MANAGEMENT OF FRACTURES OF NECK FEMUR IN ADULTS WITH DYNAMIC HIP SCREW (D H.S.)

THESIS

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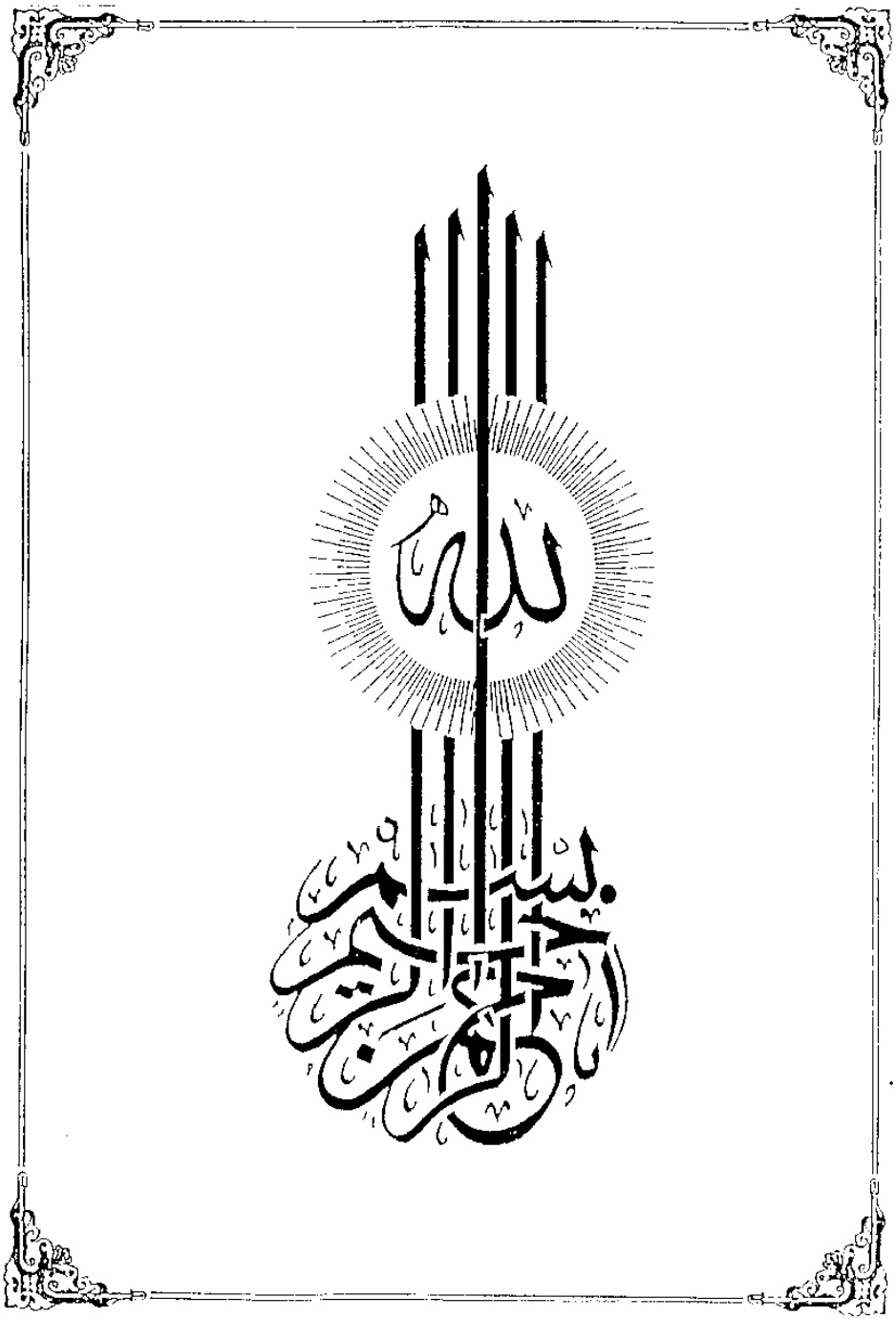
To my dearest mother

To the soul of my beloved father.



