Metastases to Bones of the Hands and Feet

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Although metastases to bones from solid tumors are very common, involvement of small bones of the hands and feet is extremely rare. One half of the cases reported in literature resulted from a primary tumor in the lung. Four cases seen over the last four years with metastases to bones of the hand and one case with metastases to foot bones are discussed. None of these patients had a lung primary tumor. Three of the four patients who had metastases to hand bones had the disease on the right side.

One of the most common sites of metastatic disease is bone. The incidence of bone metastasis from different primary sites in a large number of autopsy cases was published in 1950 by Abrams.[1] With present diagnostic procedures, especially bone marrow biopsy, it has been shown that the incidence of bone metastases is much higher than thought, especially in oat cell carcinoma of the lung[3] and rectal cancer.[10] The bones involved with metastatic disease in the order of descending frequency are vertebrae, pelvis, femur, cranium, ribs, and humerus. The reason for the frequent involvement of the vertebrae and pelvis was well described by Batson.[2] Metastases to bones of the hands and feet are extremely rare. Gold and Reffe[5] reported only two cases in 3,000 patients with varous types of malignant diseases, and DePass and Roswit[4] reported two cases in 800 patients with bronchogenic carcinoma who had metastases to bones of the hand. Of 171 malignant tumors of the hand, Pack[7] noted only two of metastatic origin. Vaezy and Budson[9] recently reported two cases with metastases to the phalangeal bones from bronchogenic carcinoma. All six cases with metastases to hand and foot bones reported by Mulvey[6] originated in the lung. In about one half of cases reported in the literature,[8] the primary malignancy has been in the lung. Over the last four years the authors have seen five patients with metastatic disease to bones of the hand and foot. None of the five patients had carcinoma of the lung.

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Report of Cases

Case 1

A 64-year-old black male was admitted to the hospital on July 17, 1974 with a one-month history of dysphagia and weight loss of 25 lb over that period. An esophagogram done on July 19, 1974 shows an irregular filling defect in the middle third (Figure 1). The patient had an esophagoscopy on July 26, 1974 and a biopsy was taken. Pathology reported epidermoid carcinoma. A complete metastatic work-up at this stage was negative. The patient received a split course of external irradiation to the esophagus from July 30, 1974 through September 17, 1974. A tumor dose of 6,000 rad was delivered in 30 fractions. Repeat esophagogram at the end of the treatment showed a smooth esophageal wall and the patient had marked relief of dysphagia. However, he complained of pain in the right hand associated with slight swelling. X-ray of the hand showed no evidence of bone pathology except for slight soft tissue swelling. The patient was seen in surgical clinic and a diagnosis of nonsuppurative tenosynovitis was made. Meanwhile he developed a painful swelling over the right gluteal region which ulcerated. A biopsy from this area was reported as metastatic carcinoma. He received local irradiation to the right gluteal region from October 15 through November 15, 1974 and a tumor dose of 4,000 rad was delivered in 20 fractions. In spite of physical therapy to the right hand, it continued to swell and became very painful. A repeat x-ray of the right hand in January 1975 showed massive destruction of the metacarpal bones (Figure 2). Needle biopsy from this area was reported as metastatic epidermoid carcinoma. Local irradiation to the right hand gave marked relief of pain and, following a 3,000 rad tumor dose, repeat x-ray showed evidence of new bone formation. The patient developed hemoptysis and expired on April 11, 1975.

Case 2

A 45-year-old black female, gravida 5, para 5, was admitted to the hospital in February 1974 for irregular vaginal bleeding. Pelvic examination revealed a fungating growth arising from the cervix. Biopsy from the growth was reported as adenocarcinoma of the cervix

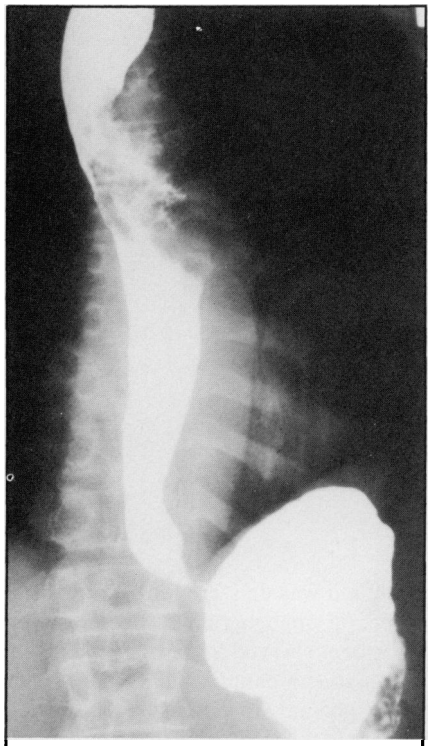

Figure 1. Esophagogram of Case 1 showing irregular filling defect in the middle third. Biopsy from this area was reported as epidermoid carcinoma.

