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Case Report Open Access

Metastatic osteosarcoma near-totally occluding the right atrium: A rare cause of cardiovascular emergency

Fatih Ada, Vural Polat

Department of Cardiovascular Surgery, Sivas Cumhuriyet University, Faculty of Medicine, Sivas, Türkiye

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ABSTRACT

Emergency surgical treatment of metastatic cardiovascular tumors is rarely required in cardiovascular surgery. Metastatic cardiovascular tumors constitute a small portion of open-heart surgeries. Intracardiac metastasis of osteosarcomas is much less common. Herein, we present the diagnosis and management of dyspnea, cyanosis, and respiratory failure secondary to near-total occlusion of the right atrium due to right humerus metastatic osteosarcoma in a 21-year-old female patient.

Keywords: Cardiac tumor, emergency surgery, metastasis, osteosarcoma.

Traumas, acute myocardial infarction and its complications, complications due to interventional procedures, gunshot wounds, stab injuries, aortic dissections/ruptures, thromboembolisms, and acute cardiovascular thromboses are the most common reasons of major emergency cases in cardiovascular surgery. Other causes of emergency surgery are uncommon. As cardiac tumors slowly develop, whether primary or secondary, the patients do not require emergency surgery. Most common metastases of osteosarcomas are to the brain, lymph nodes, skin, and rarely to the heart.[1,2] Herein, we present the diagnosis and management of respiratory failure secondary to near-total occlusion of the right atrium due to right humerus metastatic osteosarcoma.

CASE REPORT

A 21-year-old female patient was admitted to the emergency room with complaints of dyspnea and peripheral cyanosis and hospitalized in the chest diseases department with the suspicion of pulmonary embolism. It was learned from the patient that she was diagnosed with osteosarcoma originating from the right humerus three years ago, and after the diagnosis, the patient received three courses of chemotherapy. In addition, the patient had a total humerus resection and prosthesis implantation operation two years after the diagnosis. Afterward, she received 37 courses of chemotherapy and 32 courses of radiotherapy. The patient was in remission during the last year and was followed up at an external center. Physical examination revealed that the patient was cyanotic and had severe dyspnea. The computed tomography angiography (CTA) taken at the emergency room showed a full-filling thrombus in the right atrium, and the patient was consulted with cardiovascular surgery and then transferred to our department for emergency surgery (Figures 1 and 2). No pathological finding was found in the routine complete blood count, biochemistry, coagulation parameters, and thyroid function tests of the patient. The D-dimer value was 324 ng/mL. The 100% nasal oxygen 6 L/min arterial blood gas was measured as follows: pH, 7.467; pCO_2, 21.6 mmHg; pO_2, 34.5 mmHg; sO_2, 59.5%; actual base excess (ABE), -5.9 mmol/L; lactic acid (Lac), 2.1 mmol/L. Upon these findings, the patient was prepared for an emergency operation, and the patient's peripheral oxygen saturation was 30% when she was taken to the operation. Following routine surgical procedures, the mediastinum was opened with a median sternotomy, and aortic cannulation was

Corresponding author: Fatih Ada, MD. Sivas Cumhuriyet Üniversitesi Tıp Fakültesi Kalp ve Damar Cerrahisi Anabilim Dalı, 58140 Sivas, Türkiye.
Tel: +90 505 - 742 03 12 e-mail: drfatihada@gmail.com

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performed. Venous cannulation could not be performed as the right atrium and superior and inferior vena cava were occluded by the mass. Thereupon, the right atrium was opened, and venous drainage was provided through venous suction. After the partial resection of the mass located in the right atrium, extending from the tricuspid valve to the right ventricle and the inferior cava, the venous cannula was placed through the inferior vena cava from the atrium, partially entering the pump. *En bloc* removal was not possible as the mass was rigid; therefore, it was broken out and removed part by part (Figure 3). The mass extending into the superior vena cava, right subclavian vein, and brachiocephalic vein was consecutively removed (Figure 4). A pericardial patch was required to close the superior vena cava. Then the right atrium was closed, and the partial bypass was finished. The extracted materials were sent to pathology, and the result was osteosarcoma. Postoperative extubated first arterial blood gas was measured as follows: pH, 7.498; pCO_2, 16.7 mmHg; pO_2, 74.9 mmHg; sO_2, 97.5%; ABE, -3.1 mmol/L; Lac: 1.2 mmol/L. The patient was followed up for hemodynamic problems for one week

