A Case of Colorectal Cancer with Metastasis to the Chest Wall and Subsequent Hematoma Formation

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ABSTRACT

We report a rare case of a patient with colorectal cancer with chest wall metastases. The development of bleeding at the site of the metastasis ultimately resulted in the development of a hematoma, necessitating resection of the tumor along with part of the chest wall. Literature on chest wall metastases of colonic adenocarcinoma is reviewed and discussed. The teaching point is that a chest wall mass seen on imaging should prompt consideration of metastatic cancer in the differential diagnosis. The colon is a rare though reported primary site.

CASE REPORT

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A 77-year-old man presented with complaints of weakness and lethargy. He was in his usual state of health until two week prior to admission, when he began feeling persistently "out of breath" and "tired." He denied chest pain, palpitations, increase in his chronic lower extremity edema, syncope, headache and changes in urinary habits, as well as any focal neurological signs. The patient also denied nausea, vomiting, bloody or black stools, weight loss, fevers, chills, cough and sore throat.

His past medical history was significant for hypertension, hyperlipidemia, type II diabetes mellitus, chronic kidney disease (baseline serum creatinine 2.5), atrial fibrillation on warfarin 2.5 mg PO qpm (INR 18.9, aPTT 187.1), gout, an episode of upper gastrointestinal bleeding two years prior to admission, and colon cancer that had metastasized to his lungs and chest wall. The primary tumor was resected 8 years earlier, and the patient underwent multiple wedge resections for his lung metastases in the same year and 5 years prior to this presentation. A left chest wall metastasis was diagnosed and partially resected 3 years before the current presentation. His most recent chemotherapy treatment (5-FU/Bevacizumab/Folinic acid) had been administered three weeks prior to admission. In addition to the aforementioned procedures, the patient's surgical history included a partial colectomy, prostate surgery for benign prostatic hyperplasia, and appendectomy.

On physical exam, his breath sounds were coarse bilaterally and decreased on the left side although oxygen saturation was 100% on room air. He was hypotensive (blood pressure 77/41) and complete blood count showed marked leukocytosis (white blood cell count 22.5 with 92% neutrophils and no bands noted.)

Transthoracic echocardiogram taken on the day of admission revealed a vague lucent mass abutting the left ventricular wall and distorting the normal diastolic wall motion. Portable AP chest radiograph taken on the day of admission (Fig. 1) showed a large peripheral left-sided opacity. This opacity encompassed an area consistent with an FDG-avid chest wall mass seen on a prior PET/CT taken during a previous hospitalization 5 months earlier (Figs. 2-4), but was significantly larger in size. Noncontrast chest CT taken on day 3 (Fig. 5) demonstrated a left-sided chest wall mass with solid and hemorrhagic components, consistent with the patient's known metastatic chest wall tumor. The image displayed peripheral dense areas, and slightly lower

attenuation central areas likely representing hemorrhage. There were also mixed areas with variable contributions from both components. The peripheral lobulated regions measured soft tissue density, distinguishable from the adjacent hematoma. No calcifications were seen within the mass or hematoma.

There were osteolytic fragments within the distribution of the 7th rib. The associated hematoma extended from the level of the tumor to the paraspinal region and lower neck, and was contiguous with the left-sided pleural space. There was erosion of normal extrapleural fat and the aforementioned subcutaneous rib by tumor involvement. The normal compartment dividers between the pleural space and chest wall had been infiltrated secondary to metastastic neoplastic involvement, such that there was a direct involvement of pleural space.

The patient received packed red blood cells, fresh frozen plasma and vitamin K before bedside thoracoscopic incision and drainage of the extrapleural subfascial hematoma. Cultures of the fluid obtained showed no bacterial or fungal growth, and were negative for acid-fast bacilli. The pathological specimen of drained fluid consisted of an aggregate of deep-red soft coagulated blood clots measuring 18.7 cm x 15 cm x 6.5 cm in aggregate. No viable tissue was identified. A subsequent CT taken on day 11 showed improved discrete visualization of his chest wall mass (Fig. 6), which was found to measure 5.4 cm x 8.7 cm, slightly larger than the 5.7 cm x 7.7 cm measurement from 5 months before. The patient underwent palliative tumor excision and 7th rib resection on day 15.

