

Polyserositis as a primary clinical manifestation of CD7+ acute myelogenous leukemia with myeloid sarcoma

A case report

Yubo Pi, MD¹, Beining Wang, MD, Lihong Wang, MD, Hanyun Ren, MD*

Abstract

Rationale: Myeloid sarcomas (MS) are defined as rare extramedullary masses composed of immature myeloid cells. MS mostly develops in patients with acute myeloid leukemia (AML), and involves primarily the skin, soft tissues, bones, and lymph nodes. Pleura and pericardium involvement of MS are extremely uncommon. Polyserositis is also a very rare extramedullary presentation of acute myeloid leukemia (AML).

Patient concerns: A 30-year-old woman with a complaint of right neck mass combined with coughing for 2 months as well as fever and systemic edema for the last 10 days, was admitted to our center on July 11, 2019. Initial positron emission tomography (PET) scan indicated systemic lymphadenopathy, bilateral pleural effusion, and pericardial effusion.

Diagnosis: The initial pathological diagnosis of lymph nodes was MS. Subsequent bone marrow analysis confirmed AML.

Interventions: Conventional IA induction regimen followed by high-dose cytarabine (HiDAC) regimen.

Outcomes: Complete absorption of pericardial and pleural effusion after the first cycle of IA induction chemotherapy.

Lessons: Polyserositis can be an extramedullary presentation of AML. Patients with polyserositis should undergo routine flow cytometric analysis. For AML with extramedullary infiltration, systemic chemotherapy should be administered in all confirmed cases.

Abbreviations: AML = acute myeloid leukemia, CML = chronic myeloid leukemia, HiDAC = high dose cytarabine, MPN = myeloproliferative neoplasm, MS = myeloid sarcoma, NCCN = national comprehensive cancer network, PET = positron emission tomograph, SUV_{max} = maximum standard uptake value.

Keywords: acute myeloid leukemia, case report, myeloid sarcoma, polyserositis

1. Introduction

Myeloid sarcoma (MS) is a rare form of localized malignancy that is caused by extramedullary proliferation and infiltration of

myeloid primitive cells and immature myeloid cells.^[1] This type of sarcoma is most frequently associated with AML, but can also develop from chronic myeloid leukemia (CML) and myeloproliferative neoplasm (MPN).^[2,3] Regarding its association with AML, MS can occur prior to or concurrently with AML, or as a form of extramedullary relapse. Most commonly, MS involves the skin, soft tissues, bones, and lymph nodes. Polyserositis as a result of leukemic infiltration, on the other hand, is an extremely rare extramedullary presentation of AML with only one case documented to date.^[4] In this report, we present a case of acute myelogenous leukemia with myeloid sarcoma confirmed in the lymph nodes. Notably, AML also manifests as polyserositis.

2. Case report

A 30-year-old woman with a complaint of right neck mass combined with coughing for 2 months as well as fever and systemic edema for the last 10 days, was admitted to our center on July 11, 2019. The patient was diagnosed with a systemic infection. Prior to admission, the patient suffered from acute pericardial tamponade that required emergency pericardiocentesis. Otherwise, she was previously healthy. Her initial chest CT is shown below in Figure 1 and the initial positron emission tomography (PET) scan in Figure 2. As suggested by the PET scan, increased diffuse uptake of ¹⁸F-FDG in the spine, pelvis, and femur was detected. Additionally, systemic lymphadenopathy

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This report was approved by the ethics committee of Peking University First Hospital.

Written informed consent was obtained from the patient for publication of this case report and the accompanying images.

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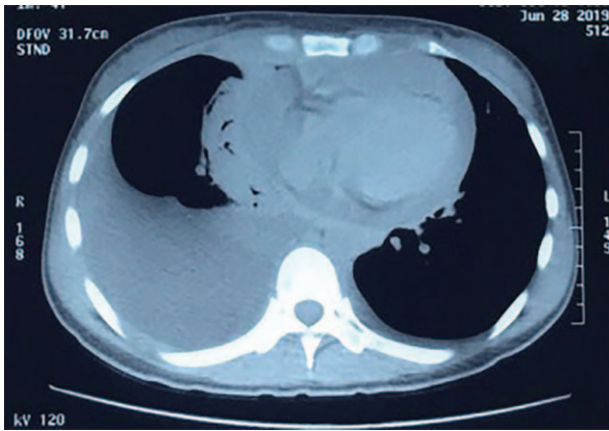


Figure 1. Initial chest CT.

with a maximum standard uptake value (SUV_{max}) of 6.6, thickening region of the right pleura with SUV_{max} of 4.3, and bilateral pleural effusion and pericardial effusion were also evident.

