

Case Report

Metastasis to skeletal muscle from gastric adenocarcinoma: a case report and literature review

Dong-Dong Huang^{1*}, Jin-Xiao Lu^{1*}, Cheng-Le Zhuang¹, Zhen Yu^{1,2}, Xiao-Dong Zhang¹

¹Department of Gastrointestinal Surgery, The First Affiliated Hospital, Wenzhou Medical University, Wenzhou, China; ²Department of Gastrointestinal Surgery, Shanghai Tenth People's Hospital Affiliated to Tongji University, Shanghai, China. *Equal contributors.

Received November 3, 2015; Accepted January 5, 2016; Epub February 1, 2016; Published February 15, 2016

Abstract: Gastric carcinoma is one of the most common malignancies in the world, but skeletal muscle metastatic lesions arising from gastric carcinoma are rare. We report here a rare case of an 87-year-old female patient with skeletal metastasis following surgery of gastric carcinoma. Gastroscopy examination showed a tumor located in the anastomotic stoma and gastric biopsy demonstrated poorly differentiated adenocarcinoma. The patient underwent total gastrectomy and Roux-en-Y reconstruction with D2 lymph node resection, followed by subsequent chemotherapy. Four months after the operation, the patient developed a left gluteal mass. After surgical resection of the mass, pathological examination showed a metastasis from gastric adenocarcinoma for the mass. After a systemic examination using ultrasonography, computed tomography (CT) and magnetic resonance imaging (MRI), no other metastatic lesions were found. No additional chemotherapy or radiotherapy was applied thereafter. The patient recovered well after surgery and did not show any signs of relapse during the follow-up period. Unfortunately, she died of a traffic accident nine months after resection of the metastatic mass. In order to get a better understanding of its incidence, clinical manifestation, diagnosis, therapy and prognosis, we further reviewed 13 cases of skeletal muscle metastases from gastric carcinoma worldwide since 1984.

Keywords: Stomach neoplasms, neoplasm metastasis, skeletal muscle

Introduction

Gastric carcinoma ranks fifth in terms of incidence and third in terms of cancer-related deaths worldwide [1]. Its most common metastatic sites are regional lymph nodes, abdominal peritoneum, liver, lungs, bones and adrenal glands. Metastasis of gastric carcinoma to skeletal muscle distant from the primary gastric carcinoma is extremely rare. We reported here a case of an 87-year-old female patient with skeletal metastasis following remnant gastric carcinoma surgery. In order to get a better understanding of its incidence, clinical manifestation, diagnosis, therapy and prognosis, we further reviewed 13 cases of skeletal muscle metastases from gastric carcinoma worldwide since 1984.

Case report

An 87-year-old Chinese woman was admitted in the department of Gastrointestinal Surgery,

The First Affiliated Hospital of Wenzhou Medical University on April 30, 2014 due to progressive weight loose, fatigue and low-grade fever. She was normal in vital signs on admission. She had no abdominal pain, no nausea or vomiting, no hematemesis, and no change in bowel habits. On admission, she was 152 cm in height and 35 kg in weight. She had a temperature of 37.4°C, heart rate 82 beats/min, and blood pressure 116/57 mmHg. She was a non-smoker and had not been taking any medication. She had a history of subtotal gastrectomy 29 years ago, cholecystectomy 21 years ago and colectomy for colon carcinoma 10 years ago. She had lost 5 kg of weight over the past 5 months. On physical examination, the abdomen was soft and flat, a mild tenderness was presented beneath the xiphoid process, the liver and the spleen were not palpable, and no abdominal mass was palpable, no swelling supraclavicular lymph nodes were presented. Gastroscopy examination showed a swelling lesion located

Skeletal muscle metastasis from gastric carcinoma



Figure 1. Endoscopic image of the tumor located in the anastomotic stoma.

