Review Article

Myeloid sarcoma

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Abstract

Myeloid sarcoma is an extramedullary tumor of immature granulocytic cells. It is usually accompanied by acute myeloid leukemia, although in some rare cases, it may present in nonleukemic patients. It is a rare entity characterized by the occurrence of one or more tumor myeloid masses occurring at an extramedullary site. It may occur at any site, leading to very varied clinical presentations. However, the most common locations are soft tissues, bone, peritoneum, and lymph nodes. The aim of this review is to summarize about pathogenesis, diagnostic test, prognosis, and treatment of myeloid sarcoma.

Keywords: Bone, granulocytic cells, lymph nodes, medullary tumor, pathogenesis

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INTRODUCTION

Myeloid sarcoma is a neoplastic condition which consists of immature cells of granulocytic series. It is called as chloroma owing to its green color attributed to the enzyme myeloperoxidase. It is also called as granulocytic sarcoma, myeloblastoma, and extramedullary myeloid cell tumor.[1] It is a pathologic diagnosis for an extramedullary proliferation of blasts of one or more of the myeloid lineages that disrupt the normal structure of the tissue in which it is found.[2] It consists of myeloblasts, with or without features of promyelocytic or neutrophilic maturation, that partially or totally efface the tissue architecture.[3] Myeloid Sarcoma may occur in association with Acute Myeloid Leukemia, before or after as a relapse. It is less often associated with myeloproliferative neoplasm or myelodysplastic disorder. Multiple sclerosis (MS) occurs at any age both in pediatric and elderly patients.[4,5]

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PREVALENCE AND CLINICAL PRESENTATION

The incidence of the isolated Myeloid Sarcoma in adults is 2%. The age of patients at MS presentation is highly variable, with cases being reported in patients 1–81.[6] It mostly occurs in soft tissues, bone, peritoneum, lymph nodes, and gastrointestinal system. Other sites include genitourinary system of males and females and the central nervous system. In children with newly diagnosed AML, extramedullary involvement was most common in the skin (in 54%), with orbital involvement being the second most common site. MS size at diagnosis is highly variable ranging from 2 to 20 cm. It is reported in 2%–8% of patients with AML either as a single or as a multifocal tumor.[1]

DIAGNOSIS

Diagnosis of MS with known AML or other hematologic malignancies is relatively easy. However, the differential

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diagnosis of primary MS is relatively difficult for a pathologist. The rate of misdiagnosis is 75% and mostly misdiagnosed as large cell lymphoma followed by malignant lymph proliferative disorders. The misdiagnoses are non-Hodgkin lymphoma, histolytic lymphoma, thymoma, myeloma, eosinophilia sarcoma, extramedullary hematopoiesis, mucosa-associated lymphoid tissue, Ewing sarcoma and carcinoma, undifferentiated cancer, malignant melanoma, extramedullary hematopoiesis, and inflammation.[7] The characteristic microscopic growth pattern of myeloid cells is either a diffuse or an Indian file pattern.[8] Although the fine needle aspiration is used for diagnosis in the literature,[9] tissue biopsy is the preferred method.[10] The morphologic appearance on H and E varies according to differentiation of the cells. It mainly consists of infiltration by myeloblasts. It is recommended to send the specimen to immunohistochemistry, flow cytometry, fluorescence *in situ* hybridization, and molecular analysis followed by bone marrow biopsy, and aspiration should be performed to rule out other hematological malignancies. Based on localization of the tumor, magnetic resonance or computed tomography is performed. These techniques differentiate from abscess and hematomas in patients with AML.[11]

PROGNOSIS

The prognosis of isolated MS is not well examined in large prospective studies, but it has a poor prognosis. In some series with subgroup analysis of isolated MS performed in children, it was demonstrated that it had a better prognosis than children with AML, without MS, and patients concomitant with AML.[12,13] Another study conducted by Tsimberidou *et al.* have stated that isolated MS patients with chromosome 8 abnormalities had a worse prognosis, and intensive chemotherapies were needed in this group.[14]

LOCAL APPROACHES

Radiotherapy

The role of radiotherapy in addition to systemic chemotherapy is not established, although it is often given. Studies have shown that patients treated only with radiotherapy had a high rate of progression to AML after a short no-leukemic period.[8] It could also be used as a consolidation therapy after systemic chemotherapy while considering the possible toxicities due to the localization of the tumor.[13,15] The study conducted by Tsimberidou *et al.* stated that the failure-free survival in 21 patients with no leukemic granulocytic sarcoma was lower with the combination treatment of chemoradiotherapy. In other study, it had no effect on survival in multivariate analyses. Hence, it could be used in conjunction with systemic therapies or patients who need a rapid relief of symptoms, or it could also be used as a consolidation therapy.[16]

Surgery

The patients who undergo surgery, almost always relapse or progress to AML, and die. The incidence of AML or extramedullary relapse was significantly higher in patients who were treated with surgery only.[7,10] It was also demonstrated by Yamauchi *et al.* that the time interval to progression to AML was higher in patients who did not receive systemic therapy. Most of the patients (81%) who did not receive systemic treatment were shown to progress to AML in the first 11 months. Therefore, surgery is not an effective treatment strategy for primary MS, and surgery should be considered before the systemic treatment in acute situations. It could also be used to confirm the diagnosis in rare cases.[17]

