Biological fixation of closed comminuted femoral fractures using plates versus intramedullary nailing

Thesis Submitted in Partial Fulfillment of M.D. Degree of
Orthopaedic Surgery

By
Mohamed Ismail Gomaa
(M.B., B.Ch, M.Sc.)

Under the supervision of

Prof. Dr.
Sameh Ahmed Shalaby
Professor of Orthopedic Surgery
Faculty of Medicine, Ain Shams University

Assist. Prof. Dr.
Mohamed Abdel Moneim Eid
Assist. Professor of Orthopedic Surgery
Faculty of Medicine, Ain Shams University

Faculty of Medicine
Ain Shams University
2017

ACKNOWLEDGMENT

Praise is to Allah, who guided me to do this work.

I would like to express my sincere gratitude to my thesis senior supervisor ***Prof. Dr. Samah Shalaby (Professor of Orthopaedic Surgery, Faculty of Medicine, Ain-Shams University)*** for his supervision, patience and helpful discussions he has given me during this work. It was his constant encouragement, creative thoughts and suggestions that led to every progress in this research.

I am grateful to ***Dr. Mohamed Abd El-moneim (Assistant Professor of Orthopaedic Surgery, Faculty of Medicine, Ain-Shams University***) for his assistance and support during my research. I would like to express my sincere gratitude to him for reviewing and providing me with necessary comments, suggestions and feedback.

Table of Contents

List of Figures

List of Tables

List of Abbreviations

AO	ArbeitsgemeinschaftfürOsteosynthesefragen
IM	Intra medullary
IMN	Intra medullary nail
LC-DCP	Limited contact dynamic compression plate
DCP	Dynamic compression plate
LISS	Less Invasive Stabilization System
MIPPO	Minimal invasive percutaneous osteosynthesis
MVC	Motor vehicle collision
LCP	Locked compression plate
TSF	Thread shape factor
DCS	Dynamic condylar screw
DHS	Dynamic hip screw
LHS	Locking head screw
DCU	Dynamic compression unit
LPHP	Locked proximal humeral plate
CSMI	Cross-sectional moment of inertia
WL	Working length
ISS	Injury Severity Score
FGF	Fibroblast growth factor
PDGF	platelet derived growth factor
IGF-1	Insulin like growth factor 1
TGF- β	transforming growth factor β
MMP-2	Mono morphogenetic protein 2
VEGF	vascular endothelial growth factor
TEE	transesophageal echocardiography
RFN	Reamed femoral nail
UFN	Undreamed femoral nail
ARDS	Acute respiratory distress syndrome
CT	Computerized tomography
LLD	Limb length discrepancy
FU	Follow up
HHS	Harris hip score

Introduction

Orthopaedic surgeons have long been fascinated with fractures of the femur, the largest and strongest bone in the body.

In healthy adults this bone will not fracture without considerable violence, making femoral fractures major injuries that are commonly the result of high-energy trauma, often associated with other complex injuries and forming part of a life-threatening injury pattern.

Accordingly, femoral fractures have become the index bony injury in fracture research associated with severe polytrauma and the subject of extensive work relating the management of fractures to the care of the whole patient. [1]

Femoral fractures should be considered in two ways: first, according to the general physiologic effects of severe injury and the wider effects of their treatment, and second, with regard to their anatomic patterns and relevant biomechanical management issues. [2]

There are many methods for the treatment of femur shaft fractures. The surgeon must be aware of the indications, advantages and disadvantages of each treatment option and decide the appropriate treatment method for each patient individually. [2]

Fracture type, location, presence of comminution or not, patient age, and lifestyle expectation are important factors when selecting the treatment method. [2]

The initial mechanical concept of osteosynthesis of long bone fractures aimed at perfect anatomic reduction and stable fixation. Primary bone healing without external callus formation was the target. [3]

However, in comminuted fractures, anatomic reduction requires extensive soft tissue stripping and subsequent damage to the blood supply at the fracture site. [3]

After observing the better results with closed intramedullary nailing (IMN) in comminuted fractures, priority changed from a mechanical to biological basis. [3]