Clinical Applications of SPECT-CT in Pediatric Musculoskeletal Disorders : 10 Year Experience

Amin A, Zubair A, Bashir H, Hassan A.
[1]Shaukat Khanum Memorial Cancer Hospital and Research Centre, Nuclear Medicine Department, Lahore, Pakistan.
[2]East Kent Hospitals University NHS Foundation Trust

OBJECTIVE

- Conventional planar bone scintigraphy is an integral part of staging/restaging work up of many musculoskeletal tumors and other bone pathologies.
- Scan interpretation in pediatric population using only planar imaging can be challenging. For instance, the normal epiphyseal growth plates activity can obscure or mimic osseous lesions. Similarly, there can be issues in delineating bladder activities from potential osseous lesion involving pelvic bones.
- These problems can be addressed by the introduction of hybrid imaging like SPECT-CT. ***In this abstract, we present a 10 year data on the added value of SPECT/CT in evaluation of musculoskeletal diseases in pediatric age group.***

MATERIALS AND METHODS

- Sample Size : ***Out of 282 SPECT/CTs which were retrospectively reviewed, 203 were specifically performed for musculoskeletal disorders.***
- ***Age limit : <18 years.***
- Study Duration : ***August 2014 to August 2024***.

RESULTS

- **Mean age : ± 12.9 years. Female : 66, Male : 137.**
- Opting for SPECT-CT led to **detection of metastases in 54% of malignant cases.**
- **Additional information like detection of pulmonary nodules, enlarged nodes, pleural effusions, pneumothorax & cord compression in 22.6% of cases (46/203)**
- SPECT-CT increased interpretative confidence by ruling out disease involvement in 42.2 % of cases which had non specific uptakes on planar images.

Table 1 : Distribution of Cases with Significant Findings and Ambiguous Uptake on Planar Imaging that Were Clarified by SPECT

Ambiguous uptake on planar bone imaging due to tracer contamination, urinary bladder activity, and other non-specific findings.	***N=86***	***42.2%***
Significant findings in diagnosis on SPECT	**N=118**	**57.8%**

