



BHARATH INSTITUTE OF HIGHER EDUCATION
AND RESEARCH

Program

MS Orthopedics

(Revised with effect from 2019-2020 onwards)

Syllabus

Basic Science

Anatomy :

- Clinical and functional anatomy with pathological and operative relevance
- Anatomy and embryology of nervous and vascular systems
- Surgical approaches to the limbs and axial skeleton
- Anatomy and embryology of musculoskeletal system
- Histology

Tissues :

- Bone – Structure
- Cartilage – articular, meniscal
- Structure & Function
- Muscle and tendon – Structure & Function
- Synovium – Structure & Function, synovial fluid analysis
- Ligament – Structure & Function, synovial fluid analysis
- Nerve - Structure & Function 3
- Intervertebral disc - Structure & Function

Physiology, Biochemistry & Genetics:

- Structure and function of connective tissues
 - Application /relevance of modern genetics to orthopaedic disease and treatment
 - Shock – types, physiology, recognition and treatment
 - Metabolism and hormonal regulation of musculoskeletal system and other related orthopaedic physiology.
 - Metabolic and immunological response to trauma, poly trauma and management.
 - Blood loss in trauma/ surgery, fluid balance and blood transfusion
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- Bone grafts, bone banking and tissue transplantation.

Pathology – General Pathology

- Tumour pathology in Musculoskeletal diseases.
- Other orthopaedic pathology.
- Gene therapy in Orthopaedic disorders, stem cells in Orthopaedic surgery

Biochemistry

- General biochemistry
- Biochemical aspects related to orthopaedic diseases

Biomechanics & Bioengineering:

- Biomechanics of musculoskeletal tissues
- Biomechanics of fracture fixation, fracture fixation in osteoporotic bones.
- Tribology of natural and artificial joints
- Design of implants and factors associated with implant failure (wear, loosening)
- Kinematics and gait analysis
- Biomaterials
- Bone grafting and bone substitutes.

Orthopaedic Oncology:

- Knowledge of the presentation, radiological features, pathological features, treatment and outcome for common benign and malignant tumours
- Understanding of the principles of management of patients with metastatic bone disease in terms of investigation, prophylactic and definitive fixation of pathological fractures and oncological management.
- Knowledge of the presenting features, management and outcome of soft tissue swellings, including sarcomas

General:

- Osteoarthritis
- Osteoporosis
- Metabolic bone disease
- Rheumatoid arthritis and other arthropathies (inflammatory, crystal, etc.)
- Hemophilia
- Inherited musculoskeletal disorders – Mucopolysaccharidosis and dysplasia of bone: epiphysis metaphysis, diaphysis, marrow and whole bones.
- Neuromuscular disorders – inherited and acquired
- Flurosis

- Osteonecrosis
- Osteochondritides
- Heterotopic ossification
- Metastases
- Disaster management
- Management if war wounds & civil disturbance.

Investigations:

- Blood tests
- Musculoskeletal imaging/; x-ray, contrast studies (myelography, arthrography), CT, MR, ultrasound, radioisotope studies
- Effects of radiation
- Bone densitometry
- Electrophysiological investigations

Operative Topics

- Tourniquets
- Design of theatres
- Anaesthesia – principles and practice of local and regional anaesthesia and principles of general anaesthesia

Infection, Thromboembolism & Pain

- Infection of bone, joint, soft tissue, including tuberculosis, and prophylaxis
- Pyogenic osteomyelitis, bone & joint infection in brucellosis fungal infections, salmonella osteomyelitis, hydatid disease of the bone.
- Syphilitic affections of bone and joints – congenital acquired
- Surgical site infection, prevention and treatment.
- Sterilisation
- Thromboembolism and prophylaxis
- Behavioural dysfunction and somatization
- AIDS and surgery in high-risk patients
- Pain and pain relief
- Skin preparation
- Complex regional pain syndromes eg. Reflex Sympathetic Dystrophy and Causalgia

Physical Medicine and Rehabilitation

- Principles of physical therapy including exercise therapy and electro therapy

- Prescriptions for splints, braces, calipers, special shoes.
- Occupational therapy principle
- Principles of electro diagnosis

Prosthetic & Orthotics

- Principles of design & prosthetic fittings
- Rehabilitation of amputing
- Principles of orthotic bracing for control of disease, deformity and instability
- Concept of total rehabilitation including medical, educational, vocational and social rehabilitation.
- Disability process and disability evaluation

Research & Audit:

- Design and conduct of clinical trials
- Data analysis and statistics – principles and applications
- Principles of Epidemiology
- Audit

Medical Ethics

- Duties of care
- Informed consent
- Medical negligence
- Medico legal aspects in Orthopaedics

Hand Surgery

Basic Science

Anatomy of:

- The wrist/MCP/PIP/DIP joints and CMC joint of the thumb
- The flexor and extensor mechanism of the fingers including interaction between extrinsic and intrinsic mechanism
- The posture of the thumb in pinch, power and key grip
- The nerve supply to the hand
- The closed compartments of forearm and hand

Pathology:

- An understanding of the special circumstances associated with swelling and the effects of rising pressure in a closed compartment secondary to infection and injury
- An understanding of the special circumstances in which oedema causes fibrosis and permanent stiffness.
- Tendon injury and healing
- Nerve injury and healing
- An appreciation of the imbalances and deformities associated with inflammatory arthritis
- A classification system for congenital hand disorders
- Langers lines
- Hand tumours (eg. Ganglion/enchondroma)
- Dupuytren's disease
- Post poliomyelitis paralysis
- Cerbral palsy
- Hansens disease

Clinical Assessment:

