Metastatic Pancreatic Adenocarcinoma Presenting as a Large Pelvic Mass Mimicking Primary Osteogenic Sarcoma: A Series of Two Patient Cases

Osteogenic sarcoma (ie, osteosarcoma) classically presents as a painful destructive lesion in bone with a large associated soft tissue mass. It has a range of appearances on plain radiographs based on the volume of boney destruction and degree of mineralization within the lesion.¹ It is pathologically defined by the production of osteoid matrix by malignant cells. This predilection for bone formation is often apparent on imaging. Although periosteal reactive bone formation in response to a number of aggressive neoplasms and infections can vary in appearance, consistent mineralized bone formation throughout the substance of a mass is considered nearly pathognomonic for osteosarcoma. To our knowledge, there is no case report of a patient presenting initially with a metastasis from pancreatic adenocarcinoma to bone resulting in a large osteogenic mass mimicking osteosarcoma. Although the pelvic girdle has been shown to be a location of skeletal metastases after treatment with surgery and systemic therapy in adenocarcinoma, it is rare for pain resulting from a large osteogenic mass to be the initial presenting symptom.²

Our first patient case involved a 62-year-old man who was diagnosed with degenerative spondylosis by lumbar spine imaging after 1 year of right-side hip and back pain. The spondylosis was managed with a lumbar spine fusion that provided no significant pain relief. His pain progressed and was focused in the groin, occasionally extended down the anterior thigh. He remained vigorous and healthy otherwise. Specifically, he experienced no weight change, lethargy, or loss of appetite. He developed a significant narcotic tolerance as a result of the medications for his back and leg pain. He continued to smoke cigarettes as he had for 40 years. Unsatisfied with the persistent pain after lumbar fusion, his primary care physician obtained a plain radiograph of his pelvis, which showed a destructive mass (Fig 1A, frontal radiograph of pelvis shows sclerosis of right iliac bone [black arrows] with soft tissue ossification [white arrow]; Fig 1B, close-up of frontal pelvic

radiograph shows sclerosis of right iliac bone [black arrows] with sunburst pattern of periosteal reaction [white arrows] that is almost pathognomonic for osteosarcoma). The primary care physician promptly referred the patient to our multidisciplinary sarcoma clinic.

On examination, the patient had tenderness over the iliac wing with no palpable mass and normal strength in the quadriceps, hamstrings, and hip flexors. There was subtle atrophy on the right thigh and buttock musculature as compared with the left. Range of motion at the hip was limited to 50 degrees of flexion before pain. No internal or external rotation of the hip was possible secondary to excruciating pain on any attempt.

Plain radiographs, computed tomography (CT), and magnetic resonance imaging demonstrated a destructive osseous mass with a large soft tissue extension (Fig 2A, axial CT of right iliac bone, bone window, shows linear new bone [white arrow] arranged in radial pattern perpendicular to iliac bone, characteristic of sunburst periosteal new bone formation that is almost pathognomonic of osteosarcoma; Fig 2B, axial contrast-enhanced CT of pelvis, soft tissue window, shows right iliac bone sclerotic mass [black arrows] with large soft tissue component [white arrows] indicating new bone formation).

Patient history and imaging studies were reviewed by our institutional multidisciplinary tumor board; broad consensus was that other than his age, which was older than typical, his case was classic for osteogenic sarcoma. Pathologic review of the biopsy specimen did not support this, instead showing metastatic adenocarcinoma (Fig 3A, reactive bone formation at periphery of iliac lesion, hematoxylin and eosin, $\times 40$; Fig 3B, metastatic pancreatic carcinoma with reactive bone formation, hematoxylin and eosin, $\times 100$; malignant cells intercalate between benign bone islands; osteoblastic rimming of lamellar bone with benign osteocytes distinguishes lesion from osteosarcoma, which would have shown osteoid production directly from malignant cells; Fig 3C, metastatic pancreatic carcinoma hematoxylin and eosin, $\times 400$; large epithelioid malignant cells heavily invested in rich capillary network; Fig 3D, positive cytokeratin [CAM 5.2] immunohistochemical cytoplasmic staining of malignant cells, $\times 400$; note absence

Fig 1.