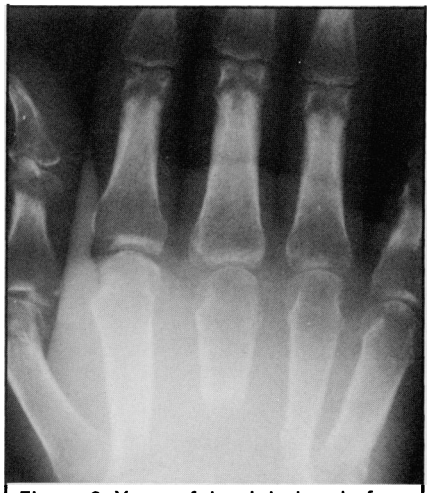

Figure 2. X-ray of the right hand of Case 1 showing destruction of the proximal part of the second, third, and fourth metacarpal bones.

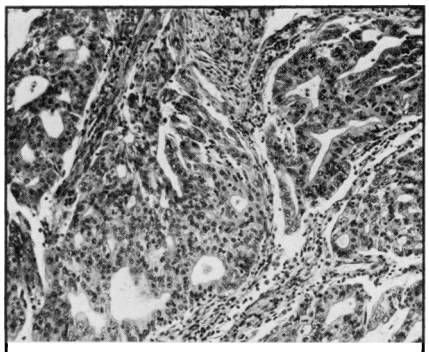

Figure 3. Biopsy from the cervix of Case 2 showing moderately well-differentiated adenocarcinoma (H & E x 100).

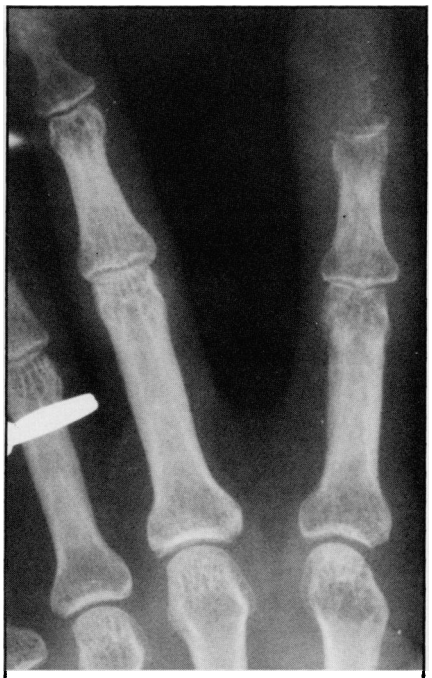

Figure 4. X-ray of the left hand of Case 2 showing destruction of the distal phalanx of the index finger.

(Figure 3). She underwent total abdominal hysterectomy and bilateral salpingoophorectomy in the same month. No pre or postoperative radiotherapy was given. The patient was well until July 1974, when she returned to the hospital with the same complaint, vaginal bleeding. Pelvic examination revealed a fleshy 2 cm × 2 cm × 2 cm growth at the vaginal vault. Repeat biopsy of this growth was reported as adenocarcinoma similar to the previous one. The patient was given 4,000 rad TD to the whole pelvis through 15 cm × 15 cm anterior/posterior fields in 20 fractions followed by an additional dose to the vagina through intravaginal application. The tumor completely regressed and the patient was asymptomatic. During the first follow-up on November 22, 1974, a chest x-ray was taken which showed multiple bilateral pulmonary metastases. The patient was started on progesterone (Provera). In February 1975, the patient developed a painful swelling at the tip of the left index finger. X-ray of the finger showed complete resorption of the distal phalanx except the periostenum and marked soft-tissue swelling (Figure 4). Aspiration biopsy from this area showed malignant cells consistent with the known primary, adenocarcinoma of the cervix. Then, 4,000 rad TD was given to this area in 20 fractions. Repeat x-ray at the completion of the treatment showed complete new bone formation. However, the patient died of progressive pulmonary disease on November 16, 1975.