- History of examination of hand and wrist in the assesement of tendons, distal radioulnar and radiocarpal joints, TFCC injuries.
- Ability to elicit median, ulnar and radial nerve function and disorders
- Recognition of patterns of presentation of common compressive neuropathies and brachial neuralgia
- Brachial plexus injury
- Assessment of intrinsic motors in digits and recognition of common deformities and deficiencies
- Awareness of presentation of work – related hand disorders
- Ability to examine and assess common rheumatoid hand deformities, e.g.: inferior radioulnar subluxation and carpal translocation; MCP subluxation and ulnar drift; digital Boutonniere and swan neck; thumb Boutonniere deformity and CMC disease
- Ability to recognize and assess focal hand swellings

Investigations :

- Interpretation of plain and assess stress x- rays of wrist. A Knowledge of other views.
- Awareness of role of MRI/ bone scan/ arthrography/ arthroscopy
- Place and interpretation of nerve conduction studies

Treatment:

- Knowledge of a strategy of management for the osteo arthritic rheumatoid hand. Understanding of the place of soft tissue reconstruction, joint fusion, interposition and excision arthroplasty in the treatment of arthritic hand and wrist.
- Knowledge of the management of stenosing tenovaginitis
- Knowledge of the principles of treatment for common flexor and extensor tendon injuries and of the common surgical approaches to the digital flexor and extensor compartments
- Fractures of metacarpals and phalanges
- Familiarity with the surgical treatment of Dupuytren's disease
- Awareness of the principles of tendon transfer for the reconstruction of median, ulnar and radial nerve palsy and familiarity with simple transfers, e.g. indicis to EPL
- Knowledge of splinting techniques rehabilitation principles
- Ability to plan management for finger tip injuries and undertake closed management
- Knowledge of surgical approach to digits with particular regard to the restoration of function and prevention of stiffness.
- Knowledge of the levels for digital amputation
- Injuries of ulnar collateral ligament of thumb
- Dislocations of carpal and carpo metacarpal joints
- Knowledge of closed and operative options of treatment for fractures of distal radius and common carpal injuries including scaphoid non union.
- Familiarity with the surgical treatment of common compressive neuropathy
- Ability to manage common hand infections

Knee

Basic Science

Anatomy:

- Knowledge of regional anatomy of the knee, including:
- Surface anatomy
- Neural and vascular structures and their relations with particular reference to standard anterior and posterior surgical approaches
- Bones and joints
- Functional anatomy of ligaments and supporting muscles
- Innervation's of the knee including controlling musculature
- The extend and function of the synovium and bursae of the knee
- The structure function of the menisci, and articular cartilage

Biomechanics:

- The mechanics of the patello – femoral mechanism
- The medial and lateral weight – bearing joints and their inter – relationship
- The cruciate and collateral ligaments and other ligamentous and muscular supports
- Menisci and articular cartilage

Pathology:

- The mechanism of ligamentous, bony and combined trauma to the knee and healing potential
- A complete knowledge of arthritides, including degenerate wear, ageing changes and traumatic damage
- Pathology of inflammatory disease and infection affecting the knee
- The response of synovium to debris
- Benign and malignant conditions in the knee and surrounding structures including recognized classification where appropriate

Clinical Assessment:

- A sound knowledge and understanding of:
- History and examination of the knee to include relevant surrounding structures
- The standard clinical signs of the knee and relevant adjacent structures and competent skill in describing these
- A critical understanding of rating and outcome measures in common use

Investigations:

Indications for and interpretations of:

- Radiographs – standard and specialized
- Blood investigation
- Aspiration
- Special investigations including CT, MRI and radioisotope scanning
- Arthroscopy
- Biomechanical testing

Treatment:

A sound knowledge of conservative and surgical management, including the indications for referral to a specialist of:

- Paediatric disorders, including deformity, dislocations, epiphyseal disorders, osteochondritis and discoid meniscus

- Adolescent disorders including patello femoral and meniscal dysfunction, osteochondritis dissecans
 - Young adult disorders including patello femoral and meniscal injuries, instability and ligament deficiency, synovial disorders, benign and malignant tumours
 - Degenerative and inflammatory arthritis, including a balanced understanding of conservative and surgical options, including osteomy, arthodesis and arthroplasty
 - Traumatic disorders including skin and soft tissue injuries , fractures and dislocations of patella, tibia and femoral components, ligament ruptures and internal rearrangement of the knee.
- Conservative and surgical indications and operative management
- Infections, particularly infections and inflammations of the bursae, intra- articular sepsis, prevention and management of sepsis in implant surgery
 - A sound working knowledge of the range of arthroplasties for primary and revision surgery for patella femoral, unicompartmental and total replacement of the knee with particular reference to secure bone anchorage, alignment, ligament stability and optimizing range of movement; a good knowledge of post-operative complications, their prophylaxis and management
 - A knowledge of the indications and techniques of revision surgery particularly for aseptic and septic loosening
 - A knowledge of simple arthroscopic surgery including meniscectomy, trimming and shaving
 - An appreciation of complex arthroscopic procedures
 - An appreciation of medical and surgical techniques available to repair and replace articular cartilage

Ankle & Foot Surgery

Basic Science

Anatomy:

- Bones and articulations
- Ligamentous structures – ankle/hindfoot/midfoot
- Plantar fascia and MPT anatomy
- Surface markings of neural and vascular structures
- Tendon anatomy
- Muscle compartments of the foot

Biomechanics

- Function of the lower limb and foot in gait
- Ankle and subtalar joint
- Plantar fascia mechanisms
- Tendon function
- Orthoses and footwear

Pathology:

Arthritides

- Degenerative joint disease
- Rheumatoid foot disease

Neuropathy

- Neuropathic joint and skin changes

Tumours

- E.g. osteoid osteoma and plantar fibroma

Clinical Assessment:

History and clinical examination of the foot and ankle in order to assess pain, joint function, deformity, nerve, muscle and tendon function Ability to recognize and assess the following diseases of the ankle and foot:

Neurological disorders:

- Charcot joint
- Morton's neuroma opportunities
- Nerve entrapment
- Neurological foot deformity

Trauma:

- Evaluation of skin and soft tissue injury
- Compartment syndrome
- Recognition of all fractures

