Case Report

An unusual case of solitary metachronous calf metastasis from gastric carcinoma after curative surgery

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ABSTRACT

Gastric carcinoma is the fifth most common cancer worldwide and a significant cause of cancer-related mortality. It commonly metastasizes to the liver, peritoneum, lungs, and bones. We highlight a rare case with solitary metachronous metastasis to the soleus muscle. A 70-year-old man was evaluated for complaints of dysphagia and diagnosed with locally advanced gastric carcinoma. He underwent radical gastrectomy followed by adjuvant chemotherapy and remained disease free for 2.5 years. Subsequently, he developed a painless swelling in the right calf. Radiological and functional imaging showed an intramuscular lesion within the right soleus muscle with no evidence of disease elsewhere. Histopathological examination of the swelling revealed metastatic adenocarcinoma, consistent with gastric primary. He was started on palliative chemotherapy. Solitary skeletal muscle metastasis with a well-controlled primary is challenging to diagnose and requires histopathology and immunohistochemistry to differentiate it from other soft-tissue neoplasms. The prognosis is poor and the intent of treatment remains palliative.

Key words: Calf metastasis, Gastric adenocarcinoma, Skeletal muscle metastasis, Soleus metastasis

Gastric carcinoma is the fifth most common cancer worldwide, with a staggering 1.09 million new cases diagnosed in 2020. It is a significant cause of cancer-related mortality, accounting for more than 700,000 deaths annually [1]. It commonly metastasizes to the liver, peritoneum, lung, and bone but rarely to the skeletal muscles [2]. The incidence of skeletal muscle metastasis (SMM) from gastric cancer is <1% and is seldom present without synchronous metastasis to other organs [3]. Isolated SMM as the exclusive site of recurrence of gastric carcinoma is even more uncommon.

Here, we report a case of solitary metachronous metastasis in calf muscles from a gastric primary, appearing 2½ years after curative gastrectomy and adjuvant treatment. Our experience underscores the significance of diligent follow-up in gastric cancer after curative treatment and the possibility of unusual clinical presentations of recurrent disease. Clinicians should bear in mind the likelihood of SMM when assessing patients with a soft-tissue mass.

CASE REPORT

A 70-year-old man, known diabetic on oral medication, was evaluated in 2019 for complaints of progressive dysphagia to solids for 4 months. Clinical examination yielded no significant finding. Esophagogastroduodenoscopy demonstrated a growth extending from the gastroesophageal junction (GEJ), along the lesser curvature, up to 5 cm beyond GEJ. Contrast-enhanced computed tomography (CECT) imaging of the abdomen and pelvis showed concentric wall thickening involving GEJ, cardia, and the proximal body of the stomach, measuring 5 cm long. Few perigastric nodes were noted. Biopsy turned out to be poorly differentiated adenocarcinoma, intestinal type. He underwent radical gastrectomy with D2 lymph node dissection and roux-en-y esophagogastrojejunostomy. Post-operative histopathology revealed adenosquamous carcinoma of the stomach and GEJ infiltrating through muscularis propria. Lymphovascular invasion was not seen. Extensive perineural and intraneural invasion was present. Four out of 57 dissected lymph nodes were positive for malignancy, with three showing extranodal extension. Omental nodules showed tumor deposits. The final staging was reported as pT3N2M1. He received six cycles of adjuvant chemotherapy with a docetaxel, oxaliplatin, and capecitabine regimen. After completion of adjuvant chemotherapy, he was on regular follow-up and disease free for 2.5 years.

He then presented to our outpatient department in 2022 with complaints of painless swelling in the right calf region. On examination, he was conscious and well oriented to time,

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place, and person. His vitals were stable with blood pressure of 130/80 mmHg, pulse rate of 90/min, and SpO_2 of 99% at room air. Eastern cooperative oncology group performance status was 1. There was no pallor, icterus, pedal edema, or palpable lymph nodes. A globular swelling measuring 6×5×5 cm was present over the posterior aspect of the left leg, firm in consistency, and non-tender with no local rise of temperature. There was no neurovascular deficit and no limitation in range of motion.

