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Chest Wall Mass in a 50-year-old Woman

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History and Physical Examination

A 50-year-old postmenopausal woman presented with a 9-month history of a lump on her left anterior chest wall in the region of the 2nd and 3rd costochondral junction. She reported the mass changed in size and at times felt soft and fluctuant. It intermittently swelled, causing her local discomfort followed by periods of spontaneous regression, which would be accompanied by inflammation localized to the surrounding chest wall. Physical examination revealed a firm mass along the left superior chest wall measuring approximately 6 × 3 cm. It was fixed in position and slightly tender to palpation. She was afebrile. No other joint complaints were reported. She had a history of ovarian cancer diagnosed at age 24 years; the workup for metastatic disease to the bones and solid organs was negative at that time. Her ovarian cancer was treated with whole-abdomen radiation therapy, chemotherapy, and a total abdominal hysterectomy and bilateral salpingo-oophorectomy. She had no symptoms or signs of metastatic disease in the interim.

Plain radiographs of the chest were noncontributory. CT and MRI of the chest wall were performed (Figs. 1, 2).

Based on the history, physical examination, and imaging studies, what is the differential diagnosis?

Imaging Interpretation

CT scanning of the chest showed a mixed attenuation mass along the anterior left chest wall involving the second and third costochondral and costosternal regions, measuring approximately 5 × 3 × 3.6 cm. It was unclear by imaging whether the mass was centered in the osseous or soft tissue structures. Areas of somewhat amorphous, coarse calcification were present in the mass (Fig. 1A). Small focal areas of sclerosis were noted involving the adjacent margins of the sternum and ribs, with no gross destructive changes observed. The more superficial, low-attenuation component of the mass appeared to mildly displace but not invade the overlying pectoralis muscle (Fig. 1B).

On MRI, the more superficial component of the mass had low signal intensity on coronal T1-weighted images (Fig. 2A) and fluid signal intensity on the T2-weighted images. The deeper component adjacent to the costosternal junction had low signal intensity on both sequences, consistent with a nodular soft tissue component measuring approximately 4.2 × 1.6 cm. There were no obvious calcifications seen on the MR images. The axial T2-weighted image showed a single fluid-fluid level (Fig. 2B). On postcontrast imaging, the nonenhancing cystic component

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Each author certifies that his or her institution approved the reporting of this case report, that all investigations were conducted in conformity with ethical principles of research, and that informed consent for participation in the study was obtained.

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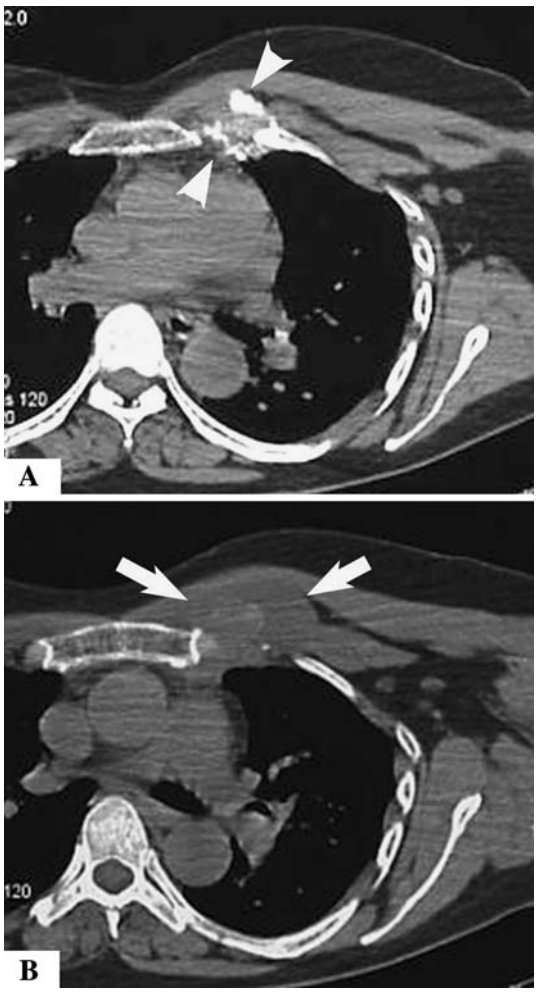

