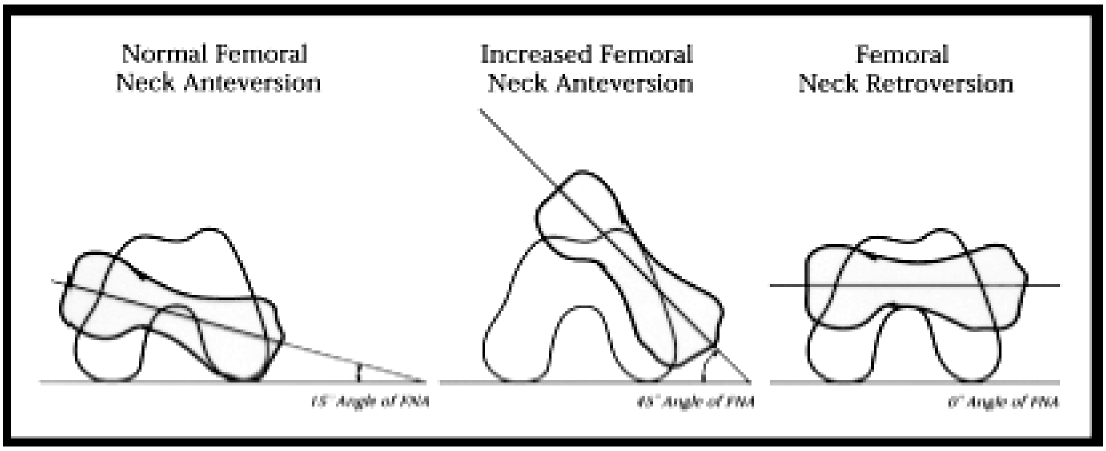

Fig.(2): *Illustration of normal, increased, and decreased femoral neck anteversion angle* ***(Cibulka 2004).***

The greater trochanter:

The greater trochanter is quadrangular in shape and presents a roughened lateral surface giving attachment to many muscles. Its antero-lateral surface receives the insertion of gluteus minmus, while its postero-lateral surface receives the gluteus medius. An intervening space between these insertions is covered by a bursa to facilitate the motion of overlying anterior part of the glueteus maximus.

The posterior edge of the greater trochanter is raised to a prominence that overhangs a depression between it and the base of femoral neck called the trochanteric fossa which receives the combined tendons of obturator internus and the piriformis muscle while the tendon of obturator externus insertion just dorsal to the trochanteric fossa.

The quadrate tubercle is a prominence inferior to the intertrochanteric crest and gives attachment to the tendon of quadratus femoris muscle ***(BaIdreston et al, 1992).***

The lesser trochanter:

The lesser trochanter is rounded postero-medialy directed prominance serving as insertion of ilio-psoas muscle ***(BaIdreston et al, 1992).***In the development of the proximal femur, the lesser trochanter is formed by traction of the iliopsoas which separates the medial femoral cortex into two distinct layers, the outer cortex and the inner calcar. The two join together proximally to form the medial femoral neck which commonly, but erroneously, is often referred to as the ‘calcar’. With advancing age and declining function the medullary canal enlarges by thinning of the inner aspect of the femoral cortex. The calcar femoral may then become thin or disappear. It contributes to the strength of the femoral neck by resisting torsion, and its resorption plays a significant part in the increasing incidence of fracture of the neck of the femur with typical posteromedial comminution ***(Wroblewski et al, 2000).***

Calcar femoral:

It is a dense vertical plate of bone. It springs from the posterior medial portion of the femoral shaft under the lesser trochanter and radiating laterally to the greater trochanter. It reinforces the femoral neck postero-medially as it joins the inner surface of the posterior wall of the femoral neck ***(Fig.3)***. The calcar femoral is thickest medially and gradually thins as it passes laterally. The calcar femoral represents the upward extension of the original cylindrical shaft and is considered transitional from the tubular outline to the metaphyseal trochanteric area. ***(Griffin, 1982).***

In trochanteric fractures, the wedge of the calcar femorale often forces the thin walled trochanteric crest and the lesser trochanter posteriorly off the thick walled anterior parent shaft ***(Tronzo, 1973).***