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Kaitlyn Gurnari
gurnarik@misericordia.edu

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White Blood Cell Scintigraphy in Nuclear Medicine

MISERICORDIA UNIVERSITY

Kaitlyn Gurnari and Lynn Blazaskie M.S.,R.T. (R)

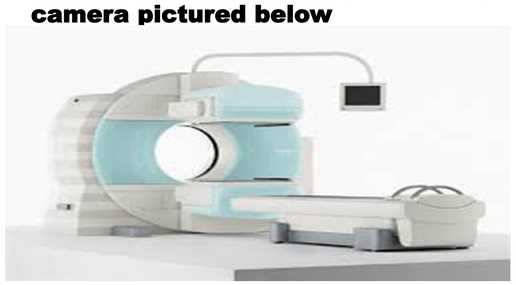
INTRODUCTION

- Nuclear medicine is an imaging modality that determines medical problems based on the function of organs and tissues
- This modality is a specialized department that focuses on the administration of radiopharmaceuticals to aid in diagnosing abnormalities and diseases.
- Tc99m is the most commonly used radiopharmaceutical in nuclear medicine

(Long, Rollins, and Smith, 2019)

WHITE BLOOD CELL SCINTIGRAPHY

- White blood cell (WBC) scans are commonly performed in nuclear medicine departments utilizing a gamma Single Photon Emission Computed Tomography (SPECT/CT) camera pictured below



(Absolute Medical Imaging, 2019)

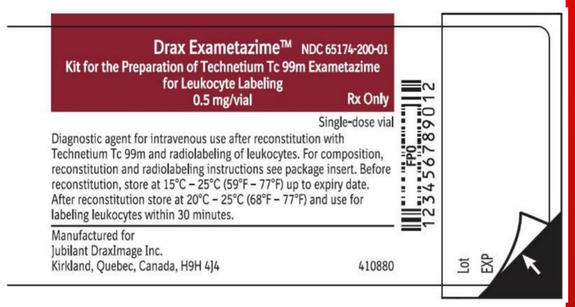
- These scans are considered to be the gold standard to detect infection sites.
- The technologist draws 40 mL of blood from the patient and tags the blood with a radioactive tracer utilizing the following procedure to tag blood cells:

(Palestro and Love, 2017)

- .25 units of heparin is added to a syringe

(Pigmon, Weatherman, Brehl, and Nielson, 2016)

- The sample is added to 8 mL 6% Hydroxyethyl starch
- Mix gently for 2 minutes
- Add 7 mCi-25 mCi Tc99m-HMPAO to blood sample
- Reinject sample between 1-2 hours after tagging



(GE Healthcare, 2013)

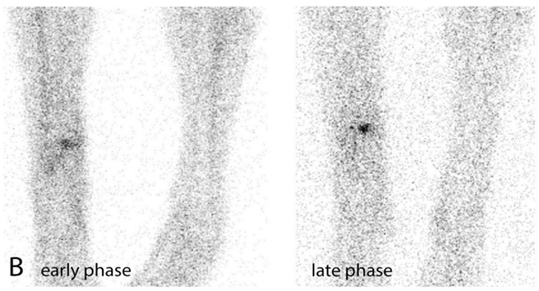
FRACTURE-RELATED INFECTION DETECTION

- Post-op infection most common and serious
- Advanced imaging is required for diagnosis
- Early detection is key for diagnosis

SURGICAL FIXATION INFECTION CASE STUDY

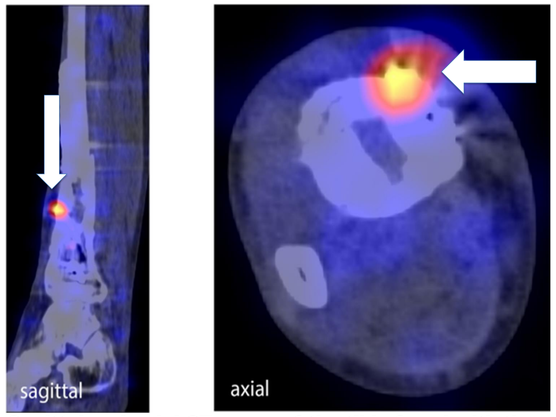
- White blood cell scans of 162 patients recovering from open/closed fracture fixations were evaluated
- Infections occurred between February 2009 and November 2019
- Infections present in appendicular skeleton only
- Most commonly affected anatomic regions
- Scans taken at 4hrs (early phase) and 24hrs (late phase)
- <u>Results</u>: 92% accurate with 97% sensitivity

(Govaert et al., 2018)



SPECT scan of patient's lower leg with increased uptake of tracer, indicating an infection.