Case 3

A 21-year-old black male was admitted to the hospital on September 2, 1975, with a six-week history of back pain and swelling and pain of the right hand and a two-week history of lower extremity weakness. A bone survey showed collapse of T6, destruction of the left pedicle of T10, and punched-out lesions in the proximal part of the right third metacarpal bone (Figure 5). Myelogram showed total block at T6. Laminectomy was done on September 9, 1975 following which the patient became totally paraplegic and incontinent. Tissue from the laminectomy site and the proximal part of the right third metacarpal bone was reported as metastatic rhabdomyosarcoma (Figure 6). Postoperatively the patient received irradiation to the "T" spine and right hand. A tumor dose of 4,500 rad was delivered to the right third metacarpal bone with relief of pain and regression of swelling. However, the spinal irradiation had to be stopped at 1,200 rad because of nonhealing of the laminectomy wound which exposed the cord. The patient subsequently died of septecemia and disseminated disease.

Case 4

A 53-year-old black female, gravida 2, para 1, ab 1, was admitted to the hospital on April 16, 1976 with a six-week history of an ulcerative lesion of the left breast (Figure 7). She also had hard mobile nodes in the left axilla. Biopsy from the breast was reported as infiltrating adenocarcinoma. Metastatic work-up revealed bilateral pulmonary and spine metastases. On April 21, 1976, a simple mastectomy was performed and the patient was started on local irradiation to the left chest wall, regional nodes, and spine. The patient was also started on a chemotherapy regimen of cyclophosphamide methotrexate and 5-fluorouracil (CMF). On July 28, 1976, she developed painful swelling over the dorsum of the right hand. X-ray of the hand showed destruction of the distal part of the right second metacarpal bone (Figure 8). Needle biopsy from this area showed malignant cells consistent with metastatic breast carcinoma. Local irradiation to this area was begun and after receiving three treatments, the patient expired on July 1, 1976.

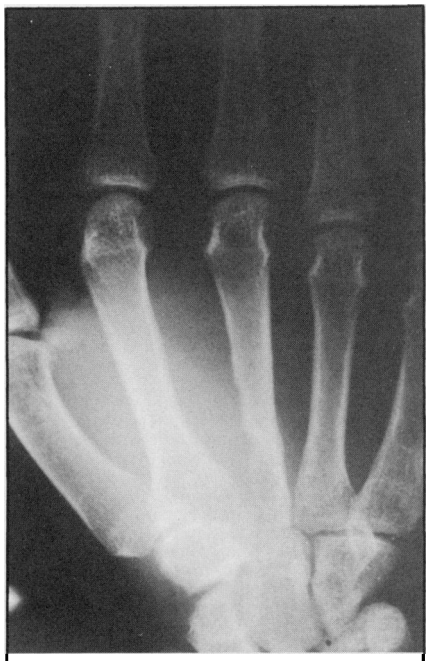

Figure 5. X-ray of the right hand of Case 3 showing punched-out lesion in the proximal part of the third metacarpal bone.

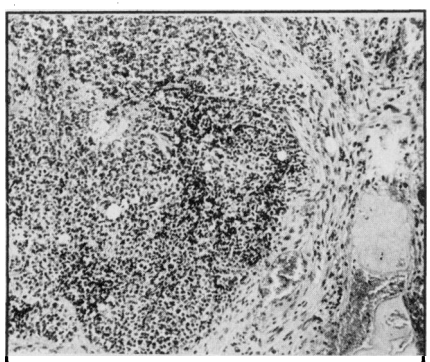

Figure 6. Soft tissue mass removed from the spinal cord area of Case 3 showing, in the vicinity of dilated capillaries at the right, nodular aggregates of neoplastic cells. Small round or ovoid tumor cells are loosely adherent to the nearby fibrovascular stroma. An example of alveolar rhabdomyosarcoma, embryonal type (H & E x 100).

Case 5

A 55-year-old black male was admitted to the hospital on November 28, 1976 with a nine month history of pain in the left flank, right hip, and right big toe. Bone survey showed lytic lesions in the right iliac bone and proximal phalanx of the right big toe (Figure 9). A bilateral renal angiogram showed a large vascular mass in the lower pole of the left kidney and another small vascular tumor in the lower peripheral part of the right kidney (Figure 10). The patient also had an enlarged left supraclavicular node. He underwent exploratory surgery on December 7, 1976 and a left partial nephrectomy and biopsy of the right kidney tumor were performed. The pathology report was adenocarcinoma of the left kidney with metastasis to the left supraclavicular node, right iliac bone, and right big toe. On April 12, 1977 the patient was readmitted with a neurological deficit below T6. X-ray of the spine showed a large lytic lesion in T7. Myelogram revealed extradural obstruction at the same level. Decompressive laminectomy was performed and the patient was referred back to radiotherapy for local irradiation to the T spine. Repeat bone survey at this time showed additional lytic bone lesions in the right fibula, the proximal phalanx of the left third toe, and the skull bones. The patient received 3,000 rad TD to the laminectomy site from May 3 through May 17, 1977. By this time, the patient had developed extensive bilateral pulmonary metastases and expired in July 1977.