Pathologic evaluation revealed the mass to be metastatic colonic adenocarcinoma. Low and high magnification images (Figs. 7 and 8, respectively) show a moderately differentiated adenocarcinoma infiltrating bone and fibroconnective tissue. The glands are lined by columnar cells with peripheral palisading and show central dirty necrosis, characteristic of colonic adenocarcinoma. This morphology is similar to that of the resection of metastasis to lung done 5 years prior to this presentation. Immunohistochemical analysis performed on this prior metastasis showed tumor cells to be positive for CK20, CK7 (focal) and CDX-2. The immunoprofile is confirmatory of colonic origin.

The patient's leukocytosis was determined to be due to bacteroides bacteremia of unclear origin. He was started on intravenous Zosyn and the bacteremia resolved after several days.

DISCUSSION

Colorectal cancer has the 3rd highest worldwide incidence at 1.23 million cases per year, or 9.7% of all new cancer cases. It is the 4th most common cause of cancer death, accounting for 608,000 or 8% of all cancer deaths per year [1]. It has a male:female ratio of 1.2:1 and death ratio of 1.1:1. Over 90% of cases occur during or after the 5th decade of life. For locoregional disease, the treatment is curative-intent surgery then 6 months of adjuvant chemotherapy (Oxaliplatin-containing regimen.) The most common sites of metastasis include liver, lung, and regional lymph nodes [2].

The most common primary malignant chest wall tumor type is sarcoma, arising from soft, cartilagenous or bone tissue. Common primary soft tissue neoplasms include peripheral nerve tumors, lipomas, liposarcomas, hemangiomas, elastofibromas, lymphomas, desmoid tumors and malignant fibrous histiocytomas [3]. Most metastases to the chest wall are from adjacent structures, commonly breast, lung, pleura and mediastinum [4]. Lung metastases can occur via hematogenous spread, lymphangitic spread, or by direct extension. Hematogenous spread manifests as multiple nodules of various sizes on CT, whereas lymphangitic spread is characterized by the presence of laminar effusion, Kerley B lines, fluid in the fissures and peribronchial cuffing on CT.

In contrast to the lung, to which colorectal cancer commonly metastasizes, the chest wall is a very rare site of metastasis, with only a handful of reported cases [5-8]. Jiang et al. [5] reported the case of a 52-year-old female who presented with a left anterior chest wall mass that had invaded the 4th rib. Pathology revealed poorly-differentiated adenocarcinoma of unknown origin. Colonoscopy then matched this tumor to a primary colorectal malignancy.

In another report, Cabibi et al. [6] described a patient who presented with tumors in the breast parenchyma and intercostal muscles six years following resection of a pulmonary metastasis from colon adenocarcinoma. However, the chest wall mass, along with the breast mass, was concluded to have been seeded from the resection and did not represent a true metastasis from the colon neoplasm.

Maheshwari et al. [7] reported a case with metastatic cancer to the right 6th rib. Along with the 5th and 6th ribs, the patient's tumor was resected, and pathology showed adenocarcinoma. The primary tumor was subsequently localized to the descending colon.

Choi et al. [8] presented the case of a 30-year-old male with a painful sternal mass. A biopsy specimen was taken, showing dedifferentiated adenocarcinoma. The primary tumor was found by colonoscopy to be adenocarcinoma of the rectosigmoid.

Although metastasis to the chest wall from colonic adenocarcinoma is an extremely rare condition, colonoscopy should be performed in the setting of chest wall tumor with an unknown primary site. No patterns regarding age, timeline of disease progression, or specific metastatic location on the chest wall were apparent among the handful of published cases. To our knowledge, the present report represents the only case of metastatic colorectal cancer metastasized to the chest wall that resulted in hematoma requiring drainage along with palliative chest wall resection.