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PART (I)

INTRODUCTION

Although Ambroise Paré first recognized the existence of fractures of the femoral neck almost 400 years ago, this injury has continued to be difficult to treat up till now.

Prior to the introduction of the three-flanged nail in the 30's by Smith-Petersen, there was considerable truth to the phrase " We come into the world under the brim of the pelvis and go out through the neck of femur ". With the improvements in internal fixation, the results obtained today show great progress, but still not at all comparable with results obtained with other fractures. The incidence of non-union and avascular necrosis is high and their occurrence unpredictable.

One of the most important causes of non-union, in femoral neck fractures, is the pronounced bone resorption of the femoral neck. This resorption can be stopped as Pauwel demonstrated in 1980, if a compressive force is created on the regenerated tissue. This principle has been well demonstrated over the years. Senn, 1883, stated; " We are not only justified but warranted in asserting

that the only cause for non-union in the case of intracapsular fractures is to be found in our inability to maintain perfect coaptation and immobilization of the fragments during the time required for bony union to take place ".

As early as the 50's, most of the new fixation devices were designed on the basis of this principle, with the achievement of continuous contact compression in femoral neck fractures until union occurs. More recently the Swiss Association for the Study of Internal Fixation has introduced a new version of the known Richard's compression hip screw under the name of dynamic hip screw (DHS). Contact compression is achieved by the ability of the screw to slide maintaining the compression at the fracture site, under stresses of body weight.

This work represents the findings and the results of a series of 50 femoral neck fractures treated with dynamic hip screw (DHS) osteosynthesis and with immediate postoperative full weight bearing.

To be able to conceive the spectrum of the results as well as the complications expected, a brief review of the anatomy of the upper end of femur with a detailed biomechanical description

of the hip joint was given.

Also a brief study of the femoral neck fracture was demonstrated with a short note on the most conventional internal fixation devices used nowadays.

In this work, we have undertaken a detailed study of the clinical and operative factors; as age, type of fracture, degree of displacement, accuracy of reduction and position of the fixation device; in an attempt to determine their relationship to the incidence of non-union and avascular necrosis.

The final results are also assessed to see if the dynamic hip screw will produce any noticeable difference in the final outcome as compared to the other types of internal fixation devices that are available for the treatment of acute femoral neck fractures.

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ANATOMY OF THE UPPER END OF FEMUR

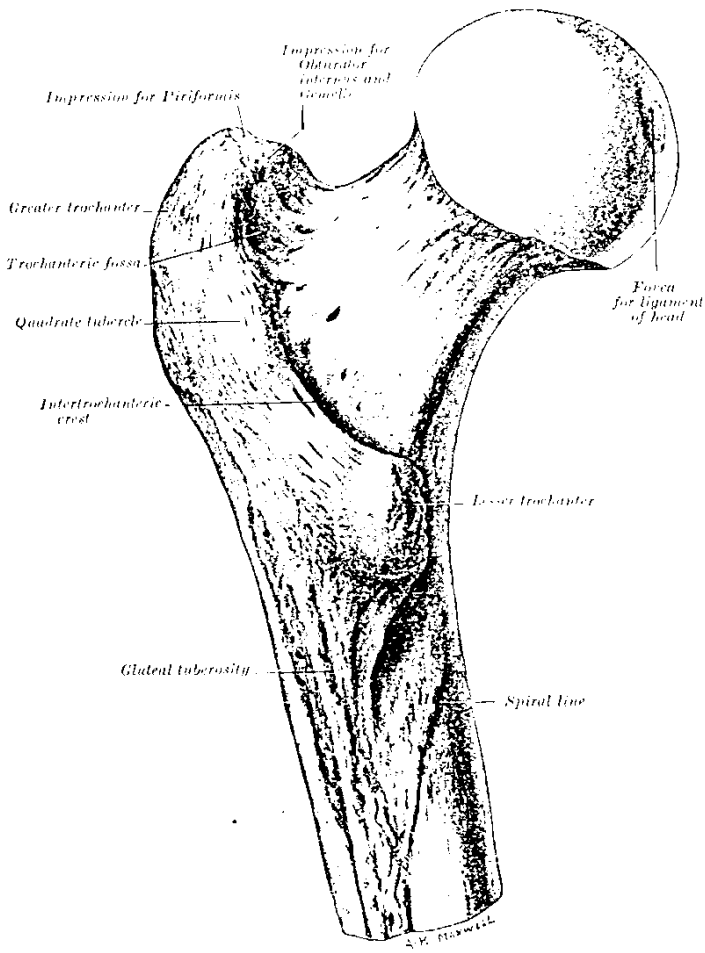

Fig. (1) . The upper part of the left femur viewed from behind (Gray's Anatomy, 1973).

