



Cardiac metastasis from colorectal cancer: A case report

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INTRODUCTION

Metastases from colorectal cancer can occur either by lymphatic or hematogenous spreading, and the sites most commonly involved are the liver and lung. Unusual metastases from colorectal cancer into organs including the spleen, thyroid gland, spermatic cord, and skeletal muscle have been reported^[1-4]. Although metastases to these sites might occur as a feature of end stage-disease, metastasis to the heart from colorectal cancer is extremely rare. To our knowledge, only nine cases of cardiac metastasis from colorectal cancer have been previously described^[5-9,10-13]. Here, we report a case of cardiac metastasis from colorectal cancer that presented preoperatively as a benign atrial myxoma.

CASE REPORT

A 70-year-old woman, presenting with bloody stools, was admitted to our hospital. She experienced shortness of breath and had lost 4 kg in weight in the past 3 mo. A colonoscopy revealed an encircling mass in the sigmoid colon, nearly obstructing the lumen of the colon. A pediatric colonoscope could not be passed beyond this point. The biopsy gave evidence of an adenocarcinoma of the sigmoid colon. Laboratory studies, on admission, were within the normal limits, except for carcinoembryonic antigen, which was 9.2 ng/mL. A routine transthoracic echocardiography showed the presence of a right atrial (RA) enlargement and mobile, round, spherical, and inhomogenous mass (3.72 cm × 4.15 cm) adjacent to the lateral RA wall (Figure 1). This pedunculated mass had a broad stalk (1.88 cm), and projected through the tricuspid valve into the right ventricular (RV) cavity, obstructing the RV inflow during the diastolic phase. A chest X-ray showed cardiomegaly and a prominent aorta. Computed tomography revealed a low attenuated lobulating mass in the right atrium (Figure 2). Preoperative diagnosis

Abstract

The heart is an unusual site of metastasis from any malignancy. We report a case of cardiac metastasis from colorectal cancer. A 70-year-old woman was referred with a presumptive diagnosis of sigmoid colon cancer with cardiac myxoma. Two-dimensional echocardiography showed a 4 cm × 4.5 cm mobile mass on the lateral right atrial wall, and computed tomography revealed a low attenuated lobulating mass in the right atrium. The patient underwent anterior resection for sigmoid colon cancer (T4N2). Thereafter, she experienced progressive shortness of breath. Therefore, a cardiac operation was performed 2 wk after the colorectal operation. Histological examination revealed adenocarcinoma, which was identical to the primary lesion. Although two-dimensional echocardiography has become the diagnostic test of choice for detecting cardiac tumors, in patients with colorectal cancer showing a cardiac mass, further diagnostic evaluation such as a magnetic resonance imaging might be necessary.

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Key words: Heart; Cardiac metastasis; Colorectal cancer; Atrial myxoma; Magnetic resonance imaging

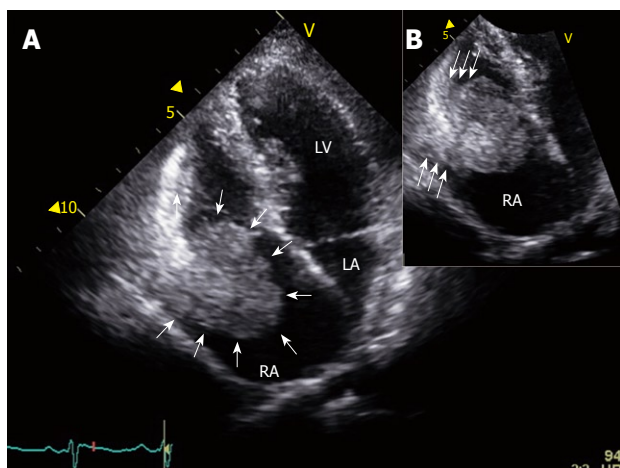


Figure 1 Transthoracic echocardiography. A: A mobile, round, spherical, and echogenic mass (white arrows) is seen adjacent to the lateral right atrial wall on an apical four chamber view of the transthoracic echocardiography; B: A magnified image of the right atrial mass shows a pedunculated character with a broad stalk (tris-arrows). RA: Right atrium; LA: Left atrium; LV: Left ventricle.

