Ain Shams University
Faculty of Medicine

BIOMECHANICS OF BONE

An Essay

Submitted for Partial Fulfilment of Master Degree in Orthopædic Surgery

By

Mohamed Saad El-Din Abdel Fatah El-Mohammedy
M.B.B.ch (Cairo)

Under Supervision of

Prof. Dr. M. Nabil Khalifa

Professor of Orthopædic Surgery
Faculty of Medicine
Ain Shams University

Dr. Atef M. El- Beltagy

Lecturer of Orthopædic Surgery
Faculty of Medicine
Ain Shams University

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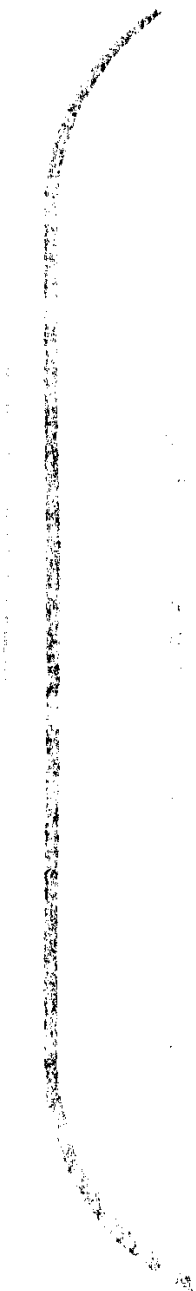

