



White Blood Cell Imaging

GALVESTON COLLEGE NUCLEAR MEDICINE

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Patient History

- ▶ Age: 60 year old Male
- ▶ Suspected osteomyelitis of left foot and ankle
- ▶ Referred for comparative follow up after an X-Ray and MRI imaging completed after metal removal July 2023.
- ▶ **Indications for Procedure:**
 - ▶ Musculoskeletal infections such as disc space, joint space, prosthetic joint and other orthopedic hardware.
 - ▶ Osteomyelitis superimposed on existing bone pathology, osteomyelitis in diabetics. (99mTc-sulfur SPECT Marrow Maps to assess presence of anomalous marrow)
 - ▶ Differentiating osteomyelitis from bone infarction
 - ▶ Fever of unknown origin (FUO)
 - ▶ Detection and localization of an unknown source of sepsis (occult infection)

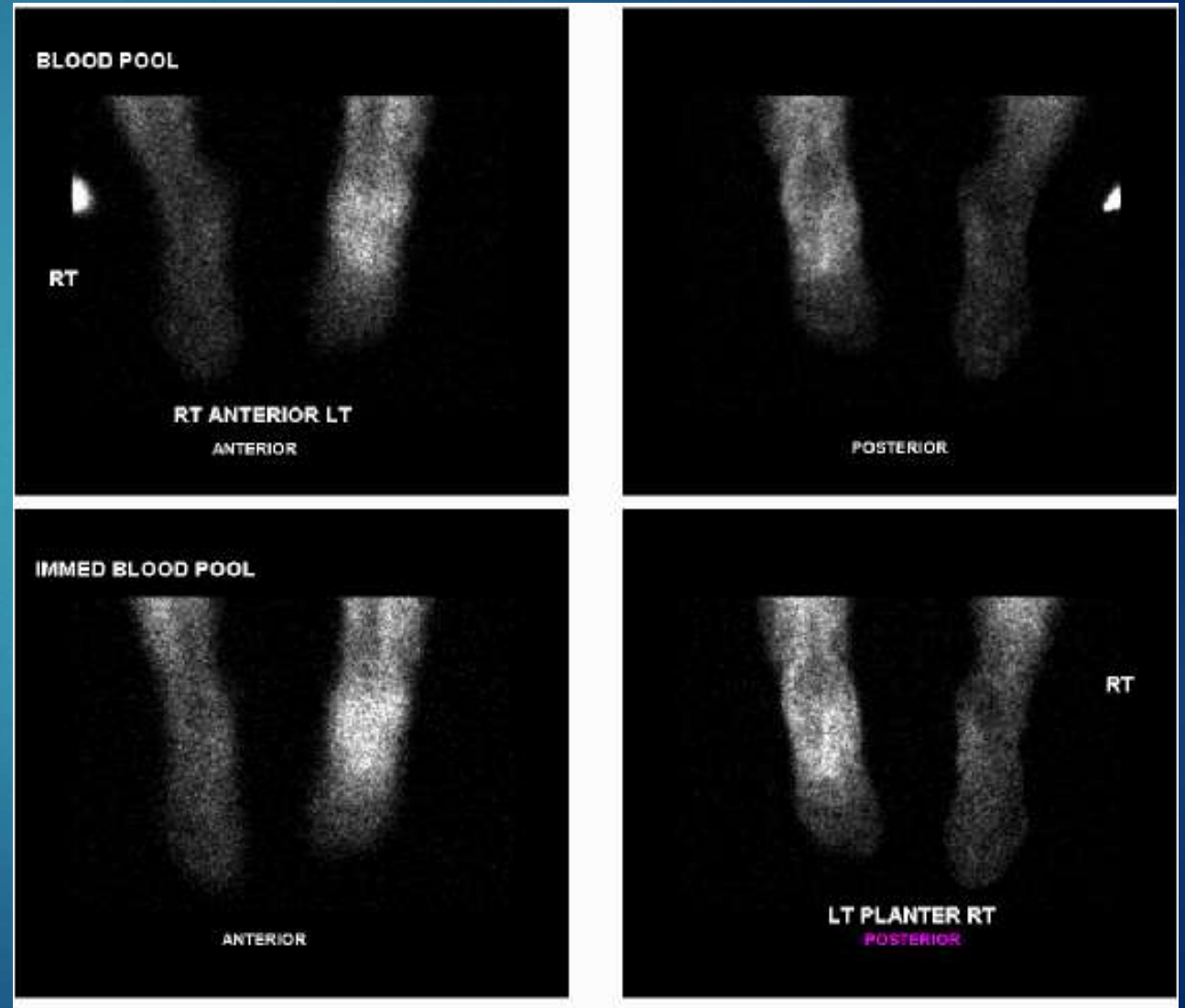
99-m-Tc HMPAO-WBC

- ▶ 3-phase acquisition (flow, 90min dynamic, 4 hour delay)
- ▶ Dose: 11.7 mCi 99mTc-HMPAO labeled WBC intravenous injection
- ▶ GE Infinia Hawkeye 4 SPECT-CT gamma camera
- ▶ Low Energy High Resolution Collimators with 20% window centered at 140 KeV