An important consideration in the differential diagnosis of a new chest wall mass is tuberculosis. From 1-2% of

tuberculosus cases involve the chest wall. Grover et al. performed a retrospective review of the clinical and imaging records of 12 confirmed cases of tuberculosis with spread to the thoracic cage. CT and ultrasound images showed osteolytic and sclerotic changes with overlying soft tissue swelling at the sites of involvement, namely the sternum, sternoclavicular joints and ribs [9].

Two other important considerations in the differential diagnosis are primary chest wall neoplasm and abscess in the chest wall. However, the patient's history and histological findings make the former unlikely, while the lack of rim-enhancing pattern on CT renders the latter possibility improbable.

In addition to CT, two important imaging modalities to characterize chest wall metastases are MRI and ultrasonography. In a review of 48 chest wall metastases, Bolintineanu et al. found MRI to have the highest sensitivity and specificity for characterization of bone marrow and spinal involvement. The approach successfully detected intramedullary lesions in three patients [10].

Real-time MRI provides a sequence of MRI images that allows for radiologic animation with MRI-level spatial resolution. Recent advances have improved the temporal resolution to 20 milliseconds, permitting detailed observation of such dynamical processes as cardiac wall motion [11]. Given that our patient had impairment of diastolic relaxation due to his left-sided mass, this modality could have provided a detailed illustration of the effect.

Transthoracic ultrasound is useful for bedside imaging of a varity of lung and chest wall diseases. It has the added benefit of providing real time vascular perfusion data via doppler ultrasound. One limitation for imaging chest wall neoplasms is a lack of image specificity relative to other modalities, showing variable echogenicity within a mass. A review by Koh et al. [12] illustrates this phenomenon for a lipoma and a hemangioma of the chest wall.

TEACHING POINT

A chest wall mass seen on imaging should prompt consideration of metastatic cancer in the differential diagnosis. The colon is a rare though reported primary site.

REFERENCES

1. Ferlay J, Shin HR, Bray F, Forman D, Mathers C, Parkin DM. Estimates of worldwide burden of cancer in 2008: GLOBOCAN 2008. International Journal of Cancer 2010; 127: 2893-2917. PMID: 21351269

2. Ko FC, Liu JM, Chen WS, Chiang JK, Lin TC, Lin JK. Risk and patterns of brain metastases in colorectal cancer: 27-year experience. Dis Colon Rectum 1999; 42:1467-1471. PMID: 10566536

3. O'Sullivan P, O'Dwyer H, Flint J, Munk PL, Muller N. Soft tissue tumours and mass-like lesions of the chest wall: a pictorial review of CT and MR findings. Br J Radiol. 2007; 80(955):574-80. PMID: 16728417

4. Hong WK. Chest Wall Tumors. In Merck manual online. Retrieved from http:// http://www.merckmanuals.com/professional/pulmonary_disorders/tumors_of_the_lungs/chest_wall_tumors.html

5. Jiang L, Gao Y, Sheng S, Xu M, Lu L, Lu H. A first described chest wall metastasis from colon cancer demonstrated with (18)F-FDG PET/CT. Hell J Nucl Med. 2011; 14(3):316-7. PMID: 22087459

6. Cabibi D, Cipolla C, Valerio MR, Ingrao S. Metastatic seeding of colon adenocarcinoma manifesting as synchronous breast and chest wall localization: report of a case. Surg Today 2011; 41(2):242-6. PMID: 21264761

7. Maheshwari V, Alam K, Khan SA, Upadhyay V, Beg MH. Metastatic adenocarcinoma rib presenting as chondrosarcoma. Indian J Chest Dis Allied Sci 2000; 42: 123-124. PMID: 10916278

8. Choi JH, Kim SJ, Oh JY, Ryu SR, Shim KS, Kim KH, Baek SY, Choi HY, Lee SW, Kim MJ. A case of rectal cancer with sternal metastasis as initial presentation. J Korean Med Sci. 1995; 10(4):303-6. PMID: 8593213

9. Grover SB, Jain M, Dumeer S, Sirari N, Bansal M, Badgujar D. Chest wall tuberculosis - A clinical and imaging experience. Indian J Radiol Imaging. 2011; 21(1):28-33. PMID: 21431030

