Curriculum for

Post-Doctoral Fellowship Course

In

**CROSS SECTIONAL IMAGING**

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**SRI AUROBINDO UNIVERSITY**

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# FELLOWSHIP IN CROSS SECTIONAL IMAGING

**SYLLABUS**

**Cardiovascular and thoracic imaging:**

SYLLABUS FOR THORACIC IMAGING

* Benign and Malignant Neoplasms of the Thorax
* Lung Neoplasms :
* Staging system update for lung cancer
* Standard treatment regimens
* Mediastinal tumors
* Esophageal cancer
* Lymphoma
* Thoracic sarcomas

Trachea

* Tracheal neoplasms
* Tracheal stenosis
* Benign tracheal diseases
* Tracheobronchomalacia
* Interstitial Lung Disease
* Emphysema
* Airways Disease
* Broncholithiasis
* Large airways disease
* Small airways disease
* Pleural Disease
* Pleural effusion
* Pleural infection
* Pleural Tumors/Masses
* Pneumothorax, Hemothorax, Chylothorax
* Mediastinal Disease including various tumors, infective, inflammatory pathologies
* Infections of the Lung, Mediastinum and Pleura
* Imaging in the Immunocompromised Patient
* Pulmonary Vascular Diseases
* Occupational Lung Disease
* Critical Care/Intensive Care Unit Imaging
* Drug and Radiation Induced Diseases of the Lung
* Immunologic and Miscellaneous Diseases, including pulmonary manifestations of

connective tissue diseases and amyloidosis

* Congenital Diseases of the Thorax
* Thoracic Trauma
* Transplant Imaging, including BMT and its complations
* Post Operative Chest
* Thoracic Positron Emission Tomography (PET)

in imaging of malignancy, inflammatory diseases

* Thoracic Magnetic Resonance Imaging (MRI)
* Mediastinal mass evaluation
* Pleural evaluation: pleural mass, mesothelioma, diaphragm and chest wall invasion
* Hilar evaluation
* Chest wall evaluation

SYLLABUS FOR CARDIOVASCULAR IMAGING

Anatomy - Segmental Cardiac Anatomy, coronary artery segments, cardiac veins anatomy

Cardiac MRI

Cardiac MRI physics, MR safety aspects Technique

Cardiomyopathies

Ischemic heart disease – including viability imaging Congenital heart disease

Pulmonary artery and aorta – congenital and acquired conditions Post surgical repair of congenital heart disease

Valvular heart disease

Cardiac tumour and tumour mimics Pericardial diseases

Cardiac CT

Technique

Coronary artery calcium scoring – for risk stratification Congenital heart disease

Pulmonary vein mapping – pre and post ablation, anomalous pulmonary venous drainage assessment

Thrombus evaluation TAVI

Cardiac tumors Pericardial disease Valvular heart disease

Vascular Imaging

CT angiogram and MR angiogram

**Head and Neck Radiology**

Specific anatomic regions and related pathology

* 1. **Temporal bone**

Imaging features of congenital disorders leading to deafness (e.g. cochlear aplasia/hypoplasia, Mondini malformation, large endolymphatic sac anomaly (LESA) / large vestibular aqueduct syndrome (LVAS)

Disorders leading to secondary deafness including otosclerosis, Menière’s disease, temporal bone inflammatory disease, and tumors of the cerebellopontine angle Course of cranial nerves VI – XI in their different components

Imaging of tumors of the temporal bone and cerebello-pontine angle Imaging of fractures of the temporal bone

Imaging and clinical features of cholesteatoma and other inflammatory lesions Pathologies of the external auditory canal, including atresia and tumorous lesions Imaging of pathologies of the middle ear

Various causes of vascular tinnitus with imaging features

* 1. **Facial skeleton, skull base and cranial nerves**

Lesions of the jugular foramen, including glomus tumour / paraganglioma, jugular bulb pseudolesions, jugular bulb diverticulum, dehiscent jugular bulb, jugular foramen schwannoma, jugular foramen meningioma and others