Laboratory tests indicated a white blood cell count of $16.4 \times 10^9/L$, with blasts accounting for 83%. Tests on bone marrow aspirate indicated a myeloblast proportion of 79.5%. Flow cytometric analysis revealed that the bone marrow blasts were positive for CD7, CD34, CD33, CD38, and HLA-DR, and negative for CD117, CD3, CD20, CD10, CD19, CD56, CD14, CD64, CD11b, CD13, GlyA, CD7, CD61, cMPO, cCD3, cCD79a, cCD22, and cTDT, confirming a diagnosis of AML (Fig. 3). Cytogenetics revealed no abnormalities, and genotyping was negative for MLL, EV11, FLT3, NPM1, and C-KIT.

Thoracentesis and pericardiocentesis were performed, and both pleural and pericardial fluid turned out exudative according to Light's criteria. Flow cytometric analysis revealed that both effusions were predominantly myeloblasts, with an immunophenotype identical to bone marrow blasts (Figs. 4 and 5). Thus, a diagnosis of AML involving the pleura and pericardium was

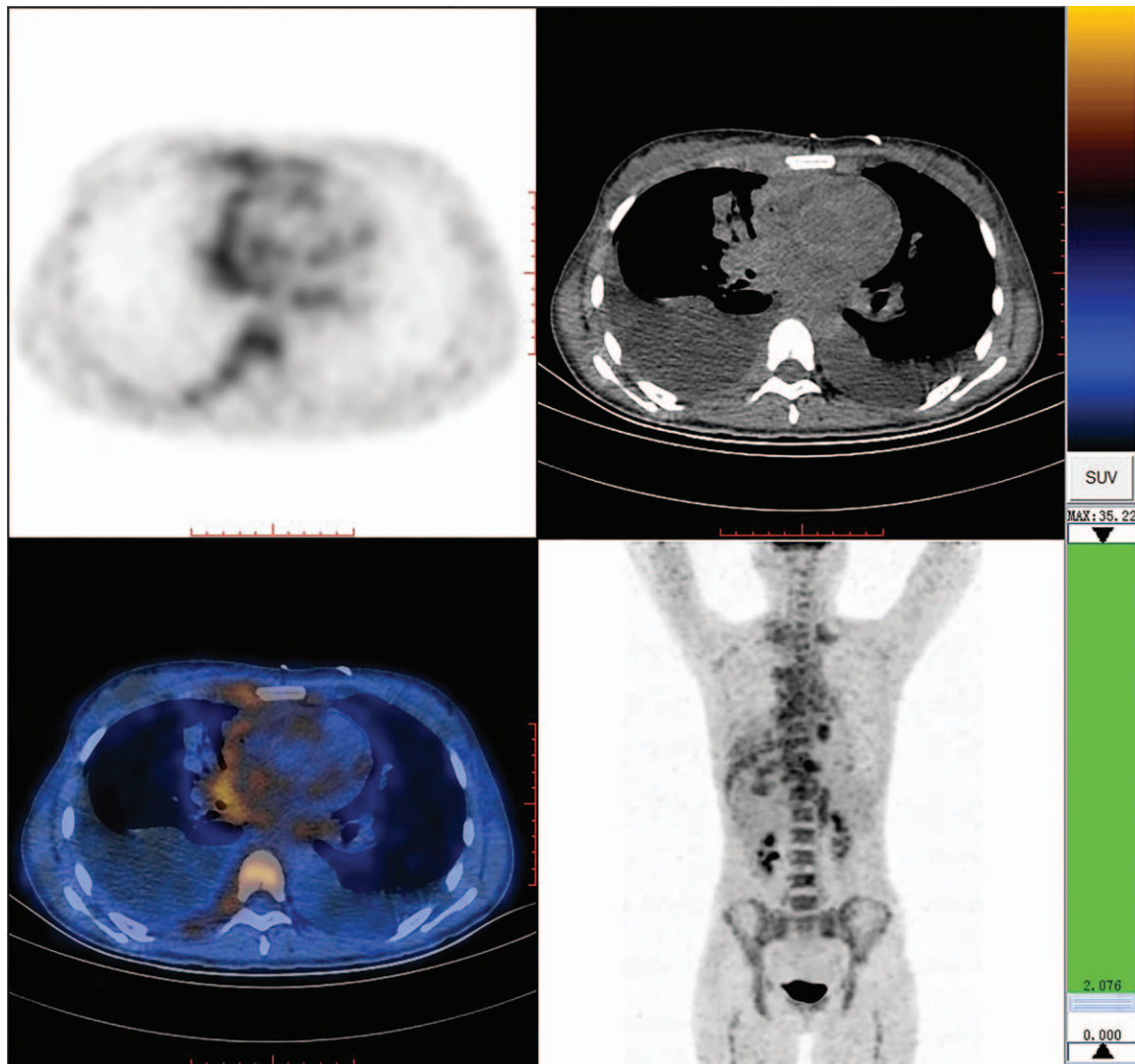


Figure 2. Initial PET scan.

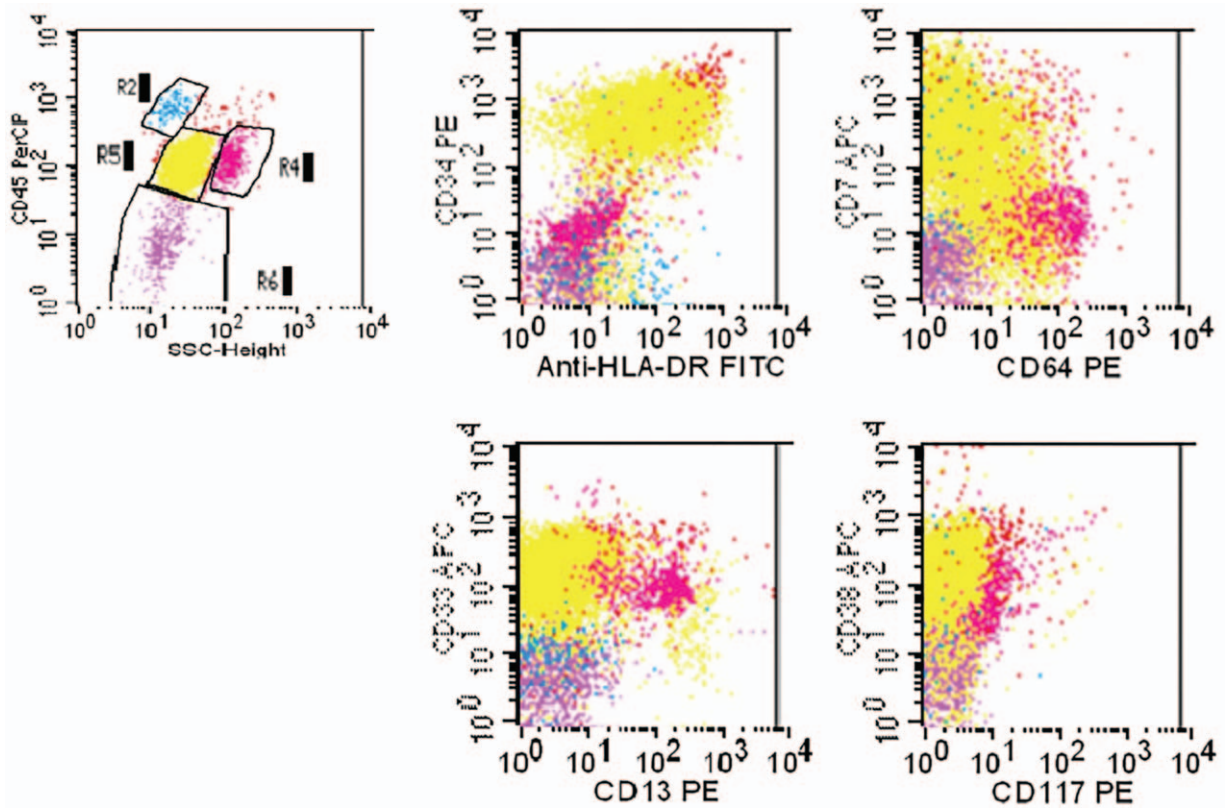


Figure 3. Flow cytometric analysis of bone marrow aspirate. R5 were myeloblasts positive for CD7, CD34, CD33, CD38, HLA-DR.

