



OSTEOMYELITIS

- Clinical findings are still the mainstay for suspecting the diagnosis of musculoskeletal infections, especially osteomyelitis. [1](#)



- No single test has 100% specificity and sensitivity for every case of musculoskeletal infection. Depending on the age of the patient, presence of orthopaedic hardware, location of infection, and systemic conditions, the choice of imaging modalities must be tailored to the patient's condition. [1](#)

PLAIN RADIOGRAPHY

- Initial modality for investigation of suspected osteomyelitis. [1,2](#)
- May be normal in early stages of osteomyelitis because 30-50% loss of bone density is required before a radiograph becomes abnormal. [1](#)
- Earliest radiographic finding is deep soft tissue swelling that may cause obliteration of the tissue planes. [1](#)
- Characteristic bone changes (periosteal new bone, bone erosion etc) may take 10-14 days to appear. [1](#)
- When changes are present they are often non-specific. [3](#)
- Normal plain radiographs do not exclude osteomyelitis.
- Guides the selection of subsequent imaging by determining if the suspected osteomyelitis is superimposed on some other process that requires more complex evaluation.

BONE SCAN

- Next imaging study of choice for investigation of suspected osteomyelitis. [4](#)
- High (>90%) sensitivity and specificity for detection of osteomyelitis in patients with normal radiographs. [4,6](#)
- Highly sensitive in early diagnosis of osteomyelitis (usually abnormal within 24hrs of the onset of symptoms). [4](#)
- Allows differentiation of cellulitis from osteomyelitis or septic arthritis. [5](#)
- Cellulitis is characterised by initially high soft tissue uptake in the flow and blood pool phases, with mild and diffuse bone uptake in the third phase. [5](#)
- Osteomyelitis causes increased uptake in the earlier phases and focal intense uptake on the delayed images. [5](#)
- Limitations:
 - Reduced specificity in a bone with pre-existing conditions, such as fractures, orthopaedic hardware, or arthropathy. [5,7-9](#)

LABELLED WHITE CELL SCAN

- High (>95%) sensitivity and specificity for acute osteomyelitis. [4,7,10,11](#)





- Particularly useful in excluding infection in a previously violated site of bone such as post-traumatic, diabetic, and postsurgical conditions. [4,7,10,11](#)
- Correlation with three-phase bone scan is recommended and usually required for accurate localisation. [10,12](#)
- More specific than gallium scan and three-phase bone scan. [4,12](#)
- Highly accurate in detection of osteomyelitis of the foot in patients with diabetes. [13,14](#)
- An monoclonal antibody marker targeted at granulocytes is available within Australia but has limited indications for use.
- Limitations:
 - Less sensitivity for chronic osteomyelitis. [9,15](#)
 - Low sensitivity for vertebral osteomyelitis. [16](#)
 - Normal bone marrow activity can confound image interpretation.
 - Complex preparation.
 - Higher cost.
 - Relatively higher radiation dose to the spleen.

MAGNETIC RESONANCE IMAGING

- Alternative if labelled white cell study not available.
- Comparable accuracy to that of labelled white cell study. [17,18](#)
- Aids surgery by delineating sinus tracts and soft tissue abscesses, by differentiating osteomyelitis from cellulitis, and by disclosing the extent of intramedullary involvement. [17,19,20](#)
- Superior to CT for evaluating the extent of infection. [17](#)
- Advantages: [1](#)
 - No ionising radiation
 - High sensitivity in early stages
 - Rapid examination
 - High contrast resolution
 - Direct multiplanar imaging
 - Direct demonstration of bone marrow involvement
 - Accurate assessment of spinal canal involvement and soft tissue abscesses
 - Immediate visualisation of neural structures
- Limitations: limited availability and high expense.

GALLIUM SCAN

- Alternative if labelled white cell study or MRI is not available.





- Used in combination with bone scans to diagnose osteomyelitis in specific situations of possible spinal osteomyelitis. [5](#)
- Similar sensitivity but improved specificity compared to bone scan alone. [4](#)
- Criteria for diagnosing osteomyelitis are: [5](#)
 1. Gallium activity greater than bone scan uptake
 2. Discordant uptake
- Limitations:
 - High radiation dose
 - Poor spatial resolution
 - 48-hr delayed imaging necessary for optimal Ga-67 scintigraphy.
 - Lacks specificity in evaluation for suspected osteomyelitis that is superimposed upon other diseases causing increased bone turnover. [9,12](#)

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FURTHER READING

1. Sammak B, Bagi AE, Al Shahed M, et al. **Osteomyelitis: a review of currently used imaging techniques.** Eur Radiol 1999;9:894-900. (Pictorial Review)

Website

For more information go to www.imagingpathways.health.wa.gov.au

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