10. Bolintineanu S, Brad S, Brad V, Motoc A. The value of radio-imaging methods in the diagnosis of chest wall metastases. Rom J Morphol Embryol. 2006; 47(1):79-81. PMID: 16838063

11. Uecker M, Zhang S, Voit D, Karaus A, Merboldt KD, Frahm J. Real-time MRI at a resolution of 20 ms. NMR Biomed. 2010; 23(8):986-94. PMID: 20799371

12. Koh DM, Burke S, Davies N, Padley SP. Transthoracic US of the chest: clinical uses and applications. Radiographics. 2002; 22(1):e1. PMID: 11796913

13. Mayer RJ. Chapter 91. Gastrointestinal Tract Cancer. In: Longo DL, Fauci AS, Kasper DL, Hauser SL, Jameson JL, Loscalzo J, eds. Harrison's Principles of Internal Medicine. 18th ed. New York: McGraw-Hill; 2012. http://www.accessmedicine.com/content.aspx?aID=9115982 Accessed July 15, 2012.

FIGURES

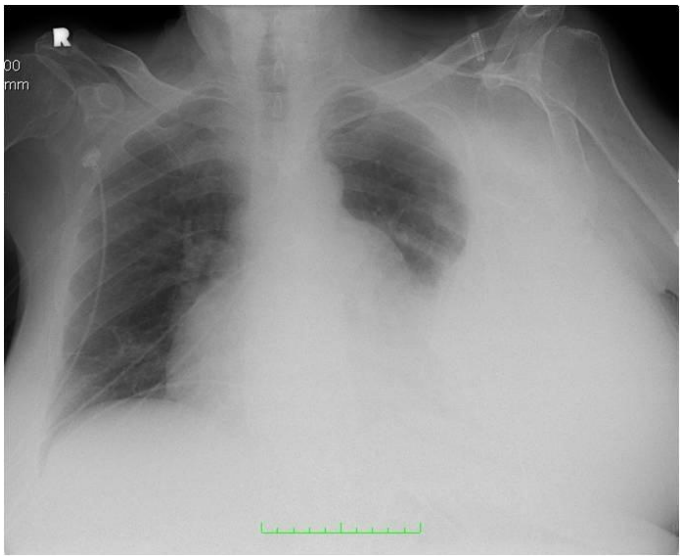

Figure 1. 77-year-old male with colonic adenocarcinoma metastatic to the chest wall. 1st day of admission portable AP Chest Radiograph demonstrates extensive left lateral basilar opacity, demonstrating obtuse margins. Diagnostic considerations include a large loculated pleural effusion or mass lesion. Enlarged cardiac silhouette and pulmonary trunk also noted.

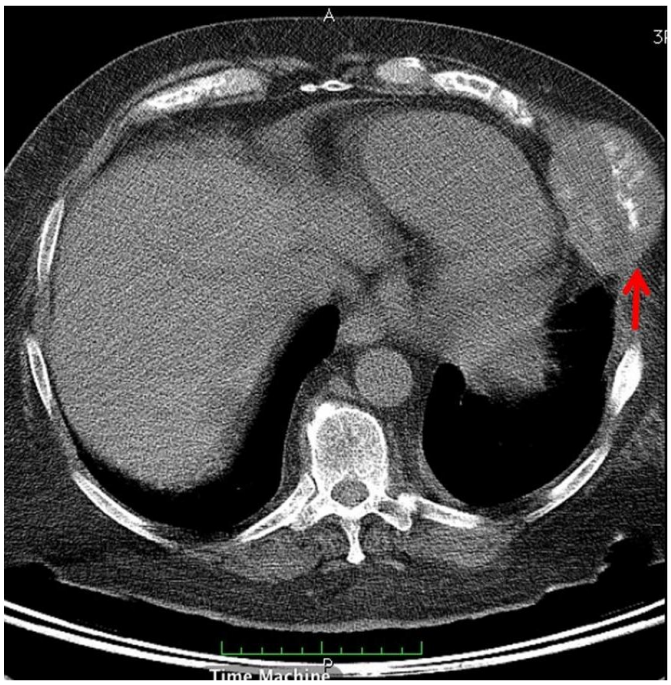

Figure 2. 77-year-old male with colonic adenocarcinoma metastatic to the chest wall. Five months prior to admission non-enhanced 5 mm axial CT images (window level 40, window width 300, 130 kV, DLP 1212, Siemens Biograph 6) through the lower thorax demonstrates a soft tissue density mass lesion (red arrow) with associated destruction of the left anterior 7th rib highly suspicious for a metastatic lesion given the history of colon cancer. The lesion's mean attenuation is 33.6 HU with standard deviation 63.9.

