

MUSCULOSKELETAL IMAGING

James A. Haley VA Hospital

Rotation Director: Sangeeta Rao, M.D.

General Goals: The field of musculoskeletal radiology consists of a diversity of topics that can be more easily learned by categorization into subdivisions of bone pathology: metabolic, tumor, dysplasias, arthritis, and trauma. The use of an algorithmic approach to musculoskeletal imaging allows the resident to properly arrive at a concise and well-thought out differential diagnosis.

The first year resident should obtain a fundamental grasp of basic orthopedic radiology, and should also begin to categorize and organize subdivisions of musculoskeletal radiology such as rheumatology, neoplasms, etc.

The second year resident should be increasingly knowledgeable in orthopedic radiology, particularly with increased experience in the Emergency Department. At this point, more detailed knowledge of neoplastic and metabolic processes as well as rheumatologic disorders is warranted.

Third and fourth year residents should become increasingly capable of diagnosing musculoskeletal pathology on all modalities and in applying the algorithmic approach to differential diagnoses.

Daily Work: The radiology resident assigned to “Musculoskeletal Imaging” should begin review of radiographic, CT, and MR cases via PACS immediately after arrival from morning conference. All pertinent previous radiographs and CT scans must be reviewed, if available. The staff radiologist assigned to the section, primarily Dr. Sangeeta Rao, will subsequently review cases as they are presented by the resident.

Requests for consultation made by the clinical staff should be handled by the resident working with the staff radiologist. During their second, third and fourth months on a musculoskeletal rotation, residents should take increasing responsibility in those consultations. The staff radiologist will be available at all times. Resident presence in the reading area, except for conference periods, is maintained until at least 4:30 p.m. All dictations should be completed prior to leaving the area.

Dr. Sangeeta Rao, who has formal fellowship training in musculoskeletal radiology, will be primarily responsible for supervising this curriculum and evaluating resident performance.

Suggested Reading:

1. Fundamentals of Skeletal Radiology. Clyde A. Helms.
2. Arthritis in Black and White. Anne C. Brower
3. Musculoskeletal MRI. Kaplan, Helms, Dussault, Anderson, Major.

Educational Goals and Objectives:

First Year Residents

Patient Care:

- Be able to critique the technical quality of a radiograph
- Understand the indications for more advanced imaging (ultrasound/CT/arthrography/MRI)
- Be able to protocol, with assistance, musculoskeletal examinations

Medical Knowledge:

- Fundamental understanding of basic orthopedic radiology, pertinent normal anatomy in a musculoskeletal radiograph
- Recognize and describe, in a systematic fashion, radiographic findings on a radiograph
- Begin to categorize and organize subdivisions of musculoskeletal radiology such as rheumatology, neoplasm, infection, etc.
- Should be able to distinguish an aggressive process, such as malignant tumor or infection, from a more benign process, such as a benign bone tumor, based on specific radiographic findings
- Be facile with basic orthopedic concepts. The resident should be able to very specifically and accurately describe a fracture such that the referring orthopedic surgeon would be able to envision the fracture in three dimensions. The resident should have a grasp on basic classification systems of fractures such as intraarticular vs. extraarticular, as well as named fracture such as Monteggia, Galeazzi, etc.
- Discuss the most common musculoskeletal pathologic entities
- Have a basic understanding of technique and indications for arthrography, bone biopsy and other invasive procedures. Additionally, the residents should be well aware of the strengths and limitations of musculoskeletal MRI and computed tomography in the evaluation of musculoskeletal disorders. Indications for radionuclide bone scanning should also be understood, as should the basic concepts of this imaging modality, and interpretation of some of the more common bone scans.

Interpersonal and Communication Skills:

- Call referring physicians for positive results
- Communicate effectively with all members of the health care team

Practice-Based Learning and Improvement:

- Identify, rectify and learn from personal error
- Incorporate feedback into improved performance
- Use electronic and print resources to access information

Professionalism:

- Demonstrate respect for patients and members of health care team
- Respect patient confidentiality
- Come to work with a professional appearance
- Demonstrate a responsible work ethic

Systems-Based Practice:

- Demonstrate knowledge of ACR standards
- Attend imaging conferences
- Attend orthopedic grand rounds when possible
- Attend orthopedic bone tumor conferences when possible

Second and Third Year Residents

Patient Care:

- Protocol CT and MRI exams without assistance
- Monitor musculoskeletal CT exams
- Understand indications for MRI

Medical Knowledge:

- Increasingly facile with orthopedic radiology
- More detailed knowledge of neoplastic, metabolic, infectious and rheumatologic disorders is warranted
- Discuss the most common techniques in musculoskeletal imaging, the indications and contra-indications and complications of the following:
 - Radiography and fluoroscopy
 - Musculoskeletal scintigraphy
 - Arthrography
 - Musculoskeletal biopsy
 - CT
 - MRI
- Describe pertinent normal anatomy on MRI's of shoulder, knee, hip, elbow, wrist, hand, foot and ankle

Interpersonal and Communication Skills:

- Communicate effectively with patients and all member of the health care team
- Function as a consultant in musculoskeletal radiology yet be free to obtain more experienced opinions

Practice-based Learning and Improvement:

- Identify, rectify and learn from personal error
- Incorporate feedback into improved performance
- Use electronic and print resources to access information

Professionalism:

- Demonstrate respect for patients and members of health care team
- Respect patient confidentiality
- Come to work with a professional appearance
- Demonstrate a responsible work ethic

Systems-Based Practice:

- Demonstrate knowledge of ACR standards
- Attend imaging conferences
- Attend orthopedic grand rounds when possible
- Attend orthopedic bone tumor conferences when possible
- Greater participation in unknown case analysis at noon conference is expected

Fourth Year Residents:

Patient Care:

- Protocol CT and MRI examinations without assistance
- Monitor musculoskeletal CT and MRI exams
- Understand indications for CT contrast and gadolinium

Medical Knowledge:

- Discuss the radiographic findings of all musculoskeletal pathology
- Establish a precise diagnosis and provide a pertinent differential diagnosis
- Orient and supervise the investigation of a patient or of a specific disease
- Discuss MRI findings of musculoskeletal pathology
- Understand and appreciate orthopedic procedures of greater complexity such as joint replacement, osteotomies, spinal fixation
- Be able to streamline the diagnostic imaging work-up for a specific musculoskeletal abnormality

Interpersonal and Communication Skills:

- Communicate effectively with patients and all member of the health care team
- Function as a consultant in musculoskeletal radiology yet be free to obtain more experienced opinions

Practice-Based Learning and Improvement:

- Identify, rectify and learn from personal error
- Incorporate feedback into improved performance
- Use electronic and print resources to access information

Professionalism:

- Demonstrate respect for patients and members of health care team
- Respect patient confidentiality
- Come to work with a professional appearance
- Demonstrate a responsible work ethic

Systems-Based Practice:

- Demonstrate knowledge of ACR standards
- Attend imaging conferences
- Attend orthopedic grand rounds when possible
- Attend orthopedic bone tumor conferences when possible
- Greater participation in unknown case analysis at case conference is expected

Evaluation: Medical knowledge in musculoskeletal radiology will be specifically evaluated by the ACR in-service examination and the mock oral board examination. Patient care, practice-based learning and systems-based practice relevant to musculoskeletal radiology will be evaluated by imaging conference presentations and monthly global evaluations by the faculty.