Intramedullary Nail Fixation in Treatment of Intertrochanteric Femoral Fractures

Thesis Submitted for Partial Fulfillment of M.D Degree In Orthopedic Surgery

By

Hossam Mohamed Safouh

M.B., B.Ch, M.Sc. Orthopedic surgery

Supervisors

Hazem Abdel Azeem, M.D.

Professor of orthopaedic surgery
Cairo University

Ahmed Kholeif, M.D

Professor of orthopaedic surgery
Cairo University

Yasser Abdel Fatah Radwan, M.D

Professor of orthopaedic surgery
Cairo University

Nehad El Mahboub, M.D

Asst.Professor of orthopaedic surgery
MUST University

Faculty of Medicine

Cairo University

2016

التثبيت بواسطة المسمار النخاعى فى علاج
كسور الفخذ ما بين المدورين

رسالة مقدمة توطئة للحصول على درجة الدكتوراه
فى جراحة العظام

إعداد

الطبيب/ حسام محمد السعيد سافوح

بكالوريوس الطب والجراحة - ماجستير جراحة العظام

تحت إشراف

الأستاذ الدكتور / حازم عبد العظيم

أستاذ جراحة العظام
كلية الطب - جامعة القاهرة

الأستاذ الدكتور / أحمد خليف

أستاذ جراحة العظام
كلية الطب - جامعة القاهرة

الأستاذ الدكتور / ياسر عبد الفتاح رضوان

أستاذ جراحة العظام
كلية الطب - جامعة القاهرة

الأستاذ الدكتور / نـهاد المحبوب

أستاذ مساعد جراحة العظام
كلية الطب - جامعة مصر للعلوم والتكنولوجيا

كلية الطب
جامعة القاهرة
2016

Acknowledgment

First of all, I would like to express my deep gratitude to **ALLAH** *for his care and generosity throughout my life.*

I would like to express my sincere appreciation to **PROF. DR. Hazem Abdel Azeem,** *Professor of orthopaedic surgery Cairo University, for his keen supervision and guidance and his overwhelming support that has been of great help throughout this work.*

I am very thankful to **PROF. DR. Ahmed Kholeif,** *Professor of orthopaedic surgery Cairo University for his great support & effort throughout the whole work.*

I would also like to express my great thanks to **PROF. DR. Yasser Abdel Fatah,** *Professor of orthopaedic surgery Cairo University for the great effort he has done in this work and for helping me through it*

I wish to introduce my deep respect and thanks to **PROF. DR. Nehad El Mahboub,** *Asst. Professor of orthopaedic surgery MUST University, for his kindness, supervision and cooperation in this work.*

Hossam Mohamed Safouh

List of Contents

Title	Page No.

List of Tables

List of Figures

Fig. No.	Title	Page No.

List of Figures (Cont.)

List of Abbreviations

Abb.	Full term
DHS	Dynamic Hip Screw
IMHS	Intra Medullary Hip Screw
PCCP	Percutaneous Compression Plate
PFN	Proximal Femoral Nail
RTA	Road traffic accidents
TAD	Tip Apex Distance
TAN	Trochanteric Antegrade Nail
TFN	Trochanteric Fixation Nail
VHS	Variable Angle Hip Screw

Abstract

Ninety percent of these fractures occur in patients older than 50 years.

The goal of treatment of these fractures is fracture reduction so that near anatomic alignment and normal femoral antiversion are obtained.

Internal fixation is the treatment of choice for treating intertrochanteric femoral fractures of the femur with the following aims: to obtain best possible anatomic reduction, to get stability for early mobilization and early weight bearing, to reduce the complication associated with prolonged recumbency, and for maximal functional restoration.

Intramedullary fixation devices, which combine a hip screw with either a short or long intramedullary nail such as the Gamma nail, have the theoretical advantages of percutaneous insertion, a lower bending moment on the fixation device, and an intramedullary buttress that precludes excessive medial migration of the shaft. The intramedullary devices transmit progressively decreasing loads to the proximal femur with increased instability of the fracture.

Key Words

Intramedullary Nail Fixation in Treatment of Intertrochanteric Femoral Fractures

INTRODUCTION

Trochanteric hip fractures represent a society issue because of their human, social and economic repercussions ***(Willig et al., 2001)***, which will keep increasing with ageing of the population and the increasing incidence of this type of fracture. These fractures are a leading cause of death and disability among the elderly ***(Kyle, 1994).***

Treatment goals include early rehabilitation, restoration of the anatomic alignment of the proximal part of the femur, maintenance of the fracture reduction and early rehabilitation ***(Hardy et al., 1998).***

The orthopedic surgeons cannot control the quality of the bone, patient compliance, or co-morbidities, but should be able to minimize the morbidity associated with the fracture. This requires choosing the appropriate fixation device for the fracture pattern, recognizing the problem fracture patterns, and performing accurate reductions with ideal implant placement while being conscious of implant***(Hardy et al., 1998).***

