

Post - Doctoral Fellowship in Orthopaedic Limb Reconstructive Surgery

SYLLABUS

Duration of the Course : One year

INTRODUCTION

Subject syllabus

The course covers the following topics.

- **Basic Sciences**

- o Development of skeleton

- o Anatomy of extremities including

- ☐ Cross sectional anatomy to plan transfixation wires and pins
- ☐ Compartments of limb
- ☐ Course and distribution of artery and nerve
- ☐ Vascularity, Nerve supply, Attachment and function of muscles
- ☐ Vascularity of Bone
- ☐ Cutaneous vascularity
- ☐ Anatomy of joints

- o Histopathology of bone

- o Embryology of limbs and comparative anatomy

- o Physiology of fracture healing

- ☐ Contact healing
- ☐ Healing by callus
- ☐ Healing with bone grafting
- ☐ Allograft incorporation
- ☐ Distraction osteogenesis
- ☐ Factors stimulating and inhibiting bone healing

o Principles of wound healing

- ☐ Stages of wound healing
- ☐ Facilitating and inhibiting factors of wound healing
- ☐ Healing of flaps
- ☐ Healing of chronic wounds

o Mineralization of bone, physiology of cartilage, biophysical properties of bony and bone disease

o Vitamin D metabolism, Parathyroid hormone, Calcitonin, and Growth factors

o Bone infection

- ☐ Pathologic basis of establishment and persistence of infection
- ☐ Microbial flora
- ☐ Chemotherapy of bone infections

- Spectrum of antibiotics
- Drug interaction and Contraindications of drugs
- Tissue penetration of antibiotics
- Prescription knowledge of commonly used antibiotic

o Mode of administration, Dosage, frequency and Duration

o Microvascular bone transfer

- Indications
- Surgical technique
- Donor site and morbidity

o Biomaterials in orthopaedics

o Research methodologies

- ☐ Planning a research
- ☐ Ethical issues in research
- ☐ Nonrandomized Interventional Study Designs
- ☐ Randomized Clinical Trials of Surgical Procedures
- ☐ Use of Observational Databases (Registries) in Research \
- ☐ Risk Adjustment

- Basic Statistical Methods
- Survival Analyses
- Assessing the Performance and Validity of Diagnostic Tests and Screening Programs
- Secondary Data Analyses

□ OUTCOME MEASUREMENT

- Traditional Outcome Measures
- Health-Related Quality of Life
- Measuring Patient Satisfaction

□ Quality of Care

□ Cost-Effectiveness Analyses

□ Qualitative Research Techniques

□ Systematic Reviews and Meta-Analyses

- Assessment of patients with limb deficiency
 - o Congenital
 - o Traumatic
 - o Post tumour resection
 - o Developmental
- Pre-operative planning
- Bone grafting
 - o Principles of bone regeneration following bone grafting.
 - o Autografts and allografts including strut grafts
 - o Preparation of allografts
 - o Operation of Bone Bank
- Bone regeneration using distraction osteogenesis
 - o Biology of regeneration
 - o Techniques
 - AO external fixator
 - Ilizarov fixator
 - LRS

- Taylor spatial frame
 - ISKD
 - o Post-operative care of patients undergoing bone transport and treatment of complications
 - o Functional rehabilitation
- Skeletal reconstruction, deformity correction and limb lengthening
 - Normal lower limb alignment and joint orientation
 - o Mechanical and anatomic bone axis
 - o Joint center points
 - o Joint orientation lines
 - o Joint orientation angles
 - o Mechanical axis and mechanical axis deviation
 - o Joint orientation
 - Malalignment and malorientation in the frontal plane
 - o Malalignment
 - o Malalignment test
 - o Malorientation of hip and ankle
 - Radiographic assessment of lower limb deformities
 - o Knee
 - o Ankle and hip
 - o Radiographic examination in sagittal plane
 - o Radiographic examination of one plane when deformity is other plane
 - Frontal plane mechanical and anatomical axis planning
 - o Mechanical axis planning
 - o Anatomic axis planning
 - o Determining the CORA by frontal plane mechanical and anatomic axis planning
 - o CORA method for tibial and femoral deformities
 - Osteotomy concepts and Frontal plane realignment

