Case Report

Resection of Mediastinal Granulocytic Sarcoma Triggered the Rapid Progression of Acute Myeloid Leukemia

Ryuichi Suemitsu, MD, Seiichi Fukuyama, MD, Kaoru Ondo, MD, and Hitoshi Ueda, MD

Mediastinal granulocytic sarcoma (GS) is a relatively rare disease. We experienced a case of acute myeloid leukemia (AML) that took a rapid turn for the worse after the resection of a mediastinal GS. A healthy 60-year-old man had been in good general health all his life, but was diagnosed with a mediastinal tumor by his family physician and was referred to our department. The patient underwent resection of the mediastinal tumor because thymoma was highly suspected. On postoperative day (POD) 3, the patient suffered a fever as well as an elevated white blood cell (WBC) count and a high C-reactive protein level. His WBC count was 77,240 at its peak on POD 9, at which point the patient was diagnosed with AML by bone marrow aspiration. The immunohistological findings showed the features of leukemia, and GS was diagnosed. Despite chemotherapy, the patient died on POD 28 as a result of rapid disease progression. (Ann Thorac Cardiovasc Surg 2008; 14: 181–183)

Key words: mediastinal tumor, extramedullary granulocytic sarcoma, acute myeloid leukemia

Introduction

Thymic tumor, thymoma, and teratoma present as common anterior mediastinal tumors, which are easily distinguished by computed tomography (CT) scan. In contrast, mediastinal granulocytic sarcoma (GS) is rare and may be difficult to discriminate from a thymic tumor. We report an asymptomatic and nonleukemic patient with mediastinal GS who was diagnosed after surgery and who developed acute myeloid leukemia (AML) after tumor resection.

Case Report

A 60-year-old male being treated for alcoholic liver dysfunction showed an abnormal shadow in the mediastinum on a chest roentgenogram taken by his family physician. Serum chemistry and blood counts were normal, and the patient had no weight loss, general fatigue, or fever. A chest CT scan showed a homogeneous massive tumor of 5.5 cm in diameter originating from the anterior mediastinum, and thymoma was highly suspected (Fig. 1). The patient was then admitted to our facility and scheduled to undergo thymectomy. Our policy of operation for thymoma is not video-assisted thoracotomy, but median sternotomy, through which complete resection of the thymoma was performed.

The operative findings were as follow. In the right thoracic space, loose adherence was observed. The main tumor, which was elastic and hard, was located in the anterior mediastinum. It was flat and fist-sized, was tightly adhered to the pericardium and right middle lobe of the lung, and extended to the right brachiocephalic vein. The tumor had adhered to the innominate vein and superior vena cava, but had not invaded them. For a visualization of the relationship between the vein and the tumor, and for a safe release of the tumor, it was incised over the right internal thoracic vein. The patient made an uneventful recovery after operation. A chest roentgenogram on

From Department of Thoracic Surgery, Matsuyama Red Cross Hospital, Matsuyama, Japan

Received March 23, 2007; accepted for publication June 15, 2007
Address reprint requests to Ryuichi Suemitsu, MD, PhD: Department of Thoracic Surgery, Clinical Research Institute, National Hospital Organization, Kyushu Medical Center, 1–8–1 Jigyohama, Chuo-ku, Fukuoka 810–8563, Japan.

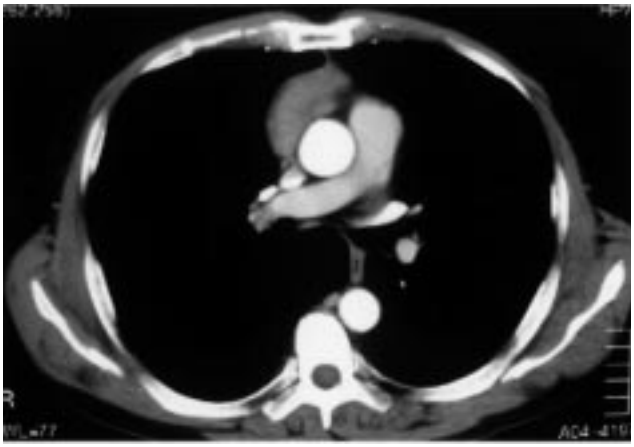

Fig. 1. A chest computed tomography scan revealed an anterior mediastinal tumor.