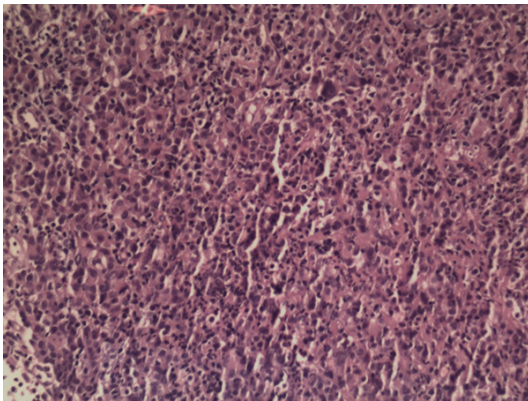


Figure 2. Gastric biopsy showed poorly differentiated adenocarcinoma.

in the anastomotic stoma, the lesion displayed mucous membrane hyperaemia, oedema, become fragile, easy hemorrhage (**Figure 1**). Gastric biopsy from the lesion demonstrated poorly differentiated adenocarcinoma (**Figure 2**). The patient underwent total gastrectomy and Roux-en-Y reconstruction with D2 lymph node resection on May 13, 2014. A swelling tumor measuring 5×6 cm was observed in the anastomotic stoma. The tumor had infiltrated into the serosal layer but did not invade the adjacent organs. There were no signs of metastasis in the transverse colon, Douglas pouch and mesentery. The lymph nodes around the stomach were not swelling or hard. The operation was successful. The pathological examination of the resected specimen showed moderately to

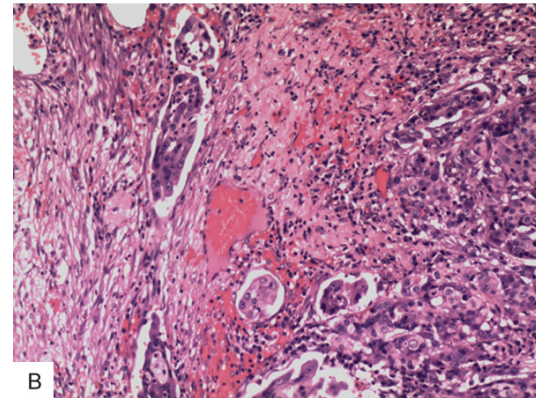
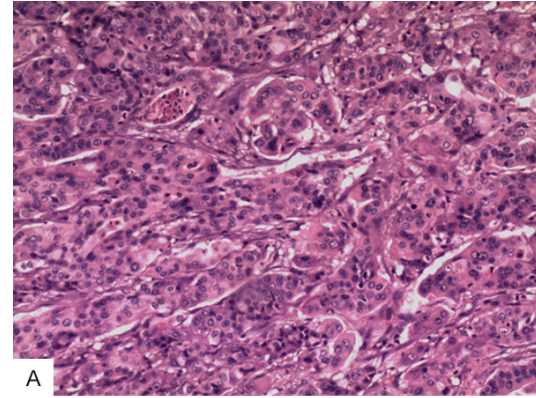


Figure 3. A. Pathological examination of the resected gastric specimen showed moderately to poorly differentiated adenocarcinoma; B. Tumor vascular invasion was observed.

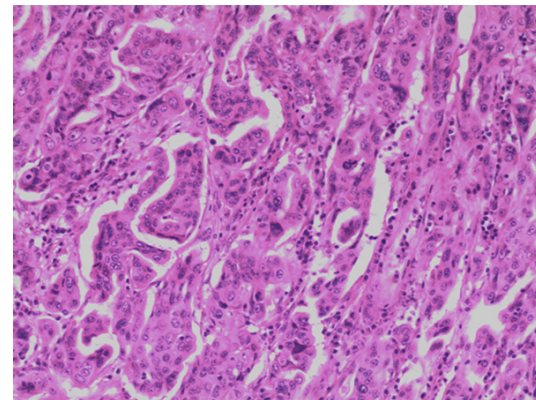


Figure 4. Pathological examination of the resected mass showed metastasis from the gastric adenocarcinoma.

poorly differentiated adenocarcinoma (**Figure 3A**). Tumor vascular invasion was observed (**Figure 3B**). Pathological examination of the retrieved lymph nodes detected no tumor metastasis. According to the Japanese classification of gastric carcinoma [2], the tumor was classi-

