Interest of bone scan in malignancy:

- Patient with high probability of bone metastases
- Follow up when specific tumor marker levels rise
- Evaluation of bone pain
- Further study in solitary radiographic lesion (or equivocal)
- Monitoring of therapy
Skeleton is a frequent site of metastatic spread for many neoplasms.

Mechanism of uptake includes:
- active blood flow
- enhanced ostoblastic activity: primarily lytic lesions -> stimulation of osteoblasts
  -> concentration of radiolabeled phosphates on hydroxyapatite crystal
  -> if lytic component predominant

Bone scintigraphy: more sensitive than radiography
Interpretation of bone scintigraphy

- Whole body scanning

- If bladder activity obscures pelvic structures: delayed images (24h)

- Use of SPECT (especially for the spine) (SPECT/CT if available: particularly important in case of a solitary lesion (relatively rare: +/- 10%, more frequent in breast ca) (17 to 40% according to the studies)

- Multiple random lesions: most typical findings (total body scan is mandatory even in case of local pain)
Isolated lytic lesion of L1 in a case of myeloma. Left: planar bone scintigraphy, right: SPECT/CT: note the lytic lesion of right part of vertebra on CT and osteoblastic response of the rest of the vertebra. If osteoblastic response is minimal, osteolysis is predominant with a cold area.
Drug interaction: increased renal uptake may be observed shortly after administration of chemotherapeutic drugs (this finding can also occur in nephrocalcinosis, myoglobinuria, etc...).
Patient suffering from a breast cancer. Random placed lesions
Treatment: zometa. Multiple metastases, evolution between april and october 04
Bone metastases frequently occur in the axial skeleton by involvement of vertebral venous system (bypass of vena cava and portal system). The involvement occurs generally in the vertebral body and pedicle of the vertebra (posterior activity is predominantly due to degenerative process: the use of SPECT is helpful to determine the part of involved vertebra)
Increased uptake by long bones in a case of chronic myeloid leukemia: note increased uptake by femoral and humeral shafts. Proliferative changes in most of the bone marrow elements can produce changes in the bone scan appearance due to reactive process or direct involvement. This is most commonly associated with abnormalities in the white blood cells elements.
Patient suffering from a breast cancer with bone metastases: note the interest of SPECT/CT of the Spine: increased osteoblastic activity of the right part of the vertebra corresponds to a CT vertebral lesion
Prostate cancer
About 40% of patients with positive scan present with no pain
-> bone scan = most sensitive method for early detection of metastatic disease

Incidence of skeletal metastases rises with increasing blood PSA level (In about 30% of patients receiving antiandrogen therapy, PSA is in the normal range, despite the presence of metastases)
Unknown oat cell carcinoma of upper part of left lung (See RX). Patient complained from left shoulder pain and was referred for a suspicion of arthritis: Pancoast S.

Lung cancer
If bone metastases present: grave prognostic sign (about 80% of patients with abnormal bone scan at presentation die within 6 months)
Incidence of bone metastases in small cell and anaplastic cancer is high and, bone scan at initial workup is necessary for these patients
Incidence of appendicular metastases is higher than in other cancers (tumor cells spread by arterial route to distal extremities)
Patient suffering from a left lung carcinoma (see RX) with involvement of first left rib: Pancoast syndrome. Note a second vertebral lesion.
Renal and bladder carcinoma
Low incidence of bone metastases (10% of the metastases are lytic with photopenic images)

Thyroid cancer
Detection of metastases in well differentiated ca can be performed using 131 scan. However, bone scan can be of interest in medullary carcinoma (which does not concentrate iodine)

Hemoproliferative disorders
Lymphomas, leukemias: Bone marrow expansion often cause diffuse uptake of the tracer in appendicular skeleton
Note that in myeloma, lytic lesions are often observed
Child presenting with a metastatic neuroblastoma: metastases in the skeleton: osseous metastases in the calvarium, metaphyseal location, proximal humerus (left), distal femora, proximal tibiae, ribs
Right: bone scintigraphy, left: 123I MIBG scan: most bone scan abnormalities demonstrate MIBG uptake