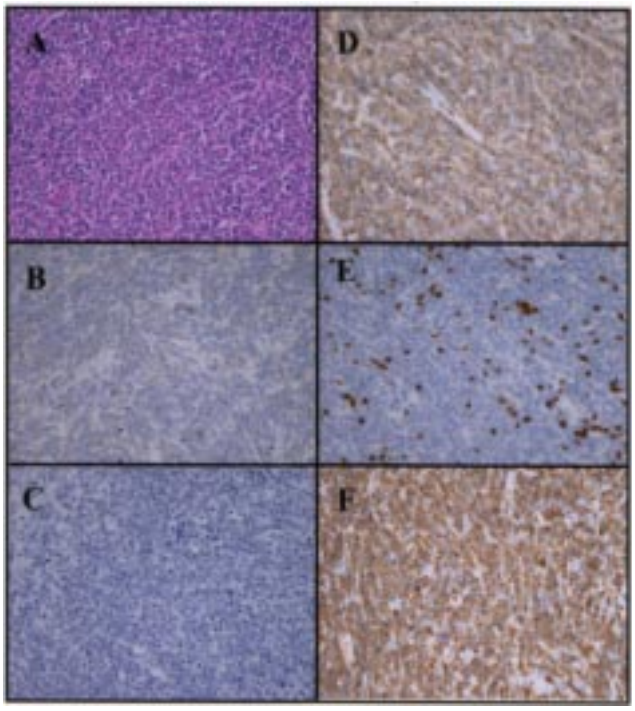

Fig. 2. Microscopic findings. (**A**) A slide of the tumor was stained routinely with hematoxylin and eosin. A section of the primary lesion showed atypical tumor cells. (**B**) Immunohistological microscopic findings of the tumor were negative for AE1/AE3, an epithelial marker. (**C**) Immunohistological microscopic findings of the tumor were negative for CAM5.2, an epithelial marker. (**D**) Immunohistological microscopic findings of the tumor were positive for LCA, a marker generally detected on leukemia cells. (**E**) Immunohistological microscopic findings of the tumor were weakly positive for CD3, a marker for T-cell lymphocytes. **(F**) Immunohistological microscopic findings of the tumor were positive for bcl-2, a marker for B-cell lymphocytes.

postoperative day (POD) 3 showed normal findings; however, the patient had a fever, his peripheral white blood cell (WBC) count was 16,550, and his C-reactive protein level was 5.79 ng/mL. We suspected infection and began broad-spectrum antibiotics. However, the patient did not respond to antibiotics, and peripheral WBC gradually increased, finally reaching 77,240 with the appearance of myeloblasts on POD 9. We therefore suspected leukemia and performed a bone marrow aspiration, which revealed a hypercellular marrow with 78.0% myeloblasts, which were negative for peroxidase and alpha-naphthyl butyrate esterase staining. CD45 blast gating showed CD7 molecule of 97.1%, CD56 of 95.3%, CD33 of 99.3%, and CD34 of 98.7%. Cytogenetic analysis revealed 48 (XY, +8, +14) and 49 (XY, +8, +10, +14). A diagnosis of AML was rendered. Furthermore, the pathological features of the mediastinal tumor revealed GS in microscopic findings (Fig. 2). Besides the results of conventional hematoxylin and eosin staining (Fig. 2A), negative stains for two different epithelial markers (Fig. 2B, AE1/AE3; Fig. 2C, CAM5.2) suggested that there was no epithelial mediastinal tumor, such as a thymoma or thymic carcinoma. On the other hand, leukemia markers such as leukocyte common antigen (LCA; Fig. 2D), CD 3 (a conventional T-lymphoid cell marker; Fig. 2E), and bcl-2 (a conventional B-lymphoid cell marker; Fig. 2F) were positive, suggesting the presence of leukemia cells invading a mediastinal tumor.

The patient was diagnosed with AML and treatment with anticancer drugs was initiated immediately. Severe anemia and thrombocytopenia appeared followed the treatment, and a blood and flesh frozen plasma transfusion was carried out. However, remission was not achieved, and the patient died as a result of rapid disease progression.

Discussion

Mediastinal GS, a mass consisting of myeloblasts or immature myeloid cells occurring in an extramedullary site, is a relatively rare tumor and one of extramedullary granulocytic sarcoma that develops in 2%–8% of cases of myelocytic leukemia.[1,2] Generally, this tumor is detected before or together with the onset of myelocytic leukemia. The tumor commonly appears in the orbit, subcutaneous tissue, nerves, lymph nodes, and/or skin,[3] and pulmonary involvement is uncommon.[4] No unique chromo-

somal abnormalities are associated with mediastinal GS; however, most cases of AML-associated mediastinal GS have the FAB Classification[5] M1, M2, and M5 morphology.[6,7] Furthermore, the most common cytogenetic findings in GS complicating adult AML have been t (8, 21) and inv (16).[6,8]

