

Curriculum

FNB Fellowship



Musculoskeletal Radiology

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I. INTRODUCTION

The Musculoskeletal Radiology Fellowship is a two-year advanced training in clinical radiology and research to prepare fellow to bring musculoskeletal imaging and intervention expertise for an academic as well as specialty practice.

II. PROGRAMME GOALS AND OBJECTIVES

1. Programme Goal

During the fellowship Programme, the fellow will receive advanced training in all aspects of musculoskeletal imaging in both outpatient and hospital radiology settings and work closely with experts in its imaging and interventional aspects. The detailed learning experience will enable fellow to become highly proficient in various components of musculoskeletal radiology. This program shall teach radiologists how to plan, protocol, perform and interpret studies and procedures at a subspecialty level, preparing them to bring musculoskeletal imaging expertise to an academic as well as specialty practice.

2. Programme Objectives

- i. Become conversant with advanced interpretation of all MSK-related imaging modalities including radiography, sonography, CT-scan (including Dual-energy CT), MRI (including arthrogram), fluoroscopy, DEXA, and DSA.
- ii. Know proper radiographic views of musculoskeletal system and Interpret them properly.
- iii. Interpret MSK CT especially in trauma setting and incorporate classification systems of fractures in reporting.
- iv. Perform and interpret ultrasound for various musculoskeletal indications including familiarity with equipment, technical factors and various positioning techniques & dynamic maneuvers.

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- v. Interpret MRI examination of various joints for internal derangements, tendon and ligament tears, bone and soft tissue tumors and tumor like lesions, MR arthrogram, MR neurography.
 - vi. To perform various MSK intervention procedures as per standardized protocol.
 - vii. To understand the treatment protocols for various Musculoskeletal disorders through the clinical and radiology rounds.
 - viii. Learn the basics of research methodology and pursue both clinical and experimental research in this field.

III. TEACHING AND TRAINING ACTIVITIES

1. Academic Training:

- a. MSK MRI- 7 months
- b. MSK CT- 3 months
- c. MSK USG-5 months
- d. MSK Radiographs- 3 months
- e. MSK interventions- 3 months
- f. Miscellaneous (Nucl Med,Ortho,Rheumat and Histopath)-2 months
- g. Elective-1 month

2. Case load of the department:

a. Diagnostic imaging:

- i. Magnetic Resonance Imaging:
 - Extremity MRI, Spine MR, MR arthrography.
 - Spectrum: Congenital/variants, Arthropathy, trauma, infection, tumor, Spondyloarthropathy.
 - Advanced MR imaging: Advanced Bone tumor imaging, Cartilage imaging, Diffusion Neurography.
 - Post operative imaging

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- ii. Computed Tomography:
 - Musculoskeletal trauma, Assessment of arthropathy, focal bone lesions, Spine assessment such as scoliosis, post-operative scans.
 - Advanced CT imaging: Dual energy CT for gout assessment.
 - CT arthrography
 - iii. Ultrasound:
 - Imaging of joint, Synovium, ligaments, tendons, nerves, muscles, dynamic imaging of joints.
 - Sports imaging, rheumatological imaging.
 - Advanced US imaging: Elastographic imaging.
 - iv. Radiographs:
 - Congenital/Variants, Trauma, tumor, infection, metabolic bone diseases.

b. Interventions:

- i. US-guided MSK procedures
 - Joint fluid aspiration, cyst aspiration, abscess aspiration, Synovial biopsy, soft tissue biopsy, Therapeutic joint injection, Sclerosant injection in soft tissue haemangioma, Sports intervention.
 - Advanced intervention: Platelet rich plasma injections, prolotherapy
- ii. Fluoroscopy-guided procedures
 - Arthrography (shoulder, wrist, elbow)
 - Advanced intervention: Vertebroplasty, kyphoplasty, cementoplasty (desirable)
- iii. CT- guided MSK procedures
 - Nerve root injection, facet joint injection, facet cyst fenestration, SI joint injection, vertebral biopsy, bone tumor biopsy, unicameral bone cyst injection, ABC sclerosant injection.
 - Advanced intervention: CT-guided radiofrequency ablation of osteoid osteoma, Radiofrequency ablation with cementoplasty (Desirable).

IV. SYLLABUS

1. Radiography:

- a. Important radiographic views for each joint and bone
- b. Normal measurements on the radiographs
- c. Interpretation of normal variants and artifacts
- d. Interpretation of Post-operative and post implant fixation radiographs
- e. Anomalies, Bone Dysplasias
- f. Trauma radiographs
- g. Arthritis and osteomyelitis
- h. Hematologic and vascular disorders including osteonecrosis
- i. Nutritional, metabolic and endocrine disorders including Osteoporosis, Osteomalcia /Rickets, Scurvy, Fluorosis
- j. Bone tumors and Tumor-Like Lesions including Cartilaginous tumors, bone-forming neoplasms, fibrous and fibro-histiocytic lesions, metastases myeloma.

