Module 1 Teaching Faculty

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Chairman (Module 1)
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MODULE 1
Analysis of Muscle & Joint Loads
17 & 18 September 1999
SGH Postgraduate Medical Institute
Lecture Room 4

Organised By
Dept of Orthopaedic Surgery of National University of Singapore & Singapore General Hospital
School of Mechanical & Production Engineering, Nanyang Technological University

Organising Secretariat
SGH Postgraduate Medical Institute

Supported by
Specialist Training Committee (Orthopaedics)
Singapore Orthopaedic Association
Biomedical Engineering Society
The aim of this entire course is to provide the fundamental understanding of the key concepts and applications of biomechanics in orthopaedic surgery. The clinical problems that arise in orthopaedics basically concern the bone and musculoskeletal system and the body's effective ability to support and move weights and loads. Consequently, the history and development over the years in orthopaedic surgery has shown the important contribution of biomechanical engineering in solving these problems. The benefits have been manifested in some of the current practices and devices used commonly in orthopaedic surgery that are a result of an effective blend of biomechanical and clinical solutions. Stabilisation and reconstruction of bones and joints, fracture fixation methods, and the design and development of prostheses and orthotics, owe its current state-of-the-art to the biomechanical techniques used to study muscle and joint loads, bone failure mechanics, physiological stability of joints, human motion, and biomechanical characterisation of soft tissue. The subject on Biomaterials has also been incorporated into Modules 5, 6 and 7 given its importance in orthopaedic biomechanics. Each module will be conducted on a quarterly basis usually over one Friday afternoon and whole day on Saturday. This programme will cover all these topics and more, with the hope that orthopaedic surgeons, physiotherapists and other relevant healthcare providers will be equipped with a new scientific approach to complement their practice.

The recommended text for the course is Basic Orthopaedics Biomechanics", 2nd Edn, Eds. V C Mow and W C Hayes. Most of the modules in the programme have been structured to follow the chapter outline of the book. Additional course notes will also be given.

SYNOPSIS

T he aim of this entire course is to provide the fundamental understanding of the key concepts and applications of biomechanics in orthopaedic surgery. The clinical problems that arise in orthopaedics basically concern the bone and musculoskeletal system and the body's effective ability to support and move weights and loads. Consequently, the history and development over the years in orthopaedic surgery has shown the important contribution of biomechanical engineering in solving these problems. The benefits have been manifested in some of the current practices and devices used commonly in orthopaedic surgery that are a result of an effective blend of biomechanical and clinical solutions. Stabilisation and reconstruction of bones and joints, fracture fixation methods, and the design and development of prostheses and orthotics, owe its current state-of-the-art to the biomechanical techniques used to study muscle and joint loads, bone failure mechanics, physiological stability of joints, human motion, and biomechanical characterisation of soft tissue. The subject on Biomaterials has also been incorporated into Modules 5, 6 and 7 given its importance in orthopaedic biomechanics. Each module will be conducted on a quarterly basis usually over one Friday afternoon and whole day on Saturday. This programme will cover all these topics and more, with the hope that orthopaedic surgeons, physiotherapists and other relevant healthcare providers will be equipped with a new scientific approach to complement their practice.

Orthopaedic Biomechanics Course

Name: ____________________________
Faculty/Dept: ______________________
Organisation: ______________________
Tel no: ____________________________ Fax no: ______________________
Pager no: ______________________
E-mail: ____________________________

Please indicate interest

☐ I would like to register for Module 1. The registration fee is S$350/-
☐ I would like to purchase the reference text entitled: "Basic Orthopaedic Biomechanics" @ $210.00 per copy (not included in the registration fee). (The cost of the book includes courier delivery charges. Due to the specialised nature of the book, there may be a possible waiting period of up to 6 weeks to process the orders.)

Please enclose cheque made payable to Nanyang Technological University and mail together with this registration form to:

SGH Postgraduate Medical Institute
Singapore General Hospital
Blk 6 Level 1, Outram Road
Singapore 169608

Orthopaedic Biomechanics Course

A Introduction (Khong K S)
- Importance of Biomechanics to Orthopaedics — Surgeon's viewpoint
B Pre-course Assessment
C Force and Moments — I (Thambyah A)
- Forces / Force Vectors
- Moments / Moment Arms
- Newton's Law and Static Equilibrium
  Q & A
- Composition and Resolution of Forces
- Combination of Force Vectors
- Resolution of Force Vectors
  Free-body diagrams
  Q & A
D Force and Moments — II (Thambyah A)
- Static Equilibrium
  - Translational
  - Rotational
  Q & A
- General Planar Force Systems
  - Intersegmental Load
  Q & A
E Problem Solving / Examples
- Calculation of joint and muscle forces (worked examples)

Muscle Architecture (Pereira B P)
- Physiological Cross-Sectional Area
  - Index of architecture
  - Estimating muscle forces
  Q & A
- Length-tension relationship
- Force-velocity relationship
  Q & A
B Joint Forces During Daily Activities (Lee B)
C Tutorial
D Laboratory Exercise
- Brief Introduction to experimental measurements in biomechanics (Chou S M)
  - Experiment I — M easuring the effects of changing 'muscle' insertion points on joint reaction force.
  - Experiment II — M easuring the effects of changing joint angles on joint reaction force.
  (Lee P, Pereira B P, Thambyah A)
- Discussion (Goh J C H)

Day 1 (17th Sept 1999) 1.30 pm to 5.15 pm

Day 2 (18th Sept 1999) 9.00 am to 1.15 pm