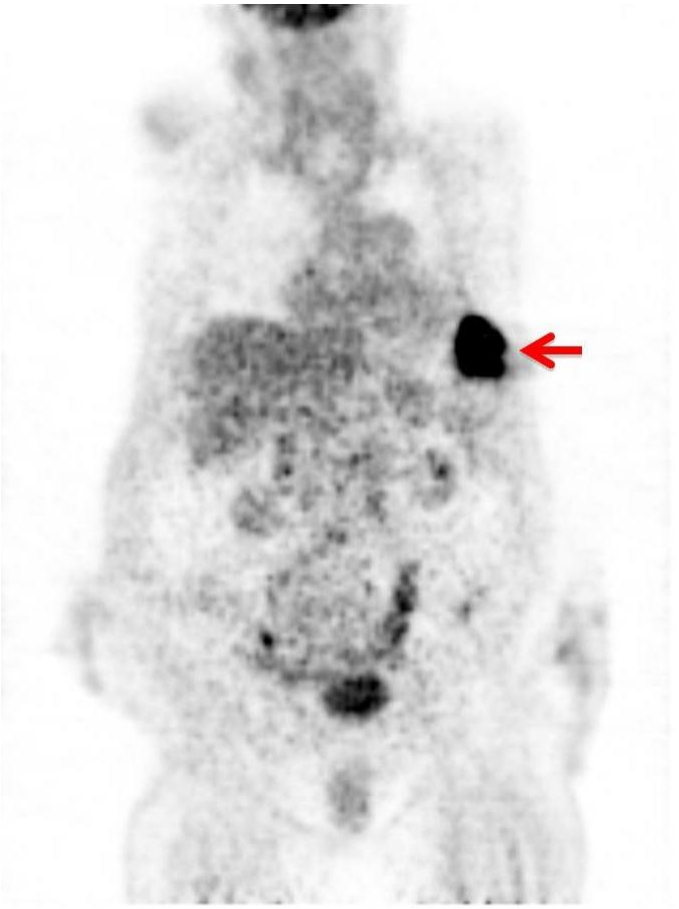

Figure 3. 77-year-old male with colonic adenocarcinoma metastatic to the chest wall. Coronal PET image corresponding to Fig. 2 demonstrates a focus (red arrow) of high FDG uptake projecting in the lateral left basilar region, within known left basilar chest wall mass consistent with metastatic disease. Maximum SUV was 1.9.

