







شبكة المعلومـــات الجامعية التوثيق الالكتروني والميكروفيا.



جامعة عين شمس

التوثيق الالكتروني والميكروفيلم



نقسم بللله العظيم أن المادة التي تم توثيقها وتسجيلها على هذه الأفلام قد اعدت دون آية تغيرات



يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

40-20 في درجة حرارة من 15-20 منوية ورطوبة نسبية من

To be kept away from dust in dry cool place of 15 – 25c and relative humidity 20-40 %









Designs, Principles of Total Hip Prostheses

Essay

Submitted for Partial Fulfillment for Master Degree in Orthopaedic Surgery

Ву

Khaled Hamed Mohamed Rizk

M.B.B.CH.

Resident of Orthopaedic.

El-Mabra Hospital - El-Mahla El-Kobra.

Carried Carr

11

U.

Supervised By

Prof. Dr. Adel Hussein Ali

Professor of Orthopaedic Surgery

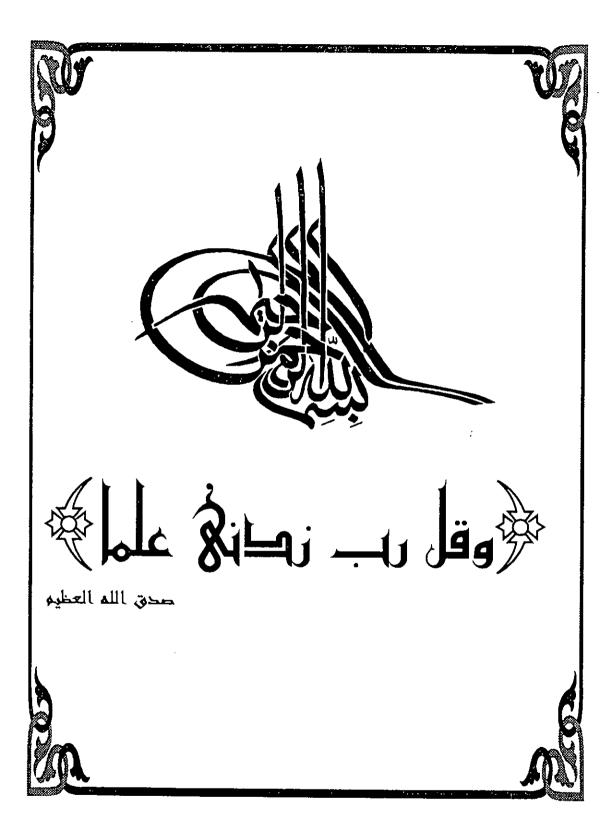
Prof. Dr. Hassan Ahmed Neena

Professor of Orthopaedic Surgery

Dr. Ahmed El Badawei Mahmoud Shahein

Lecturer of Orthopaedic Surgery.

Faculty of Medicine Menoufiya University



CONTENTS

Subject	Page
- ACKNOWLEDGMENT	
- INTRODUCTION	1
- CHAPTER (I). HISTORY OF HIP ARTHROPLASTY	3
* Osteotomy Arthroplasty	4
* Interpositional Arthroplasty	4
* Reconstruction Arthroplasty	8
* Replacement Arthroplasty	8
* Total Arthroplasty	12
- CHAPTER (II). APPLIED BIOMECHANICS OF TOTAL	
HIP ARTHROPLASTY	21
* Forces Acting on the Hip	22
* Reduction of the Forces Acting on the Hip	24
* Valgus and Varus Position	28
* Coefficient of Friction and Frictional Torque	30
* Lubrication	35
* Wear	37
- CHAPTER (III)- DESIGNS OF TOTAL HIP PROSTHESES	41
The Femoral Component	45
* Femoral Head Diameter	45
* Effect of the Head and Neck Diameter and Shape on Arc of	
Motion	49
* Effect of the Head Diameter on Frictional Torque	50

* Effect of the Head Diameter on Dislocation	•••••
* Effect of the Head Diameter on Wear	••••••
The Neck	•••••
* Neck Cross Section	
* The Neck Length	•••••
* The Head - Stem Offset	
* The Neck - Stem Angle	•••••
The Collar	••••
* Mechanical Considerations in Favor of A Collar	
* Mechanical Considerations Against the Collar	***************************************
Stem Design	•••••
* The Tensile Stress	
* The Shape of the Stem	
* Stem Length	
* Stem Cross - Section	
* Surface of the Stem	
The Acetabular Component	
* Material	
* The Socket	•••••
* The External Contour	•••••
* The Metal - Backed Acetabular Component	
* Wire Markers	
- ENGLISH SUMMARY	******
- REFERENCES	*****
- ARABIC SUMMARY	******

Dedication

To the spirit of my mother,

To my father,

To my wife,

And to my daughter,

All in their own special way

Dive a meaning to my life.

