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CASE REPORT

Radiotherapy in Cervical Myeloid Sarcoma: A Case Report and Literature Discussion

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Background: Myeloid sarcoma (MS) is a rare extramedullary tumor formed by the abnormal proliferation of immature myeloid cells. It can occur concurrently with or secondary to various myeloid neoplasms, most commonly acute myeloid leukemia (AML). Cervical involvement is extremely rare, and its clinical presentation often mimics that of primary gynecologic malignancies, typically manifesting as vaginal bleeding, a palpable cervical mass, or cervical enlargement.

Case Presentation: We report the case of a 67-year-old woman with a history of AML who had received multiple lines of chemotherapy and presented with irregular vaginal bleeding since more than 1 month. Cervical biopsy showed diffuse infiltration of atypical myeloid cells, and immunohistochemistry supported the diagnosis of MS. She received pelvic radiotherapy with 6 MV X-ray intensity-modulated radiation therapy combined with intracavitary brachytherapy, and follow-up evaluation 3 months later demonstrated marked shrinkage of the cervical mass.

Conclusion: This case highlights that cervical MS is prone to being misdiagnosed and that histopathology with immunohistochemistry is essential for a definitive diagnosis. Even in patients who have undergone multiple lines of systemic therapy and are unable to receive hematopoietic stem cell transplantation, local radiotherapy can achieve rapid and effective local control, and may confer a survival benefit.

Keywords: myeloid sarcoma, cervical myeloid sarcoma, acute myeloid leukemia, radiotherapy, prognosis

Introduction

Myeloid sarcoma (MS) is a rare hematological tumor, which is formed by the abnormal proliferation of myeloid cells within the bones, soft tissues, and other anatomical sites. It may occur synchronously with or subsequent to a variety of myeloid malignancies, including acute myeloid leukemia (AML), myelodysplastic syndromes, myeloproliferative neoplasms, and chronic myeloid leukemia.[1–3] MS is also known as "green tumor" due to the overexpression of myeloperoxidase.[4] MS has been reported in a proportion of AML patients, with an incidence of approximately 2–9% across different series.[5–9] Cervical involvement in this setting is exceptionally rare, and has been largely described in only isolated case reports and small case series, with a higher prevalence observed in male patients aged 46 to 59 years.[10,11] MS is often initially misdiagnosed as lymphoma, undifferentiated cancer, malignant melanoma, extramedullary hematopoiesis, or inflammation.[12–14] MS cells demonstrate clonal cytogenetic abnormalities in 54–70% of cases.[12] Here, we present a rare case of cervical MS (CMS) with AML, and review various aspects of MS in previously published reports from the limited literature, including clinical features, diagnosis, and treatment. We highlight the significance of radiotherapy in the management of CMS.

Case Presentation

A 67-year-old woman complained of irregular vaginal bleeding since more than 1 month. The patient was married, and had given birth to 3 children. Her family history was unremarkable. She had a history of bilateral rib pain with cough in

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March 2020. Laboratory tests at the time revealed a white blood cell count of 22.43 × 10^9/L, and she was eventually diagnosed with AML. She received chemotherapy with the IA regimen (idarubicin + cytarabine), a high-dose cytarabine regimen, a high-dose triapine + cytarabine regimen, idarubicin + cytarabine + the BCL-2 inhibitor venetoclax, and the PD-1 inhibitor sintilimab. Repeated bone marrow puncture during follow-up showed partial remission of CMS (Table 1). The patient did not undergo hematopoietic stem cell transplantation due to financial reasons. On November 21, 2024, the patient again developed vaginal bleeding, consisting of mainly dark red blood clots. The blood test results at this time were as follows: white blood cells, 2.55 × 10^9/L; red blood cells, 3.51 × 10^{12}/L; platelets, 84 × 10^9/L; alanine aminotransferase, 12.5 U/L; aspartate aminotransferase, 12.6 U/L; total protein, 67.1 g/L; albumin, 42 g/L; urea, 3.00 mmol/L; blood creatinine, 60 μmol/L; and uric acid, 335 μmol/L. Colposcopy and pathological examination of a cervical biopsy specimen showed a cervical malignant tumor, and immunohistochemical analysis showed the following results: MPO (+), Ki67 (+, 60–70%), CD15 (partial +), and lysozyme (+) (Figure 1). The patient's medical history, and results of pathological examination and immunohistochemical staining indicated a diagnosis of MS. Magnetic resonance imaging (MRI) of the pelvis revealed a space-occupying lesion in the cervical region.