Diffuse diseases of the skull base, including fibrous dysplasia, plasmocytoma, Langerhans cell histiocytosis, chondosarcoma and metastases

Normal anatomy of cranial nerves and common pathologies

Traumatic lesions of the facial skeleton and skull base and to be familiar with complications and therapeutic consequences

Jaw lesions including cysts and cyst-like lesions

Infectious and inflammatory lesions of the mandible, maxilla and skull base, including osteomyelitis, osteoradionecrosis, bisphosphonate osteonecrosis

* 1. **Orbit and visual pathways**

Imaging of congenital lesions of the orbit, including coloboma

Imaging of typical tumours of the orbit including dermoid and epidermoid cysts, cavernous haemangioma, lymphangioma, rhabdomyosarcoma and retinoblastoma, meningioma, optic/chiasmal glioma, orbital haemangioma, and benign mixed tumour of the lacrimal gland, ocular melanoma, orbital lymphoma, higher grade optic glioma, adenoid cystic carcinoma of the lacrimal glands

Orbital manifestations of neurofibromatosis type I and other congenital diseases Imaging and clinical features of infectious and inflammatory disorders of the orbits including optic neuritis, abscesses, sarcoidosis and idiopathic inflammatory disorders

* 1. **Nose, nasopharynx and paranasal sinuses**

Imaging of congenital lesions of the paranasal sinuses including choanal atresia and frontoethmoidal encephalocele

Normal variants of the nose and paranasal sinuses

Imaging of infectious and inflammatory disorders and complications of the nose and paranasal sinuses including acute and chronic rhinosinusitis, fungal sinusitis, sinonasal polyposis, sinonasal mucocele and sinonasal Wegener granulomatosis

Imaging of benign and malignant neoplasms of the nose and paranasal sinuses including inverted papilloma, juvenile angiofibroma, sinonasal hemangioma, sinonasal osteoma, sinonasal fibrous dysplasia, sinonasal squamous cell carcinoma, sinonasal adenocarcinoma, sinonasal melanoma, esthesioneuroblastoma, sinonasal lymphoma and others

Imaging features of the nose and paranasal sinuses after surgery

Imaging features and clinical features of the nasopharyngeal pathologies including inflammatory and infectious lesions and neoplasms

* 1. **Masticator space, parotid space and carotid space**

Anatomical delineations of the masticator space, parotid space and carotid space Imaging features of inflammatory conditions and benign and malignant neoplasms of the masticator space including peripheral nerve sheath tumors

Imaging features of infectious and inflammatory lesions of the parotid space including parotitis, Sjogren syndrome and benign lymphoepithelial lesions in patients with HIV Imaging features and clinical features of benign and malignant neoplasms of the parotid space including Warthin tumor, benign mixed tumor, adenoid cystic carcinoma, mucoepidermoid carcinoma, lymphoma, lymph node metastases and malignant tumors of the skin

Imaging and clinical features of vascular lesions of the carotid space including ectatic carotid arteries, carotid artery pseudoaneurysm, carotid artery dissection, and jugular venous thrombosis

Imaging features of neoplasms of the carotid space including carotid body paraganglioma, glomus vagale paraganglioma, schwannoma, and neurofibroma

* 1. **Lymph nodes of the head and neck region:**

Nomenclature of the lymph nodes and nodal regions

Imaging features of infectious and inflammatory disorders of the lymph nodes including reactive lymph node enlargement, suppurative lymph nodes, Kimura disease, Castleman disease and others

Imaging features and clinical features of neoplastic disorders of the lymph nodes, including lymphoma (Hodgkin and Non-Hodgkin) and nodal metastases

* 1. **Oral cavity, oropharynx and retropharyngeal space**

Imaging features and clinical features of inflammatory and infectious lesions of the oral cavity and oropharynx, including abscesses, retention cysts, sialoceles, sialadenitis and ranula