Routine blood investigations were in the normal range. CECT thorax and abdomen revealed no evidence of disease. Magnetic resonance imaging (MRI) of the right lower limb showed a well-defined intramuscular lesion of size 43×46×60 mm, within the soleus muscle, in the posterior compartment of the calf. The lesion appeared hyperintense on T2/STIR (Fig. 1a, c, d) and isointense on T1-weighted (Fig. 1b) sequences. Soft-tissue edema was prominent in the posteromedial aspect of the leg. On positron emission tomography-CT imaging, surgical bed and anastomotic sites were normal. There was a fluorodeoxyglucose-avid, heterogeneously enhancing mass in the right soleus muscle, measuring 51×48×42 mm (Fig. 1e). A similar soft-tissue lesion of 29×13 mm was appreciated in the popliteal region, encasing the popliteal artery. A few hypermetabolic right inguinofemoral and popliteal lymph nodes were also noted. Upper gastrointestinal endoscopy and colonoscopy were done and showed no abnormality. An ultrasound-guided biopsy was taken from the calf swelling, and under the microscope, polygonal cells with pleomorphic nuclei arranged in ill-formed glands or cords were seen (Fig. 2a and b). Some of the cells showed signet ring cell morphology with intracytoplasmic mucin. Immunohistochemistry revealed focal positivity for CDX2 (Caudal-type homeobox 2) (Fig. 2c), whereas staining was negative for CK-7 (Fig. 2d) and CK-20 (Fig. 2e). The pathological findings and the clinical history correlate well with metastatic adenocarcinoma of gastric origin.

Our patient was started on palliative chemotherapy with capecitabine and irinotecan. After six cycles, there was progressive disease. He is currently undergoing Gemcitabine-based chemotherapy and has stable condition.

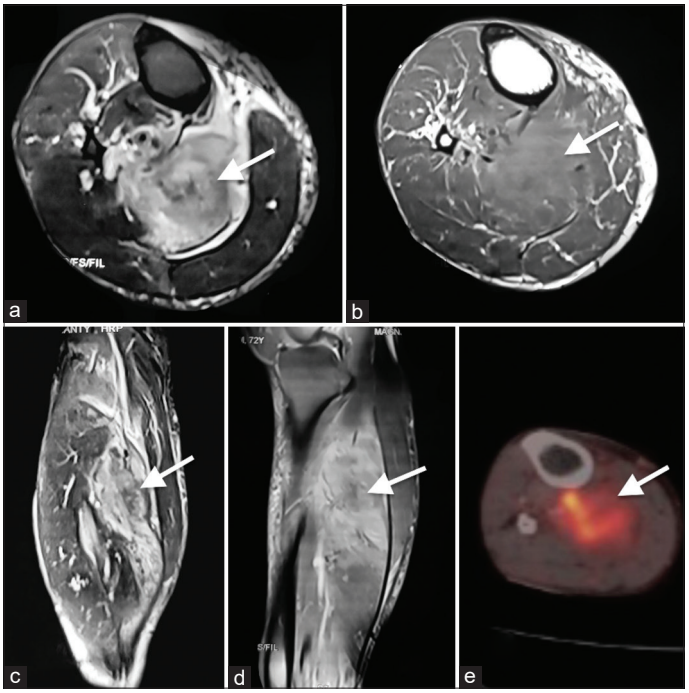

Figure 1: (a) T2/STIR magnetic resonance imaging (MRI) of right leg in axial section showing a hyperintense lesion within soleus muscle. (b) T1W MRI shows the same lesion appearing isointense. (c and d) T2/STIR MRI of right leg showing hyperintense intramuscular lesion in coronal and sagittal sections, respectively. (e) positron emission tomography-computed tomography image showing an fluorodeoxyglucose-avid heterogeneously enhancing mass in right soleus muscle

DISCUSSION

Gastric carcinoma is the fifth most common malignancy globally, with an incidence of 6.72/1,00,000 population. Lymph nodes, liver, and peritoneum constitute the most common sites of recurrence and metastasis from gastric carcinoma [4]. Neoplastic cells from the stomach can spread via multiple pathways such as lymphatic, hematogenous, transperitoneal seeding, or dissemination along peritoneal surfaces and ligaments [5]. Skeletal muscles are a rare site of hematogenous metastasis and carry a poor prognosis [6]. Sugitani *et al*. showed that patients with skeletal muscle secondaries had significantly worse survival when compared to patients with metastases to other organs [7].