Bone marrow transplantation

Allogeneic stem cell transplantation was an efficient treatment modality with a no-relapsing mortality rate of 17%. Nearly half of the patients (47%) in this study got transplantation in the first remission. The 5-year overall survival was 33%, and leukemia-free survival was 30%. It was concluded that hematopoietic stem cell transplantation (HSCT) as a first-line effective therapeutic option with longer overall survivals.[18]

Targeted therapy

There is no targeted therapy for patients with MS but new agents such as the nucleoside analogs, FLT3 inhibitors, farnesyltransferase inhibitors, histone deacetylase inhibitors, and DNA methyltransferase inhibitors are currently being tested for AML treatment and may change treatment options and prognosis.[19]

CONCLUSION

The optimal treatment of the myeloid sarcoma is not clear since there is not enough data and large prospective studies in the literature. Systemic chemotherapies used in AML remission induction treatment are mostly suggested therapy with or without radiotherapy. HSCT should also be considered in relapsed or refractory patients after reinduction and used as a consolidation treatment in suitable patients. New large prospective studies and new agents are needed for the treatment.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Pileri SA, Ascani S, Cox MC, Campidelli C, Bacci F, Piccioli M, *et al.* Myeloid sarcoma: Clinico-pathologic, phenotypic and cytogenetic analysis of 92 adult patients. Leukemia 2007;21:340-50.
2. Szomor A, Baranyai F, Tornóczky T, Losonczy H. Penile chloroma in a patient with secondary acute myeloid leukemia. Eur J Haematol 2002;68:322.
3. Hancock JC, Prchal JT, Bennett JM, Listinsky CM. Trilineage extramedullary myeloid cell tumor in myelodysplastic syndrome. Arch Pathol Lab Med 1997;121:520-3.
4. Kasahara S, Tsurumi H, Hara T, Goto H, Moriwaki H. Idiopathic myelofibrosis developing isolated granulocytic sarcoma with der (1;7) (q10; p10) after splenectomy and finally transforming to acute myelogenous leukemia. Leuk Lymphoma 2000;39:427-33.
5. Maeng H, Cheong JW, Lee ST, Yang WI, Hahn JS, Ko YW, *et al.* Isolated extramedullary relapse of acute myelogenous leukemia as a uterine granulocytic sarcoma in an allogeneic hematopoietic stem cell transplantation recipient. Yonsei Med J 2004;45:330-3.
6. Jaffe ES, Harris NL, Stein H, Vardiman JW. Pathology and genetics. In Tumours of Haematopoietic and Lymphoid Tissues. Lyon: IARC Press; 2001. p. 3.
7. Antic D, Elezovic I, Milic N, Suvajdzic N, Vidovic A, Perunicic M, *et al.* Is there a "gold" standard treatment for patients with isolated myeloid sarcoma? Biomed Pharmacother 2013;67:72-7.
8. 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.
9. Bakst RL, Tallman MS, Douer D, Yahalom J. How I treat extramedullary acute myeloid leukemia. Blood 2011;118:3785-93.
10. Ngu IW, Sinclair EC, Greenaway S, Greenberg ML. Unusual presentation of granulocytic sarcoma in the breast: A case report and review of the literature. Diagn Cytopathol 2001;24:53-7.
11. Pui MH, Fletcher BD, Langston JW. Granulocytic sarcoma in childhood leukemia: Imaging features. Radiology 1994;190:698-702.
12. Dusenbery KE, Howells WB, Arthur DC, Alonzo T, Lee JW, Kobrinsky N, *et al.* Extramedullary leukemia in children with newly diagnosed acute myeloid leukemia: A report from the children's cancer group. J Pediatr Hematol Oncol 2003;25:760-8.
13. Lan TY, Lin DT, Tien HF, Yang RS, Chen CY, Wu K. Prognostic factors of treatment outcomes in patients with granulocytic sarcoma. Acta Haematol 2009;122:238-46.
14. Tsimberidou AM, Kantarjian HM, Estey E, Cortes JE, Verstovsek S, Faderl S, *et al.* Outcome in patients with nonleukemic granulocytic sarcoma treated with chemotherapy with or without radiotherapy. Leukemia 2003;17:1100-3.
15. Imrie KR, Kovacs MJ, Selby D, Lipton J, Patterson BJ, Pantalony D, *et al.* Isolated chloroma: The effect of early antileukemic therapy. Ann Intern Med 1995;123:351-3.
16. Avni B, Rund D, Levin M, Grisariu S, Ben-Yehuda D, Bar-Cohen S, *et al.* Clinical implications of acute myeloid leukemia presenting as myeloid sarcoma. Hematol Oncol 2012;30:34-40.
17. Stölzel F, Röllig C, Radke J, Mohr B, Platzbecker U, Bornhäuser M, *et al.* ^{18}F-FDG-PET/CT for detection of extramedullary acute myeloid leukemia. Haematologica 2011;96:1552-6.
18. Chevallier P, Mohty M, Lioure B, Michel G, Contentin N, Deconinck E, *et al.* Allogeneic hematopoietic stem-cell transplantation for myeloid sarcoma: A retrospective study from the SFGM-TC. J Clin Oncol 2008;26:4940-3.
19. Avni B, Koren-Michowitz M. Myeloid sarcoma: Current approach and therapeutic options. Ther Adv Hematol 2011;2:309-16.