- o Angulation correction axis
- o Bisector lines
- o Relationship osteotomy Type to Bisector lines
- o Osteotomy Rules
- o Translation and Length Displacement at the Osteotomy line
 - * Opening Wedge Osteotomy
 - * Closing Wedge Osteotomy
- o Focal Dome Osteotomy
- o Clinical Choice of Osteotomy level and type
- o Multiapical Osteotomy Solutions
 - * Single Osteotomy Solutions
 - * Multiple Osteotomy Solutions

□ Sagittal Plane Deformities

- Sagittal Plane alignment in the lower limb
- Sagittal Plane MT
- Knee joint Malorientation
- Overall Sagittal Plane MOT
- Knee Level sagittal Plane MOT
- Overall sagittal plane MOT of the ankle
- Ankle level sagittal plane MOT of the ankle
- Sagittal plane anatomic Axis planning of tibial deformity correction
- Sagittal plane anatomic axis planning of femoral deformity correction
- Osteotomies in the sagittal plane

□ Translation and angulation translation deformities

- Translation deformity
- Two angulation equal one translation
- Translation effects on MAD
- Osteotomies for correction of translation deformity
- Combining angulation and translation
- Deformities and MAD
- Graphic analysis at deformities
- Type 1: Angulation and translation in the same plane
 - Anatomic plane deformity
 - Oblique plane deformity

- Type 2: Angulation and translation in different planes.
 - Anatomic plane deformity with angulation and translation 90deg Apart
 - Oblique plane deformity with angulation and translation 90deg Apart
- One anatomic and one oblique plane deformity with angulation and translation in different planes less than 90deg apart
- Oblique plane deformity with angulation and translation less than 90deg apart
- Osteotomy correction of a-t deformities
- Osteotomy correction and angulation and translation in the same plane
- Correction of angulation and translation in different planes.
- Multilevel fracture deformities

□ Rotation and angulations rotation deformities

- Clinical assessment of rotation deformities
- Level of osteotomy for rotation deformities
- Frontal plane preoperative planning for rotation deformities
- Factoring in rotation for mechanical axis planning of the femur
- Frontal plane anatomic axis planning for rotation deformities
- Combined angulation and rotation deformities
- Locating the inclined axis
- Locating the inclined osteotomy
- Inclined Focal dome osteotomy
- Clinical examples

□ Length Considerations : Gradual versus acute correction of deformities

- Length considerations for angular corrections
- Neurovascular structure
- Muscles, Tendons and Fascia
- Ligaments
- Skin

□ Hardware and Osteotomy considerations

- Choice of hardware
- Patient's age
- Osteotomy types
 - Closing wedge osteotomy
 - Opening wedge osteotomy

- Angulation – translation osteotomy
- Dome osteotomy
- Hardware
 - Plate fixation
 - Intramedullary nails
 - External fixation
- Order of correction
- Lever arm principle
- Method of osteotomy

□ Six axis deformity analysis and correction

The Taylor Spatial frame fixator

- Introduction
- Modes of corrections
- Planning Methods
- Fracture method
- CORA method
- Virtual Hinge method
- Line of closes approach (LOCA)
- Taylor computer – assisted design (CAD) software
- Reference concepts
- Rate of correction and structure at risk(SAR)
- Parallaxic Homologues of deformity :
- Proximal versus distal references perspective

□ Consequences of Malalignment

- Static considerations
- Dynamic Considerations
- Rotational considerations
- Animal laboratory models
- Cadaver laboratory models
- Clinical longitudinal studies

□ Knee joint line deformity sources of malalignment

□ Ankle And Foot considerations

- Frontal plane ankle deformities
- Supramalleolar osteotomy for varus and valgus deformities
- Sagittal plane ankle deformities

- Supramalleolar osteotomy for recurvatum and procurvatum deformities
- Compensatory mechanisms and deformities : Mobile, Fixed and absent
- Specific ankle malalignment deformities
- Ankle fusion malunion
- Flatfoot talus deformity
- Ball and socket ankle joint
- Over corrected clubfoot and other lateral translation deformities of the heel
- Posterior tibial tendon dysfunction
- Completely stiff foot treatment by supramalleolar osteotomy
- Partial growth arrest
- Malunion of fibula
- Ankle contractures