Ankle and hindfoot disorder:

- Hindfoot pain
- Ankle instability
- Heel pain
- Degenerative disease of the ankle
- Rheumatoid arthritis
- Osteochondritis dissecans of talus

Forefoot disorders:

- Hallux valgus
- Hallux rigidus
- Lesser toe deformities
- Metatarsalgia
- Inflammatory arthritis

Tomours:

- Ability to recognize and assess local foot swellings

Diabetic foot**Complex deformity**

- Flatfoot deformity – mobile and rigid
- Cavus deformity
- Residula congenital foot deformity

Investigations**Radiography**

- Standard foot and ankle views

CT, MRI and Scintigraphy:

- Knowledge of role of these ancillary investigations in certain specific conditions e.g. infection, tumor, tibialis posterior rupture, osteonecrosis

EMG

- Relevance to foot and ankle disorders

Treatment:**Non – operative:**

- Knowledge of rational basis for the use of footwear modifications, and total contact casting

Operative:

- Detailed knowledge of closed and operative methods for management of fractures and dislocations of ankle, hindfoot and forefoot, including knowledge of common reconstructive surgical procedures for foot deformity including hallux valgus, lesser toe deformity, acquired flat – foot, to include arthrodesis, osteotomy and soft – tissue reconstruction.
- Knowledge of common amputations through foot and ankle
- Knowledge of common reconstructive surgical procedures for degenerative, inflammatory and paralytic disorders of ankle and foot including arthrodesis, arthroplasty, excision arthroplasty procedures to first ray both proximal and distally for management of hallux valgus and rigidus. Knowledge of treatment of congenital and neglected deformities

Hip**Basic Science****Anatomy:**

- Basic knowledge of the regional Anatomy of the Hip including:

- Development of the Hip joint
- Relationship of bony elements
- Blood supply of the femoral head
- Anatomical course all major regional vessels and nerves
- The capsule, labrum and related ligaments
- An understanding of the action, anatomy and innervation of the regional musculature
- Detailed knowledge of the applied anatomy of common surgical approaches to the Hip (medial, anterior, lateral and posterior)

Biomechanics:

- An understanding of the lever arms, muscles and body weight force that produce the joint reaction force both normal and abnormal hips
- An understanding of the application of these principles to the rationale of both pelvic and femoral osteotomies, and replacement arthroplasty.
- Knowledge of the tribological properties of materials used for articulating surfaces
- Knowledge of biocompatibility and mechanical properties of materials in common use in total hip arthroplasty

Pathology:

- Basic knowledge of the Pathology of pyogenic and non- pyogenic arthritis, slipped upper femoral epiphysis (SUFE), Perthes' disease and hip dysplasia
- Mechanism and pattern of common fractures and fracture dislocations around the hip (intracapsular, extracapsular, acetabular and periacetabular, femoral head, etc.)
- Knowledge of the Pathology of osteoarthritis, rheumatoid arthritis and the seronegative arthritides at the hip and of osteonecrosis of the femoral head.
- Familiarity with current theories of the aetiopathogenesis of osteoarthritis
- An understanding of the Microbiological rationale for the prevention of sepsis in total hip arthroplasty.

Clinical assessment

- A sound knowledge of clinical assessment of the hip, lumbosacral spine and knee. Particular reference should be paid to the gait, the Trendelenburg sign, limb length, loss of movement and deformity at the joint
- The trainee needs to be well informed of current opinion regarding aetiopathogenesis, clinical presentation and appropriate investigation of the hip

- Proximal femoral fractures (intracapsular, extracapsular) and simple fracture dislocations of the hip
- Osteoarthritis and the inflammatory arthropathies
- Perthes' disease
- Slipped upper femoral epiphysis
- Septic arthritis
- Osteonecrosis
- Soft tissue conditions around the hip (snapping hip, gluteus medius tendonitis, etc) . A working knowledge of the clinical presentations and investigations of :
 - The sequelae of SUFE
 - Juvenile arthritis
 - Non pyo genic arthritis
 - The painful total hip replacement
 - TB Hip

Investigation :

- A working knowledge of the interpretation of plain radiographs, dynamic arthrography, CT, bone scintigraphy and MRI of the hip rejoin
- A working classification the proximal femoral and periacetabular fractures. Also , mechanisms and classification of failure of joint replacement and of periprosthetic fractures

Treatment

- Non – Operative
- An understanding of the principles of traction, bracing and spica immobilization. An understanding of the non operative aspects of the management of hip pathology

Operative

- A thorough knowledge of soft tissue history, osteotomy, arthrodesis, and arthroplasty (excision and replacement).
- A sound knowledge of : internal fixation of proximal femoral fractures, hemiarthroplasty for intracapsular fractures, primary total hip replacement for OA and inflammatory arthropathies in the elderly, simple proximal femoral osteotomies. Familiarity with potential complications(i.e. thromboembolism, sepsis, dislocation, etc) and be aware of current opinion on the prevention and management of these complications

- A knowledge of the indications for , and principles of complex proximal femoral osteotomies, hip arthroscopy, reconstruction of the hip in young adults (JCA and hip dysplasia, etc), complex hip revision surgery
- An appreciation of complex acetabular and pelvic fractures, complex periacetabular osteotomies
- An understanding of the place of modern technologies such as, joint resurfacing procedures minimally invasive hip replacements and computer assisted implantation in the management of hip pathology and the attendant risks and complications

The spine

Basic science

Anatomy:

- Development of the spine, spinal cord and nerve roots
- Surgical anatomy of the cervical, dorsal and lumbosacral spine
- Anterior and posterior surgical approaches to the spine at each level

Biomechanics

- Basic knowledge of the biomechanics of the cervical and lumbosacral spine
- An understanding of the biomechanics of spinal instability as applied to trauma, tumour, infection and spondylolysis / listhesis
- Biomechanics of spinal deformity
- A knowledge of the basic mechanics of spinal instrumentation