The patient was not administered surgery or chemotherapy, but received pelvic radiotherapy consisting of 6 MV intensity-modulated radiation therapy (IMRT) and high-dose-rate intracavitary brachytherapy (HDR-ICBT). She was administered 50.4 Gy of whole-pelvic external beam radiotherapy in 28 fractions. The gross tumor volume (GTV) was the visible cervical tumor and uterus on CT. The clinical target volume (CTV) included the GTV, the common iliac, external iliac, internal iliac, obturator, pre-sacral, and pelvic floor lymphatic drainage areas. The upper boundary of the CTV was the bifurcation of the common iliac artery, and the lower boundary was the lower edge of the obturator. The planning target volume (PTV) was the CTV with an external margin of 0.7 cm in front and behind, 0.6 cm above and below, and 0.5 cm left and right (Figure 2). Additionally, the organs at risk were delineated as follows: bladder, rectum, small intestine, and femoral head. HDR-ICBT was delivered once per week at a fractional dose of 6 Gy 5 times at point A. During the patient's hospitalization for treatment, bone marrow suppression occurred (Figure 3). Therefore, the patient received supportive treatment consisting of subcutaneous recombinant human granulocyte colony-stimulating factor at a dose of 150 μg once daily for 5 consecutive days, and this course was repeated for 7 cycles. Concomitantly, the patient was administered Shengxuebao granules orally at a dose of 8 g three times daily and kojic acid tablets at a dose of 0.3 g three times daily. Pelvic MRI after treatment showed that the lesion was significantly smaller than before. The specific comparison results are given below. MRI findings before treatment (Figure 4A): heterogeneous signal intensity in the anterior wall of the uterus; patchy, slightly long T2 signals; high signal intensity on diffusion-weighted imaging (DWI); marked enhancement of the tumor edges on enhanced scans; and a tumor diameter of 17 mm. A mass measuring 34×55 × 66 mm was found in the right lateral and anterior wall of the cervix with

Table 1 Detailed Treatment Course of the Patient After Being Diagnosed with Acute Myeloid Leukemia

Time	Treatment	Result
2020-4–2020-11	IA	Complete remission
2020-12–2021-3	High-dose Ara-C/Ara-C + Homoharringtonine	Leukemia cells 3.5%
2021-4	Idarubicin + cytarabine + BCL-2 chemotherapy	Peripheral blood smear indicated that the proportion of immature cells was 23%.
2021-5	PD-1 inhibitor + BCL-2 inhibitor therapy	Complete remission
2021-6–2022-5	PD-1 inhibitor	Partial remission
2022-6–2024-8	Sintilimab + Venetoclax	Complete remission
2024-9–2024-10	Sintilimab	Bone marrow puncture showed that the proportion of mature and immature monocytes was 2.5%.
2024-11	The patient was diagnosed with cervical myeloid sarcoma in November 2024 and subsequently received 28 fractions of external beam radiotherapy and 5 sessions of high-dose-rate intracavitary brachytherapy.	

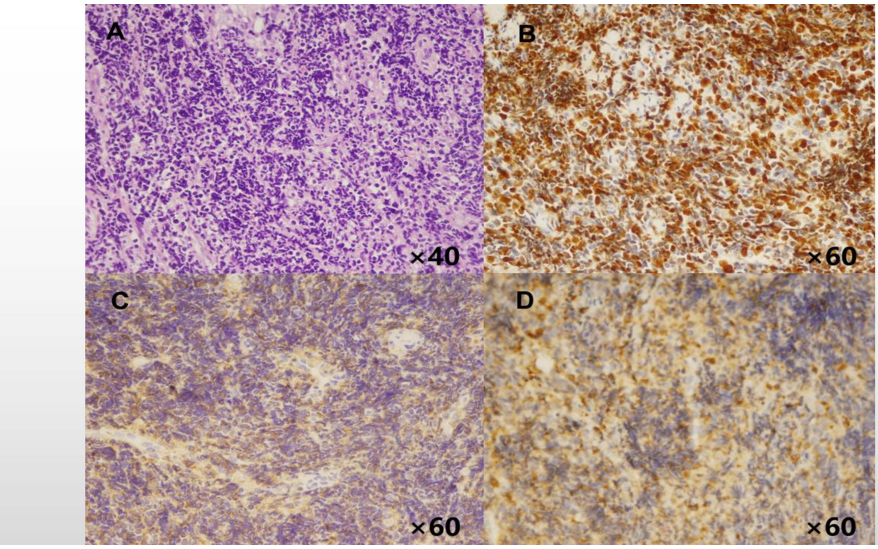

Figure 1 (**A**) Hematoxylin and eosin stained microscopic image showing medium-sized tumor cells with irregular cell nuclei and frequent mitotic figures, (**B**) Ki67 (+), (**C**) lysozyme (+), (**D**) MPO (+).