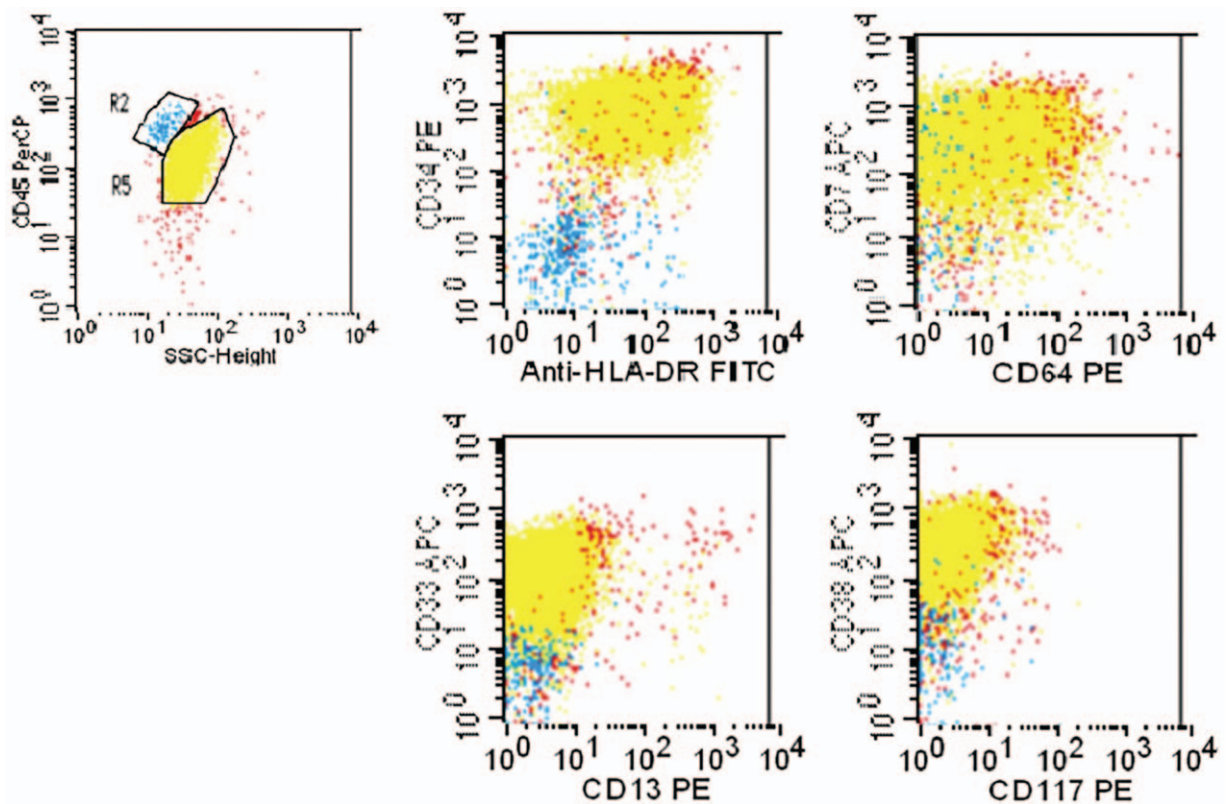


Figure 4. Flow cytometric analysis of pleural effusion. R5 were myeloblasts positive for CD7, CD34, CD33, CD38, HLA-DR.