Pathology

- Pathophysiology of the ageing spine and degenerative disc disease
- Acute and chronic infections of the spine including Tuberculosis
- Pathology of spinal deformity
- Pathology of the acutely prolapsed cervical and lumbar disc
- Recognition of pattern of Spinal injury and associated cord and nerve root damage
- Tumours of the spine
- Diffuse idiopathic skeletal hyperostosis (DISH)

Clinical Assessment:

- A through knowledge of general and orthopaedic history taking and examination
- A Knowledge of the assessment of spinal deformity
- An understanding of the assessment of thoracic pain
- A sound knowledge of clinical assessment of the spine for low back pain, sciatica, spinal claudication, neck pain, radiating arm pain, spinal injury and incipient myelopathy
- A knowledge of the assessment of spinal tumour
- A basic knowledge of the assessment of a patient after failed spinal surgery

Investigation:

- A through knowledge of the basic investigations required in spinal surgery, specifically: blood tests, plain radiographs, bone scintigraphy, discography, electrophysiological studies (including cord monitoring) CT scanning, MRI scanning
- A through knowledge of how each of these investigations contributes to the diagnosis and management of each of the major areas of spinal disease

Treatment:

Non- operative

- A knowledge of the non – surgical methods available for the treatment of low back pain, sciatica, claudication, neck pain, spinal deformity, instability, tumour, infection and fracture to include:
- Analgesics and NSAIDs, physiotherapeutic regimes, pain clinic techniques, bracing, use of radiotherapy and chemotherapy, non – operative management of spinal injuries

Operative

- A sound knowledge of the indications for and operative surgical management of the acute prolapsed lumbar intervertebral disc, spinal stenosis, lumbar spinal instability due to spondylolysis / listheses
- A knowledge of the indications for, and operative surgical management of the acutely prolapsed cervical disc, cervical stenosis, spinal injury and the surgery of spinal infection
- Vertebroplasty, Kyphoplasty in osteoporotic vertebral compression
- A basic knowledge of the surgery of spinal deformity and tumours of the spine

Trauma

Basic Science

Anatomy:

- Applied to diagnosis and surgical treatment of common bone, joint and soft tissue injuries

- Knowledge of those anatomical structures particularly at risk from common injuries or in surgical approaches
- Physical anatomy and its application to injury

Biomechanics:

- Application to open reduction and internal fixation of fractures and external skeletal fixation
- Applied to fracture formation and fracture treatment both operative and non operative
- Biomechanics of implants and fracture fixation systems, including their material properties

Epidemiology and research Methods:

- Research and audit methods including the design of clinical trials

Pathology:

- Applied to fracture and soft tissue healing, including skin, muscle, tendon and neurological structures
- Classification systems for fractures and dislocations
- Pathology of non – union of fractures
- Response of the body, and local musculoskeletal tissues to infection
- Systemic response of body to major injury
- Mechanisms underlying Acute Respiratory Distress Syndrome and similar life threatening conditions
- Science of fluid replacement therapy in the acutely injured including application to the treatment of burns.
- Science of treatment of compartment syndrome
- Response of infants, children and the elderly to injury

Clinical Assessment:

- Initial clinical assessment of the patient with severe injury, including spinal cord injury, soft tissue injury, burns and head injury
- Assessment of all types of fracture and dislocation, their complications, early and late
- Identification of life threatening / limb threatening injuries. Understanding priorities of treatment. Principles of damage control orthopedics

Investigations:

- Knowledge of the principles, application and side effects of commonly used investigations, including radiographs, CT and MRI scans, radioisotope imaging ultrasound scans and electrophysiological investigations.

Treatment:

- A sound knowledge of normal variants, e.g. knock knees, bow legs and flat feet A detailed knowledge of the treatment for
- Fractures (including non – accidental injury) and growth plate injuries and recognizes the sequelae
- Bone and joint infection
- Common childhood orthopaedic conditions, e.g. irritable hip, anterior knee pain

A working knowledge of the treatment for

- Slipped epiphysis
- Perthes' disease
- Developmental dysplasia of the hip
- Talipes
- Scoliosis
- Simple foot deformities (e.g. hallux valgus, metatarsus varus)
- Simple congenital hand abnormalities (e.g. trigger thumb)
- Osteogenesis imperfecta
- Skeletal dysplasias
- Tarsal coalitions
- Torticollis
- Leg length discrepancy : Ilizarov methodology

Birth palsy

A knowledge of

- Screening services for congenital abnormalities
- Assessment of physical disability

Shoulder & Elbow

Basic Science

Anatomy:

Basic knowledge of the regional anatomy of the shoulder including

- Detailed anatomy of the sternoclavicular acromioclavicular, glenohumeral and elbow joints to include the connecting bones, muscles and tendons acting across them, neurovascular supply, bursae and relationships to local structures
- Surgical approaches: deltopectoral and posterior approaches to glenohumeral joint; superior (McKenzie) approach to rotator cuff and surgical approaches to the acromioclavicular and sternoclavicular joints
- Structure and function of the above joints; a clear understanding of the static and dynamic stabilizers of the glenohumeral and elbow joints

Biomechanics:

- Biomechanics of the Shoulder and elbow

- Knowledge of the various types of shoulder and elbow prostheses including the factors influencing design, wear and loosening.

