Superscan in carcinoma prostate

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A 66-year-old man presented with progressively worsening low back pain and no lower urinary tract symptoms. Digital rectal examination revealed a 40 gm hard nodular prostate. Serum PSA was >150 ng/ml and serum alkaline phosphatase was 14,701 IU/L. A needle biopsy of the prostate was reported as adenocarcinoma prostate, Gleason score 3+3. Bone scan showed marked diffuse uptake in the vertebrae, ribs and long bones with no obvious renal activity (Fig. 1). Following bilateral orchidectomy he had symptomatic improvement with a decrease in serum PSA to 17.2ng/ml at 5 months.

Carcinoma of the prostate predominantly metastasizes to the bone. Radionuclide scintigraphy using Technetium 99 Methylene Diamine Phosphonate (^{99}Tc MDP) is commonly used to detect skeletal metastases and are visualized as focal areas of increased uptake or hotspots. A change of 5–10% in the ratio of the lesion to normal bone can be identified on a bone scan [1]. The areas of increased uptake reflect increased metabolic activity which is dependent on the osteoblastic activity and blood flow. Bone scan is more sensitive in detecting metastases from prostate, breast and lung cancer which are predominantly osteoblastic. It is less sensitive in osteolytic lesions arising from multiple my-

eloma or rapid bone destruction where these lytic lesions appear photopenic or “cold” [1].

Fig. 1 Superscan showing extensive skeletal metastases in a patient of carcinoma prostate

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Soloway et al [2] described five grades of bony involvement based on the number of metastases or extent of disease.

- Grade 0 Normal or abnormal due to benign bone disease.
- Grade I Number of bony metastases less than six, each of which is less than 50% the size of vertebral body
- Grade II Number of metastases between six and twenty.
- Grade III Number of metastases more than 20.
- Grade IV More than 75% involvement of the ribs, vertebrae and pelvic bones.

This grade IV picture of extensive metastases to the skeletal system has a picture of increased diffuse uptake which is called a superscan.

Diffuse skeletal uptake may be at times mistaken for a normal bone scan. There is absent or poor visualization of the kidneys in a superscan whereas a normal scan has uniform uptake in the kidney. Though there is renal excretion the renal uptake is below the threshold for imaging as there is an intense uptake in the bones. A further point of differentiation is the ratio of bone to soft tissue uptake. A superscan will have an atypically high bone to soft tissue ratio.

Metabolic conditions that may cause diffuse skeletal uptake include renal osteodystrophy, primary hyperparathyroidism and osteomalacia [3, 4]. The clinical history is important and so is the need to note the ratio of uptake in the axial skeleton relative to the appendicular skeleton. Metastatic disease generally has a relatively greater uptake in the axial skeleton, whereas in metabolic conditions the radiopharmaceutical uptake is increased in both the appendicular and the axial skeleton with a relatively intense calvarial uptake [3].

References

1. Even-Sapir E (2005) Imaging of malignant bone involvement by morphologic, scintigraphic, and hybrid modalities. *J Nucl Med* 46:1356–1367
2. Soloway MS, Hardeman SW, Hickey D, Raymond J, Todd B, Soloway S (1988) Stratification of patients with metastatic prostate cancer based on extent of disease on initial bone scan. *Cancer* 61:195–202
3. Love C, Din AS, Tomas MB, Kalapparambath TP, Palestro CJ (2003) Radionuclide Bone Imaging: An Illustrative Review. *Radiographics* 23:341–358
4. Khan AU, Ahmad S, Khan AA, Khan SM, Rauf M (2001) Causes of Superscan Picture on Bone Scintigraphy. *J Coll Physicians Surg Pak* 11:765–775