Anatomy Of The Upper End Of Femur

It is important to review the normal antomic features of the proximal femur and to be familiar with it, in order to treat the pathological conditions that occur in this region e.g. femoral neck fractures.

The upper end of the femur (Fig. 1), comprises a head, a neck, a greater and lesser trochanter.

The HEAD

The femoral head forms rather more than half a sphere; it is directed upwards medially and slightly forwards, to articulate with the acetabulum of the hip bone. Its surface is smooth; capped with hyaline cartilage which encroaches a little on the anterior surface of the neck for articulation with the acetabulum when the hip is flexed; and is marked a little below and behind its centre by a small roughened pit or fovea, that gives attachement to the ligament of the head of the femur (Gray's Anatomy, 1973). The covering cartilage is about 4 mm in thickness over the superior portion of the femoral head and 3 mm at the equator (Hoaglund

et al, 1980).

The femoral head is entirely intracapsular and is encircled immediately lateral to its greatest diameter by the acetabular labrum. The inferomedial part of the anterior surface of the head is related to the femoral artery from which it is separated by the tendon of the Psoas major muscle and the articular capsule (Gray's Anatomy; 1973).

The femoral head has an axis which is parallel to that of the neck (Hoaglund et al, 1980).

The NECK

The neck of the femur is an upward extension of the shaft. It has two rounded borders. The upper border is nearly horizontal and is gently concave upwards. The lower border is straight but oblique, and is directed downwards, laterally and backwards to meet the shaft near the lesser trochanter. The neck of the femur has two surfaces an anterior and a posterior one. The anterior

surface is flattened and its junction with the shaft is marked by a prominent rough ridge, termed **the intertrochanteric line.** The posterior surface is convex backwards & upwards in its transverse axis, and concave in its long axis, and its junction with the shaft is marked by a rounded ridge, termed **the intertrochanteric crest.**

The neck of the femur is marked by numerous vascular foramina, especially on its anterior surface and on the upper part of its posterior surface (Gray's Anatomy, 1973).

Synovial membrane covers the entirety of the femoral neck anteriorly but only the upper portion of the neck posteriorly. It arises at the border of the margin of the articular cartilage of the femoral head and is reflected on to the under surface of the capsule of the hip joint. The capsule is attached at the intertrochanteric line anteriorly and approximately 1.5 cm. proximal to the intertrochanteric crest posteriorly, in other words, the capsule is attached halfway along the femoral neck posteriorly. Beneath the synovial membrane, periosteum covers the proximal femur. Banks, in 1965 (Quoted from Hoaglund et al, 1980), has shown that the periosteum doesn't have a cambium layer on the femoral neck. This accounts for the lack of peripheral callus formation in the healing process

after a fracture in this region. Therefore, healing in the femoral neck area is dependent on endosteal union alone.

The neck of the femur inclines upon the shaft at an angle of about 125°, ranging normally between 113° and 136°, (Fig. 2). This angle is more obtuse in infants, decreases with maturity notably in the first 5 years of life (Jones, 1954). This angle is known as **the angle of inclination or the vertical neck-shaft angle** (Saunders', 1971).

The neck of the femur also doesnot lie in the same plane as the shaft, but it is set upon the shaft at an angle of about 15° which is known as **the angle of femoral torsion or declination** (Fig. 3) (Gray's Anatomy, 1973).

The femoral neck is about 5 cms long. Its diameter is three quarters the diameter of the femoral head, allowing a greater range of motion before impinging on the acetabular labrum (Harty, 1982).

A knowledge of the variational anatomy of the neck of femur in respect to lengths, diameters, is a valuable aid in the diagnosis and treatment of fractures of the upper end of the femur.