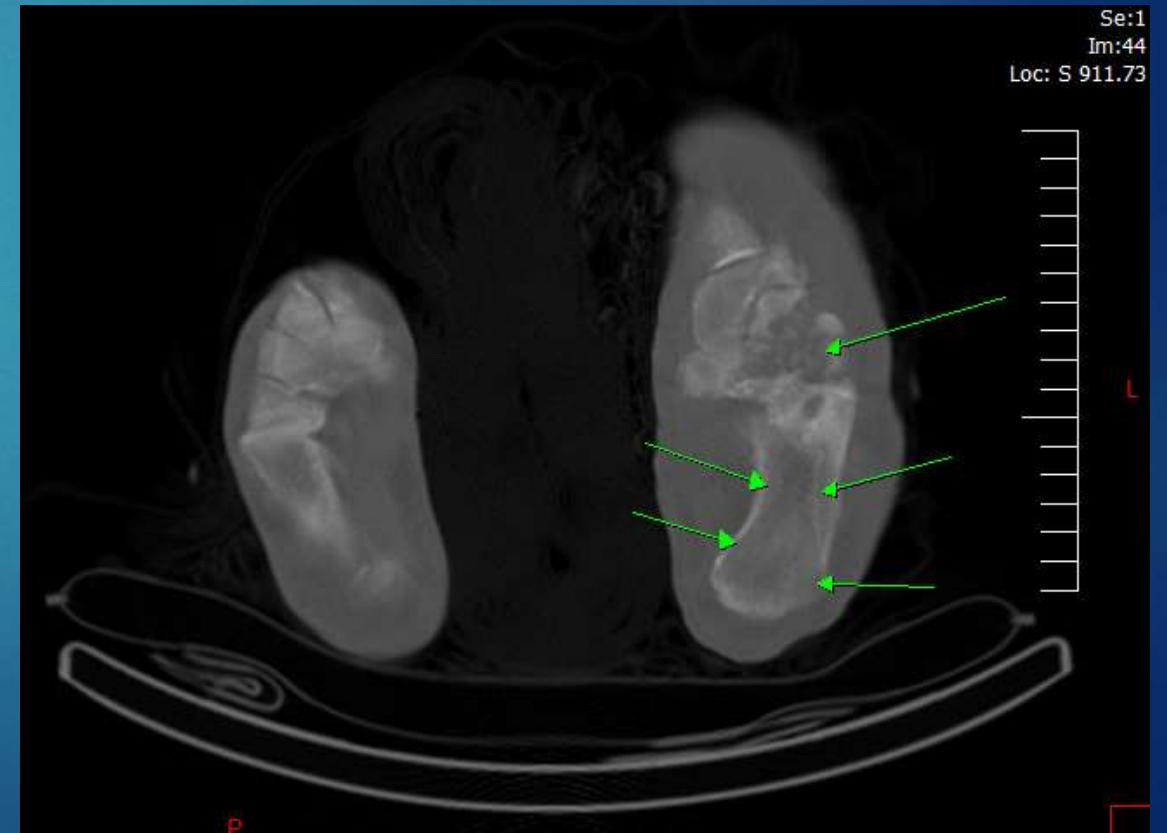
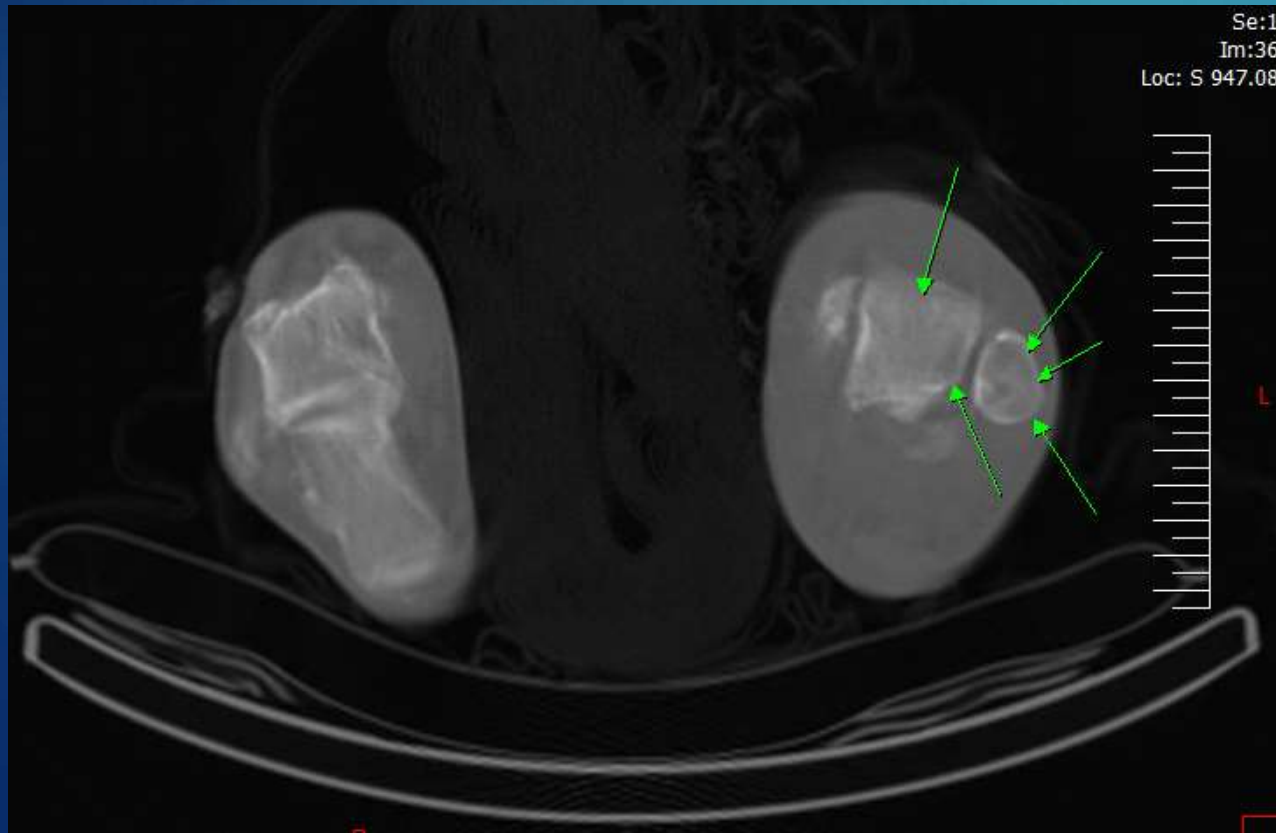
99-m-Tc HMPAO-WBC