□ Hip joint considerations

- Limb in neutral alignment to pelvis, no intra or periarticular limitation of range of motion
 - Varus deformity
 - Valgus deformity
- Lesser trochanter considerations
- Greater trochanter considerations
- Sagittal plane considerations
- Deformities of the head and neck of the femur
- Pseudo-subluxation of the hip
- Deformities due to hip ankylosis and arthrodesis between the femur and the pelvis.
- Pelvic support osteotomy

□ Growth plate considerations

- LLD
- Predicting LLD
- Multiplier method
- Additional growth databases
- Relationship of multipliers for boys to multipliers for girls
- Development of the multiplier
- Limb length discrepancy prediction formulae
- Prediction of limb length discrepancy at skeletal maturity using the multiplier growth remaining method for cases of

postnatal developmental discrepancy

- Percentage of total bone growth from the distal femur and proximal tibia
- Using the multiplier method to calculate timing for epiphysiodesis
- Growth prediction controversies
- Growth plate consideration relative to deformity
 - Case of deformities
 - Developmental angular deformities
- Angular deformities : gradual correction by hemi-epiphysiodesis
 - Planning for hemi-epiphyseal stapling for angular correction at the knee in children
 - Multiple method for timing : Hemi-epiphyseal stapling for correction of angular deformity
 - Multiple methods for calculating: When to remove hemi-epiphyseal staples in young children.

□ Gait Consideration

- Gait considerations in Association with lower limb deformities
 - Sacrifice of joint motion
 - Fixed joint position
 - Abnormal loading of joints
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- Compensatory mechanisms
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- Frontal plane malalignment
 - Distal tibia varus or valgus
 - Varus deformity at the knee
 - Valgus deformity of the knee
 - Varus or valgus deformity of the proximal femur
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- Sagittal plane deformity
 - Ankle equinus deformity
 - Excessive ankle dorsiflexion
 - Ankle arthrodesis deformities
 - Anterior translation of the foot
 - Fixed flexion deformity of the knee
 - Recurvatum of the knee
 - Hip Flexion deformity
 - Hip fusion

- Rotational Malalignment
- Leg length considerations

- Dynamic Deformities and lever arm considerations
 - Levers
 - Mechanical advantage
 - Moments and motions
 - Redundancy

Reconstruction of soft tissue defects

- The Reconstructive Ladder
 - Secondary Intention Closure
 - Direct closure (Primary or delayed primary)
 - Skin grafts
 - Local and Regional flaps
 - Free tissue transfer
- Lower extremity trauma
 - Classification system
 - Initial treatment of lower extremity traumatic wounds
 - Reconstruction of soft tissue defects
 - Bone defects
 - Nerve defects
- Lower Extremity Tumors
 - Reconstruction of Oncologic defects
- Lower extremity chronic wounds
 - Etiology and History
 - Preparing the Chronic wound for reconstruction
 - Treatment options
- Endoprosthetic reconstruction
 - o Principles and biomechanics of endoprosthetic reconstruction
 - o Planning prosthesis design and templating
 - o Cemented and cementless implantation of implants

- o Post-operative care
- Microvascular reconstruction
 - o Principles of local and microvascular flaps
 - o Free vascularized fibula grafts
- Amputation
 - o Decision making Amputation vs Limb Salvage
 - o Level of Amputation for mangled limbs
 - o Amputation for diabetic foot and vascular disorders
 - o Management of stump disorders and phantom limb syndrome.
 - o Gait training in amputees
- Rehabilitation
 - Orthotics
 - Types of orthotics
 - Orthotics for protection of weak bones
 - Orthotics for deformity correction
 - Care for patients in orthotics
 - Prosthetics
 - Design and advantages of various types of prosthesis
 - o Endoskeletal and exoskeletal prosthesis
 - o Myoelectric prosthesis
 - Care of patients with prosthesis
- Psychological care of patients with limb deficiency, those undergoing treatment and amputees .