Fig. 1A–B (**A**) An axial CT scan of the chest (soft tissue windows) shows a mixed-attenuation mass along the anterior left chest wall involving the second and third costochondral and costosternal regions. Areas of somewhat amorphous, coarse calcification (arrowheads) and small focal areas of sclerosis involving the adjacent margins of the sternum and ribs with no gross destructive changes are seen. (**B**) An axial CT scan (soft tissue window) slightly more cephalad shows a more superficial, low-density or cystic component of the mass (arrows), which appears to mildly displace but not invade the overlying pectoralis major muscle.

and an enhancing mural nodule were observed, with adjacent soft tissue enhancement (Fig. 2C).

Differential Diagnosis

- Osteoarthritis of the second and third costochondral and costosternal regions with complex ganglion cyst formation
- Infection (mycobacterial origin)
- Crystal deposition disease (gout or calcium hydroxyapatite)
- Myxoid sarcoma
- Metastatic disease

A CT-guided biopsy and aspiration were performed. Subsequently, the lesion was excised and examined histologically (Fig. 3).

Based on the history, physical findings, radiology, and histology, what is the diagnosis?

Histopathology Interpretation

Approximately 5 to 6 mL serous fluid was aspirated and submitted. The histologic features were predominantly those of skeletal muscle and fibrofatty tissue with two tiny clusters of malignant epithelial cells with hyperchromatic nuclei forming papillae diagnostic of metastatic well-differentiated adenocarcinoma (Fig. 3A).

Diagnosis

Metastatic papillary serous adenocarcinoma from ovarian primary.

Discussion and Treatment

At age 24 years, our patient had Stage IIIB disease with contiguous spread to the ovaries, uterus, fallopian tubes, pelvic side wall, peritoneum, bladder, and serosa of the large bowel. Workup for metastatic disease at the time of original diagnosis was negative. She had been considered disease free for a 26-year interval. In view of the remote history of ovarian carcinoma, the biopsy results were consistent with metastatic papillary ovarian carcinoma. Diagnosis was confirmed by a positive immunoassay for CA 125 and CK 7 (Fig. 3B). Fluid submitted for cytopathologic study showed metastatic papillary serous adenocarcinoma with psammoma bodies consistent with an ovarian primary.

This case is of interest from the perspective of a long-term quiescent malignant disease recurring with an unusual metastatic focus and presenting as a soft tissue lesion centered around the costosternal or sternoclavicular joints. The sternoclavicular and costosternal joints, when symptomatic, are typically the sites of degenerative or arthritic changes. Osteoarthritis, inflammatory arthritis, and gout are common diseases that manifest as costosternal or sternoclavicular pain. These entities are centered at the joint margin and tend to have productive changes, such as osteophyte formation, reactive periostitis, and hyperostosis. These were notably absent in our patient on advanced imaging. A unilateral presentation also would include the differential of septic arthritis, however, this typically would result in a much more rapid onset of joint destruction and

