INTRODUCTION

Colorectal cancer is one of the most common cancers affecting adults in the United States. Approximately twenty percent of patients with colorectal cancer present with metastases at the time of diagnosis, and an even greater number present with metastases further down the road. The most common sites for colorectal cancer metastases are the liver, lungs, brain, and bones. Bone metastasis from colorectal cancer is a rare late manifestation that occurs in only 4-6% of patients. Bone metastasis is nearly always preceded by other organ metastases, such as the liver or lungs. There has been only a handful of documented cases involving colorectal cancer directly metastasizing to bone without prior organ involvement. The following case is a unique presentation of colorectal cancer metastasizing directly, and only, to a patient’s right tibia.

CASE S13-519 (SS)

CHIEF COMPLAINT & PAST MEDICAL HISTORY

In January 2013, a 64 years old white male presented with chief complaints of right tibia and ankle pain as well as open wounds in his right lower leg for the last couple of months.

The patient’s past medical history was significant for poorly differentiated infiltrating adenocarcinoma of the rectosigmoid colon (PT5CD2, status post partial colectomy in 2007; metastatic adenocarcinoma to the right distal tibia, consistent with a colon primary (CEA, CK20, CDX2 positive; CK7, TTF-1 negative), in 2008; status post prophylactic nodding in 2011, and metastatic adenocarcinomas to right proximal lymph nodes consistent with a colon primary, status post excision in 2010. Additional PMH included hypertension, hypercholesterolemia, status post appendectomy in 1961, history of detatched retina in 1990, and status post left ankle fracture in 1998. Other than the metastases to the right tibia, no additional colorectal cancer metastases were diagnosed in the patient.

The patient was doing relatively well until Fall 2012. At this time, the patient complained of increasing lower leg pain and was ambulating with the assistance of canes. New open wounds were present along the anterior surface of the right lower leg. Radiography showed a continuous extensive osteolytic lesion involving the mid and distal right tibial shaft, with no overt pathological fractures. In addition to this pre-existing lesion, there were two new lucencies noted in the femoral condyle and proximal tibial shaft, consistent with possible metastases, as well as two foci in the right pelvis on PET/CT imaging, consistent with possible metastases.

In January 2013, the patient returned with increasing pain, lower right leg swelling, and additional open wounds on the distal tibial surface. At this time, a decision was made to perform a right above-the-knee amputation.

RADIOLOGY

- Aggressive, predominantly osteolytic lesion involving the mid to distal tibial shaft with aggressive peristernal reaction
- Fixating intramedullary rod present, with no pathological fracture observed
- Degenerative changes in right ankle joint, diffuse osteopaenia in distal tibia, right hindfoot
- Suspicious lucencies within distal femoral condyle, proximal tibial shaft worse for tibial osseous metastasis
- 2 probable metastases in right pelvis
- Increased BM activity consistent with Neutala treatment

GROSS FINDINGS

GROSS DESCRIPTION

The specimen is received from labeled “Right Leg” and consists of a right above-the-knee amputation 25.5 cm from the head to the tip of the joint two, and 58 cm from the skin and soft tissues resection margin. Extending from the soft tissues margin 4 cm is unremarkable portion of femur. The proximal half of the skin is wrinkled, glistening and grey-white. Along the anterior knee is a 9.5 cm x 6.5 cm oval area with no prior history. In the distal half of the anterior tibial region is a 10.0 x 3.0 cm markedly subcutaneous discoloration dark brown to gray-purple area. The distal half of this area incorporates a 7.0 x 4.0 cm debrided granular reddish purple to gray-purple area. This area extends within 25 cm of skin which tissue resection margin and 52 cm from the osseous resection margin. Sectioning reveals approximately 17.0 x 10.0 x 4.0 cm mass which extends to the medial half of the shaft along the anterior tibial and malleolar surfaces. The mass extends through the width of the tibia, distally from 0 cm to partial margin, to the proximal end of the bone. The osteolytic lesions affects the bone approximately 2.0 cm, reveals a 0.5 cm x 0.5 cm x 1.0 cm area of bone involvement. The bone was thickened within 1.0 cm of the anterior tibial region.

HISTOLOGY

HISTOPATHOLOGIC EXAMINATION

The specimen consists of bone and soft tissues from the right lower leg, including skin and subcutaneous tissue. The bone is characterized by a large, irregular, lytic lesion extending through the cortex into the medullary cavity. The lesion is predominantly osteolytic, with areas of osteosclerotic reaction. The bone shows areas of medullary bone with increased vascularity and fibrous stroma.

Bone and cartilage decalcification

The bone is highly decalcified, revealing areas of osteolytic bone destruction with reactive fibrous tissue and cartilage. The cartilage shows areas of hyalinization and chondroplasia.

Neutala treatment

The specimen includes areas of Neutala treatment, with areas of fibrosis and reactive tissue.

DISCUSSION

The most frequent sites for colorectal cancer metastases, in order of frequency, are the liver, lungs, brain, and bones. Organ involvement is largely attributable to the pattern of blood and lymph flow. The majority of bone metastases arise from the colon entering the portal system, making the liver the most common site for colorectal cancer metastases. An exception to this is adenocarcinoma of the rectum, which does not drain into the portal circulation and instead drains into the iliac veins. As a result, the majority of rectal cancer metastases circumvent the liver and first present elsewhere.

The spread of cancer is also influenced by the intrinsic properties of the tumor cells and the microenvironment of an organ. Many factors make bone an ideal metastatic niche, including extensive lymphatic drainage; sluggish vascular supply through the metaphyses of long bones, allowing adequate time for tumor cells to move in and out of bone marrow; a high rate of angiogenesis; and stromal cells that support the differentiation and proliferation of cancer cells through specific signaling pathways, especially those involving VEGF, MMP-2, and syndecan-1. Most research indicates that colorectal cancer cannot bypass major organs and metastasize directly to bone; in order for bone metastases to occur, there must first be prior organ involvement. Numerous studies have shown that patients do not have bone metastases without at least lung or liver involvement. While this appears to be the general consensus, there have been several documented cases where colorectal cancer metastasized directly to bone in the absence of other metastatic organs. How and why this happened in these cases remains unknown.

This case is a unique presentation of metastatic colorectal adenocarcinoma with a metastasis to the right distal tibia in the absence of additional overt organ metastases. It is possible that this patient is part of the very small percentage of cases in which colorectal cancer appears to directly metastasize to bone and circumscribe organs such as the liver, lungs, and brain. An alternative possibility is that the patient had additional undetected metastases at the time of his right tibial metastasis, which due to their size or intrinsic properties, were unable to be detected by diagnostic imaging. If the latter is true, these additional metastases continue to exist and remain undetected as of the patient’s most recent x-rays and PET/CT scans.

TREATMENT & PROGNOSIS

Treatment options for bone metastases include surgery, radiation, chemotheraphy, endocrine therapy, and bisphosphonates. Treatment improves the quality of life and overall survival of the patient, but it does not target the underlying pathophysiology and therefore does not prevent additional lesions from developing. The average survival of patients with bone metastases is 10 months, with an 8.1% year survival rate. According to these statistics, our patient had been doing really well considering that his initial tibial bone metastasis was diagnosed in 2009. Despite this, the presence of new lucencies on radiology indicate probable new bone metastases requiring further treatment and signaling a worsening prognosis.

REFERENCES