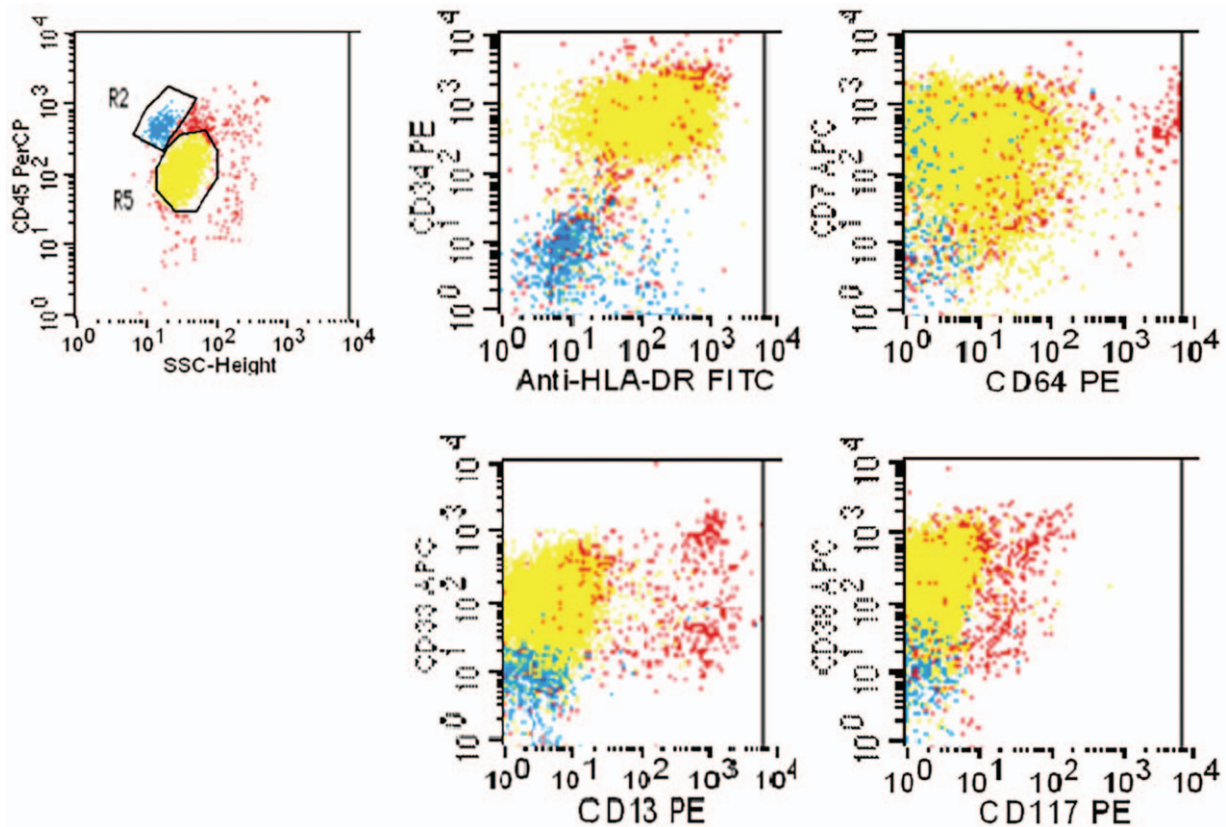


Figure 5. Flow cytometric analysis of pericardial effusion. R5 were myeloblasts positive for CD7, CD34, CD33, CD38, HLA-DR.

confirmed. Pathological examination of her axillary lymph node indicated infiltration of primitive cells, of which immunohistochemical staining was positive for MPO, TdT, CD68, CD34, CD99, and lysozyme (sporadic), while Ki-67 was expressed in 80% of the cells. Therefore, the diagnosis was further confirmed as myeloid sarcoma.

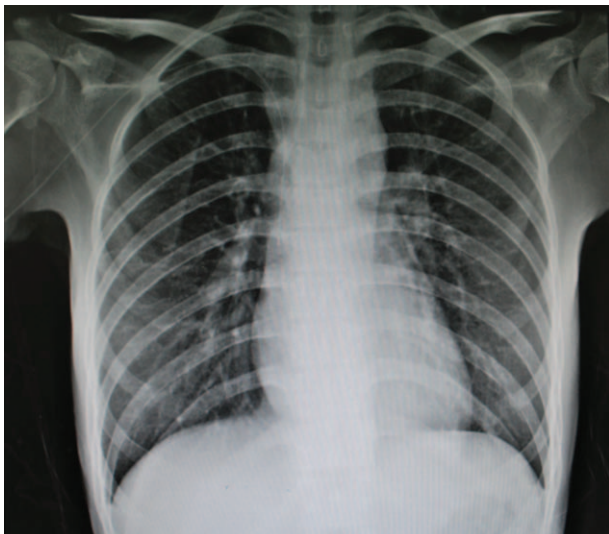


Figure 6. Follow-up x-ray after the first cycle of IA induction chemotherapy.

