Case Report

Myeloid Sarcoma Mimicking Dental Abscess in a Patient with Chronic Myeloid Leukemia: Diagnostic and Therapeutic Dilemma

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Abstract
Chronic myeloid leukemia (CML) is a hematologic malignancy that has significant improvement in its prognosis after the introduction of tyrosine kinase inhibitors. Transformation to accelerated phase or blast phase can happen. Myeloid sarcoma or chloroma is an uncommon extramedullary disease. It is very unusual for patients with CML to develop myeloid sarcoma. We report a young man with CML in the chronic phase who developed myeloid sarcoma. There were many difficulties in the diagnosis of myeloid sarcoma due to the simulation of other more common conditions like infections and other malignancies. In addition, there are treatment challenges because of lack of standardized treatment. The case shed light on this rare complication, the challenging diagnosis, and its implication in patients with CML.
Introduction

Chronic myeloid leukemia (CML) is a myeloproliferative neoplasm with an overproduction of mature granulocytes. The hallmark of the disease is the presence of the Philadelphia chromosome, a reciprocal translocation between chromosomes 9 and 22, resulting in the BCR-ABL1 fusion gene. Patients with CML usually present with nonspecific symptoms like fever, fatigue, and abdominal discomfort; many are discovered during routine investigations with elevated white blood cell count. Other unusual presentations of CML include priapism, abdominal pain or eye symptoms, or urologic manifestation [1, 2]. Among the different presentations and complications, myeloid sarcoma is a rare way for CML to present. Myeloid sarcomas are tumors made up of myeloid lineage blasts that can occur before, after, or in the absence of systemic acute myeloid leukemia (AML). Because of the greenish tint imparted on gross inspection due to the production of myeloperoxidase, they are also known as chloromas. Chloromas can develop anywhere and can be associated with or without bone marrow involvement. In this case, we present a young male with CML who developed myeloid sarcoma and his disease course.

Case Presentation

A 26-year-old man with morbid obesity (275 kg weight, BMI 113 kg/m²), hypertension, and gastroesophageal reflux disease had tried weight loss using gastric banding and did not achieve significant weight loss. Then, he was referred for a sleeve gastrectomy. In 2018, on routine blood tests for surgical assessment, he was found to have elevated WBC. He was referred to hematology for further investigations, which revealed the diagnosis of CML in the chronic phase with a low Sokal score. He was started on imatinib 400 mg once daily with a recommendation to deflate the pump as patients with gastrectomy, gastric bypass, and patients with gastric balloon have reduced transient time, reduced stomach acidity, and reduced surface of absorption; this will result in low drug absorption. He was followed according to the European Leukemia Network 2013, and he achieved complete hematological remission with white blood cell count of less than 10,000/µL, no immature granulocytes, and less than 5% basophils on differential; platelet count <450,000/µL; and no palpable spleen and achieved major molecular response with BCR-ABL1 expression of less than 0.1% after 12 months. In 2019, he traveled abroad to study, and because of the COVID-19 pandemic, he was short of medications for six months. He came back to Doha in December 2021. When the patient arrived, he complained of left facial swelling. He was referred to a dentist for assessment of the swelling as initially, it was thought to be a dental infection or abscess. On examination, there was left-sided facial swelling over the maxilla, firm in consistency and non-tender. After dental evaluation, he was sent to the maxillofacial team because the shape of the swelling is not typical of an abscess and might be a tumor-like nasopharyngeal carcinoma and better to be evaluated by the maxillofacial team. Further evaluation with MRI sinuses with contrast revealed a mass centered on the left maxilla/retromolar trigone measuring approximately 68 × 54 × 23 mm with homogenous enhancement and restriction on diffusion-weighted imaging. There was destruction of the posterior maxillary alveolar process with extension into the maxillary sinus and destruction of the lateral bony wall and extension to the buccal mucosa via buccinator muscle into the adjacent soft tissues. Additionally, there were multiple enlarged lymph nodes bilaterally in levels 1b–5b, the largest cluster in left level 1b. Inferiorly, these extend into the root of the neck, particularly on the left side. Furthermore, a positron emission tomography (PET) scan was done (Fig. 1), which demonstrated intensely increased (SUV max 11.6) corresponding to left maxillary sinus mucosal thickening extending into the left masticator
space, suspicious of malignancy with 2.3 cm measuring levels II cervical lymph nodes, more on the right, demonstrating moderately increased (SUV Max 3.8) uptake.