Pathology:

Sound knowledge of all commonly encountered benign and malignant conditions affecting the shoulder girdle, elbow and surrounding soft tissues

- A basic understanding of the Pathology of:
- Impingement and rotator cuff disorders
- Instability of the shoulder and the elbow
- Inflammatory and degenerative conditions affecting the articular cartilage and synovium infection
- Adhesive capsulitis of the shoulder
- The pathology of the stiff elbow
- Disorders such as ulnar neuritis and tennis or golfer's elbow

Clinical Assessment:

- Detailed history and examination of the painful, stiff or unstable shoulder or elbow
- Knowledge of clinical tests used specifically to assess instability of the shoulder and elbow, rotator cuff disorders, the stiff shoulder or elbow and the use of local anesthetic in assessment. Examples are the apprehension tests for shoulder instability, impingement signs and tests, gerber's lift off test, Napoleon's sign, elbow instability tests ulnar nerve assessment
- Knowledge of conditions causing referred symptoms to the shoulder and elbow (e.g. cervical spine diseases, entrapment neuropathies and thoracic outlet disorders)
- Knowledge of including instability, impingement, rotator cuff tears, adhesive capsulitis, osteoarthritis, rheumatoid disease, avascular necrosis, biceps tendon disorders of the acromioclavicular and sternoclavicular joints and scapula
- Knowledge of common conditions affecting the elbow including instability, osteoarthritis, rheumatoid arthritis, causes of stiffness, soft tissue problems such as medial and lateral epicondylitis, neuropathies and fractures around the elbow

Investigation:

- Knowledge of plain radiographs as used to assess shoulder and elbow disorders. This should include a knowledge of those special
- Knowledge of the value of ultrasound, arthrography, CT and MRI as used to assess the shoulder and elbow.
- Knowledge of the use and abuse of arthroscopy of the shoulder and elbow including a knowledge of normal and abnormal arthroscopic finding

Treatment:

Non – operative

- An ability to supervise the non – operative management of fractures, dislocations and soft tissue injuries around the shoulder and elbow
- An in – depth knowledge of the management of straightforward fractures and dislocations of the shoulder girdle and elbow. Knowledge of the treatment options for more complex fractures
- An ability to recognize upper limb injuries involving injuries to the brachial plexus and refer on as appropriate
- A knowledge of injection techniques for both the shoulder and the elbow
- Knowledge of both the non operative and operative treatment of common disorders such as recurrent anterior traumatic instability of the shoulder, rotator cuff impingement and small rotator cuff tears, adhesive capsulitis, acromioclavicular joint pain.

Operative:

- A knowledge of the management of the soft tissue elbow disorders such as lateral and medial epicondylitis and ulnar neuropathy
- Knowledge of the indications, options and complications for prosthetic replacement of the shoulder and elbow
- Knowledge of the indications and benefits of arthroscopy of the shoulder and elbow .
- Understanding the principles of management of tumours around the shoulder and elbow.

SKILLS TO BE ACQUIRED DURING THE TRAINING PERIOD

Sl. No.	Name of the procedure	Observed	Assisted	Performed Under Supervision
	ORTHOPAEDICS			
1	Skin Traction Application of splints Application of plaster, slab & cast			Yes
2	Skeletal traction of upper tibia, distal tibia, lower Femoral, Trochanteric screw, Olecranon,			Yes

	Calcaneal and skull traction			
3	Wound dressing and management Prescription of Orthotics			Yes
4	Management of open fractures - Debridement, external fixation - Soft tissue reconstruction - including bone coverage			Yes
5	Open reduction and internal fixation of Fractures - Plate Osteosynthesis in shaft Humerus and both bones forearm fractures - Tension band wiring of Olecranon, Patella & Medial malleolus fractures - Krischner wire fixation of supra condylar fracture of humerus - Cannulated screw fixation for fracture neck of femur - Dynamic Hip Screw of Trochanteric fracture - Intramedullary nailing for femoral shaft fracture - Fixation of Potts fracture - Excision of Head Radius			Yes Yes Yes Yes Yes Yes Yes Yes
6	Fixation of fractures like proximal Humeral, Supracondylar Femur, Proximal tibia & Talus fracture- Dislocation Interlocking Nail – Femur, Tibia		Yes	
7	Spine - Exposure to spine by posterior, anterior and anterolateral approaches		Yes	Yes
8	CTEV Manipulation and POP application Tendo Achilles lengthening			Yes Yes
9	Postero – medial soft tissue release Bony procedures including triple arthrodesis		Yes Yes	
10	High tibial osteotomy		Yes	
11	Tendon repair		Yes	
12	Poliomyelitis			
	Hamstring release & Posterior Capsulotomy Flexor Abductor release			Yes
	Corrective osteotomies of Humerus, Femur and Tibia		Yes	
	Knee & Ankle arthrodesis Pantalar and triple arthrodesis		Yes	
	Limbs lengthening / illizarov procedure		Yes	
13	Bone & Joint infections Apiration of joint			Yes
	Drilling / Decompression of metaphysis Drainage of abscess			Yes

	Sequestrectomy & saucerisation Girdlestone/ Excision Arthroplasty of Hip			Yes
14	Arthrolysis of elbow joint		Yes	
15	Bone tumors			
	- Biopsy from tumor - Excision of osteochondroma - Curettage & Bone grafting			Yes Yes Yes
16	Amputations			Yes
17	Limbs salvage procedures		Yes	
18	DESIRABLE PROCEDURES Arthroscopy of knee Joint replacement - Hip Joint - Knee joint Peripheral nerve repair Tendon transfer procedures Spinal stabilization Procedures like pedicular screw Scoliosis Corrections	Yes Yes Yes	Yes Yes Yes Yes Yes Yes Yes	

Investigations / tests which the candidates must know to interpret

	Name of investigations . tests
Hematological investigation in orthopaedics conditions like	<ul style="list-style-type: none"> - C- reactive protein, - Rheumatoid factor, - HLA – B27 - Serum Electrophoresis - Serum Ca, P, Alkaline phosphatase, Uric Acid Total Proteins & A.G. ratio - Elisa
Urine	<ul style="list-style-type: none"> - Bence Jones proteins - 24hr Urinary Ca
Radiological investigations	<ul style="list-style-type: none"> - Plain radiography - CT Scan, MRI - Radio – isotope bone scan
Histopathological slides of common orthopaedic conditions like	<ul style="list-style-type: none"> - Interpretation of Tubercle, - Myeloma - Osteosarcoma - Ewing Sarcoma

