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Case Report

Colon cancer metastasis to the sternum: palliative treatment with radiofrequency ablation and cement injection

Bryan E. Wessel MS, MBA^a, Douglas Coldwell MD, PhD^{b,*}

^a University of Louisville School of Medicine, 323 E Chestnut St, Louisville, KY 40202, USA

^b Department of Radiology, University of Louisville, Louisville, KY 40202, USA

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ABSTRACT

Colon cancer metastasis to bone is extremely rare and has devastating consequences on patients' quality of life. Furthermore, radiofrequency ablation in conjunction with cementoplasty to nonweight bearing, flat bones has not been widely reported as palliative treatment for pain as a result of bone metastasis. Here, we present a case of a 47-year-old man who developed a sternal metastasis from an invasive adenocarcinoma of the colon originally diagnosed several years prior. The pain from the metastasis was originally treated with external beam radiation therapy, but after 6 weeks of continuous pain, it was retreated using radiofrequency ablation in conjunction with cementoplasty.

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Introduction

In 2016, about 1,685,210 new cancer cases are expected to be diagnosed and about 595,690 Americans are expected to die of cancer the same year. Of the 1,685,210 new cases in 2016, it is estimated that 95,270 will be due to colon cancer. Colorectal cancer is currently the third leading cause of cancer death for both men and women [1]. Although surgical removal of a primary colorectal tumor has proven to be beneficial, 30% of patients subsequently develop a metastasis [2,3]. The most common sites of metastasis are the liver, lungs, and draining lymph nodes [4].

Although it is common for colon cancer to metastasize to the liver and lungs, mainly due to pattern of blood flow and molecular signal proteins, it is widely accepted that colon

cancer rarely metastasize to bone [5]. The most common sites for bone metastasis are typically within the axial skeleton and can lead to skeletal-related events such as severe bone pain, pathologic fracture, and the need for surgery to bone as a result of the metastasis [6].

Radiation therapy, analgesics, neurolysis, implantable neuromodulatory procedures, and physical therapy have been used to help treat the pain associated with bone metastasis [7]. Furthermore, treatment for skeletal metastasis is multidisciplinary and requires the combined efforts of orthopedic surgeons, radiation oncologists, and interventional radiologists [8]. Aside from the approaches mentioned previously, percutaneous ablation has been accepted as an effective and minimally invasive technique for treatment of pain associated with metastasis [9]. We present a case where radiofrequency

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* Corresponding author.

E-mail address: dmcold01@louisville.edu (D. Coldwell).

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ablation (RFA) was used in conjunction with cement injection as palliative treatment for colon cancer metastasis to the sternum after failure of radiation therapy.

Case presentation

A 47-year-old Caucasian man presented to the emergency department with a chief complaint of chest pain for a period of about 4 months. He was diagnosed with costochondritis and treated with pain medications. His medical history included a diagnosis of colon cancer, T3N0, low-to-moderate differentiated adenocarcinoma in August 2012. During that time, he had presented to the emergency room with complaints of abdominal pain, and he was later diagnosed as having a ruptured appendix. When taken for surgery, it was noted that he had invasive adenocarcinoma, and he underwent a right colectomy. The pathology report was consistent with a $9 \times 4 \times 3$ -cm tumor, which was low grade, well to moderately differentiated, and invaded through the muscularis propria into the subserosa. Twenty-six lymph nodes were evaluated and noted to be negative for metastatic disease, and hence, the patient was staged as pT3N0Mx colon adenocarcinoma and was subsequently treated with adjuvant chemotherapy and noted to be without any evidence of the disease about 7-8 months later.

However, since the pain did not improve, the patient underwent computed tomography (CT) of the chest, which showed areas of bronchiectasis with ill-defined opacities and nodularity within both lungs with the right greater than the left. The sternum was noted to be expanded. Subsequently, a positron emission tomography/CT was performed, and it was noted that he had widespread hypermetabolic lesions distributed throughout the body suggesting metastatic disease.