In the present case, a chest roentgenogram showed a mediastinal solid mass when the patient was being examined for liver cirrhosis by his family physician. He had no symptoms, such as fever, general fatigue, or chest pain. A chest CT revealed a solid, noninvasive, and homogenous mediastinal tumor, highly suggestive of noninvasive thymoma. The patient underwent extended thymectomy; however, he showed symptoms of leukemia on POD 3 and rapidly took a turn for the worse. Generally, mediastinal GS in healthy patients may occur as a typical form of AML after an interval of weeks, months, or even years.[2,9] Occasionally it evolves before the onset of AML, and a misdiagnosis of malignant lymphoma is frequently made.[10] Our patient was difficult to diagnose preoperatively and was misdiagnosed with thymoma. He underwent tumor resection, after which his AML emerged. In this case, the surgical treatment is believed to have triggered the rapid progression of the leukemia. The patient was immediately treated for leukemia using anticancer therapies, including blood transplantation, because of severe anemia and thrombocytopenia resulting from adverse events.

Ramasamy et al. reported peripheral blood circulating blasts were present in 93% of patients with mediastinal GS and concurrent AML.[7] Our case was also recognized to be an appearance of blasts according to increasing WBC. Further, chromosomal abnormalities such as heteroploidea were detected by bone marrow aspiration. Nounou et al. have reported an increased incidence of triploid and tetraploid chromosomal abnormalities associated with mediastinal GS.[11] Peripheral blood blasts or chromosomal abnormalities on peripheral blood and bone marrow might be one of the helpful diagnostic factors of mediastinal GS, indicating whether it is an operable case, such as thymoma.

We experienced the rare case of a patient with dormant AML and primary mediastinal GS. When surgically treating a mediastinal tumor, general thoracic surgeons must be aware of the possibilities of thymic neoplasm and hematological malignancy.

References

1. Yamauchi K, Yasuda M. Comparison in treatments of nonleukemic granulocytic sarcoma: report of two cases and a review of 72 cases in the literature. *Cancer* 2002; **94**: 1739–46.
2. Neiman RS, Barcos M, Berard C, Bonner H, Mann R, et al. Granulocytic sarcoma: A clinicopathologic study of 61 biopsied cases. *Cancer* 1981; **48**: 1426–37.
3. Imrie KR, Kovacs MJ, Selby D, Lipton J, Patterson BJ, et al. Isolated chloroma: the effect of early antileukemic therapy. *Ann Intern Med* 1995; **123**: 351–3.
4. Stafford CM, Herndier B, Yi ES, Weidner N, Harrell JH 2nd. Granulocytic sarcoma of the tracheobronchial tree: bronchoscopic and pathologic correlation. *Respiration* 2004; **71**: 529–32.
5. Bennett JM, Catovsky D, Daniel MT, Flandrin G, Galton DAG, et al. Proposed revised criteria for the classification of acute myeloid leukemia: a report of the French American British Co-operative Group. *Br J Haematol* 1985; **103**: 626–9.
6. Tallman MS, Hakimian D, Shaw JM, Lissner GS, Russell EJ, et al. Granulocytic sarcoma is associated with the 8;21 translocation in acute myeloid leukemia. *J Clin Oncol* 1993*;* **11***:* 690–7.
7. Ramasamy K, Lim Z, Pagliuca A, Devereux S, Ho AY, et al. Acute myeloid leukaemia presenting with mediastinal myeloid sarcoma: report of three cases and review of literature. *Leuk Lymphoma* 2007; **48**: 290–4.
8. Byrd JC, Edenfield WJ, Shields DJ, Dawson NA. Extramedullary myeloid tumors in acute nonlymphocytic leukemia: a clinical review. *J Clin Oncol* 1995; **13**: 1800–6.
9. Eshghabadi M, Shojania AM, Carr I. Isolated granulocytic sarcoma: report of a case and review of the literature. *J Clin Oncol* 1986; **4**: 912–7.
10. Menasce LP, Banerjee SS, Beckett E, Harris M. Extramedullary myeloid tumour (granulocytic sarcoma) is often misdiagnosed: a study of 26 cases. *Histopathology* 1999; **34**: 391–8.
11. Nounou R, Al-Zahrani H H, Ajarim DS, Martin J, Iqbal A, et al. Extramedullary myeloid cell tumours localised to the mediastinum: a rare clinicopathological entity with unique karyotypic features. *J Clin Pathol* 2002; **55**: 221–5.