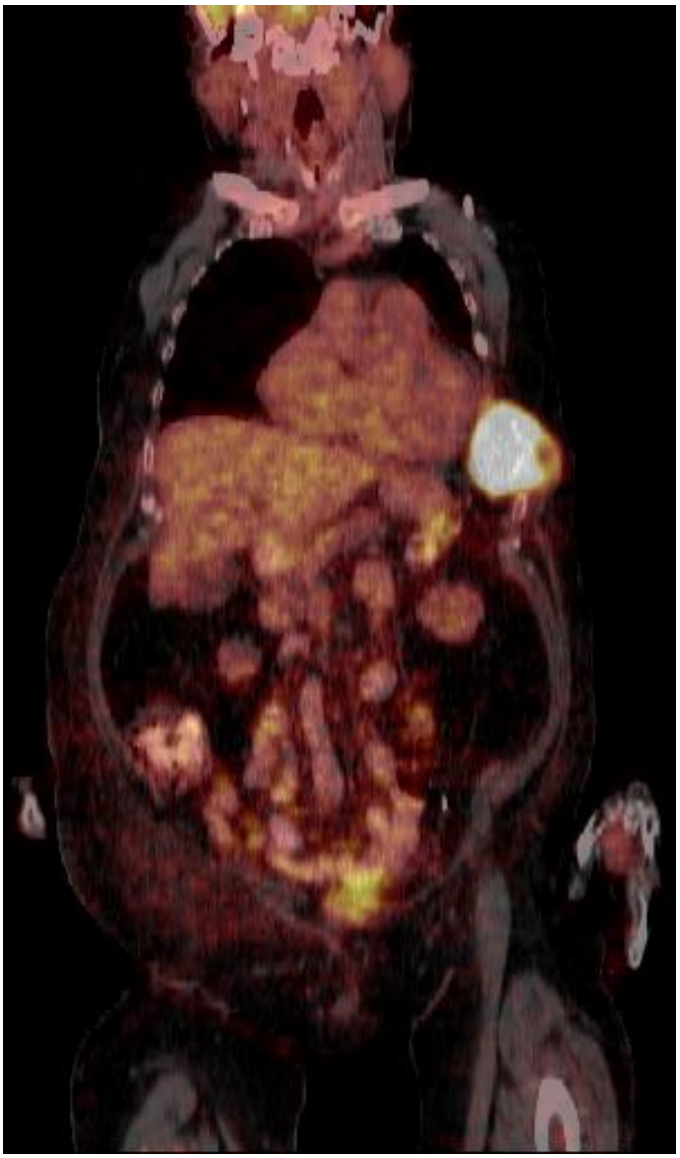

Figure 4. 77-year-old male with colonic adenocarcinoma metastatic to the chest wall. Fused PET/CT image corresponding to Fig. 2 confirms location and exophytic morphology of a left lower chest wall mass with maximum SUV of 1.9.

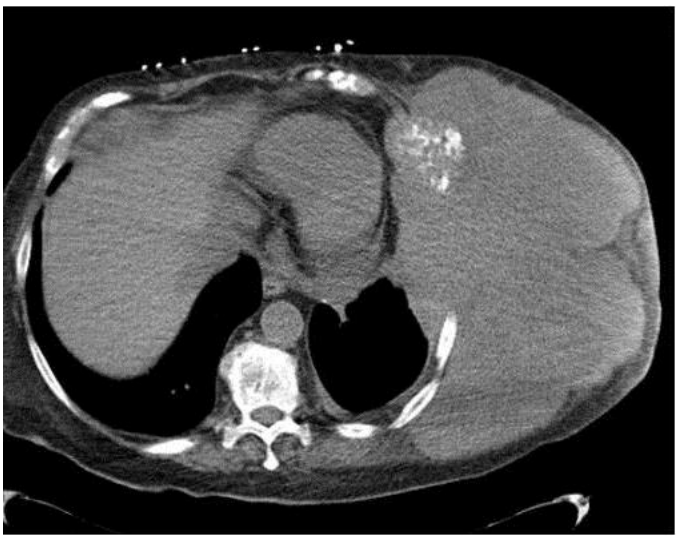

Figure 5. 77-year-old male with colonic adenocarcinoma metastatic to the chest wall. Third day of admission non-contrast axial 5 mm CT image (window level 40, window width 400, 120 kV, DLP 477, Siemens Sensation 40) of the lower chest shows an exuberate large lobulated soft tissue density chest wall mass with evidence of rib destruction anteriorly. Minimal left pleural fluid layers dependently. Average attenuation is 38.3 HU, with standard deviation = 24.4, consistent with acute bleeding.