Discussion

Metastases from malignant tumors that arise in organs drained by the portal venous system occur first in the liver and those drained by the systemic venous system occur in the lungs. There is also the vertebral venous system, described by Batson, which drains blood via various routes from the pelvis to the base of the skull. This system is located along the ventral surface of the vertebrae and communicates at differ-

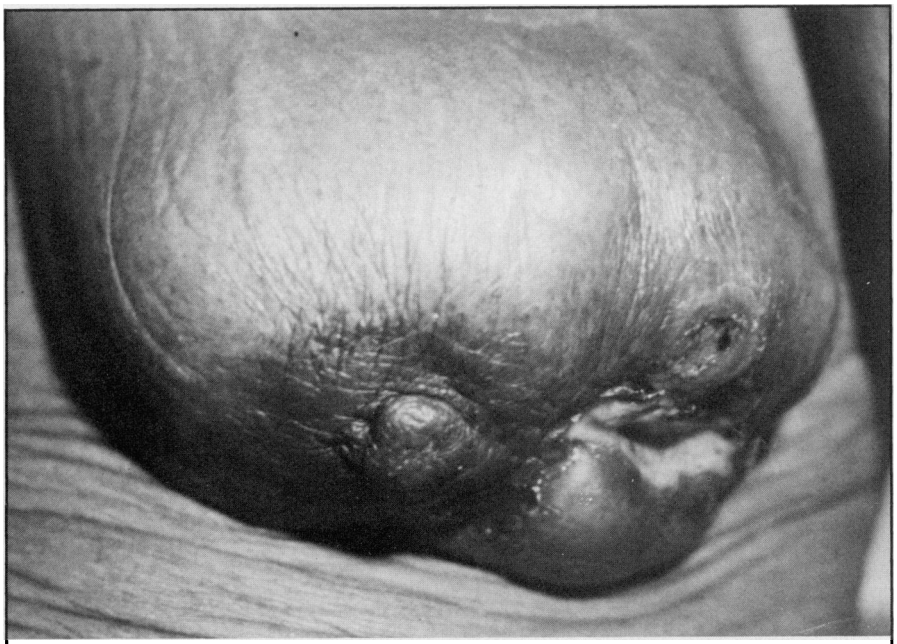

Figure 7. Left breast of Case 4 showing ulcerative lesion lateral to the nipple.

ent levels with the systemic venous system. Blood may pass into this system owing to either mechanical obstruction to the vena cava, or functional obstruction from causes such as coughing and straining in/out flow obstruction to the urine or feces. The dorsal vein of the penis, interconnecting with the prostatic and pelvic veins, drains into the vertebral venous system. In the thorax, the vertebral venous system connects with the intercostal venous system at many levels and provides access to the vertebral bodies. It is because of this direct link between the pelvic and intercostal veins and vertebral venous system that cancers of the prostate, rectum, and breast can directly metastasize to vertebrae and not necessarily through the pulmonary circulation.

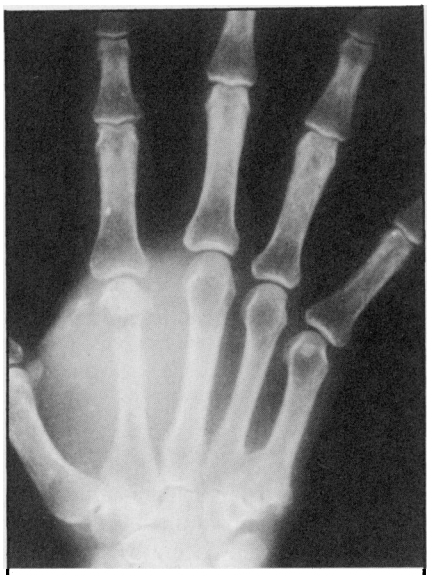

Figure 8. X-ray of the right hand of Case 4 showing destruction of the distal end of the second metacarpal bone.