According to National Comprehensive Cancer Network guidelines, the patient subsequently received a conventional 3+7 induction regimen: 125 mg/m² cytarabine from D1 to D7, and 12 mg/m² of idarubicin from D1 to D3. Follow-up echocardiography and chest X-ray indicated complete absorption of pericardial and pleural effusion (Figs. 6 and 7). Bone marrow aspirate indicated 23.4% myeloblasts. Afterwards, she received high-dose cytarabine (HiDAC) regimen, with 3 g/m² of cytarabine every 12 h from D1 to D6. Following chemotherapy, the patient developed pneumonia and diffuse alveolar hemorrhage. Broad-spectrum antibiotics (piperacillin-tazobactam, meropenem, linezolid, and tigercycline), antifungals (amphotericin B and candida), and hemostasis drugs (pituitrin, carbazochrome sodium sulfonate, and hemocoagulase) were administered. Eventually, she refused further treatments and died 69 days after the initiation of induction chemotherapy.

3. Discussion

MS as extramedullary infiltration of immature myeloid cells is a very rare condition. It mostly develops in patients with AML. Previous reports have suggested no significant difference between the prognosis of isolated MS and MS with concomitant AML.^[5-7] According to a recent study, approximately 55% of MS cases also expressed CD7.^[5] CD7-positive AML exhibited high blast cell counts and poor outcomes.^[8-10] Additionally, it has been reported that leukemic pleural effusion could also be an initial manifestation of CD7-positive AML.^[11]

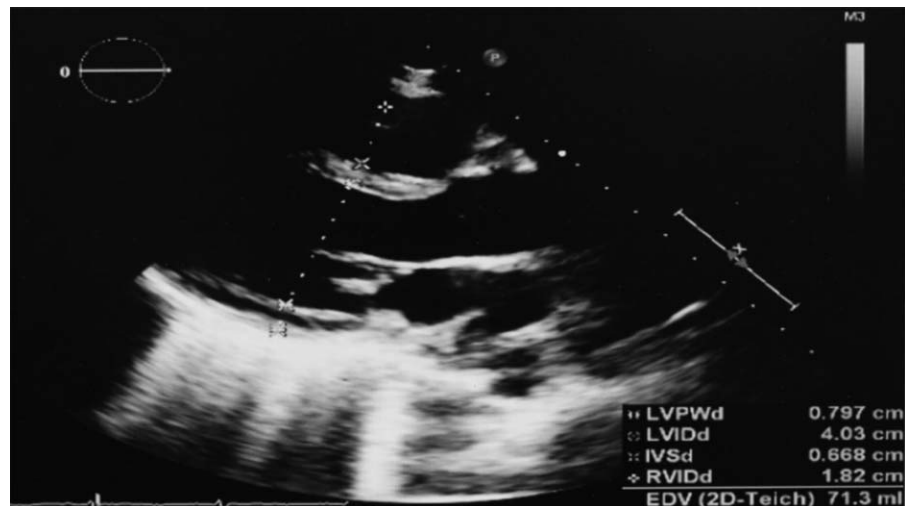


Figure 7. Follow-up echocardiography after the first cycle of IA induction chemotherapy.

As far as pleural effusion is concerned, it can occasionally occur during the clinical course of any hematological malignancies, especially in Hodgkin and non-Hodgkin lymphomas.^[12] However, leukemic pleural effusion is rare, and no more than 20 cases have been reported.^[4,11,13–26] The average age of patients reported in the literature was 53 years (range, 22–76 years), of whom 14 were male and 4 were female. One of these cases was CD7 positive AML. However, the exact incidence rate of leukemic pleural effusion is difficult to estimate. Awasthi et al found that 18% of 898 pleural fluid samples were malignant, yet none of them were AML.^[27] Cakir et al reviewed 4684 pleural fluid specimens in Turkey and found only one case of AML.^[28] Although the prognostic implication of leukemic pleural effusion in AML is undetermined, most cases have a poor prognosis. Nevertheless, both induction chemotherapy and stem cell transplantation were proven efficacious against this particular condition.^[11,17]

In contrast, pericardial effusion can occur in 21% of patients with AML at initial diagnosis, but only 0.5% manifests as pericardial tamponade,^[29] a condition for which only 4 documented cases can be found.^[30–33] The average age of these 4 patients was 42 years (range, 28–73 years), of whom 3 were male and 1 was female. 2 of 4 patients died prior to any possible treatment. Therefore, the prognostic value of leukemic pericardial effusion needs further investigation. Nevertheless, early recognition may improve clinical outcomes.

