Three phase bone scan

Technetium-99m (99mTc) pertechnetate is a radioisotope that may be attached to various substrates for use in bone scanning. It may be used to label polyphosphate (rarely used today), diphosphonate [1)]

(MDP), or phosphorous (HDP) (the most widely used agent currently). Accumulates in areas of osteoblastic activity.

Three-phase bone scan: uses technetium 99m-HDP. Images are obtained immediately after injection (flow phase), at 15 min (blood pooling) and in 4 hours (bone imaging). Cellulitis shows up as increased activity in the first 2 phases, and there is little or diffuse increased activity in the 3rd. Osteomyelitis causes increased uptake in all 3 phases.

Used in evaluation of acute osteomyelitis with sensitivity and specificity of ≈ 95% each, and is usually positive within 2–3 days. False positives can occur in conditions involving increased bone turnover, e.g. fracture, septic arthritis, tumors. False negative can occur in cases with associated bone infarction.

Applications for bone scans include:

1. infection

a) osteomyelitis of the spine—vertebral osteomyelitis —or skull osteomyelitis.

b) discitis

2. tumor

a) spine metastases

b) primary bone tumors of the spine

c) skull tumors

3. diseases involving abnormal bone metabolism

a) Paget’s disease: of the skull or spine

b) hyperostosis frontalis interna

4. craniosynostosis

5. fractures: spine or skull

6. “low back problems”: to help identify some of the above conditions

1)
Handa J, Yamamoto I, Morita R, et al. 99mTc- Polyphosphate and 99mTc-Diphosphonate Bone Scintigraphy in Neurosurgical Practice. Surg Neurol. 1974; 2:307–310