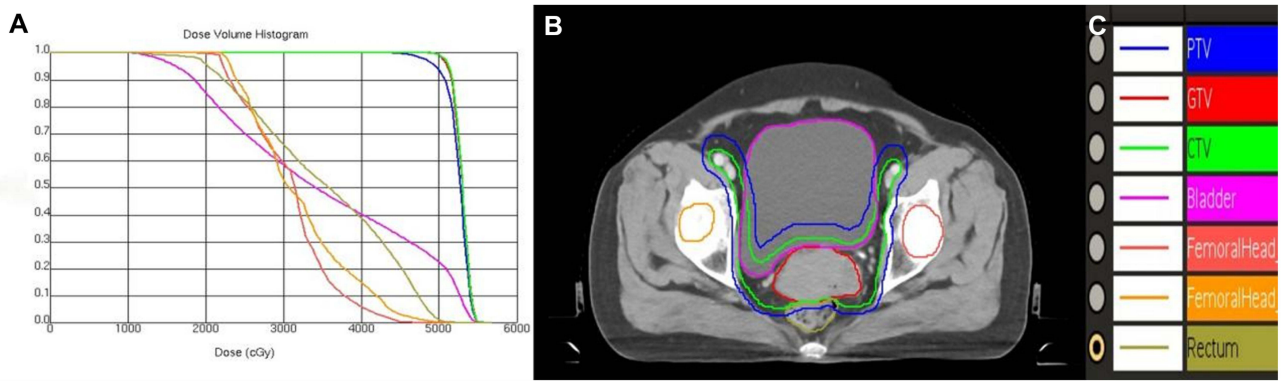

Figure 2 (A) Dose-Volume Histogram, (B) Target volume delineation, (C) Legend of target volumes and organs at risk.
Abbreviations: PTV, planning target volume; GTV, gross tumor volume; CTV, clinical target volume.

equal T1 and slightly long T2 signals, which showed obvious high signals on DWI. The lower margin of the lesion did not extend beyond the lower third of the vagina. MRI reexamination at 1 month after treatment (Figure 4B): lack of smoothness of the inner wall of the cervical canal; reduced local, T2-weighted, fat-suppression signals; no soft tissue mass; no obvious high signals on DWI; and no obvious abnormalities in the morphology and signals of the uterine body. MRI reexamination at 3 months after treatment (Figure 4C): small cervical volume; rough endometrium; reduced local, T2-weighted, fat-suppression signals; no soft-tissue mass; no obvious high signals on DWI; and no obvious abnormal enhancement. The patient was followed up for 14 months. As of January 8, 2026, contrast-enhanced CT showed post-radiation changes in the cervical region with no evidence of recurrent disease.

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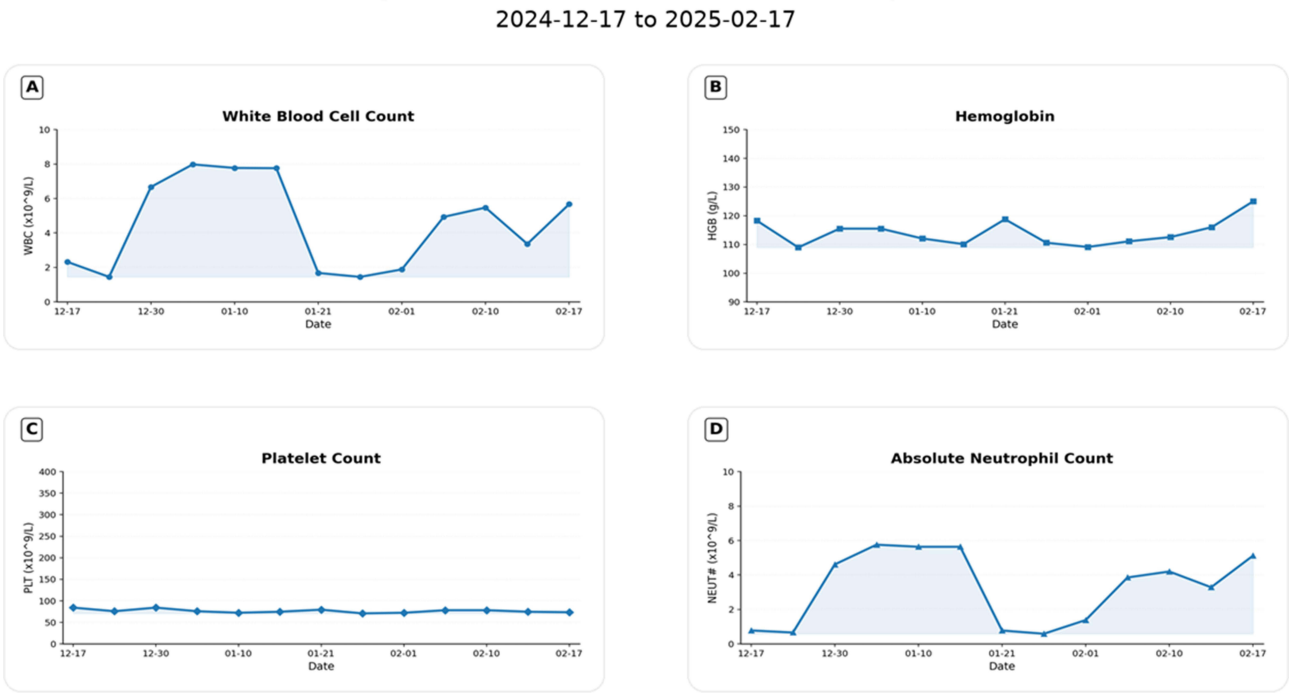