Protocol Used Based On Clinical Indication

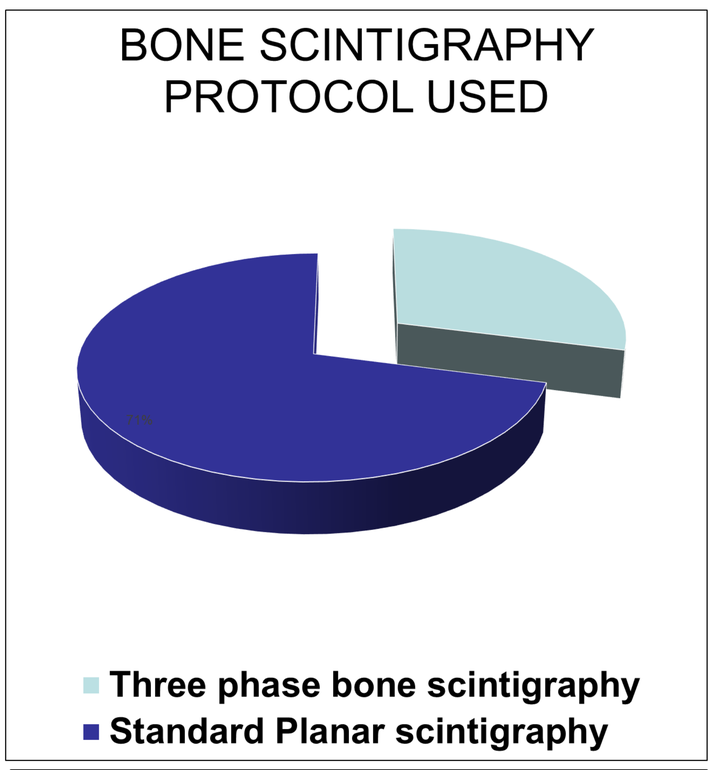
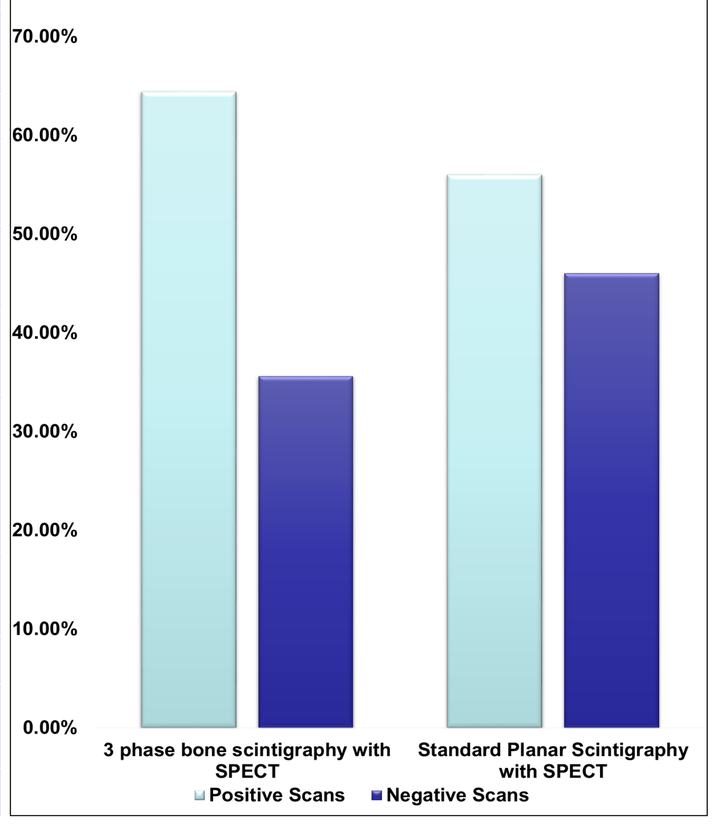
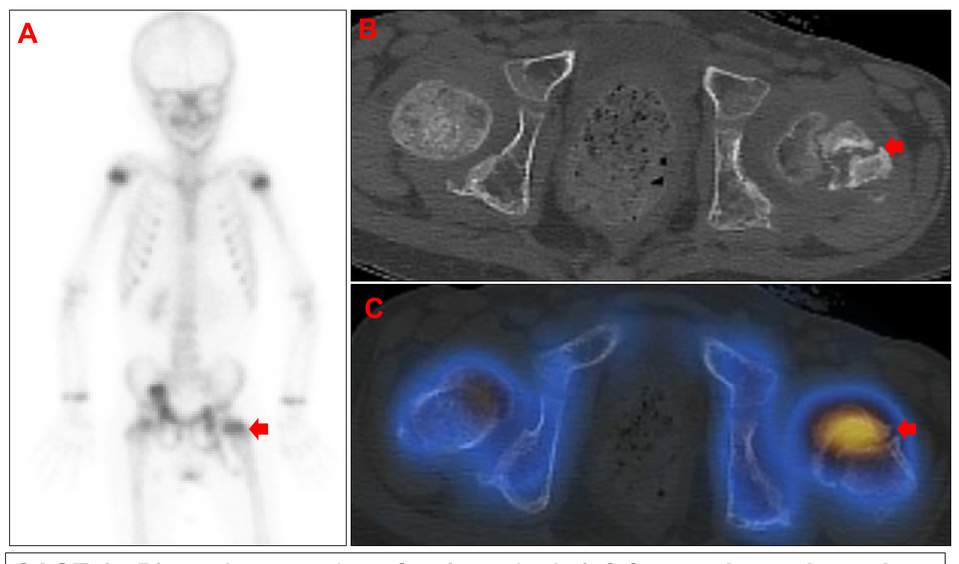


Table 2 : 3 Phase Scintigraphy Diagnosis Breakdown.