(Govaert et al., 2018)



Sagittal and axial CT scans of the tibia fused with the above image indicating exactly where in the body the infection is located; indicated by arrows

(Govaert et al., 2018)

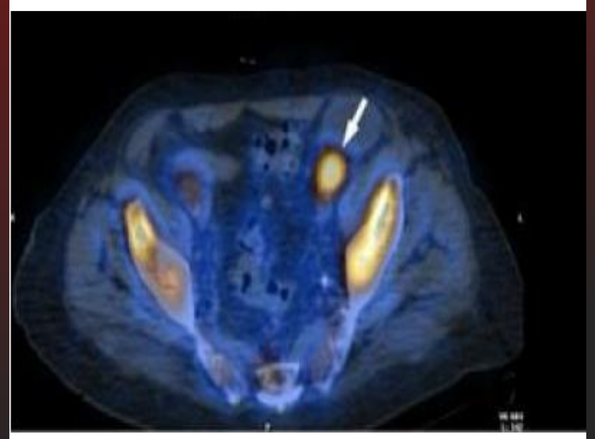
VASCULAR GRAFT INFECTION DETECTION

- Although uncommon, 75% of cases are lethal
- Symptoms include: fever, bacteremia, and lymphocele

VASCULAR GRAFT INFECTION CASE STUDY

- 30 patients studied whose graft implantation periods range from 1 month to 14 years
- Results: scan has a 95% accuracy with a 100% sensitivity

(Rubia-Marocs et al., 2020)



Axial SPECT/CT scan of the pelvis with increased uptake in the aortoiliac area; indicated by arrows

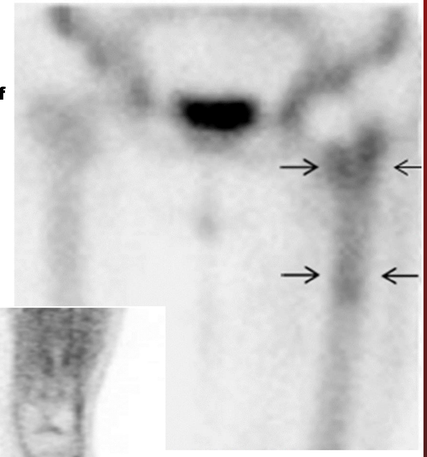
(Rubia-Marocs et al., 2020)

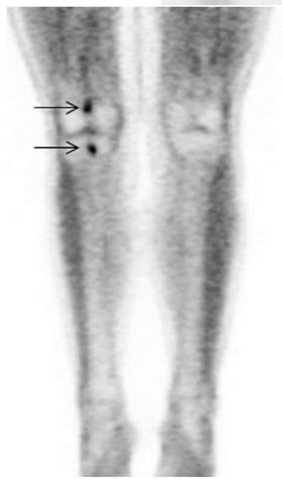
ARTHROPLASTY INFECTION

- Infection involving joint prosthesis and surrounding tissue
- Only occur with 1%-3% of prosthetic surgeries
- Most common symptom is pain
- Neutrophils are tagged
- Predominant circulating WBC
- Migrate to infection site in 8 hrs

(Palestro & Love, 2017)

SPECT scan of patient's pelvis indicating increased uptake in the left hip as indicated by arrows





SPECT scan of patient's lower limb indicating increased uptake in the right knee as indicated by arrows

(Palestro & Love, 2017)

CONCLUSION

- White blood cell scans are the most accurate diagnostic scan for detecting infections
- The scans are advantageous because tagged white blood cells only travel to infected areas.
- Nuclear Medicine has proven to be the best imaging tool available for infection detection.

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