2. Ultrasound & Doppler:

- a. Normal joint and soft tissue anatomy
- b. Normal variants and artifacts
- c. Evaluation of soft tissue vascular anomalies including venous and lymphatic malformations, arterio-venous malformations and vascular tumors
- d. Nerve injuries and other nerve pathologies
- e. Muscle injuries, avulsions, tears and other muscle pathologies
- f. Ligaments injuries and pathologies
- g. Tendon abnormalities like tenosynovitis, tendinosis, tendon degeneration and tears
- h. Soft tissue masses and other soft tissue pathologies

3. MRI:

- a. Physics and technical part of MRI with spending time on MR console
- b. Protocolling, monitoring and interpretation of MR Examinations
- c. Normal cross-sectional anatomy of extremities especially of shoulder, elbow, wrist, hand, hip, knee, ankle and feet
- d. MRI of spine- Trauma, arthropathies, Infection, tumors and other pathologies
- e. Bone and soft tissue tumors
- f. Evaluation of ligaments, tendons, instabilities and impingements
- g. Brachial plexus imaging
- h. MR neurography
- i. Vascular malformations
- j. Dynamic MR angiography

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- k. MR arthrography
 - l. Marrow pathologies
 - m. Sports related injuries
 - n. Cartilage mapping
 - o. Post operative imaging
4. **CT:**
 - a. Trauma including fracture and dislocations of the spine, pelvis and extremities
 - b. Bone tumors
 5. **Fluoroscopy:**
 - a. Fluoroscopy guided procedures
 6. **Bone Densitometry** for Bone mineral density
 7. **Interventional procedures**
 - a. Interventional procedures (diagnostic)
 - Arthrograms
 - USG / CT/ Fluoroscopy guided FNAC/Biopsy
 - Bone/ Joint / ganglion cyst aspiration
 - b. Interventional procedures (therapeutic)
 - Radiofrequency ablation of osteoid osteoma and painful tumor-like lesions
 - USG guided procedures
 - Laser ablation
 - Vertebroplasty
 - Joint and bursal injections, tenotomy
 - Angio-embolization of high flow vascular malformations
 - Pre-operative embolization for vascular bone and soft tissue neoplasms
 8. **Research and Presentation**

The fellow should attend and present oral paper/poster in conferences/CMEs
(One international conference and two national conferences/CME related with MSK radiology are necessary)
The fellow should write and publish two research paper (at least one original) in indexed journals.

V. COMPETENCIES

After two-year fellowship, the fellow will be:

1. Competent to interpret correct radiographic views of bones and joints. They will be able to interpret radiographs of congenital anomalies, trauma, infective / inflammatory conditions of bone, bone tumors and miscellaneous bony conditions.
2. Competent to independently perform diagnostic USG of MSK conditions related to sports injury, orthopedic conditions, and Rheumatological conditions.
3. Competent to independently perform UGG guided interventions in various MSK related soft tissues and joint conditions, CT guided bone tumor biopsies and other conditions related to bone, vertebral biopsies and RFA of osteoid osteoma, Fluoroscopy guided arthrogram, vertebroplasty, tumor embolization.
4. Competent to perform MRI as per clinical indication tailored study, independently interpret various bone and joint MRI, MR arthrograms, MR neurography and advanced bone tumor imaging.
5. Competent to interpret CT of MSK conditions particularly trauma and interpret as per classifications

VI. LOG BOOK

A candidate shall maintain a log book of operations (assisted / performed) during the training period, certified by the concerned post graduate teacher / Head of the department / senior consultant.

This log book shall be made available to the board of examiners for their perusal at the time of the final examination.

The log book should show evidence that the before mentioned subjects were covered (with dates and the name of teacher(s) The candidate will maintain the record of all academic activities undertaken by him/her in log book.

1. Personal profile of the candidate
2. Educational qualification/Professional data
3. Record of case histories

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4. Procedures learnt
 5. Record of case Demonstration/Presentations
 6. Every candidate, at the time of practical examination, will be required to produce performance record (log book) containing details of the work done by him/her during the entire period of training as per requirements of the log book. It should be duly certified by the supervisor as work done by the candidate and countersigned by the administrative Head of the Institution.
 7. In the absence of production of log book, the result will not be declared.

VII. RECOMMENDED TEXT BOOKS AND JOURNALS:

1. Orthopedic Imaging: A Practical Approach, 6th edition, Adam Greenspan M.D., FACR, Javier Beltran.
2. Essentials of Skeletal Radiology, 3rd edition Terry R. Yochum, Lindsay J. Rowe M App Sc.
3. Internal derangements of joints, Donald Resnick MD
4. Practical Musculoskeletal Ultrasound, 2nd edition, Eugene McNally MD
5. Fundamentals of Musculoskeletal Ultrasound, 3rd edition, Jon A. Jacobson MD
6. Fundamentals of Skeletal Radiology, 5th Edition, Clyde A. Helms MD
7. Magnetic Resonance Imaging in Orthopedics and Sports Medicine, 3rd Edition, David W. Stoller MD FACR
8. Essentials of Radiofrequency Ablation of the Spine and Joints 1st ed. Timothy R. Deer, Nomen Azeem
9. Image-Guided Percutaneous Spine Biopsy 1st ed, A. Orlando Ortiz
10. Percutaneous Vertebroplasty, 1st ed, John M. Mathis M.D.
11. Regenerative Injections in Sports Medicine: An Evidenced Based Approach, 1st ed. Suad Trebinjac, Manoj Kumar Nair
12. Current Concepts of Diagnosis and Treatment of Bone and Soft Tissue Tumors, 1st ed. H. K. Uthoff, E. Stahl
13. The American Journal of Sports Medicine
14. British Journal of Sports Medicine

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15. Journal of clinical orthopedics and trauma
 16. Diagnostic and Interventional Radiology
 17. American journal of radiology
 18. British Journal of Radiology
 19. Indian Journal of Musculoskeletal Radiology
 20. Journal of Bone Oncology
 21. The Journal of Rheumatology.
 22. Skeletal Radiology.
 23. Radiology
 24. Radiographics
 25. Seminars in Musculoskeletal Radiology
 26. European journal of Radiology
 27. European Radiology
 28. Indian Journal of Radiology



आयुर्विज्ञान में राष्ट्रीय परीक्षा बोर्ड
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**Ministry of Health & Family Welfare, Govt. of India
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