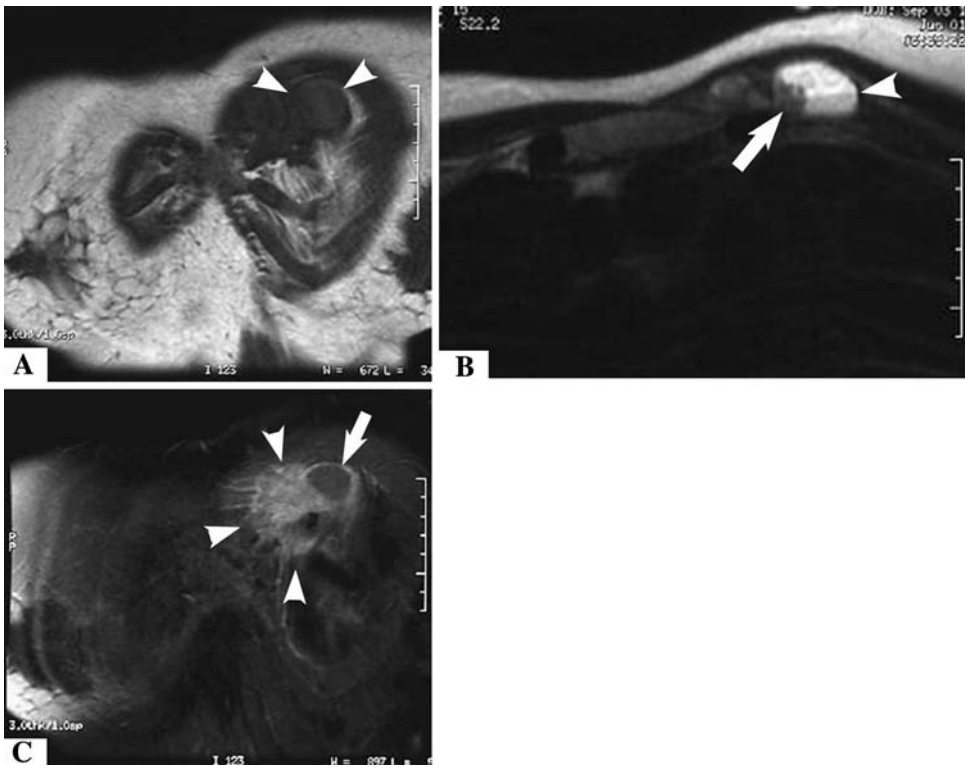

Fig. 2A–C (**A**) A coronal T1-weighted MR image of the anterior chest wall shows a low-signal-intensity mass (arrowheads) arising from the costosternal junction, deep to the pectoralis muscle. (**B**) An axial T2-weighted MR image shows the chest wall mass as a well-defined, predominantly hyperintense cystic lesion. A deeper component adjacent to the costosternal junction, which is low signal intensity on both sequences, is suggestive of a nodular soft tissue component (arrow). The single fluid-fluid level (arrowhead) can be seen. (**C**) A coronal T1 fat-saturated postgadolinium image clearly shows the nonenhancing cystic component (arrow) and enhancing soft tissue medially at the costosternal junction (arrowheads).

disorganization. Clinical features of soft tissue redness and induration were not present. This also would be atypical given the 9-month history of the patient's symptoms. Although myxoid sarcoma was included in the differential diagnosis given the imaging findings, primary bone or cartilage tumors in this region are quite rare. Secondary metastatic lesions also would be quite unusual outside of soft tissue sarcoma primaries or melanoma. The patient's history of increasing and decreasing size of the lesion also seemed inconsistent with neoplastic processes.

New diagnoses of ovarian cancer in the US in 2006 were estimated at more than 20,000 [16]. Ninety percent of cancers arise from the surface epithelium having various subtypes, with serous tumors being the most common. The overall survival rate for patients with Stage III malignancy is 21% and between 5% and 8% for patients with Stage IV disease. Ovarian neoplasms are quite deadly, with 60% to 65% of patients currently presenting with Stage III malignancy [16].

Ovarian neoplasms metastasize to intraperitoneal solid organs [9], colon [18], bladder [17], breast [8, 11, 14], skin [5], brain [4], and supradiaphragmatic lymph nodes and organs [13]. Metastases to bone are distinctly uncommon, with the prevalence reported as 1.6% [1–3, 6, 7, 15], with the most frequent subtype being papillary adenocarcinoma [7].

Although metastasis to the skin surface and subcutaneous tissues has been estimated to occur in just greater than 3% of patients with recurrent ovarian cancer [5, 12], involvement of deep soft tissues and muscles is much less common. Osseous and soft tissue involvement is thought to occur either by direct extension from paraaortic or iliac lymph nodes, or by lymphatic or hematogenous spread [7, 12]. Hematogenous or lymphatic spread may have occurred in our patient. Chemotherapy and radiotherapy are used for treatment of local and widespread metastatic disease, while resection of solitary metastases can be performed.

We found one published case of ovarian carcinoma with metastasis in the region of the sternum and costae [10]. The mean interval between diagnosis and the appearance of osseous metastasis was reported as 7 years 7 months. Our patient's interval from original disease to current presentation was substantially longer (26 years). In addition, it appears the costosternal joints were involved via spread from the adjacent muscles/soft tissues.