Fig 2.

of staining in endothelial cells and osteoblasts). CT of the abdomen revealed a 1.5-cm tumor in the tail of the pancreas and metastatic foci of the disease in the liver (Fig 4A, axial contrast-enhanced CT of upper abdomen shows hypo-enhancing pancreatic tail mass [white arrow] and peripherally enhancing right lobe lesion [black arrow] that represents hepatic metastasis; Fig 4B, coronal reformatted CT image of abdomen shows pancreatic tail mass [curved white arrow], liver metastases [white arrows], and right iliac bone metastatic lesion [black arrows]). The pancreatic mass was then needle biopsied, which showed a primary pancreatic adenocarcinoma (Fig 5, fine-needle aspiration of pancreatic mass Diff-Quik [Dade Behring, Newark, DE] stain, $\times 1,000$; cellular smear with significant variation in nuclear size of the malignant epithelial cells).

Our second patient case involved a 55-year-old man who presented with left hip pain, which he had been experiencing for about 1 year, in the region of his left iliac wing. For 3 months before presentation, he had complained of an acute exacerbation of the pain and development of a growing mass he could palpate. He visited his primary care physician, who ordered radiographs, which prompted referral to our multidisciplinary sarcoma clinic. The patient had a 20-year history of hepatitis C as well as hypothyroidism, asthma, alcohol abuse, and a 40-year cigarette smoking history of one pack daily. He noted a 15-pound unintentional weight loss over the previous 3 months. On our physical exam, he was cachectic, and his abdomen was slightly protuberant but not tender. Examination of the left hip region demonstrated a mass in the region of his left hemipelvis that

Fig 3.

Fig 4.

visibly altered the contour of his waist. He also had exquisite tenderness along his posterior iliac wing. He had full range of motion of the hip without pain and without neurologic deficit or weakness distally.

His plain radiographs revealed a destructive lesion in the lateral aspect of the iliac wing on the left, with corroboration of this finding on whole body bone scan (Fig 6A, frontal radiograph of pelvis shows large lytic lesion of left iliac bone [white arrows]; Fig 6B, whole body image of bone scan shows mainly destructive photopenic lesion of left iliac bone [black arrows] with focal area of increased uptake in lower part of lesion that corresponds to area of new bone formation). As with the first patient, there was abundant mineralization within the soft tissue extension of the mass (Fig 7A, axial contrast-enhanced CT of pelvis, soft tissue window, shows large soft tissue mass [black arrows] causing destruction of left iliac bone; air within lesion [white arrow] from percutaneous biopsy; Fig 7B, axial CT of left iliac bone view in bone window at lower level shows large soft tissue mass [white arrows] with high-density amorphous new bone formation [black arrows]).

Fig 5.

On biopsy of the iliac mass, pathology revealed metastatic adenocarcinoma, and as with the first patient, a pancreatic primary was discovered on additional imaging (Fig 8, axial contrast-enhanced CT of abdomen obtained during portal venous phase shows poorly enhancing mass in pancreatic head [white arrows] causing dilation of common bile duct [black arrow]).

Despite advances in surgical care and systemic therapy, pancreatic adenocarcinoma remains a relatively incurable disease. This disease affects approximately 250,000 people worldwide on a yearly basis, and more than 90% of these patients go on to die as a result of their disease within 1 year of diagnosis.³⁻⁹ The majority of pancreatic tumors develop in the head or uncinate process; therefore, jaundice is a common presenting symptom, because the intrapancreatic portion of the bile duct is at risk of obstruction.³ Other common symptoms include venous thrombosis, anorexia, weight loss, and glucose intolerance. Patients rarely present without the symptomatology previously mentioned and instead with metastatic disease to organ systems other than the liver and peritoneal cavity.