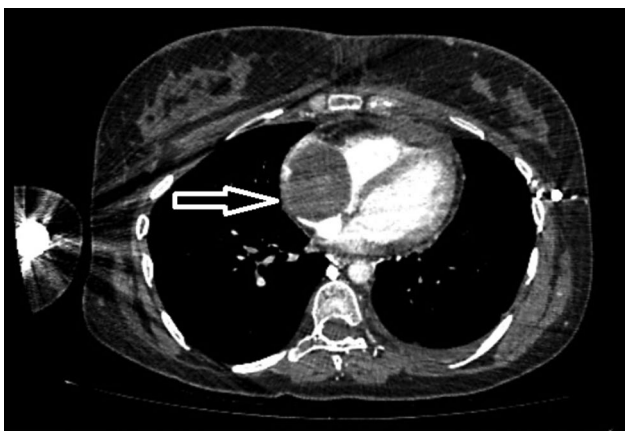

Figure 1. Preoperative computed tomography angiography image of the mass that fills the right atrium almost completely.

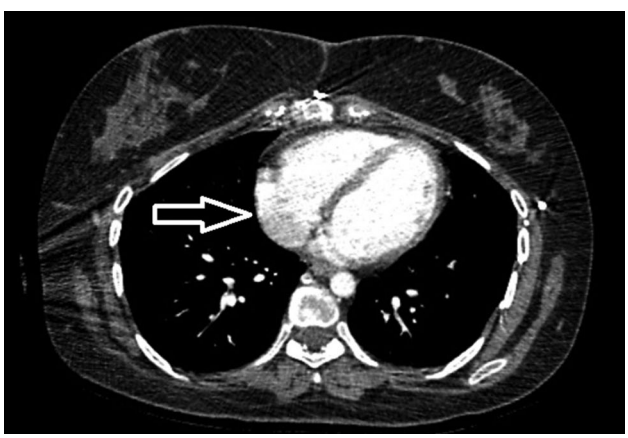

Figure 2. Postoperative computed tomography angiography image of the normal right atrium.

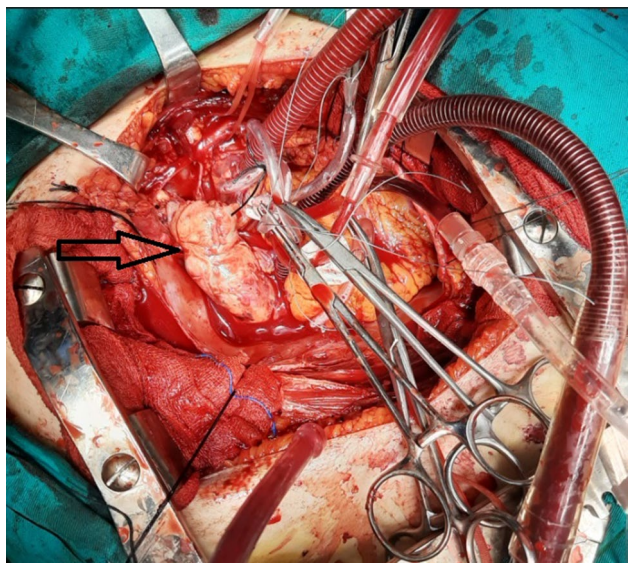

Figure 3. Intraoperative image of the osteosarcoma.