- ▶ Significantly increased perfusion to left foot relative to right side- focal increased WBC accumulation in the left ankle, mostly in distal fibular, talus,
- ▶ Diffusely involves left metatarsal bones, consistent with osteomyelitis.
- ▶ Correlative X-RAY/MRI performed outside clinic system not available at time of report. No Artifacts, patient motion, or infiltration noted).



99-m-Tc HMPAO-WBC

- ▶ Findings: Nuclear-SPECT-CT
- ▶ CT images of left ankle (pictured at left below) and left foot present with apparent translucencies share anatomical region with those areas of increased radio-labelled leukocyte uptake. Ankle picture below at left joined with first prominent slice of Left Talus



99-m-Tc HMPAO-WBC

- ▶ MR findings: Deep soft tissue ulcer along lateral distal phalanx of great Toe with underlying reactive marrow change.
- ▶ XR Findings: Charcot arthropathy of mid-foot with fragmentation of navicular., severe osteoarthritis of the midfoot. (Images Unavailable)



Considerations for Normal Biodistribution

- ▶ Normal findings at 18 to 24 hours of the study include uptake primarily by the reticuloendothelial system of the spleen, liver, and bone marrow. Diffuse pulmonary activity occurs up to 4 hours after injection, and this is a normal finding (Herron et al, 2022).
- ▶ For abscesses, the uptake in that pathologic area may have uptake either greater than or equal to the uptake of the liver. Up to one-half of the cases can be visualized four hours after injection, with greater than 90% uptake by 24 hours (Herron et al, 2022).
- ▶ If a patient has been receiving treatment with IV antibiotics before obtaining a nuclear scan with radiolabeled indium, the results may show limited uptake in that area, producing a false negative result (Herron et al, 2022).

Take-Home Points

- ▶ How does the type of infection (acute vs chronic) affect the isotope to be used (hint: half-life)?
- ▶ Why would it be good to have a Marrow Map done for patients with implants (hint: biodistribution variant for prosthetics)?
- ▶ Why is it beneficial to have correlative tests performed, and which modality provides the best interpretation (hint: extent of infection)?

Bibliography

- ▶ Clinical Protocol: Tagged White Blood Cell Studies (In-111-WBCs, Tc-99m-HMPAO-WBCs), UT Southwestern Department of Radiology: https://www.utsouthwestern.edu/education/medical-school/departments/radiology/protocols/assets/WHITE_BLOOD_CELL.pdf
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- ▶ Mary Beth Farrell, et al. Quick-Reference Protocol Manual for Nuclear Medicine Technologists. Reston, Va, Published By Society Of Nuclear Medicine And Molecular Imaging, 2014.
- ▶ Herron T, Gossman W. 111 Indium White Blood Cell Scan. [Updated 2022 Oct 7]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK554556/>
- ▶ 99mTc-HMPAO–Labeled WBC Scan for the Diagnosis of Chronic Recurrent Multifocal Osteomyelitis: <https://tech.snmjournals.org/content/jnmt/42/4/299.full.pdf>
- ▶ Tc-99m Labeled HMPAO white Blood Cell Scintigraphy in Pediatric Patients: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3590957/pdf/MIRT-21-13.pdf>