Skeletal muscle metastasis from gastric carcinoma

Table 1. Reported cases of skeletal muscle metastases from gastric carcinoma

Author	Year	Age	Sex	Muscle site of metastasis	Treatment	Survival time*
Rosenbaum et al. [11]	1984	54	M	Upper arm; femoral	Radiotherapy, chemotherapy	2 months, died
Van et al. [12]	1993	47	F	Extraocular	Managed conservatively	Not described
Sudo et al. [13]	1993	61	M	Trapezius	Radiotherapy, chemotherapy	5 months, died
Ghanekar et al. [14]	1997	75	M	Abdominal wall; left axilla	Resection	Not described
Oba et al. [5]	2001	70	M	Left lumbar; iliopsoas	Not described	2 months, died
Kondo et al. [4]	2002	64	F	Gluteus maximus; adductor magnus	Radiotherapy, chemotherapy	8 months, died
Tuoheti et al. [7]	2004	48	M	Buttock	Resection	6 months, died
Tuoheti et al. [7]	2004	89	M	Shoulder	Radiotherapy	10 months, alive
Souayah et al. [15]	2008	49	M	Right lateral rectus	Radiotherapy	2 months, died
Plaza et al. [16]	2008	55	F	Abdominal wall	Not described	Not described
Tougeron et al. [3]	2009	71	M	Right deltoid	Radiotherapy, chemotherapy	13 months, alive
Pergolini et al. [17]	2014	67	M	Right adductor	Chemotherapy	2.4 months, died
Lourenco et al. [18]	2014	68	M	Deep muscular planes of the right thigh	Chemotherapy	Not described
Present case	2015	87	F	Gluteus maximus	Resection	9 months, died

*Survival time after diagnosis of skeletal muscle metastasis.

fied macroscopically as type 1, stage IIA (T3-NOMO). Immunohistochemistry examination of the tumor showed E-cd (+), EGFR (partially+), Her-2 (+), Ki67 (80%+). The patient had pulmonary infection after surgery, and was transferred to the department of Respiratory Medicine for further treatments. She eventually recovered and discharged from hospital 40 days after surgery. The patient received 6 course of xeloda chemotherapy regimen after surgery. She tolerated well for the chemotherapy regime without significant adverse effects. She was followed up within the first month after discharge and every 3 months thereafter. The follow-up program consisted of a physical examination, laboratory tests (including blood routine examination and serum tumor markers examination), ultrasonography examination, and computed tomography (CT) or magnetic resonance imaging (MRI) examination when necessary.

Four months after surgery, the patient found a painless mass in her left buttock. Since the mass kept growing, she readmitted in our department in December 6, 2014. On physical examination, a mass was palpable in her left buttock. The mass was non-fluctuant, consistent, no pulse or tenderness, and partially mobile in the muscle layer. The range of motion of the left hip joint was normal. The patient had the mass resected in December 10, 2014. During the surgery we found the mass was approximately 3×3 cm, round in sharp without clear membrane, and its fundus adhered to the gluteus maximus muscle. There was no obvious blood supply to the mass, no enlarged lymph node nearby, and no adhesion to the sur-

rounding tissues. The mass was resected with little blood loss. The patient discharged from the hospital 2 days postoperatively. After surgery, pathological examination of the resected mass showed metastasis from the gastric adenocarcinoma (**Figure 4**). Immunohistochemistry examination of the mass showed CA125 (-), CK20 (-), CK7 (+), EMA (+). To detect other possible metastatic lesions, the patient underwent ultrasonography examination of the neck, groin and subaxile; CT scan of the chest, abdomen and pelvis; and MRI examination of the abdomen, neck and brain. Surprisingly, no sign of local or remote metastasis was detected. In accordance with the imaging examination, the serum tumor markers were all within normal ranges after surgery and during the follow-up period. The patient recovered well after surgery and no additional chemotherapy or radiotherapy was applied thereafter. No signs of relapse were detected during the follow-up period. She was last followed up in September 11, 2015. Abdominal CT scans showed no signs of local or remote metastasis. Serum tumor markers levels were: carcinoembryonic antigen (CEA) 4.1 ng/ml (normal range, <5 ng/ml), carbohydrate antigen 125 (CA 125) 12.7 U/ml (normal range, <35 U/ml), carbohydrate antigen 153 (CA 153) 13.5 U/ml (normal range, <31.3 U/ml), carbohydrate antigen 199 (CA 199) 3.8 U/ml (normal range, <37.0 U/ml). Unfortunately, she had a traffic accident in September 12, 2015 and died one day later.