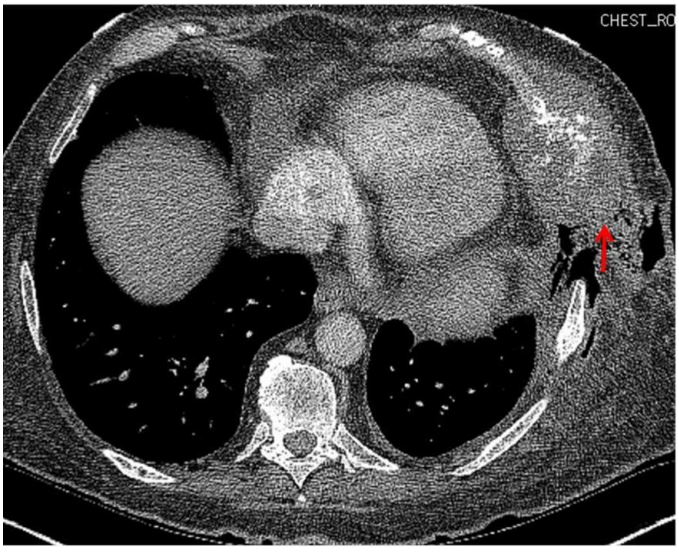

Figure 6. 77-year-old male with colonic adenocarcinoma metastatic to the chest wall. Eleventh day of admission high resolution axial CT image (window level 400, window width 350, 120 kV, DLP 614, Siemens Definition AS+) following administration of intravenous contrast and drainage procedure shows marked decrease in size of the chest wall mass (red arrow) with a residual soft tissue density mass centered about the left anterior 7th rib, evidence of rib destruction and subcutaneous emphysema. The lesion's mean attenuation is 28.8 HU with standard deviation 131.6.

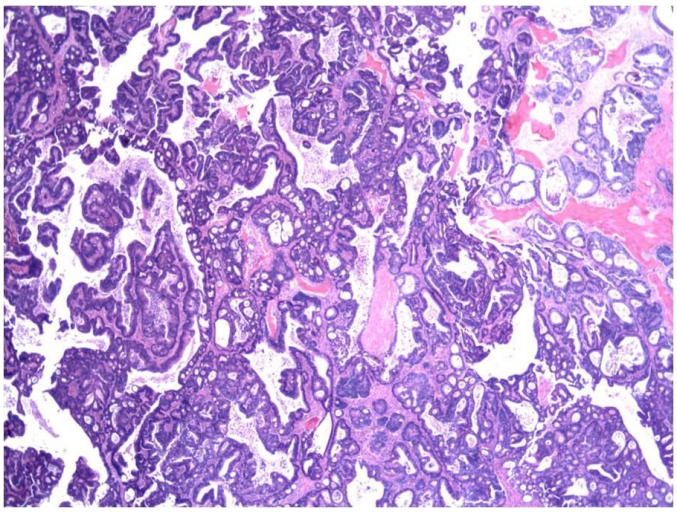

Figure 7. 77-year-old male with colonic adenocarcinoma metastatic to the chest wall. Low magnification (40X) view of chest wall biopsy specimen shows a moderately differentiated adenocarcinoma infiltrating bone and fibroconnective tissue. The glands are lined by columnar cells with peripheral palisading and show central dirty necrosis, characteristic of colonic adenocarcinoma. This morphology is similar to that of the 2007 resection of metastasis to lung.

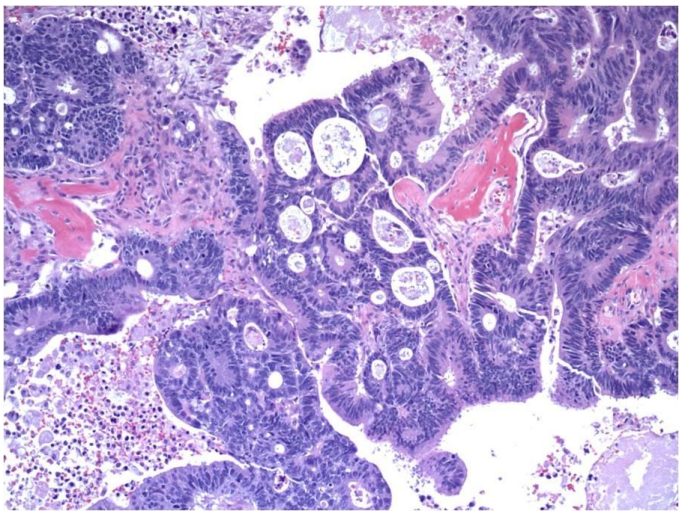

Figure 8. 77-year-old male with colonic adenocarcinoma metastatic to the chest wall. High magnification (100X) view of chest wall biopsy specimen shows a moderately differentiated adenocarcinoma infiltrating bone and fibroconnective tissue. The glands are lined by columnar cells with peripheral palisading and show central dirty necrosis, characteristic of colonic adenocarcinoma. This morphology is similar to that of the 2007 resection of metastasis to lung.