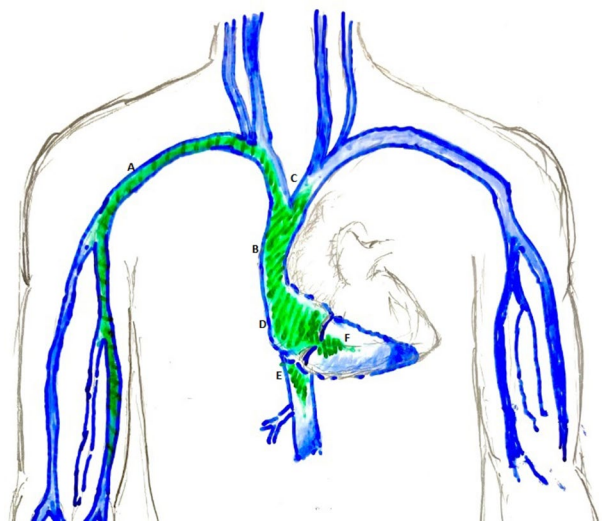

Figure 4. Illustration of the intravascular and intracardiac metastatic osteosarcoma extension (green color indicates tumor extension). The tumor was removed from B, C, D, E, and F regions.

A: Subclavian vein; B: Vena cava superior; C: Innominate vein; D: Right atrium; E: Vena cava inferior; F: Right ventricle.

and discharged. The patient has been followed up for one year without any issues.

DISCUSSION

Cardiac tumors constitute a minority of open-heart surgery cases. Primary cardiac tumors are generally benign and most frequently diagnosed as myxoma.[3] Metastatic cardiac tumors are usually diagnosed at postmortem autopsy. The most common tumors that metastasize to the heart are lung cancers, breast cancers, and hematological malignancies.[4] Osteosarcomas rarely metastasize to the heart. Osteosarcoma cases with cardiac metastasis are rare in the literature. There is a limited number of primary cardiac osteosarcoma cases.[5-7] Intracardiac metastatic osteosarcoma cases can be asymptomatically diagnosed during the follow-up. Additionally, it can be the first symptom of recurrence.[8,9] Symptoms are completely related to the affected chamber of the heart. The most common symptoms are shortness of breath, weakness, and fatigue. Rarely, it may present as peripheral arterial recurrent embolism.[7] The primary osteosarcoma site may be the lower or upper extremities. Due to the low number of cases in the literature, the most common origin of metastasis is not known. However, cardiac metastasis originating from femur osteosarcomas is more frequently encountered in the literature.[8,10] There is no clear ratio concerning metastatic heart tumors. However, metastasis to the right heart chambers is more common in the literature.[8-11] In our case, there was spread to the right chambers of the heart and superior and inferior cava. There are also publications regarding the invasion of the left chambers of the heart.[6,12] Patients are generally young females and adolescents. After the primary diagnosis, early cardiac metastasis may occur, or metastasis may be seen after many years from diagnosis.[11] There was a three-year period between primary diagnosis and cardiac metastasis in our case. Magnetic resonance angiography, CTA, ventriculography, transthoracic echocardiography, and transesophageal echocardiography can be used for diagnosis in symptomatic patients. Positron emission tomography and scintigraphy can be used in asymptomatic patients.[9] In our case, the patient was diagnosed by CTA. However, CTA images appeared more compatible with intracardiac thrombus. In our case, the diagnosis of metastatic osteosarcoma was made based on intraoperative findings and pathology. The main treatment is the surgical resection of the tumor. After surgical treatment, chemotherapy, radiotherapy, or combined treatments can be applied with a multidisciplinary approach. All osteosarcomas with cardiovascular metastasis in the literature were electively operated. However, our patient was urgently operated due to severe dyspnea and respiratory distress, impaired laboratory values, and hemodynamic instability. Although there are tumors that metastasize to the cardiovascular system, they rarely require emergency surgery. There are no intracardiac metastatic osteosarcoma cases requiring urgent surgery in the literature.

In conclusion, although rare, metastatic intracardiac tumors may require emergency surgery. In such cases, a fast and effective preoperative preparation can prevent undesirable results.

Patient Consent for Publication: A written informed consent was obtained from patient.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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