Nailing systems, particularly the modern intramedullary osteosynthesis techniques, have gained rapid acceptance in recent years because of the advantage of minimal invasiveness ***(Bojan et al., 2010).***

In the early 1990s, a novel fixation device was introduced for the treatment of intertrochanteric fractures. This device consisted of a short intramedullary nail that was placed through the greater trochanter, with a large-diameter proximal interlocking screw that was inserted in a retrograde fashion up the femoral neck ***(Anglen and Weinstein, 2008).***

The earliest version of this device was the Gamma nail (introduced by Howmedica, now Stryker, Kalamazoo, Michigan). The proposed advantages were insertion through a so-called minimally invasive incision and improved fracture fixation biomechanics ***(Anglen and Weinstein, 2008).***

Since the introduction of the Gamma nail, several similar intramedullary fixation devices of different design have been introduced by other companies ***(Anglen and Weinstein, 2008).***

The shorter lever arm (to decrease tensile strain on the implant), the lack of a requirement of an intact lateral cortex, the improved load transfer (as a result of medial location), the potential for closed fracture reduction, percutaneous insertion, shorter operative time, minimize soft-tissue dissection, thereby reducing surgical trauma, blood loss, and wound complications are advantages of intramedullary devices ***(Ricci, 2004).***

AIM OF THE WORK

The aim of this study is to evaluate the clinical results, functional outcome and complications of intramedullary nail in the treatment of femoral intertrochanteric fractures.

RELEVANT ANATOMY

Osseous Anatomy

The proximal area of the femur forms the hip joint with the pelvis(ball and socket joint).It consists of a head , neck and two bony process called greater and lesser trochanter. The angle that the femoral neck subtends with the long axis of the femur is the angle of inclination. In adult, this angle is usually between 120° and 135° and there is a gradual decrease with age; the average angle is slightly less than 125° for those older than 75 years ***(Noble et al., 1988).***

Although there is considerable variability in both the neck-shaft angle and neck length, in general the center of the femoral head is at the level of the tip of the greater trochanter. The effect of the overhanging head and neck is to lateralize the abductors, which attach to the greater trochanter, from the center of rotation (center of the femoral head). This increases the torque generated by the abductors and reduces the overall force necessary to balance the pelvis during single leg stance.Reducing this lever arm increases total load across the hip ***(Altman, 1998)***.

In addition to its angle in the frontal plane relative to the vertical axis, the femoral neck is slightly anteverted, on average 10° to 15° in relation to the position of the femoral condyles in the horizontal or transverse plane (fig1). Thus the neck of the femur passes from the head backwards as it slopes down to the shaft. This slope of the neck of the femur is in line with the forward and upward propulsive thrust of the normal progression as walking or leaping. Femoral version varies with age and decreases from about 40 at birth to 24 at age of ten and to about 16 of anteversion by mid- to late adolescence. ***(Schuenke, et al., 2006)***