There were also abnormal hypermetabolic areas in the mediastinum and hilum. Furthermore, there was increased density on CT in the midsternum with expansion of the sternum corresponding to the hypermetabolic area (Fig. 1).

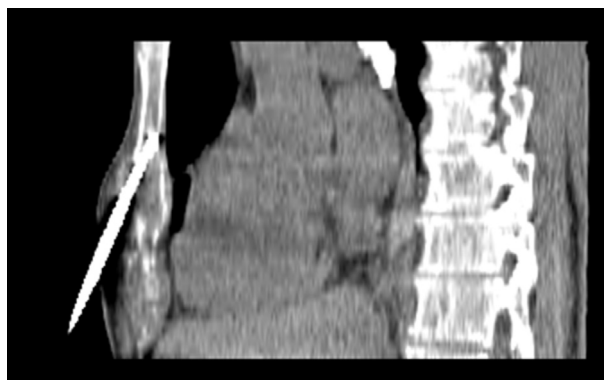


Fig. 2 – A sagittal reconstruction showing the bone guide needle and RFA probe entering the sternum.

The patient complained of excruciating pain when the area was palpated, and he was unable to remove his shirt without assistance and the pain interfered with his activities of daily living. When the patient returned to the clinic for further evaluation and treatment for his metastatic cancer with radiation therapy to the painful bony lesions, he complained of significant chest pain and reports that the pain is 9 of 10. On taking oxycodone and the MS Contin, his pain level went down to 6-7. Over the course of 2-3 weeks after the completion of the radiation, he had lost 20 lbs and noted a decreased appetite.

He was referred to the interventional radiology service for treatment of his bone pain. He was placed under general anesthesia, and the CT was used to place the 8-ga bone access needle into the sternum at a shallow angle so that it would be less likely to puncture the posterior cortex (Fig. 2). A purpose-designed bipolar radiofrequency (RFA) probe (DFINE, Inc, San Jose, CA) was placed into the tumor so that the RFA field encompassed the entire tumor and proceeded to heat the tumor to 52 C with an elliptical cross-section field size of 2×3 cm. Any heating of tissues above 46 C will result in permanent

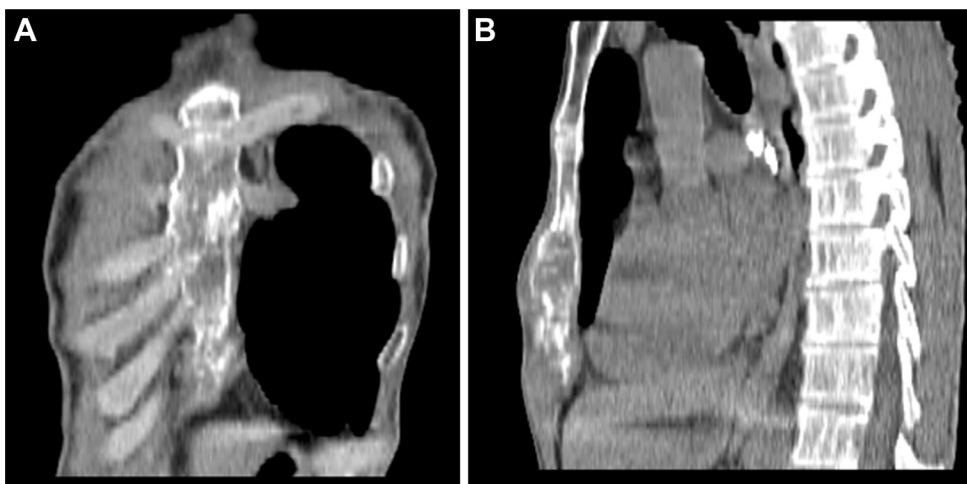


Fig. 1 – A coronal (A) and sagittal (B) reconstructed views of the untreated sternum demonstrating the enlargement of the body of the sternum at the site of the metastatic colon cancer.

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