In addition to pleural and pericardial effusion, our case of MS also involved lymph nodes. MS can be the initial manifestation of AML, particularly for M5 (monocytic) and M4 (myelomonocytic) subtypes.^[34,35] Treatments for MS include systemic chemotherapy, surgical resection, and local radiotherapy.^[36] Anti-AML induction remission therapy is sufficient and effective for MS.^[2,35] Our patient received IA and HiDAC induction therapy according to AML protocols, which resulted in complete resolution of pericardial and pleural effusion. However, complete remission (CR) was not achieved in the bone marrow, indicating different biological characteristics from extramedullary infiltration. Since the patient refused further examination, a definite validation regarding the potential difference was no longer possible.

In conclusion, although polyserositis as a primary clinical manifestation of AML is extremely rare, patients with polyserositis should still undergo routine flow cytometric analysis in order to avoid delay in diagnosis. For AML with extramedullary infiltration, systemic chemotherapy should be administered in all confirmed cases.

Author contributions

Data curation: Yubo Pi, Beining Wang.

Supervision: Lihong Wang, Hanyun Ren.

Writing – original draft: Yubo Pi.

Writing – review & editing: Lihong Wang, Hanyun Ren.

References

- [1] Almond LM, Charalampakis M, Ford SJ, et al. Myeloid sarcoma: presentation, diagnosis, and treatment. *Clin Lymphoma Myeloma Leuk* 2017;17:263–7.
- [2] Bakst RL, Tallman MS, Douer D, et al. How I treat extramedullary acute myeloid leukemia. *Blood* 2011;118:3785–93.
- [3] Wang HQ, Li J. Clinicopathological features of myeloid sarcoma: Report of 39 cases and literature review. *Pathol, Res Pract* 2016;212:817–24.
- [4] Pemmaraju N, Chang E, Daver N, et al. Extramedullary acute myeloid leukemia: leukemic pleural effusion, case report and review of the literature. *Front Oncol* 2014;4:130.
- [5] Kawamoto K, Miyoshi H, Yoshida N, et al. Clinicopathological, cytogenetic, and prognostic analysis of 131 myeloid sarcoma patients. *Am J Surg Pathol* 2016;40:1473–83.
- [6] Pileri SA, Ascani S, Cox MC, et al. Myeloid sarcoma: clinico-pathologic, phenotypic and cytogenetic analysis of 92 adult patients. *Leukemia* 2007;21:340–50.
- [7] Lan TY, Lin DT, Tien HF, et al. Prognostic factors of treatment outcomes in patients with granulocytic sarcoma. *Acta Haematol* 2009;122:238–46.
- [8] Casasnovas RO, Slimane FK, Garand R, et al. Immunological classification of acute myeloblastic leukemias: relevance to patient outcome. *Leukemia* 2003;17:515–27.
- [9] Venditti A, Del Poeta G, Buccisano F, et al. Prognostic relevance of the expression of Tdt and CD7 in 335 cases of acute myeloid leukemia. *Leukemia* 1998;12:1056–63.
- [10] Del Poeta G, Stasi R, Venditti A, et al. CD7 expression in acute myeloid leukemia. *Leuk Lymphoma* 1995;17:111–9.
- [11] Ohe K, Okamura T, Arima F, et al. CD7 positive acute myelogenous leukemia exhibiting pleural involvement as an initial manifestation. *Jap J Clin Hematol* 1994;35:552–6.