After biopsy, the whole-body bone scan showed a solitary focus of increased uptake involving the left anterior chest wall just inferior to the left sternoclavicular joint. PET/CT scans showed a heterogeneous focus of intense fluorodeoxyglucose (FDG) uptake (maximal standardized uptake value, 12.4 g/mL) in the left upper anterior chest wall, located just lateral to the manubrium.

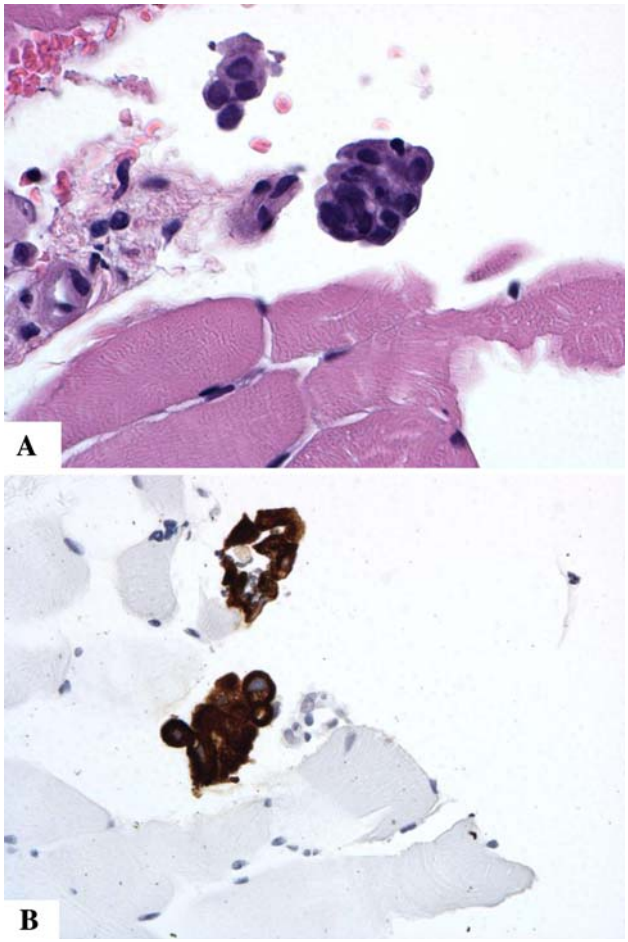

Fig. 3A–B (**A**) A photomicrograph shows skeletal muscle with two tiny clusters of malignant epithelial cells with hyperchromatic nuclei, arranged in small glands (Stain, hematoxylin and eosin; original magnification, ×40). (**B**) The cells are positive with immunoassay CA125 marker consistent with metastatic ovarian adenocarcinoma (Original magnification, ×40).

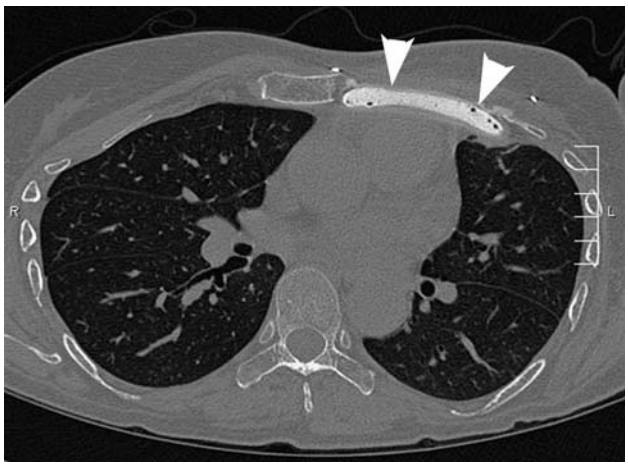

Fig. 4 An axial CT image obtained after surgery shows reconstruction of the chest wall with methylmethacrylate (arrowheads).

Our patient initially was treated with chemotherapy with poor response. Subsequently, the patient underwent radical resection of the metastatic soft tissue mass and anterior chest wall with reconstruction using methylmethacrylate and GORE-TEX® patches (Fig. 4). Final pathologic analysis of the surgical specimen showed metastatic papillary adenocarcinoma involving the soft tissues adjacent to the mass, the second and third left ribs, their respective intercostal muscles, and portions of the pectoralis major and minor muscles. Radiation was administered postoperatively. Two and one-half years after surgery, the patient is disease free and has full functional use of her left upper extremity.