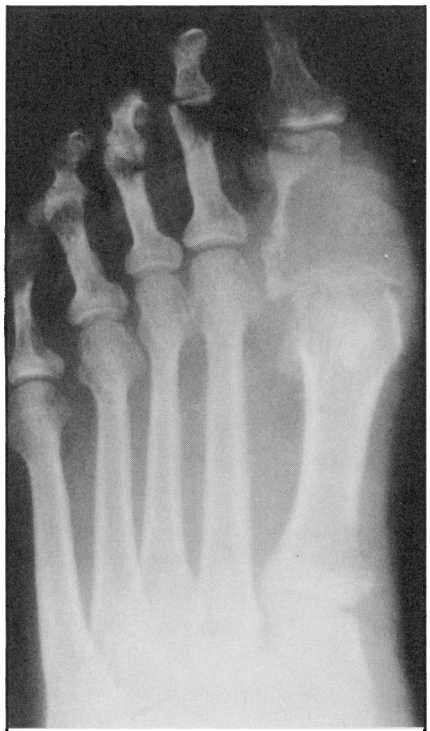

Figure 9. X-ray of the right foot of Case 5 showing massive destruction of the proximal phalanx of the big toe.

For metastatic disease to reach the axial skeleton, it has to first reach the lung and escape the lung capillaries to the left side of the heart and enter the systemic circulation. Tumor cells from carcinoma of the lung, after invading vessels directly, reach the left heart and metastatasize more frequently to remote places like bones of the hand and feet. However, cancer from any organ after reaching the pulmonary circulation can do the same. The five cases described in this article prove that once the disease is disseminated, it can metastasize to any remote structure.

Because of the rarity of metastases to bones of the hand and foot, symptoms in these areas in a cancer patient often are misdiagnosed as arthritis, gout, or some other cause and appropriate treatment is delayed. Cancer is a systemic disease and abnormal signs and symptoms anywhere in the body of a known cancer patient should be suspected as secondary to the known cancer and should be investigated thoroughly before treating it as some other disease. It has been shown experimentally that the number of metastases occurring in a particular organ is proportional to the blood flow and hence the number of tumor emboli to that organ.[9] Three of four patients who had metastases to the hand bones, had the disease on the right side. All patients were right handed. This could be due to more blood flow to the right hand than to the left hand in a right-handed individual.

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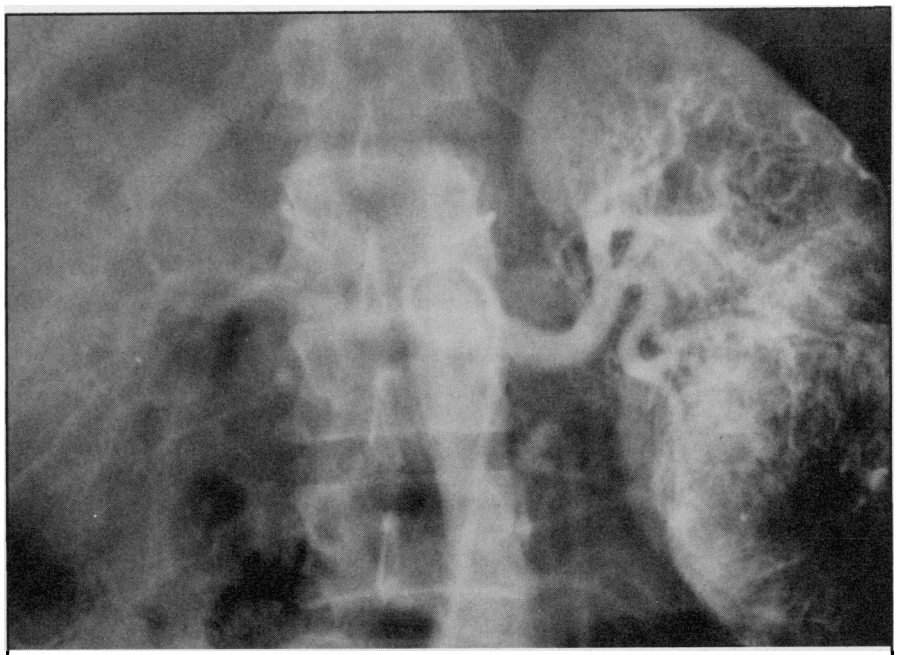

Figure 10. Renal angiogram showing large tumor in the lower pole of the left kidney.