Imaging features and clinical features of benign and malignant neoplasms of the oral cavity and oropharynx, including benign mixed tumors, squamous cell carcinoma, malignant tumors of the minor salivary glands

Imaging features of retropharyngeal abscesses and to know their patterns of spread as well as possible complications

* 1. **Hypopharynx, larynx and cervical esophagus**

Imaging features and clinical features of neoplasms of the hypopharynx and larynx, including squamous cell carcinoma of the hypopharynx, of the supraglottic, glottic and subglottic regions, chondrosarcoma and other malignant tumors of the larynx

Imaging features of vocal cord paralysis Imaging features of tracheal stenoses

Imaging features of laryngoceles and pharyngoceles, webs and strictures Imaging features of cervical esophageal carcinoma

* 1. **Thyroid and parathyroid glands**

Imaging of thyroiditis, multinodular goiter, benign and malignant neoplasms of the thyroid and parathyroid glands, including thyroid and parathyroid adenomas, different types of thyroid carcinoma, and thyroid lymphoma

Tc-99m-scintigraphy and PET/CT in various diseases of the thyroid gland

* 1. **Congenital and trans-spatial lesions**

Embryology of the head and neck region

Imaging features of branchial cleft cysts, thyroglossal duct cysts, thymus cysts, vascular lesions including AVM, venous and lymphatic malformations of the head and neck region, neurocutaneous syndromes, including neurofibromatosis type I and II in the head and neck region

Congenital malformations of the skull base and face and in particular of the inner ear and middle ear

**Musculoskeletal Radiology**

Knowledge and skills to be acquired by the students on completion of the Course: The fellow will be equipped to independently

-report CT and MRI of bone and joints

-perform and interpret musculoskeletal ultrasound

-perform USG guided joint injections, biopsies, FNAC

1. Detailed syllabus, Regulation, Guidelines and Curriculum mentioning the purpose and the knowledge aimed to be acquired for each of the theory papers and practical sessions:
2. **Basics of musculoskeletal cross sectional imaging**

Available cross-sectional imaging modalities and appropriate indications Anatomy of musculoskeletal tissues

1. **Imaging of pathology of joints**

SHOULDER –

Shoulder impingement

Tendon tears, degeneration and dislocation Shoulder impingement

Rotator interval abnormalities Shoulder instability

SLAP

Arthritis

Post operative shoulder Nerve abnormalities

ELBOW –

Fractures Ligament injuries

Muscle and tendon injuries Joint pathology

Nerve related pathologies

WRIST & HAND

Ligament & TFCC injury Tendon Pathology

Carpal tunnel and nerve related pathology Osseous abnormalities & Instability Impaction syndromes

Occult Fractures. Physeal Injuries. Osteonecrosis

Congenital Osseous Lesions. Arthritis

HIP –

Fractures

Vascular Abnormalities of Bone Osteonecrosis (Avascular Necrosis)

Idiopathic Transient Osteoporosis of the Hip (Transient Painful Bone Marrow Edema)

Avulsion injuries

Muscle, tendon & ligament pathologies Labrador injuries

Impingement syndromes Sciatic Nerve pathologies

KNEE –

Fractures

Meniscal & Ligament pathologies Posteromedial & Posterolateral corner injuries Extensor mechanism

Avulsion injuries

Infection / Inflammatory diseases Vascular pathologies

Post op knee

ANKLE & FOOT–

Fractures

Ligament & Tendon injuries Impingement syndromes Sinus Tarsi Syndrome Plantar Fasciitis

Nerve related injuries & pathologies Tarsal Coalition

Osteonecrosis of the foot and ankle Accessory Muscles.