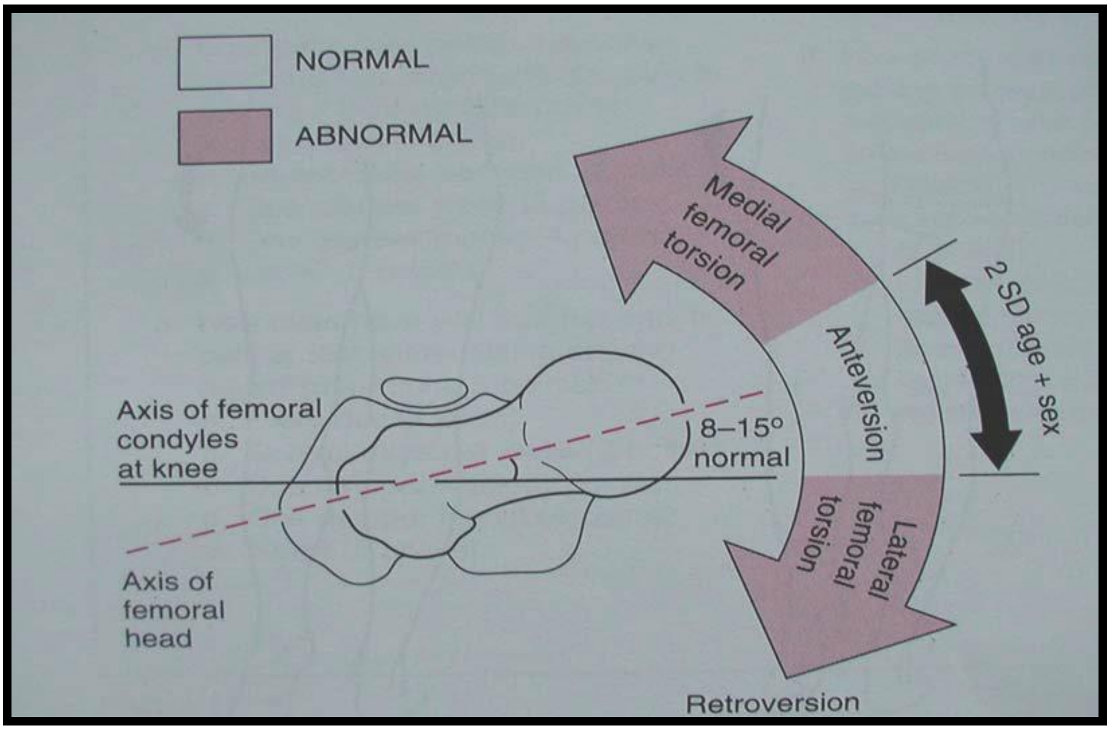

Figure (1): Normal range of anteversion and torsional deformity beyond ***(McGee 1997)***.

Supporting the femoral head and neck is an internal scaffolding system of trabecular bone. The internal trabecular structure of the proximal femur was first described by Ward in 1838. In accordance with Wolff's law, trabeculations arise along the lines of force to which the bone is exposed. In the femoral neck and trochanteric region cancellous trabeculations form from the transition of the shaft cortex into metaphyseal canellous bone. Primary compressive and tensile trabeculations pass through the neck and are separated by an area of sparse cancellous bone labeled Ward's triangle **Fig. (2)**. When mechanically tested in cross section, the cancellous bone of the hip has increased stiffness along these weight- bearing trabeculations and it is significantly reduced in Ward's triangle and in the trochanteric region ***(Griffin, 1982)*.**

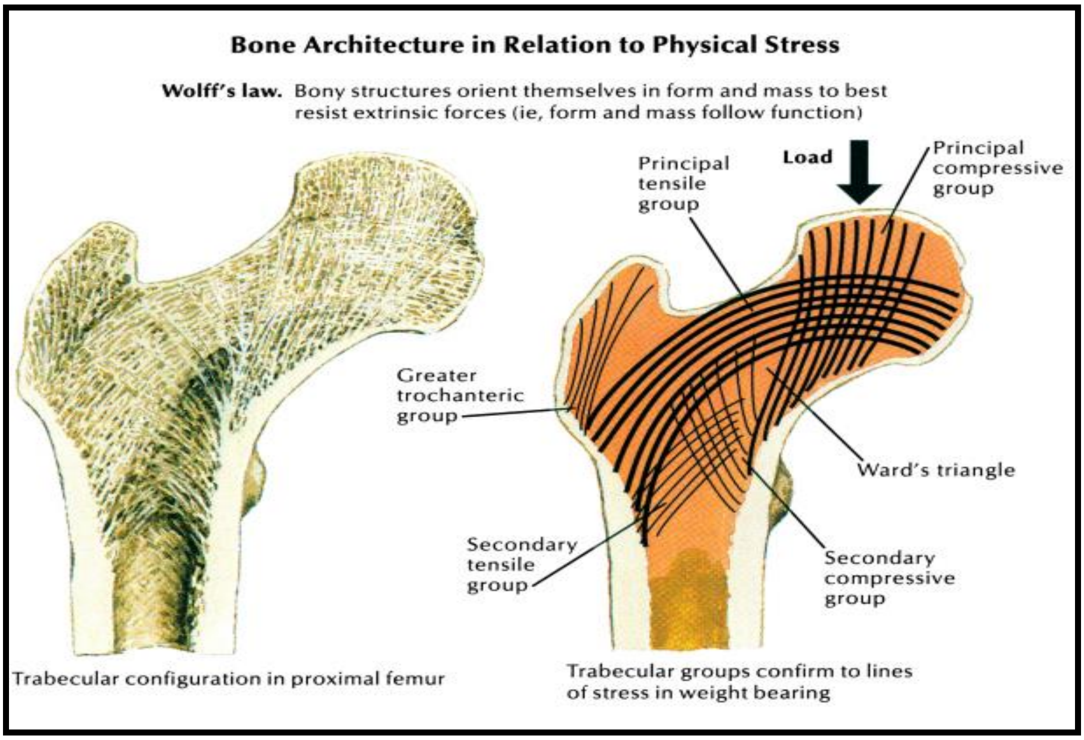

Figure (2): Ward's triangle (W) and the five trabecular groups ***(Ward, 2006).***

This nonhomogenous pattern of bone density and stiffness is particularly apparent in the osteoportotic patient and is important to appreciate when trying to establish fixation.

A dense buttress of bone in the coronal plane, the calcar femorale, extends proximally from the posteromedial portion of the femoral shaft distally and deep to the lesser trochanter ***Fig (3).***

The calcar is a key support in providing strength to the femoral neck, but does so from this vertical position at the shaft-neck transition. It has been frequently misidentified as the medial cortex at the intersection of the neck and shaft ***(Griffin, 1982).***