SAMPLE CASES FOR PRESENTATION AND DISCUSSION

Long cases

- Fixed / Ankylosed hip
- Neglected fracture neck of femur
- Tubercular hip
- Neglected traumatic dislocation hip
- Potts paraplegia
- Extra dural cord compression
- Prolapsed intervertebral disc
- Spinal Canal stenosis
- Cauda equina syndrome
- Avascular Necrosis of Hip
- Traumatic paraplegia

Short cases

- Cubitus / Valgus
- Non union Humerus with or without radial nerve palsy
- Non union lateral condyle of Humerus
- Infected non union
- Chronic osteomyelitis
- Post polio flail shoulder / paralysed elbow
- Neglected unreduced Dislocation Elbow
- Neglected unreduced Dislocation Shoulder
- Malunited Colles fracture
- Carpal tunnel syndrome.
- Bone tumors like Osteosarcoma, Ewing's Sarcoma, Giant cell tumor, Osteochondroma, Osteoid osteoma etc
- Genu varum / Genu Valgum
- Ruptured Tendo Achillis
- Erb's palsy / Brachial plexus injury
- Nerve injuries – Median Nerve, Radial Nerve, Ulnar Nerve, Sciatic Nerve, common Peroneal Nerve

Spots

- Pathological Specimen – giant cell Tumor, Osteosarcoma, Ewings sarcoma, Sequestrum, Madura foot
- Bones
- Instruments
- X – Rays
- Orthotics/ Prosthetics – Patellar tendon bearing prosthesis, Cock up Splint, Denis brown splint, Ischial weight relieving caliper, Jaipur foot.

Guidelines for Thesis / Dissertation

Thesis / Dissertation is a must for every candidate.

Collection of data, investigations and type of treatment done should be specifically written. Research methodology is to be followed though out the study. The guide should be a senior professor with minimum 10 years postgraduate experience. Subject selected should be feasible within the time allotted for the work. The work should be original.

The institution should give technical assistants and lab facilities. The candidate for the research work should try no experimental work.

Statistical analysis and data should be entered. The protocol for the thesis should be given to the university within 3 months of joining the institution. One professor can guide one candidate during the academic year.

University may reject thesis if it is not up to the mark or a fake one or the some unethical practice during the study period.

Thesis should be submitted 6 months prior to the examination. Four copies should be submitted to the university duly recommended by he guide, H.O.D and Medical Director of the institution. One copy should be submitted to the department for future reference and academic purposes. Protocol should be as follows:

**Title –Brief clear
Introductions
Objectives of study
Materials & Methods
Results and Analysis
Discussion
Conclusion
Bibliography**

Annexure – data collection, charts, questionnaire, follow up, observations must be in a checklist.

Posting to the other departments:

One month posting to the artificial limb center & physiotherapy.

One month posting to Plastic Surgery department.

The candidate must attend at least 2 national CME during the course.

Attend at least two instructional course lectures.

Periodic test – 3 tests in 3 years – at the end of each year, the test will be conducted at the end of each year and last final test will be done 3 months before the final examination, written, clinical and viva voce.

Log book should be maintained by the candidates.

There will be internal assessment by reviewing this and evaluated by the external examiner.

ACADEMIC ACTIVITIES

1. Clinical discussion in the outpatient department and also bed side clinical examination in the wards. Diagnosis, lab investigations and treatment modalities, record maintenance, discussion on various modalities of treatment etc.
2. Journal club, ICL, paper presentation and discussion.
3. Seminar – one seminar one hour every week.
4. X- ray review – every day x – ray review of the new and old cases admitted or seen in the last OPD or in the casualty and discussion regarding diagnosis and treatment.
5. Case presentation. One long case and 3 short cases in the conference room once in a month – discussion, diagnosis and management.
6. Dissertation work – preparation & presentation of the work and its review of literature in the 1st year and the whole work by the 2nd year.
7. He should attend community medical camps at least 1 per year.
8. Presentation of the cases in the Grand rounds / combined rounds once in 6 months
9. Emergency work in the casualty – 1 junior PG and 1 senior PG will attend the casualty duty on rotation.
10. He should attend the operation theatre, make preparation for the smooth conduct of the operation, and arrange the instruments, table, C-Arm etc. for the surgery.

Courses

Paper - I Basic Science Related to Orthopaedics (Course U15MSOR01)

- CO1: Understand the Anatomy, Physiology and biomechanics of musculoskeletal system.
- CO2: Know the relevance of investigations- indications, interpretation and basic knowledge of performing the same
- CO3: Understand the principles and basics of Physical medicine and rehabilitation with accurate knowledge of traction, orthotics and prostheses
- CO4: Know the basics of research and take part in a audit. Plan and execute a study with guidance from a faculty to publish in a reputed journal.
- CO5: Learn the relevance of medical ethics with importance to duties of care, informed consent and medicolegal aspects of orthopedics

Anatomy :

- **Clinical and functional anatomy with pathological and operative relevance**
- Anatomy and embryology of nervous and vascular systems
- Surgical approaches to the limbs and axial skeleton
- Anatomy and embryology of musculoskeletal system
- Histology

Tissues :

- Bone – Structure
- Cartilage – articular, meniscal
- Structure & Function
- Muscle and tendon – Structure & Function
- Synovium – Structure & Function, synovial fluid analysis
- Ligament – Structure & Function, synovial fluid analysis
- Nerve - Structure & Function 3
- Intervertebral disc - Structure & Function

Physiology, Biochemistry & Genetics:

- Structure and function of connective tissues
- Application /relevance of modern genetics to orthopaedic disease and treatment
- Bone healing and repair
- Shock – types, physiology, recognition and treatment
- Metabolism and hormonal regulation of musculoskeletal system and other related orthopaedic physiology.
- Metabolic and immunological response to trauma, poly trauma and management.
- Blood loss in trauma/ surgery, fluid balance and blood transfusion
- Bone grafts, bone banking and tissue transplantation.