Discussion

Skeletal muscle metastasis is rare for all kinds of primary malignancies, although the skeletal

Skeletal muscle metastasis from gastric carcinoma

muscle mass accounts for nearly 50% of the total body weight and has an abundant blood supply. The incidence of skeletal muscle metastasis is reported to be approximately 0.16-0.03% in clinical practice, and 0.8% in an autopsy study [3]. We here reported a case of skeletal muscle metastasis from gastric adenocarcinoma, and we further reviewed 13 cases of skeletal muscle metastases from gastric carcinoma since 1984 (**Table 1**).

The mechanism of the rarity of skeletal muscle metastasis is still unclear, but several factors have been considered to be relevant. First, the inconstant blood flow and changing tissue pressure due to muscular contractions would prevent the settlement of the tumor cells. Second, accumulation of lactic acid and the low pH values in the skeletal muscle could play an inhibitory role in the proliferation and growth of the tumor cells [4, 5].

Skeletal muscle metastasis usually manifests itself as a "painful mass", and can be associated with generalized muscle pain, muscle swelling, decreased range of motion of the adjacent joint, fever and weight loss, depending on the location and degree of impairment [5]. However, in many cases, it is asymptomatic, incidentally detected by imaging examination. Therefore, we suggest that surgeons or radiologists should be alert to their presence to avoid possible delay or miss of diagnosis and therapy [6]. Any soft-tissue mass occurring in patients with a known history of carcinoma should be highly suspicious for skeletal muscle metastasis [7].

To date, ultrasonography, CT and MRI have been widely employed in the diagnosis of skeletal muscle metastasis [4]. Compared with ultrasonography and CT, MRI is considered superior for detecting and characterizing muscle abnormalities [5, 8]. It shows a pattern of hypointense signal on T1 and hyperintense on T2 compared with surrounding muscle. Non-hemorrhagic soft-tissue sarcoma shows the same T1- and T2-weighted image patterns, but it usually has less necrosis, peritumoral edema, and lobulation, which is usually distinguished from skeletal muscle metastases [4]. However, these appearances are not always compatible with soft-tissue sarcoma. Therefore, biopsy should be performed for the final diagnosis of skeletal muscle metastases [4].

The optimal treatment of skeletal muscle metastasis is still unknown. Radiotherapy, chemotherapy, and surgical excision are common therapeutic options [7]. Radiotherapy may be effective to relieve the pain and to decrease the size of metastatic lesions [7, 9]. Surgical resection may be helpful in carefully selected patients, such as those with an isolated mass and in absence of other metastatic sites, with the hope to prolong the survival time. However, due to the advanced disease with multiple metastases, chemotherapy frequently is the only option [7]. Further studies are required to establish a standard therapy for the skeletal muscle metastasis from gastric cancer.

The prognosis principally depends on the primitive tumor type, but is generally poor because patients with skeletal muscle metastasis are generally in the terminal stage of gastric cancer [4]. Muscle metastasis has been considered to be a sign of systemic hematogenous metastasis during the terminal stage in the progress of gastric carcinoma [4]. However, in our case, systemic examination using ultrasonography, CT and MRI did not detect any local or remote metastatic lesions, and the serum tumor markers were all within normal ranges, both of which indicated a local primary tumor with solitary skeletal muscle metastasis. This may partially explain the relatively good prognosis of this patient.

One limitation of this case is that we did not perform imaging examinations to look for metastatic lesions in the upper or lower limbs. Therefore, we are not sure whether there are other skeletal muscle metastases in the upper or lower limbs. In fact, previous studies indicated that clinically undetectable metastatic lesions were already present at the initial diagnosis of the skeletal muscle metastasis [4, 10]. Therefore, we call for surgeons and radiologists to strengthen their awareness of skeletal muscle metastasis, hoping to detect and intervene skeletal muscle metastasis timely and to improve the prognosis.

Disclosure of conflict of interest

None.