Pressure Lesions Diabetic Foot Foreign Bodies

TEMPOROMANDIBULAR JOINT

Normal anatomy Internal derangement

1. **Imaging of focal lesions of bone and soft tissue**

Principles of staging

* Grade, Local Extent & Metastases Bone & Soft Tissue Tumors

Post treatment evaluation of tumors

1. **Marrow pathology imaging**

Normal marrow anatomy and function Marrow pathology

Post chemotherapy & radiation marrow changes Miscellaneous Marrow Diseases

1. **Spine imaging** Degenerative disease Spinal canal stenosis Post-operative imaging Infections

Neoplasms Trauma

Vascular pathologies

1. **Imaging of peripheral nerves and plexus**

Principles of nerve imaging Normal imaging anatomy Pathologies of brachial plexus Pathologies of lumbosacral plexus

Pathologies of peripheral nerves of upper and lower limb

1. **Arthritis imaging and cartilage imaging**

Cartilage Rheumatoid Arthritis

Ankylosing Spondylitis Gout

Calcium Pyrophosphate Dihydrate Deposition Hemophilia

Amyloid Tumors

Synovial Chondromatosis Pigmented Villonodular Synovitis

1. **Imaging in trauma**

Acute Osseous Trauma

Impaction injuries Radiographically Occult Fracture Avulsion injuries

Insufficiency fractures Fatigue fractures

Post-traumatic Osteolysis Post op imaging

Trauma to immature skeleton

Epiphysiolysis, Post-traumatic Physeal Bridges Avulsion Fractures

1. **Whole body MRI**

Indications Protocol Technique Myositis

Multifocal osteomyelitis

Recommended list of Text books & Journals:

Text books:

* Bone and Joint Imaging: Donald L. Resnick, Mark J. Kransdorf
* MRI in orthopaedics & sports medicine - Stoller
* Yochum & Rowe’s essentials of skeletal radiology
* Musculoskeletal imaging : The Requisites: B. J. Manaster, David A. May, and David g. Disler
* Ultrasound of the musculoskeletal system - Carlo Martinoli and Stefano Bianchi
* Fundamentals of Musculoskeletal Ultrasound - Jon Jacobson
* Ultrasound guided musculoskeletal injections - Gina M. Allen, David J. Wilson

Journals:

Skeletal radiology

Radiology & Radiographics journal American journal of radiology

The Fellow is expected to take part in daily teaching sessions within the department, and make regular presentations.

The Fellow will be taking part in the different Inter-departmental meetings with departments of orthopedics, rheumatology, spine imaging including others

**Neuro Radiology**

**Syllabus, books, skills (minimum training/competency requirements). Books:**

Anne Osborn “Brain- Imaging, Pathology and Anatomy”

Scott Atlas – Magnetic Resonance Imaging of the Brain and Spine James Barkovich: Paediatric Neuroimaging 2nd Edition

**Journals:**

American Journal of Neuroradiology European Journal of Spine Radiology

Radiographics

Syllabus:

1. Anatomy
2. Trauma
3. Non traumatic haemorrhage
4. Vascular Lesions – Infarcts, malformations
5. Infections
6. Inflammatory conditions
7. Demyelination
8. Neoplasms – Area specific
9. Cystic lesions
10. Other tumors
11. Toxic Encephalopathy
12. Metabolic Encephalopathy
13. Degenerative disorders
14. CSF disorders
15. Congenital malformations of skull, brain
16. Recent advances Spinal Cord
17. Anatomy and vascular anatomy
18. Tumors
19. Infections
20. Inflammation, Demyelination
21. Vascular lesions and malformations
22. Vertebral and Disc infections, tumors of the bone
23. Miscellaneous