Although skeletal muscles constitute approximately 40% of body mass and are highly vascularized, they are an uncommon site of primary and metastatic cancers [8]. Biomechanical damage to tumor cells in the muscle microvasculature, dislodgement of tumor cells by muscle contraction, and lactic acid production by

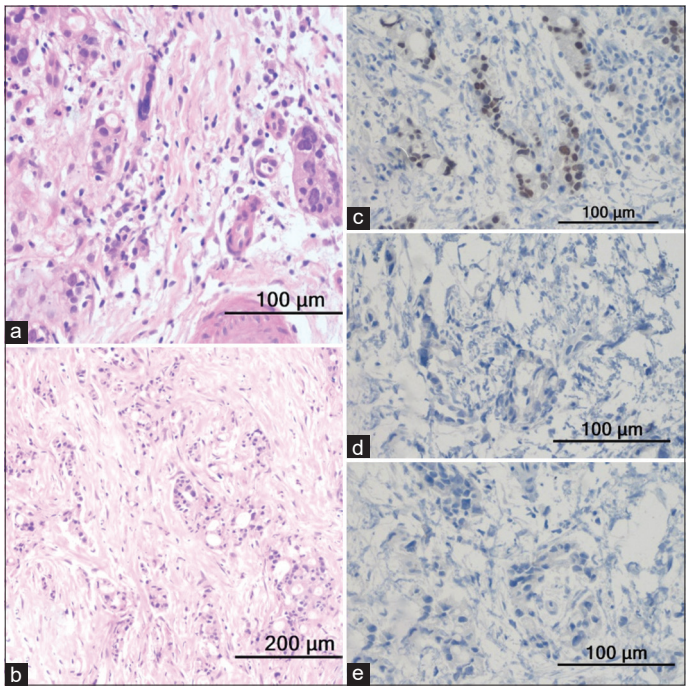

Figure 2: (a and b) Histopathological examination with H and E showing polygonal cells with pleomorphic nuclei arranged in ill-formed glands or cords. (c) Tumor cells were focally positive for CDX2. (d) Tumor cells showing negative staining for CK7. (e) Tumor cells showing negative staining for CK20

muscles are all protective factors that make the vicinity of striated muscles unfavorable for malignant cells to proliferate [9]. The sarcolemma of the skeletal myocyte also serves as a physical barrier against invading tumor cells [10]. Various autopsy series have reported the incidence of SMM in the range of 0.8–16% [11]. The most common primary tumors giving rise to SMM are the lung (25%), closely followed by genitourinary and gastrointestinal tracts (21% each) and breast (8.2%) [6]. Haygood *et al*. reviewed 332 cases of SMM and found that 6.3% (n=21) originated from the stomach. The most common muscles involved are trunk muscles, particularly paravertebral and psoas muscles, gluteus, and lower limb musculature [12].

Muscle deposits are generally asymptomatic. They may be associated with muscle pain, palpable lump, swelling, and decreased range of motion [13]. They are diagnosed by radiological and histopathological examination. Kondo *et al*. emphasized the role of MRI in differentiating metastatic tumors from other lesions, such as primary soft tissue sarcoma, hematoma, and abscess. Intramuscular metastases appear hypo-isointense on T1-weighted and hyperintense on T2-weighted images, respectively. MRI is also helpful in identifying tumor extension and bony or vascular invasion presence. Peritumoral edema, hemorrhage, and central necrosis suggest muscle secondaries [14]. Confirmation of diagnosis of a metastatic tumor is by histopathological examination and immunohistochemistry. In our case, CDX2 positivity indicates gastrointestinal primary [15]. Bayrak *et al*. demonstrated that diffuse CDX2 staining is commonly seen in colorectal cancer, while focal staining is often encountered in gastric carcinoma [16].

The treatment is customized based on the primary organ, the extent of disease, the presence of symptoms, and the patient's general condition. Chemotherapy is the standard treatment of muscle metastasis from gastric carcinoma, particularly when multiple viscera are involved. Radiotherapy is indicated mainly for palliation of symptoms such as pain and swelling [17]. Wide local tumor excision can also be performed for symptomatic relief. In cases of solitary muscle metastasis after a long disease-free interval, surgical excision may be tried to prolong survival [18].

CONCLUSION

SMM from gastric carcinoma is uncommonly encountered and is considered a marker of advanced disease. Solitary muscle metastasis, especially with well-controlled primary, may be challenging to diagnose. It is essential to distinguish the lesion from a soft-tissue sarcoma; diagnosis in such cases relies mainly on histopathology and immunohistochemistry. Treatment options include chemotherapy for systemic control, radiotherapy, and surgery to control local symptoms. Prognosis is poor in general, and palliation is the key.

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