Address correspondence to: Dr. Xiao-Dong Zhang, Department of Gastrointestinal Surgery, The First Affiliated Hospital of Wenzhou Medical University,

Skeletal muscle metastasis from gastric carcinoma

Wenzhou 325000, Zhejiang, China. E-mail: amostory@126.com

References

- [1] Siegel R, DeSantis C, Virgo K, Stein K, Mariotto A, Smith T, Cooper D, Gansler T, Lerro C, Fedewa S, Lin C, Leach C, Cannady RS, Cho H, Scoppa S, Hachey M, Kirch R, Jemal A and Ward E. Cancer treatment and survivorship statistics, 2012. *CA Cancer J Clin* 2012; 62: 220-241.
- [2] Japanese Gastric Cancer Association. Japanese classification of gastric carcinoma: 3rd English edition. *Gastric Cancer* 2011; 14: 101-112.
- [3] Tougeron D, Hamidou H, Dujardin F, Maillard C, Di Fiore F and Michel P. Unusual skeletal muscle metastasis from gastric adenocarcinoma. *Gastroenterol Clin Biol* 2009; 33: 485-487.
- [4] Kondo S, Onodera H, Kan S, Uchida S, Toguchida J and Imamura M. Intramuscular metastasis from gastric cancer. *Gastric Cancer* 2002; 5: 107-111.
- [5] Oba K, Ito T, Nakatani C, Okamura K, Yamaguchi H, Ajiro Y, Suzuki T, Nakano H, Metori S, Sano K, Hyakusoku H and Yamada N. An elderly patient with gastric carcinoma developing multiple metastasis in skeletal muscle. *J Nippon Med Sch* 2001; 68: 271-274.
- [6] Haygood TM, Wong J, Lin JC, Li S, Matamoros A, Costelloe CM, Yeung H, Sandler CM, Nunez RF, Kumar R and Madewell JE. Skeletal muscle metastases: a three-part study of a not-so-rare entity. *Skeletal Radiol* 2012; 41: 899-909.
- [7] Tuoheti Y, Okada K, Osanai T, Nishida J, Ehara S, Hashimoto M and Itoi E. Skeletal muscle metastases of carcinoma: a clinicopathological study of 12 cases. *Jpn J Clin Oncol* 2004; 34: 210-214.
- [8] Gogou PV, Polydorou A, Papacharalampous XN, Kondi-Paphiti A, Balafouta MJ, Gennatas CS and Kouvaris JR. Femoral muscle metastasis from gastric carcinoma. *Turk J Gastroenterol* 2012; 23: 611-612.
- [9] Bese NS, Ozguroglu M, Dervisoglu S, Kanberoglu K and Ober A. Skeletal muscle: an unusual site of distant metastasis in gastric carcinoma. *Radiat Med* 2006; 24: 150-153.
- [10] Porile JL, Olopade OI and Hoffman PC. Gastric adenocarcinoma presenting with soft tissue masses. *Am J Gastroenterol* 1990; 85: 76-77.
- [11] Rosenbaum LH, Nicholas JJ, Slasky BS, Obley DL and Ellis LD. Malignant myositis ossificans: occult gastric carcinoma presenting as an acute rheumatic disorder. *Ann Rheum Dis* 1984; 43: 95-97.
- [12] Van Gelderen WF. Gastric carcinoma metastases to extraocular muscles. *J Comput Assist Tomogr* 1993; 17: 499-500.
- [13] Sudo A, Ogihara Y, Shiokawa Y, Fujinami S and Sekiguchi S. Intramuscular metastasis of carcinoma. *Clin Orthop Relat Res* 1993; 213-217.
- [14] Ghanekar A and Himal HS. Carcinoma of the stomach: an unusual pattern of metastasis. *Can J Surg* 1997; 40: 392.
- [15] Souayah N, Krivitskaya N and Lee HJ. Lateral rectus muscle metastasis as the initial manifestation of gastric cancer. *J Neuroophthalmol* 2008; 28: 240-241.
- [16] Plaza JA, Perez-Montiel D, Mayerson J, Morrison C and Suster S. Metastases to soft tissue: a review of 118 cases over a 30-year period. *Cancer* 2008; 112: 193-203.
- [17] Pergolini I, Crippa S, Santinelli A and Marmorale C. Skeletal muscle metastases as initial presentation of gastric carcinoma. *Am J Case Rep* 2014; 15: 580-583.
- [18] Lourenco LG, Carlotto JR, Herbella FA, Silva DA and Setti HB. Muscular metastasis from gastric cancer. *J Gastrointest Oncol* 2014; 5: E100-102.