**GI & GU**

* + **Gastrointestinal Imaging**
    - Gastrointestinal Tract
      * ESOPHAGUS
        + Normal anatomy
        + Imaging Techniques
        + Pathologic Conditions
        + Trauma
      * STOMACH
        + Normal Anatomy
        + CT Gastrography
        + Pathologic Conditions
      * DUODENUM
      * SMALL INTESTINE
        + Normal Anatomy
        + Imaging Techniques
        + Pathologic Conditions
        + Trauma
        + Hernias
        + Intussusception
        + Small Bowel Obstruction
        + Primary Causes of Obstruction
        + Mesenteric Ischemia
        + Vasculitis
        + Drug – Induced Enteropathy
        + Radiation Enteritis
        + Obscure Gastrointestinal bleeding
      * COLON & RECTUM
        + Normal Anatomy & Imaging Techniques
        + Pathologic Conditions
    - Biliary Tract & Gallbladder
      * BILIARY TRACT
        + Normal anatomy & Variants
        + Congenital Biliary Anomalies
        + Pathologic Conditions
      * GALLBLADDER
        + Normal Anatomy
        + Congenital Variants & Anomalies
        + Pathologic Conditions
    - Liver: Normal Anatomy, Imaging Techniques & Diffuse Diseases
      * Normal Anatomy & Variants
      * Hepatic Imaging Techniques
      * Diffuse Parenchymal Diseases of the Liver
    - Liver: Focal Hepatic Mass Lesions
      * Types of Lesions
      * Imaging Techniques
    - Liver Transplantation
      * History
      * Indications for Liver Transplantation
      * Contraindications to Liver Transplantation
      * Evaluation of the Donor
      * Surgical Techniques
      * Posttransplant Complications
      * Conclusion
    - Pancreas
      * Normal Anatomy
      * Embryology & Developmental Anomalies & Variants
      * Imaging Techniques
      * Pathologic conditions
      * Trauma
      * Pancreatic Transplantation
    - Peritoneum
      * Embryology
      * Normal Peritoneal Anatomy
      * Peritoneal Physiology
      * Pathologic Conditions
      * PET Imaging of Peritoneal Processes
    - Mesentery
      * Embryology
      * Normal Anatomy
      * Imaging Findings in Disease
      * Primary Mesenteric Diseases
      * Secondary Mesenteric Disease
    - Spleen
      * Normal Anatomy & Variants
      * Imaging Techniques
      * Pathologic Conditions
      * Trauma
      * Splenic Infarct
      * Miscellaneous Disorders of the Spleen
  + **Genitourinary Imaging**
    - Contrast Nephropathy & Its Prevention
      * Risk Factors for Contrast-Induced Nephropathy
      * Incidence
      * Pathophysiology
      * Reducing the Risk of Contrast-Induced Nephropathy
      * Summary
    - Adrenal Glands
      * Normal Development & Anatomy
      * Adrenal Physiology
      * Imaging Techniques
      * Pathologic Conditions
      * Percutaneous Adrenal Biopsy
    - Kidney
      * Normal Computed Tomographic Anatomy
      * Imaging Techniques
      * Pathologic Conditions
      * Renal Trauma
      * Renal Blood Flow Disorders
      * Urinary Tract Stones
      * Retroperitoneal Fibrosis
      * Urinoma
      * Renal Transplants
    - Retroperitoneum
      * Normal Anatomy
      * CT & MRI of the Retroperitoneum
      * Pathologic Conditions
      * Retroperitoneal Fluid Collections
      * Retroperitoneal & Pelvic Lymphadenopathy
      * Other Selected Retroperitoneal Neoplasms
      * Miscellaneous Nonneoplastic Retroperitoneal Conditions
    - Male Pelvis
      * Normal Anatomy
      * Imaging Techniques
      * Pathologic Conditions
      * Trauma
    - Female Pelvis
      * Normal Anatomy
      * Developmental & Congenital Abnormalities
      * Imaging Considerations
      * Pathologic Conditions
      * Inflammatory Conditions
      * Vascular Diseases

**TRAINING SCHEDULE:**

State-of-the-art equipment includes 64-slice CT, 1.5-T MRI, PET/CT, Gamma Imaging, digital radiography, US, Digital Mammography, Perfusion MRI , MR Spectroscopy.

* 64 Slice CT : Three sessions per week
* 1.5T MRI : three sessions per week
* Ultrasound : One session per week
* Nuclear Medicine (PET CT & GammaCT) : one sessions per week
* Flexible session for simple imaging-guided interventional procedures
* General cross section radiology (reporting / procedures) : three session per week
* Study / meetings : one session per week
* Research / audit : one session per week