Etiology	Neoplastic
Incidence	Worldwide: 663,000 (men) + 571,000 (women), Rate of distant metastases = 20%
Gender ratio	Colon Cancer – male:female = 1.2:1 Colon Cancer Death – male:female = 1.1:1
Age predilection	< 50 years old: 9% 50-75 years old: 51% > 75 years old: 40%
Risk Factors [13]	• Familial Adenomatous Polyposis: genetic condition predisposing toward many colonic polyps that can undergo malignant transformation into colon cancer • Lynch Syndrome (Hereditary Nonpolyposis Colorectal Cancer): inherited defect in DNA mismatch repair. Unrepaired DNA mismatches can lead to colon cancer among other malignancies • Ulcerative Colitis: Autoimmune disease with repeated damage to the colonic mucosa that can over time lead to malignancy • Personal history of colorectal polyps • Personal history of cancer • Family history of colorectal cancer • Peutz-Jeghers • African American • Obesity • Diabetes: high levels of insulin lead to high levels of insulin-like growth factor, which stimulates growth of colonic mucosa • Streptococcus bovis: fecal bacterium that can cause septicemia or endocarditis. If responsible for either condition, such patients have a high incidence of colon cancer via unknown pathophysiology. • Cigarette smoking: for unknown reasons, increases risk for colonic adenomas, especially after more than 35 years of use.
Treatment	locoregional disease: curative-intent surgery then 6 months adjuvant chemotherapy (Oxaliplatin-containing regimen)
Prognosis	Five year survival rates: ~Localized (confined to primary site) -- 90.1% ~Regional (spread to regional lymph nodes) -- 69.2% ~Distant (cancer has metastasize) -- 11.7%, ~Unknown (unstaged) -- 33.3%

Table 1: Summary table for colon cancer

Modality	Colorectal Chest Wall Metastasis	Chest Wall Hematoma	Primary Chest Wall Neoplasm	Abscess	Tuberculosis
CT	Well-circumscribed soft-tissue 10--60 HU) lesion	Homogenous appearance with attenuation roughly 80 HU (range for blood is 50-100 HU)	Homogeneous mass with attenuation pattern reflecting tissue of origin (bone or soft tissue), with no necrosis and no infiltration of associated soft tissue or destruction of associated bone	Enhancing walls and fluid attenuate-on centrally (necrosis)	Bony erosion with adjacent sclerosis, adjoining soft tissue thickening and enhancement
PET	Typically high FDG avidity	Variably FDG avid	Typically FDG avid	Typically FDG avid	FDG avid at granulomatous sites and cold areas at necrotic sites
Radiograph AP	Isolated masses or opacities with associated pleural effusions, possible osseous destruction of ribs or sternum, periosteal reaction or calcification	Localized or diffuse opacity	Similar appearance to that of metastatic chest wall tumors	Usually single cavity with thick wall, smooth inner margin, air-fluid level, more frequent in superior segments of lower lobes or posterior segments of lower lobes	Osseous and cartilaginous destruction. Soft tissue masses are present with calcification and rim enhancement when contrast material has been administered

Table 2: Differential diagnosis table for a colonic adenocarcinoma metastatic to the chest wall

ABBREVIATIONS

5-FU = 5-Fluorouracil
AP = Anterior-Posterior
CK20/7 = cytokeratin20/7
CDX-2 = Caudal-type homeobox protein
cm = centimeters
CT = Computed Tomography
DLP = Dose-Length Product
FDG = Fluorodeoxyglucose
HU = Hounsfield Units
mg = milligrams
PET = Positron Emission Tomography
PO = by mouth
qpm = at night
SUV = Standardized Uptake Value

KEYWORDS

Colorectal Cancer; Chest Wall; Metastatic