Bone is the third most common site for distant metastases from adenocarcinomas, behind only the lung and the liver.¹⁰ In a study of the natural history of bone metastases, bone lesions were the first presentation of carcinoma in 23% of 429 previously undiagnosed patients.¹¹ Although not always clinically evident, there is bone involvement at the time of autopsy in as many as 85% of patients who die as a result of carcinoma of the breast, prostate, or lung.¹² In a large study of nearly 1,000 patients, radionuclide imaging demonstrated bone metastases in 63% of patients diagnosed with a primary adenocarcinoma; 85% of these patients had metastases secondary to breast, lung, or prostate carcinoma.¹²

Pancreatic cancer has been reported to metastasize to the bone in 5% to 20% of patient cases.¹³⁻¹⁵ However, this percentage may be an underestimation of the true number of patients with bone metastases because of the relatively short lifespan after diagnosis and the lack of skeletal staging studies employed during workup.^{2,13,14,16-19} With improved treatments for pancreatic cancer that may portend increased survival rates, bone metastases may

Fig 6.

be discovered in an increasing number of patients.¹⁵ Discerning skeletal metastases from pancreatic cancer is a challenge as a result of a number of factors. First, nearly all patients with locally advanced or metastatic pancreatic cancer experience overwhelming abdominal and pelvic visceral pain, which might mask other symptoms of skeletal involvement.²⁰⁻²² Second, because of the high incidence of patients with metastatic disease to the liver, alkaline phosphatase is characteristically high and may not prompt staging of the skeleton, as it might in other cancers. Interestingly, it has been suggested that patients with skeletal metastases seem to have a primary tumor in the tail of the pancreas.¹³ In their patient case series, Lyons et al² suggest that bone scans should be performed in patients who report bony pain, particularly in the pelvic area, and in whom pain is new, persistent, and progressive to evaluate for the presence of bone metastases. The authors suggest that pancreatic cancer “appears to metastasize to bone in a pattern that favors the pelvic girdle.”² Furthermore, they suggest that when a patient presents with metastatic disease in the form of a pelvic lesion, pancreatic cancer should be included in the differential diagnosis. Because skeletal metastases are an important form of morbidity in patients with adenocarcinoma, treatment of these is reasonable, given the modest increase in survival among some patients with new treatments.¹⁵

Differentiating metastatic adenocarcinoma from a primary bone forming tumor such as osteosarcoma is often based initially on

their particular radiographic characteristics. The radiographic appearance of metastatic adenocarcinoma, including pancreatic adenocarcinoma to bone, usually reveals osteolytic lesions, with some noteworthy exceptions. Metastatic breast carcinoma can produce osteolytic and osteoblastic lesions that can become more sclerotic after successful local or systemic therapy.^{23,24} Metastatic prostate cancer classically produces osteoblastic lesions. However, the mixed lesions of metastatic breast carcinoma and osteoblastic lesions of prostate carcinoma rarely extend significantly beyond the bone to form a large adjacent soft tissue mass. Metastatic lung carcinoma to bone can also form mixed osteolytic and osteoblastic lesions.^{23,25} Renal, thyroid, pancreatic, and other carcinomas are almost always osteolytic.²⁶ There are few known cases of bone-forming or osteoblastic metastatic pancreatic adenocarcinoma with radiographic appearance of osteosarcoma,²⁷⁻³¹ and to our knowledge, none have involved a large osseous mass as the presenting lesion.

In conclusion, this patient case series emphasizes the importance of pathologic diagnosis of all tumors, despite what are thought to be pathognomonic characteristics discovered on other modalities. Furthermore, it reinforces the finding that metastatic disease remains the most common diagnosis in patients older than age 40 years with malignant lesions and the idea that a multidisciplinary approach is paramount in appropriate diagnosis and treatment of complicated patient cases in oncology.

Fig 7.

Fig 8.

Nicholas P. Webber, Sunil Sharma, Allie H. Grossmann, Akram Shaaban, Kevin B. Jones, Lester J. Layfield, and R. Lor Randall

Huntsman Cancer Institute, University of Utah, Salt Lake City, UT

AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

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