Biopsy from the hard palate lesion showed extensive infiltration by partly crushed medium-sized blastoid cells (Fig. 2a). These atypical cells displayed prominent nucleoli and had scant cytoplasm. The cells were positive for CD45 (Fig. 2b), CD117 (Fig. 2c), and CD33, whereas ki-67 showed a proliferative index of approximately 60% (Fig. 2d). Immunostains for MPO, lysozyme, TdT, CD3, CD20, CD19, CD34, CD56, chromogranin, synaptophysin, and CK AE1/AE3 were negative. The morphology and the immunophenotype were in keeping with a diagnosis of myeloid sarcoma.

Then, he was referred back to the hematology team. The hematology workup included bone marrow aspiration and biopsy to check the status of the bone marrow, and bone marrow showed CML in chronic phase and at that time, BCR-ABL1 positive with a BCR-ABL1 to ABL1 percentage ratio of 98% (IS). However, according to WHO criteria 2016, the presence of extramedullary blast is equivalent to blast crisis; that is why this patient was discussed in the leukemia multidisciplinary team and planned for AML-type chemotherapy in addition to dasatinib for CML, HLA typing for the family with a plan for allogeneic stem cell transplant if feasible. There was no plan for surgery because the discussion with the maxillofacial team in the MDT revealed that the patient needs extensive surgery with difficult reconstruction with poor outcomes. Then, he received induction chemotherapy with 3 + 7 (idarubicin and cytarabine) + dasatinib 140 mg. Chemotherapy was complicated by neutropenia and Strep- tococcus mitis sepsis, and he received 14 days of ceftriaxone. He received radiotherapy 24 Gy in 12 fr. A follow-up MRI of the head and sinuses after completing chemoradiotherapy (Fig. 3) showed a significant decrease in the size of the left maxillary mass with retention cyst/polyp in the right maxilla. Currently, he is planning for a bone marrow transplant from an HLA-identical younger sibling.

Discussion

Myeloid sarcoma or granulocytic sarcoma is an extramedullary proliferation of blasts from one or more of the myeloid lineages that disturbs the normal architecture of the tissue in which they are found [3]. Myeloid sarcoma is typically seen with AML. Myeloid sarcoma is
seen in 2.5–9% of patients with AML, and it develops in less than 1% without involving the bone marrow; this is known as isolated myeloid sarcoma [4]. Diagnosing isolated myeloid sarcoma is challenging because their soft tissue involvement can mimic other types of cancer, both hematological and nonhematological ones [5]; this can lead to misdiagnosis or delayed diagnosis. As in this case, the patient was initially thought to have a dental abscess or dental infection. Many patients with isolated myeloid sarcoma will have evidence of bone marrow involvement after a few months of follow-up [6].

Myeloid sarcoma can occur in any part of the body, but it is reported to affect bone, soft tissues, and lymph nodes, and less frequently, the orbit, intestine, and the mediastinum [7]. Reviewing the literature, patients with CML are extremely rare to have myeloid sarcoma, with only a few cases reported in non-English literature. One reported case in a 90-year-old lady involved the maxilla and the orbit [8]. Unfortunately, the patient died within weeks of the diagnosis of chloroma after receiving chemoradiotherapy. Our patient had obesity and was not compliant with medication; both obesity [9] and noncompliance [10] will affect his disease in a drastic way. However, it is not known if controlling CML will prevent the development of myeloid sarcoma. CML is a disease of the elderly, with most patients having the disease in their sixth decade. However, our patient had the disease when he was 22 years old. CML was reported to be more common in young patients than before [11] and more aggressive in younger patients than in the elderly [12].

