A 64 y.o. man presents to the hospital with persistent cough and hemoptysis

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Teaching case Bone # 1

• A 64 y.o. man presents to the hospital with persistent cough and hemoptysis. He is a heavy smoker and has lost about 4 kg weight during the last 3 months.

• A chest X-ray examination reveals a right apical opacity. Thorax CT demonstrates a solid mass 5x3 cm in the same location, with no evidence of lymph node involvement. Possible rib lesions.
• Fibroscopic biopsy allowed the diagnosis of a bronchogenic carcinoma.

• As part of a work-up for staging, the patient is sent for a bone scan.

• Other examinations: brain CT (normal), abdominal CT (normal), laboratory tests (mild anemia, elevated alkaline phosphatase).
Which of the following is correct?

A) Lung cancer rarely produces bone mets, so a bone scan is questionable.
B) A bone scan would not influence much the therapeutic approach in this case.
C) Bone mets are common in lung cancer, and can decide treatment strategy.
D) A bone scan has low sensitivity for bone mets in lung cancer.
Which of the following is correct?

A) Lung cancer rarely produces bone mets, so a bone scan is questionable.
B) A bone scan would not influence much the therapeutic approach in this case.
C) **Bone mets are common in lung cancer, can decide treatment strategy.**
D) A bone scan has low sensitivity for bone mets in lung cancer.
Comments:

- Lung cancer is the third most common malignancy producing bone mets.

- Presence of metastasis affects treatment strategy, resection could be avoided.

- Bone mets from lung Ca usually are osteoblastic, easily detected by a bone scan.

- Other frequent localizations are: brain, liver, suprarrenal glands.
Bone scan

- The patient was injected with 740 MBq (20 mCi) of 99mTc-MDP.
- Anterior, posterior whole body images taken 3 hours later.
Interpretation?

- A) Normal bone scan.
- B) Abnormal bone scan, regional malignant bone extension.
- C) Abnormal bone scan, diffuse metastatic skeletal involvement.
- D) Abnormal bone scan, multiple focal metastasis.
Interpretation?

• A) Normal bone scan.
• **B) Abnormal bone scan, regional malignant bone involvement.**
• C) Abnormal bone scan, diffuse metastatic skeletal involvement.
• D) Abnormal bone scan, multiple focal metastasis.
Additional findings?

- A) Bone marrow malignant involvement.
- B) Osteomalacia.
- C) Stress fractures.
- D) Paraneoplastic cortical thickening.
Additional findings?

• A) Bone marrow malignant involvement.
• B) Osteomalacia.
• C) Stress fractures.
• D) Paraneoplastic cortical thickening.
• Regional bone involvement is frequent in lung Ca, especially in patients with Pancoast (apical) tumors (A).

• Cortical thickening (hypertrophic osteoarthropathy) is a common finding in some respiratory diseases, especially in lung Ca, characterized by increased cortical uptake in long bones ("tram line" or "double stripe" sign) (B).
Teaching points:

• Lung cancer is the third most common cause of bone mets after breast and prostate cancer. Other primary solid malignancies with frequent extension to bone include: melanoma, renal Ca, thyroid Ca.

• The bone scan is not a specific procedure to detect malignant involvement, however type and distribution of lesions are often characteristic.

• Benign conditions mimicking bone mets include: fractures, benign tumors, Paget disease, and some metabolic disorders.
The bone scan is a highly sensitive, inexpensive procedure for complete evaluation of the whole skeleton and it forms part of general oncologic work-up in malignancies known to have bone affinity or in patients with any malignant condition suffering from bone pain.

Hypertrophic osteoarthropathy (HOA) is a clinical syndrome of clubbing of the fingers and toes, enlargement of the extremities, and painful, swollen joints.

HOA is characterized by symmetric periostitis involving the radius, fibula, femur, humerus, metacarpals, and metatarsals. The syndrome can be primary (5%) or secondary (95%).
Teaching points:

- Secondary causes of HOA may be further classified as pulmonary, pleural, cardiac, abdominal, and miscellaneous. Cyanotic heart disease with a right-to-left shunt is the only cardiac cause that has been described.

- Pulmonary disorders that cause HOA include bronchogenic carcinoma; pulmonary tuberculosis; pulmonary abscesses; blastomycosis; bronchiectasis; emphysema; Pneumocystis carinii infection in patients with AIDS; Hodgkin disease; metastases; and cystic fibrosis.

- Numerous theories have been proposed regarding the pathogenesis of hypertrophic pulmonary osteoarthropathy (HPOA), none of which are generally accepted.
Teaching points:

• Studies have shown that when platelet precursors fail to fragment within the pulmonary circulation, they easily become trapped in the peripheral vasculature. Platelet-derived growth factor and vascular endothelial growth factor are then released; these growth factors may lead to skeletal changes.

• Tumor-secreted growth factors have also been proposed.

• HPOA is considered a para-neoplastic syndrome in lung cancer and can be reversible if the primary condition is successfully treated. The same applies for HPOA secondary to non-malignant diseases.