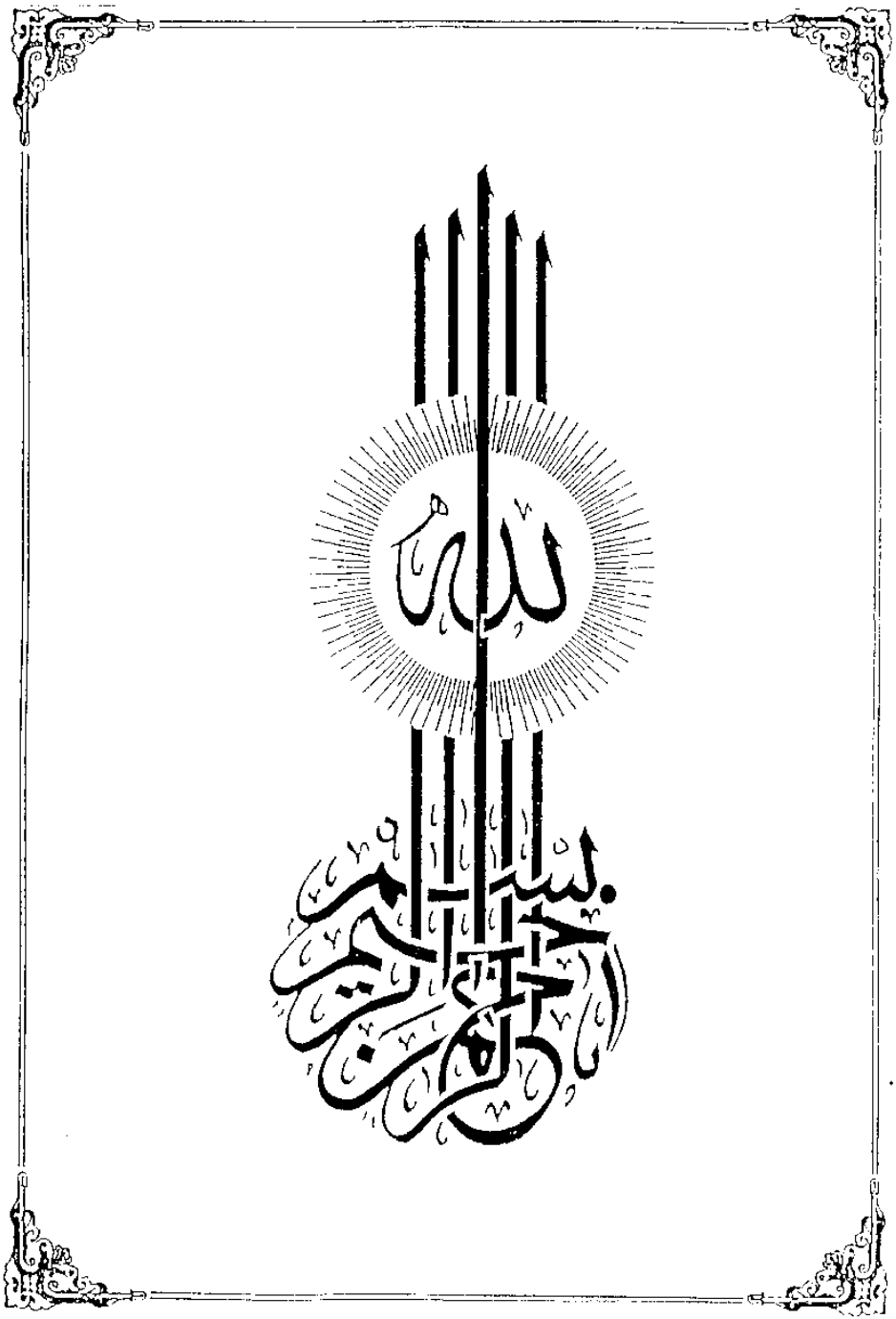

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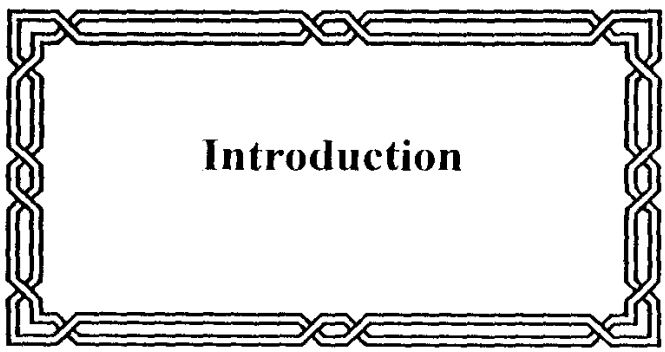

Introduction

Biomechanics is a branch of science that deals with the effects of energy and forces on biologic systems The study of biomechanics involves the application of Newton's laws of mechanics to models of biologic objects in order to describe their behavior and their functions.

Biomechanics of bone is the study of mechanics of bone as a biomaterial and application of engineering principles to the locomotor system.

Orthopædic biomechanics has focused on the effects, motion deformation of forces and moments acting on tissues such as bone, cartilage, growth plate, ligaments, meniscus ,synovial fluid and tendon.

The study of biomechanics has been important in the development and design of many of the joint replacement and fracture fixation devices commonly used in Orthopædic surgery today. Kinetics describes motions within musculoskeletal system, such as those of diarthrodial joints (hip knee, shoulder, etc.) as well as the locomotion and gait.

In addition to describing normal structure and function, clinical Orthopædic biomechanics seeks to examine specific pathologic conditions through the study of joint instability gait pathologies and fracture healing.

Furthermore, surgical procedures designed to restore normal mechanics may be critically evaluated, using techniques such as force analysis of tendon transfer, kinematics studies of ligament repair and fine analysis of joint replacement **(Mow et al, 1994)**

In his daily practice the Orthopædic surgeon deals with the effects of forces. He may alter force systems by transferring a tendon, by an arthrodesis of a spine, by designing an arch support or by performing osteotomy. He deals with a consequence of internal effects of externally

applied forces and moments when a fracture is plated or a dislocation is reduced.

The analysis and correction of disorder of the musculoskeletal system are based on an understanding of the working and properties of the members involved. This includes a knowledge of statics , dynamics and strength and behavior of materials **(Frænkel et al, 1971)**