- [12] Alexandrakis MG, Passam FH, Kyriakou DS, et al. Pleural effusions in hematologic malignancies. *Chest* 2004;125:1546–55.
- [13] Agarwal M, Purohit AH, Mahapatra M, et al. Pleural effusion as an unusual initial presentation of acute myeloid leukemia. *Indian J Hematol Blood Transfus* 2014;30:195–6.
- [14] Morell-Garcia D, Bauca JM, Lopez Andrade B. Leukemic pleural effusion: diagnostic approach and controversies in pleurodesis. *Arch Bronconeumol* 2014;50:371–2.
- [15] Chang H. Acute myeloid leukemia with leukemic pleural effusion. *Diagn Cytopathol* 2013;41:909–13.
- [16] Agrawal R. Acute myeloid leukaemia (AML) presenting as a bilateral pleural effusion. *J Clin Diagn Res* 2013;7:187.
- [17] Ou MC, Hwang WL, Teng CL. Leukaemic pleural effusion in acute myeloid leukaemia. *Br J Haematol* 2011;154:669.
- [18] Stoll LM, Duffield AS, Johnson MW, et al. Acute myeloid leukemia with myelodysplasia-related changes with erythroid differentiation involving pleural fluid: a case report and brief cytopathologic review. *Diagn Cytopathol* 2011;39:451–4.
- [19] Huang CT, Kuo PH, Yao M, et al. Pleural effusion heralds acute leukemic transformation of chronic myelomonocytic leukemia. *South Med J* 2008;101:1279–80.
- [20] Fatih T, Selim Y, Mesut A, et al. An unusual cause of unilateral pleural effusion in the setting of aortic stenosis: acute myeloid leukemia. *Intern Med (Tokyo, Japan)* 2007;46:325–7.
- [21] Farray D, Al-Masri H, Hattersley E, et al. Megakaryoblastic leukemia with involvement of the pleural fluid. *Am J Hematol* 2005;79:238–9.
- [22] Khan MY, Hussein KK, Walter MG, et al. Granulocytic sarcoma presenting with malignant anasarca in a patient with secondary acute myeloid leukemia. *Int J Hematol* 2004;79:250–2.
- [23] Park J, Park SY, Cho HL, et al. Isolated extramedullary relapse in the pleural fluid of a patient with acute myeloid leukemia following allogeneic BMT. *Bone Marrow Transplant* 2002;30:57–9.
- [24] Reynolds AH, Olivetti RG, Ekstrand RW. Aleukemic stem cell leukemia with polyserositis; report of case. *Blood* 1955;10:81–6.
- [25] Nieves-Nieves J, Hernandez-Vazquez L, Boodoosingh D, et al. Pleural effusion as the initial extramedullary manifestation of Acute Myeloid Leukemia. *F1000Research* 2012;1:39.
- [26] Leong CF, Azma RZ, Cheong SK, et al. Complex karyotypic abnormalities in a case of acute myeloid leukaemia–M4Eo. *Malays J Pathol* 2005;27:45–50.
- [27] Awasthi A, Gupta N, Srinivasan R, et al. Cytopathological spectrum of unusual malignant pleural effusions at a tertiary care centre in north India. *Cytopathology* 2007;18:28–32.
- [28] Cakir E, Demirag F, Aydin M, et al. A review of uncommon cytopathologic diagnoses of pleural effusions from a chest diseases center in Turkey. *CytoJournal* 2011;8:13.
- [29] Sampat K, Rossi A, Garcia-Gutierrez V, et al. Characteristics of pericardial effusions in patients with leukemia. *Cancer* 2010;116:2366–71.
- [30] Leptidis J, Aloizos S, Chlorokostas P, et al. Fatal cardiac tamponade as the first manifestation of acute myeloid leukemia. *Am J Emerg Med* 2014;32:1294e1291-1292.
- [31] Kawasaki M, Yamano Y, Kikuchi Y, et al. Cardiac tamponade as an initial manifestation of acute myeloblastic leukemia. *Jap J Clin Hematol* 1990;31:224–8.
- [32] Bjorkholm M, Ost A, Biberfeld P. Myocardial rupture with cardiac tamponade as a lethal early manifestation of acute myeloblastic leukemia. *Cancer* 1982;50:1867–9.
- [33] Karmo D, Hafeez A, Halalau A, et al. Cardiac tamponade as the initial presentation of acute myeloid leukemia: a case report with review of the literature. *Case Rep Oncol Med* 2018;2018:8201917.
- [34] Byrd JC, Edenfield WJ, Shields DJ, et al. Extramedullary myeloid cell tumors in acute nonlymphocytic leukemia: a clinical review. *J Clin Oncol* 1995;13:1800–16.
- [35] Shimizu H, Saitoh T, Hatsumi N, et al. Clinical significance of granulocytic sarcoma in adult patients with acute myeloid leukemia. *Cancer Sci* 2012;103:1513–7.
- [36] Tsimberidou AM, Kantarjian HM, Wen S, et al. Myeloid sarcoma is associated with superior event-free survival and overall survival compared with acute myeloid leukemia. *Cancer* 2008;113:1370–8.