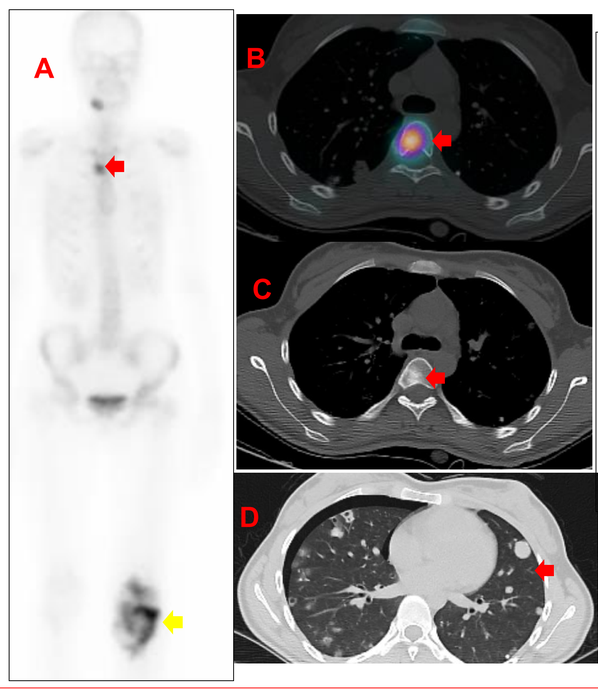
DIAGNOSIS	NUMBER
MALIGNANCY	08
OSTEOMYELITIS	08
FRACTURE	04
ACTIVE INFLAMMATION	04
MANDIBULAR HYPERPLASIA	02
AVASCULAR NECROSIS	02
HETEROTROPIC OSSIFICATION, EXTRAOOSEOUS CALCIFICATION	03
OSTEOID OSTEOMA	02
SACROILITIS	01
COMPLEX REGIONAL SYNDROME	01
SHIN SPLINTS	01



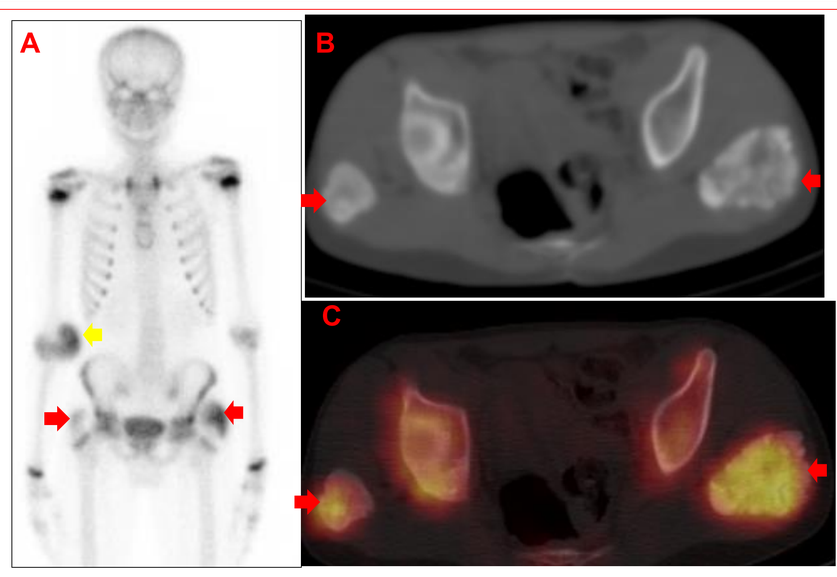
CASES



CASE 1 : Planar images show focal uptake in left femur ***shown by red arrows (A)*** which corresponds to ***underlying fracture on axial CT and fusion slices SPECT-CT (B,C, red arrows***)



CASE 2 : Patient with osteosarcoma of left distal femur, yellow arrows (A). Planar image ***shows focal uptake in T5 (red arrow, A) which correlates with sclerotic lesion on SPECT-CT. (red arrows B,C).*** Additionally, SPECT-CT demonstrated **multiple pulmonary nodules** and right hydropneumothorax **(D)**



CASE 3 : Bone scintigraphy images showed heterogeneous tracer uptake in ***right elbow joint (yellow arrow, A) and bilateral lateral thigh region (red arrows, A).*** These uptakes corresponded to ***extensive intramuscular calcifications in lateral thigh muscles (red arrows B,C)*** and medial compartment of right distal humerus near elbow joint.

CONCLUSION

Our study shows that SPECT/CT has significant added value in diagnosis of bone pathologies in pediatric population. It can improve diagnostic accuracy and influence clinical disease management. However, it is also important to consider the radiation exposure from CT in this age group, employing strategies such as using low X ray tube voltages and other radiation physics parameters.

SHAUKAT KHANUM MEMORIAL
CANCER HOSPITAL & RESEARCH CENTRE

7-A Block R III, Johar Town, Lahore, Pakistan

www.shaukatkhanum.org.pk