References

1. Abdul-Karim FW, Kida M, Wentz WB, Carter JR, Sorensen K, Macfee M, Zika J, Makley JT. Bone metastasis from gynecologic carcinomas: a clinicopathologic study. *Gynecol Oncol.* 1990;39:108–114.
2. Bergman F. Carcinoma of the ovary: a clinicopathological study of 86 autopsied cases with special reference to mode of spread. *Acta Obstet Gynecol Scand.* 1966;45:211–231.
3. Brufman G, Krasnokuki D, Biran S. Metastatic bone involvement in gynecological malignancies. *Radiol Clin (Basel).* 1978;47:456–463.
4. Chang TC, Jain S, Ng KK, Hsueh S, Tsai CS, Chen HL, Chang CN. Cerebellar metastasis from papillary serous adenocarcinoma of the ovary mimicking Meniere's disease: a case report. *J Reprod Med.* 2001;46:267–269.
5. Cormio G, Capotorto M, Vagno GD, Cazzolla A, Carriero C, Selvaggi L. Skin metastases in ovarian carcinoma: a report of nine cases and a review of the literature. *Gynecol Oncol.* 2003;90:682–685.
6. Dauplat J, Hacker NF, Nieberg RK, Berek JS, Rose TP, Sagae S. Distant metastases in epithelial ovarian carcinoma. *Cancer.* 1987;60:1561–1566.
7. Dinh TV, Liebowitz BL, Hannigan EV, Schnadig VJ, Doherty MG. Bone metastasis in epithelial ovarian carcinoma. *Int J Gynaecol Obstet.* 1996;52:173–176.
8. Gupta D, Merino MI, Farhood A, Middleton LP. Metastases to breast simulating ductal carcinoma in situ: report of two cases and review of the literature. *Ann Diagn Pathol.* 2001;5:15–20.
9. Max LD, Stastny JF, Frable WJ. Solitary splenic metastasis of an adenocarcinoma of the ovaries. *Gynecol Obstet Invest.* 1996;42:214–216.
10. Noguchi H, Mori A. A case of ovarian cancer with metastasis to the sternum and costae. *Gynecol Oncol.* 1994;52:416–419.
11. Ozsaran AA, Dikmen Y, Terek MC, Ulukus M, Ozdemir N, Orguc S, Erhan Y. Bilateral metastatic carcinoma of the breast from primary ovarian cancer. *Arch Gynecol Obstet.* 2000;264:166–167.
12. Park CM, Kim SH, Kim SH, Moon MH, Kim KW, Choi HJ. Recurrent ovarian malignancy: patterns and spectrum of imaging findings. *Abdom Imaging.* 2003;28:404–415.
13. Patel SV, Spencer JA, Wilkinson N, Perren TJ. Supradiaphragmatic manifestations of papillary serous adenocarcinoma of the ovary. *Clin Radiol.* 1999;54:748–754.
14. Recine MA, Deavers MT, Middleton LP, Silva EG, Malpica A. Serous carcinoma of the ovary and peritoneum with metastases to

the breast and axillary lymph nodes: a potential pitfall. *Am J Surg Pathol.* 2004;28:1646–1651.
15. Rose PG, Piver MS, Tsukada Y, Lau TS. Metastatic patterns in histologic variants of ovarian cancer: an autopsy study. *Cancer.* 1989;64:1508–1513.
16. Stat bite: Age-specific incidence and mortality rates for ovarian cancer, 1998–2002. *J Natl Cancer Inst.* 2006;98:511.
17. Young RH, Johnston WH. Serous adenocarcinoma of the uterus metastatic to the urinary bladder mimicking primary bladder neoplasia: a report of a case. *Am J Surg Pathol.* 1990;14:877–880.
18. Zighelboim I, Broaddus R, Ramirez PT. Atypical sigmoid metastasis from a high-grade mixed adenocarcinoma of the ovary. *Gynecol Oncol.* 2004;94:850–853.