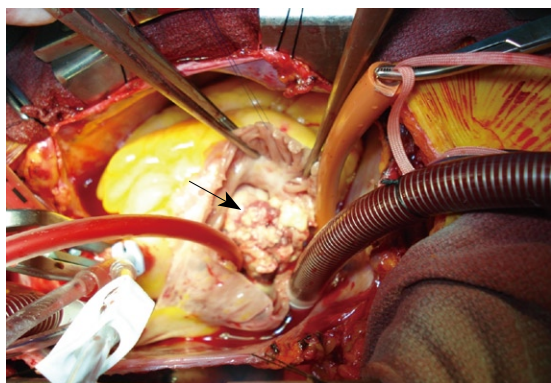


Figure 3 Operative finding. On opening the right atrium, a large multiple lobulating mass (arrow) with a rough surface was located on the antero-inferior side of the right atrial free wall. The mass was near the atrioventricular groove, with invasion into the right atrium.

was synchronous sigmoid colon cancer and right atrial myxoma. We planned to perform cardiac surgery 4 wk after colorectal surgery. An anterior resection with a colorectal anastomosis was performed. Histological investigation of the excised portion confirmed the existence of a moderately differentiated adenocarcinoma invading the serosa with lymphovascular invasion and perineural invasion. The staging of the lesion was T4N2. Although the patient complained of mild shortness of breath, the postoperative course was uneventful. However, 2 wk postoperatively, the shortness of breath had worsened. Thus, the patient was taken immediately into cardiac surgery. After a sternotomy, the pericardium was opened, and a cardiopulmonary bypass was installed to open the right atrium. The mass was present in the right atrial wall near the atrioventricular groove, and was growing toward the tricuspid valve. After removal of the mass, the right atrial wall was reconstructed with bovine pericardium (Figure 3). The atrial mass showed a nodular necrotic appearance grossly measuring

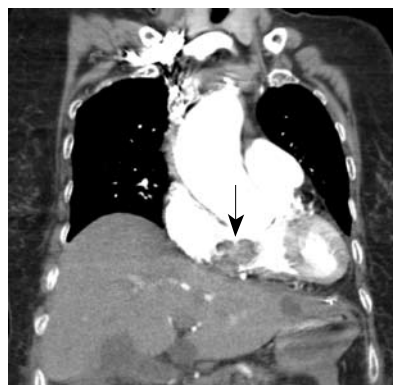


Figure 2 Computed tomography scan revealed that the mass (arrow) was located in the right atrium, obstructing the tricuspid valve opening.

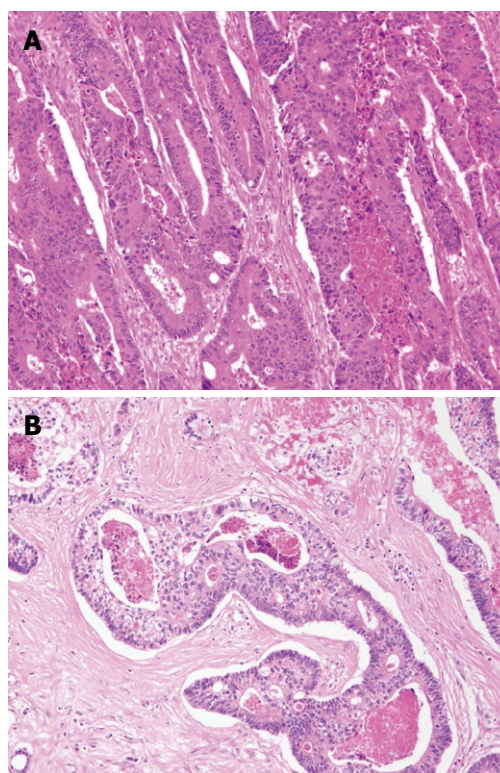


Figure 4 Microscopic findings. A: Tall malignant columnar cells line large irregular glands; some forming a cribriform architecture containing intraluminal necrotic debris in primary colon cancer (HE, $\times 100$); B: The cardiac mass shows similar histological findings to Figure 4A.

5.5 cm \times 5 cm \times 3 cm; histological examination revealed adenocarcinoma that was identical to the primary lesion (Figure 4). A further operation was performed because of postoperative cardiac bleeding; however, the patient died of recurrent cardiac bleeding on the 3rd postoperative day.

DISCUSSION

The regional lymph nodes, liver, and lung are the most common sites of metastasis from colorectal cancer. Infrequent sites of metastases, including the spleen, thyroid gland, spermatic cord, and skeletal muscle

Table 1 Clinical features of cardiac metastasis from colorectal cancer reported in English literature

Author (yr)	Age/sex	Location of primary tumor	Primary tumor stage	Diagnosis of cardiac metastasis made by/at	Location of heart	Metastatic tumor size (cm)	Operation of metastatic mass	Outcome
Henuzet (1982) ^[13]	60/M	Rectum	NA	Echocardiography	Right ventricle	2	Resection	Dead
Massachusetts General Hospital (1992) ^[12]	75/M	Colon	NA	Autopsy	Right ventricle	7.5 × 4.5 × 4	No	Dead
Parravicini (1993) ^[8]	47/M	Rectum	NA	Surgery	Right ventricle	10 × 4 × 3.5	Resection	Dead
Testempassi (1994) ^[7]	71/F	Colon	Stage III	Magnetic resonance imaging	Right ventricle	NA	NA	NA
Lord (1999) ^[6]	71/M	Rectum	Dukes' C	Biopsy	Right ventricle	NA	No	Dead
Koizumi ^[11] (2003)	65/M	Rectum	Dukes' C	Surgery	Right atrium	6 × 5	Resection	Dead
Present case (2009)	70/F	Colon	T4N2	Surgery	Right atrium	5.5 × 5 × 3	Resection	Dead