Pathology – General Pathology

- Tumour pathology in Musculoskeletal diseases.
- Other orthopaedic pathology including osteogenesis imperfecta, spondylosis, spondylolisthesis, synostoses, etc
- Gene therapy in Orthopaedic disorders, stem cells in Orthopaedic surgery

Biochemistry

- General biochemistry
- Biochemistry of bones
- Biochemical aspects related to orthopedic diseases

Paper - II Traumatology and Rehabilitation (Course U15MSOR02)

CO1: Understand the process of fracture healing and healing of soft tissues in traumatic injuries

CO2: Training to part of the trauma team with indepth knowledge of musculoskeletal trauma and basic knowledge about trauma involving other areas and life support in ICU

CO3: Know about non operative and non operative management of closed fractures and acquire the skill in managing them

CO4: Understand the principles of Open fracture management and acquiring the skills in management including a basic knowledge of reconstruction options and flap covers

CO5: Learn the basics of imaging in trauma including USG, CT and MRI and about rehabilitation of trauma victims

Knowledge in management of trauma(non operative and operative , understanding fracture /soft tissue healing , Principles of open fracture management

Physical Medicine and Rehabilitation

- **Principles of physical therapy including exercise therapy and electro therapy**
- Prescriptions for splints, braces, calipers, special shoes.
- Occupational therapy principle
- Principles of electro diagnosis

**Paper - III Orthopaedic Diseases and Paediatric Orthopaedics
(Course: U15MSOR03)**

CO1: Understand the congenital conditions and acquire proficiency in examining a child and managing pediatric orthopedic conditions

CO2: Train to be familiar and manage infections in musculoskeletal system with special importance to tuberculosis

CO3: To identify and treat Tumours of musculoskeletal system with in depth knowledge of investigations and techniques of obtaining biopsy. To know the basics of limb salvage and amputations

CO4: Understand the pathology and treatment options in various arthritis- with extensive knowledge of Osteoarthritis, Rheumatoid arthritis and seronegative arthritis

CO5: Know the basics of orthopedic rehabilitation with importance to working with Physical and occupational therapist , Knowledge about traction and splints, assisted ambulation and gait

- **Knowledge of the presentation, radiological features, pathological features, treatment and outcome for common benign and malignant tumours**
- Understanding of the principles of management of patients with metastatic bone disease in terms of investigation, prophylactic and definitive fixation of pathological fractures and oncological management.
- **Knowledge of the presenting features, management and outcome of soft tissue swellings, including sarcomas**

General:

- Osteoarthritis
- Osteoporosis
- Osteopetrosis
- Metabolic bone disease
- **Rheumatoid arthritis and other arthropathies (inflammatory, crystal, etc.)**
- Hemophilia
- Inherited musculoskeletal disorders – Mucopolysaccharidosis and dysplasia of bone: epiphysis metaphysis, diaphysis, marrow and whole bones.
- Neuromuscular disorders – inherited and acquired
- Flurosis
- Long term steroid usage and Avascular necrosis of head of femur
- Osteonecrosis
- Osteochondritides
- Heterotopic ossification
- Metastases
- Management of open fractures
- **Disaster management**
- Management if war wounds & civil disturbance.

Paper - IV Recent Advances (Course: U15MSOR04)

CO1: Acquire ability to search and go through the recent literature and to accurately assess the level of evidence. Ability to innovate and to apply the knowledge to the Indian conditions. Use of electronic devices in archiving patient data and measurement of parameters.

CO2: Upto date knowledge of newer implants and techniques in trauma care including the current ATLS protocol

CO3: Knowledge of Joint reconstruction procedures and arthroscopic surgery

CO4: Knowledge of spinal procedures, Orthopedic Oncology, Hand injuries and foot and ankle including Diabetic foot management

CO5: Attain knowledge of Bone substitutes, Newer options in bridging bone defects, Current trend in treating Osteoporosis and advanced imaging modalities like PET

Competency in identifying latest important articles and its application in day to day practice . Knowledge of latest ATLS protocols . Knowledge of bone substitutes and its application

Soft Skills (Course: U15MSOR05) Elective Course

CO1: Teaching abilities

CO2: Ability to conduct a clinical research

CO3: Knowledge of medical ethics and etiquette and proper communication skills.

CO4: Ability to work as the member of a team.

CO5: The attitude to update knowledge and skills.

SCHEME OF EXAMINATION

Theory examination : 4 papers

Practical Examination:

Clinical: One long case (30 mins)

Three short cases (10 mins x 3)

Oral,

Instruments X – rays, Specimen, slides, Orthotics & Prosthetics

Theory papers

1. There shall be 4 papers – 3 hour test for each paper.
2. One essay type and eight short note questions in each paper.
3. Maximum marks for each theory paper is 100
4. Practical 70 marks Long case
30 marks short case (10 x3)
Viva voce : 100 marks (25 x 4)

Total = 400 theory + (theory and practical) to declare successful

Paper1:

Basic science related to orthopaedics

Paper 2:

Traumatology and rehabilitation

Paper 3.

Orthopaedic diseases and Paediatric orthopaedics

Paper 4: Recent advances

MS Orthopaedics

Paper – 1

Basic science related to Orthopaedics

Time – 3 Hours

Max. Marks – 100

Answer all questions.

1. Describe the blood supply to the Head of femur. Write merits and demerits of different modalities of treatment of fracture neck of Femur in various age groups.

2. Write Short notes on
 - a. Automatic bladder
 - b. Synovial fluid analysis
 - c. Dorsal digital expansion
 - d. Ulnar paradox
 - e. Bone morphogenic protein
 - f. Glasco coma scale
 - g. Calcium homeostasis
 - h. NSAIDs in Orthopaedics

10 x 8 = 80 Marks

MS Orthopaedics

Paper – 2

Traumatology and rehabilitation

Time – 3 Hours

Max. Marks - 100

Answer all questions.