Fig. 2. a Hard palate was extensively infiltrated by partly crushed medium-sized blastoid cells (H and E ×4). b The atypical cells were diffusely and strongly positive for CD45. c There was also strong diffuse positivity for CD117. d ki-67 showed a high proliferative index of 60%.
The major dilemma in amyloid sarcoma is that there is no specific treatment protocol; the same treatment used to induce remission in acute myelogenous leukemia is still utilized to treat myeloid sarcoma, including solitary myeloid sarcoma [3]. The role of allogeneic SCT in postremission therapy is debatable. The treatment for myeloid sarcoma associated with CML is hazier because the condition is much rare with CML. For this patient, the CML in chronic phase was treated with dasatinib and chloroma treated with two induction and planned for bone marrow transplant. The patient received radiotherapy to the area of the extramedullary tumor in order to reduce the tumor size, although there are no clear guidelines regarding radiotherapy in myeloid sarcoma. This makes the treatment of chloroma in CML more indeterminate. It is not known which is the best to consolidate; radiotherapy with a bone marrow transplant or to go directly for bone marrow transplant. However, the patient was offered both chemotherapy and radiotherapy in the hope of getting the maximum benefit because the treatment for CML and acute leukemia should be tailored based on patient’s characteristics in order to get the maximum benefits [13]. Our patient had local radiotherapy, after which there was a significant reduction in the tumor size supported by MRI findings before and after the radiotherapy (Fig. 3).

**Fig. 3.** Axial (a) and coronal (b) MRI postcontrast fat-saturated images show a large homogenously enhancing mass centered on the left retromolar trigone (red arrows) measuring about 6.8 × 5.4 × 2.3 cm. Multiple enlarged cervical lymph nodes are seen in both sides (yellow arrows). Axial (c) and coronal (d) MRI postcontrast fat-saturated images after treatment showed a significant reduction to almost complete clearance of the previously described mass and the enlarged lymph nodes.
AML and CML are diagnosed by the characteristic findings on bone marrow examination; as a result, PET scan is not a routine in the diagnosis. For AML, PET scan can help detect recurrence and relapse of disease, specially extramedullary disease, and also helpful in patients who present with fever of unknown origin [14]. Typically, PET scan will show increased uptake in the bone marrow, which can be homogenous or nonhomogenous. The increased bone marrow uptake is very sensitive, with a sensitivity of 93.3% [15]. The drawback is the low specificity due to other causes of increased bone marrow uptake like infections or treatment with granulocyte colony-stimulating factor (GCSF) or erythropoietin [16]. The major benefit of PET scan is the detection of extramedullary disease, which might be difficult to diagnose early or until a significant increase in the mass size. The findings in our reported case suggest PET scan is helpful in detecting chloroma in a patient with CML.

**Conclusion**

Myeloid sarcoma is difficult to diagnose, and treatment is challenging. In patients with CML, myeloid sarcoma is more challenging as it is a very uncommon finding, and treatment outcome is not clear due to the few reported patients. Despite being rare, the clinician should have suspicions of this rare diagnosis and not to miss it for other causes like abscesses or infections. PET scan and MRI are useful imaging modalities that can aim to catch the diagnosis.

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**Statement of Ethics**

The case was approved by the Medical Research Center in Hamad Medical Corporation in Doha, with MRC-04-22-269. Written informed consent was obtained from the patient for publication of the details of their medical case and any accompanying images.

**Conflict of Interest Statement**

All authors have no conflicts of interest.

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**Author Contributions**

Elrazi Ali and Mohammed A. Yassin wrote and edited the final manuscript. Mohammad Abu-Tineh, Mohamed Abdelrazek, and Eihab A. Suhabi edited the final manuscript. Mahir Petkar and Mzaki Karzoun contributed to the histology part of the final manuscript. Lajos Szabados edited the radiology part of the final manuscript.
Data Availability Statement

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

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