NA: No available information; M: Male; F: Female.

have been reported^[1-4]. Although metastases of these unusual sites from colorectal cancer might occur with the status of widespread disease, cardiac metastasis from colorectal cancer is extremely rare^[5-9,10-13]. The incidence of cardiac metastasis in patients with malignancy might be underestimated because cardiac metastatic lesions are clinically silent in most cases^[13,14]. Therefore, the incidence of cardiac metastasis might best be determined by reviewing autopsy studies. The incidence of cardiac metastasis from any malignancy has been reported as 10%-18% in autopsy studies^[15-17]. Malignant melanoma has been reported as the most common disease^[16-19]. Leukemia and lymphoma also showed a high incidence of cardiac metastasis in the past, but this incidence is decreasing because of improvements in chemotherapy^[16,20]. In colorectal cancer, to our knowledge, only nine reports have been described in the literature (Table 1); however, the incidence of cardiac metastasis was 1.4%-7.2% in autopsy studies^[12,16,17]. Thus, the true incidence of cardiac metastasis from colorectal cancer might be higher than the cases reported so far.

Some factors that might account for the infrequency of cardiac metastasis have been suggested: the strong kneading action of the myocardium, metabolic peculiarities of striated muscle, the rapid flow of blood through the heart, and lymph flow normally moving away from the heart. The blood flow of the coronary system is the highest in the body, and the lymphatics of the heart is divided into a superficial and a deep group, joining and draining through two trunks into the tracheobronchial lymph nodes. Thus, metastasis must occur against the direction of flow^[19]. Although the reasons for its rarity have not been well established, cardiac metastasis from malignancies might occur by direct extension, lymphatic spread, hematogenous spread, or a combination of two or three of the above^[14,16,17,19]. Klatt *et al*^[16] reported that the lung was the most common primary site, and sites closer to the heart contributed to the greatest number of cardiac metastases; they suggested that the lymphatic drainage from nearby sites represents the most likely means of spread. Mukai *et al*^[17] suggested that the relative importance of these various routes would appear to depend on the type of primary tumor and on the completeness of the autopsy examination. In our case, although regional lymph node metastases were identified,

we postulate that hematogenous spread might be the most likely route in colorectal cancer.

The incidence of colorectal cancer with cardiac metastasis is rare, therefore surgery as a treatment modality has not been investigated. Koizumi *et al*^[11] reported that although surgery is rarely recommended for treating metastatic cardiac tumors, surgical treatment could be especially effective in occurrences of obstructive and solitary lesions to ensure relief from symptoms and elongation of life expectancy. In our case, the purpose of surgical treatment was the release of symptoms, even though the preoperative diagnosis was cardiac myxoma and the patient died from postoperative bleeding. With the improvement of diagnostic procedures and a prolonged life span, the incidence of cardiac metastasis from colorectal cancer is likely to increase. Therefore, to clearly delineate the role of surgical treatment in cardiac metastasis from colorectal cancer, further studies are necessary.

In general, an endocardial myxoma, the most common form of primary cardiac tumor, can be diagnosed by echocardiography, which provides the differential diagnosis of intracavitary atrial echoes, including vegetation, thrombi, and primary or secondary cardiac tumors; however, the detection of cardiac metastasis by echocardiography might be difficult in cases of an infiltrative nature^[13,21]. In our case, although the mass was found to have invaded into the right atrium in operative finding, the preoperative echocardiography showed a mobile cardiac mass. Thus, the presumptive diagnosis was atrial myxoma. The differential diagnoses of cardiac myxoma and cardiac metastasis from colorectal cancer might be difficult to determine by echocardiography alone, as in our case, because synchronous cardiac myxoma and colorectal cancer have been reported^[22]. Magnetic resonance imaging (MRI) is effective in the evaluation of secondary cardiac tumors, because it can accurately define the pericardium, the myocardial walls, and the cardiac chambers, especially in cases with an infiltrative nature^[23,24]. Therefore, in patients with colorectal cancer with a cardiac mass, further diagnostic evaluation such as an MRI, in addition to echocardiography, might be helpful in the differential diagnosis of the cardiac mass.

In conclusion, as reported in autopsy studies, cardiac metastasis from colorectal cancer might not be so rare,

and with improvements in diagnostic procedures, the incidence of cardiac metastasis from colorectal cancer is likely to increase. Thus, in patients with colorectal cancer showing a cardiac mass, further diagnostic evaluation, such as an MRI, might be necessary.

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