1. Classify ankle fractures. Briefly outline the mechanism of injury and management.

20 marks

2. Write Short notes on

- a. Monteggia #
- b. Floor reaction orthosis
- c. Closed rupture of tendoachillis
- d. TENS
- e. Anterior dislocation of Hip
- f. Pylon Prosthesis
- g. Atlas fracture
- h. Crutch walking

10 x 8 = 80 Marks

MS Orthopaedics

Paper – 3

Orthopaedic diseases and Paediatric orthopaedics

Time – 3 Hours

Max. Marks – 100

Answer all questions.

1. Describe the aetiopathology, clinical features and management of Perthe's disease.

2. Write Short notes on
 - a. Blounts Disease
 - b. Giant cell tumour
 - c. Middle path regime
 - d. Rheumatoid hand
 - e. Coccygodynia
 - f. Pigmented Villonodular synovitis
 - g. Osteomalacia
 - h. Volkman's ischaemic contracture

10 x 8 = 80 Marks

MS Orthopaedics

Paper – 4

Recent advances

Time – 3 Hours

Max. Marks – 100

Answer all questions.

1. Describe the aetiopathology, clinical features and management of Osteoporosis in an adult female.

20 Marks

2. Write Short notes on

- a. Locking compression plate
- b. Bio absorbable implants
- c. Artificial bone substitutes
- d. Carbon fiber implants
- e. Arthroscopic rotator cuff repair
- f. Leflunamide
- g. Isotope scanning
- h. Recent trends in articular cartilage repair

10 x 8 = 80 Marks

MAINTENANCE OF LOG BOOK AND RECORDS

Each candidate must maintain a logbook in which participation of various teaching learning activities by the candidate must be entered properly. Number of presentation and operation assisted, operations done with the senior faculties and operation done by self should be entered. Logbook should be corrected and signed by the Unit Chief by every month.

Computer Assistance training

Storage of data from various important medical journal, from websites should be retrieved and to increase the knowledge. EMR learning is a must in this hospital.

Periodic examination

At least 3 test should be given to the candidates by the end of 1st and 2nd year and the last one 3 months prior to the final examination,

Check list for the evaluation of journals, seminar, clinical work, war work, casualty work, OPD work, theatre work, clinical presentation, teaching skills and dissertation presentation should be maintained I proper Performa and should be graded

Evaluation of the work

Sl. No.	Points to be considered	Poor 0	Below Average 1	Average 2	Above Average 3	Good 4	Very Good 5
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Medical ethics

In modern times patient has the right to know about his disease in detail and has the right to know about the treatment protocol, investigations going to be done and different methods of treatment option. Doctor – patient relation should be very firm and cordial and then only he will have the confidence in the treating doctor. To accomplish this goals and objectives, which are laid, down are very important. So medical ethics which is a study of the moral value as applied medicine, encompasses practical application in clinical setting as well as work on its history, philosophy, theology and sociology. The human values are very important and the doctor should act in the best interest of the patient. Informed consent has been taken as and when required when the patient is faced with a many co-morbid diseases. All the documents should be kept in confidentially by the doctor. Patient has the right to refuse or choose the treatment. There should be fairness in the treatment and equally in all the matters of consideration. There should good rapport with the patient, his family members so that he can understand the real fact about his disease. So communications with the patient or his relatives are very important. The medical ethics have been included in a separate order by the medical council of India Ref. No: MCI – 21 (2)2001 section 20A 33 (M) of IMC.

Code of medical ethics

Duties of physician to their patients

Duties of physician in consultation

Responsibilities of physician to each other

Duties of physician to the public and to the paramedical professionals.

Unethical acts

Misconduct.

Punishment and disciplinary action.

Declaration

1. I pledge myself my life to the service of humanity.
2. Even under threat, I will not use any medical knowledge contrary to the laws of humanity.
3. I will maintain the utmost respect for human life from the time of conception.
4. I will not permit considerations of religion, Nationality, race, party politics or social standing to intervene between my duty and my patient.
5. I will practice my profession with conscience and dignity.
6. The health of my patient will be my first consideration.
7. I will respect the secrets that are confined in me.
8. I will give my teachers, the respect and gratitude, which is due to them.
9. I will maintain by all means in my power, the honor and noble traditions of medical profession.
10. I will treat my colleagues with all respects and dignity.
11. I shall abide by the code of medical ethics as enunciated by Indian medical council (Professional conduct, etiquette and ethics).
12. I make these promises solemnly, freely and upon my honor.

Reference Books

1. Campbell's Operative Orthopaedics 11th Edition
2. Fractures in Adults and Children – Charles A Rockwood Junior, David P Green 6th Edition Lippincott Williams & Wilkins
3. Orthopaedic principles and their application – Samuel Turek
4. Merce's Orthopaedic surgery 9th edition – Robert B Duthie & George Bentley (Arnold)
5. J.N. Wilson – Watson Jones fractures and joint injuries – 6th edition – B.B. Churchill Livingstone Ltd., New Delhi.
6. Surgery of the knee – 2 Vol. Insall & Scott – 4th edition – Churchill & Livingstone
7. Pediatric Orthopaedics Lowell & Wintres – Raymond T Morrissy & Stuart L Weintin – 6th edition
8. Browner – Skeletal trauma 3rd edition Browner, Jupiter Levine
9. Tachdjain's Paediatric Orthopaedics – 4th edition – edited John Anthony Herring & pub. By Saunders – Elsevier
10. Text book of Orthopaedics - & Trauma edited by Dr. Kulkarni – 2nd edition Jaypee Brothers, New Delhi
11. Enneking bone tumors
12. Campanacci bone tumours.
13. System of Orthopaedics – Graham Apley
14. Text book of spinal surgery 2nd edition Keith H Bridwell – Lippincott Raven

15. greens operative hand surgery – 5th edition Elsevier
16. Diagnosis of bone and joint disorders – Donald Resnick