SPECT/CT IN MALIGNANT BONE DISEASE

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BONE SCAN

HISTORICAL EVOLUTION

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BONE SCAN

Most common screening test

Ability to scan the entire skeleton

High sensitivity

Availability
Low cost

Bone scintigraphy: Limitations

Lacks specificity

Degree of avidity?

Benign pathologies take up tracer
BONE METASTASES

SOLITARY LESIONS

METASTASES

SUSPICIOUS
SUGGESTIVE

SUGGESTIVE
OF
BENIGN

FURTHER
IMAGING
Solitary skeletal lesions often remain indeterminate.

SOLITARY LESIONS

BONE SPECT
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BONE SPECT

COMPUTERISED TOMOGRAPHY
Available/Speed

Three-dimensional capability

Superior anatomical resolution

Nuclear Medicine Physicians: What is the evidence for SPECT/CT in addition to planar or SPECT alone?

Referring physicians/surgeons:
Accurate localisation, characterisation & diagnosis

Patient: Early/accurate diagnosis & smooth patient pathway
BONE SPECT/CT: CANCER PATIENTS

CURRENT EVIDENCE

SPECT/CT in the assessment of equivocal lesions on planar/SPECT

Horger et al 47 pts; 2004

Prospectively performed SPECT/ non spiral low dose CT
104 equivocal lesions on planar imaging

SPECT, SPECT + CT/X-ray, SPECT/CT fusion
Sensitivity: 94%, 100%, and 96%
Specificity: 19%, 68%, and 81%
Accuracy: 36%, 74%, and 85%

SPECT/CT correctly classified 85% indeterminate lesions compared to 36% with SPECT alone.
Significantly improving specificity and diagnostic accuracy

SPECT/CT in the assessment of equivocal lesions on SPECT guided CT

Romer et al: 57 pts; 2006

Retrospectively assessed 52 indeterminate foci in 44 pts on SPECT with SPECT guided CT using a dual slice spiral CT system

SPECT/CT classified 92% (48/52) of indeterminate lesions on SPECT.

The lesions which remained indeterminate (8%) were in the scapulae and ribs.


SPECT/CT in the assessment of equivocal lesions on SPECT

Zhao et al 125 pts. 2010

Assessed 141 lesions in cancer patients with non-specific findings on planar imaging.

The final diagnosis revealed 63 malignant bone lesions and 78 benign lesions (3-point scale: 1, definitely benign; 2, equivocal; 3, definitely malignant).

The final diagnosis was based on biopsy proof and radiologic follow-up over at least 1 year, including BS, CT and MRI.

Sensitivity (82.5%, 93.7%, and 98.4%) , specificity (66.7%, 80.8%, and 93.6%) and accuracy (73.8%, 86.5%, and 95.7%) of SPECT/CT was significantly higher than SPECT alone.

Hybrid SPECT-CT for characterizing isolated vertebral lesions observed by bone scintigraphy: comparison with planar scintigraphy, SPECT, and CT

Sharma P et al, 2013: 99 patients with 108 isolated vertebral lesions visible on planar bone scintigraphy:

A scoring scale of 1 to 5 was used, with 1 being definitely metastatic, 2 most likely metastatic, 3 indeterminate, 4 most likely benign, and 5 definitely benign.

49 were indeterminate on planar scintigraphy, 16 on SPECT, and one each on SPECT-CT and CT.

SPECT-CT was superior to both planar scintigraphy and SPECT alone.

SPECT-CT correctly characterized 96% of the indeterminate lesions observed by planar scintigraphy.

SPECT-CT had an impact on the clinical management in 60 patients.

Metastatic Prostate Cancer

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Prostate Cancer with Nodal Disease

? Malignant ? Benign
Pain in right shoulder and right hip. Previous lung cancer ?bone metastases

Prostate Cancer with rising PSA
Renal cancer (post nephrectomy) with back and hip pain? metastases

PATTERN RECOGNITION
Prostate Cancer? bone metastases

Diagnosis: Lytic metastasis with sclerosis

Prostate Cancer? Metastases

Breast Cancer patient with back pain.? Mets

Diagnosis: Degenerative disease

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Prostate Cancer with rising PSA

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Prostate Cancer: Post Robotic Prostatectomy

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Breast Cancer

Metastatic prostate cancer. Increasing pain in right ischium
Metastatic Prostate Cancer: rising PSA-restage

Marked diffuse osteopenia. Vertebral alignment is preserved. There are fractures at T11 and L4. Is the patient known to have osteoporosis?

35 year old lady with generalised body ache

Marked diffuse osteopenia. Vertebral alignment is preserved. There are fractures at T11 and L4. Is the patient known to have osteoporosis?

Back pain with previous vertebral collapse. ESR 77, CRP < 5

Question/s: ? any evidence of hot spots to suggest malignancy
35 year old lady with generalized body ache

Bone SPECT/CT—what does it add?

- **LOCALISATION**
- **REDUCTION OF EQUIVOCAL REPORTS**
- **INCREASES CONFIDENCE & SPECT/CT is SPECTACULAR**
- **COST?**
- **TIME**
- **INVESTIGATION**
Limitations

- Retrospective
- Gold standard
- Additional Radiation

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