Khaled Rizk

4пэтврэ*Г*шоп}э*Р*с

which makes the work more easier. Insurante for his bird holding of no and and one subseques in Satisfaction Disposition Chairman and head of the Orthopaedic Department, Faculty of Medicine, Misnoulyna all, I would like to thank Prof. Nr. Bahaa El-Deen El-Evruri In the proparation of this essay, naturally, I am grateful to many-first of

those who sincorely, directed, supervised and encouraged no throughout the progress of The absorbed shuttang and exembed ship in prises are in surround tough bout &

Hussein All, Preferrer or Othopoxedic Lurgary, Family of Medicine, Menoutyna The greatest and utmost eadil must be given to . Prof. Dr. Adel this work.

University, for his generaus, understanding instructions and his useful advises.

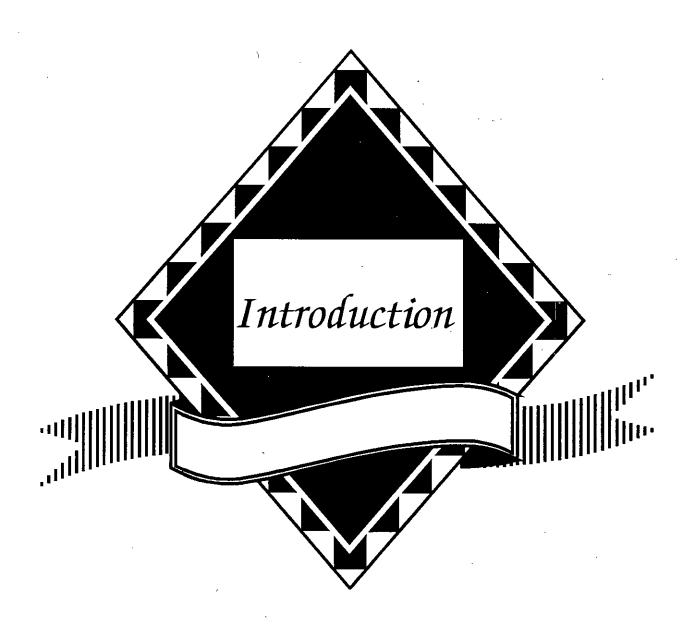
University for his kind great care, supervision and insouragement. Shoned Hearta, Professor of Orthopardic Burgay, Faculty of Medicine, Monoulys would like to express my great appreciation to Pref. Ir. Hassan

I also like to thank Ir. Ahmed 32-Badawei Mahamed

University, for his invaluable help and kind supervision during all stages of this work. Stations, Lectures of Orthopaedic Durgory, Faculty of Medicine, Menoutyna

1661 Skirl beloot





Introduction

The hip joint is one of the largest and most important joint of the body. it is the most perfect example of a ball and socket joint which is the simplest way of providing movement in every plane whilst giving strength and stability. In life, the cyclic loading forces acting on it in different planes are more than a million times per year.

So, any disorder affecting the hip joint markedly affects the individual activities. When the joint has become disorganized as a result of disease or injury total prosthetic replacement of the hip has become the most accepted method of treatment and the successful reconstruction of the disorganized hip by total hip replacement is perhaps this century's most innovative and significant development in orthopaedic surgery. Now, total hip arthroplasty is one of the most frequently performed operations in orthopaedic.

The goals of total hip replacement are to reduce pain and improve function, provided that there are no serious complications and the success of total hip arthroplasty is based essentially on the creation of stable, artificial weight bearing surfaces with low coefficient of friction between the components that are fixed securely in bones.

In support of this aim, a number of prosthetic designs have been developed, each with some features which gave the originator the feelings of that these features would give his prosthesis some advantage over the other available prostheses and at the same time, a number of investigators have, within relatively short time, changed the design of the components which they recommended in an attempt to incorporate newer concepts. Also, for an implant design to prove clearly superior or inferior to others needs a long-term of follow-up and comparative studies that are not available except in a very few cases.

However, this does confuse many orthopaedic surgeons as what should be used. So, a general knowledge of the variety of component designs, as well as their strength and weakness is an asset to the surgeon for the success of the surgery. The selection of the implant is based on patient's needs, anticipated longevity, the level of activity, the bone quality as well as the ready availability of implants, the proper instrumentation and the experience of the surgeon. However, selection of one design must be constantly re-examined and related to the measurable results.