Figure 3 Bone marrow suppression indicated by curves showing changes in white blood cells, neutrophils, red blood cells, and platelets. (**A**) The trends in white blood cell count. (**B**) The trends in hemoglobin levels. (**C**) The trends in platelet count. (**D**) The trends in neutrophil count.

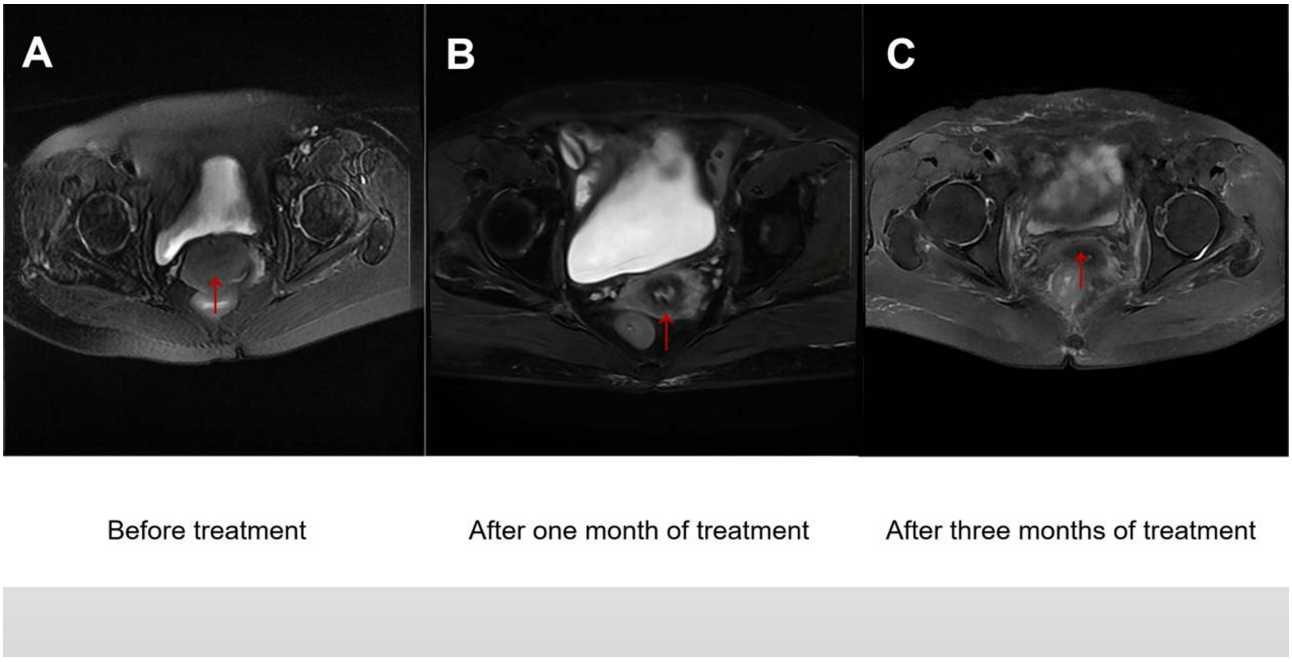

Figure 4 Magnetic resonance images of the cervical lesion before and after treatment. The red arrow indicates the tumor volume. (**A**) Before treatment. (**B**) After one month of treatment. (**C**) After three months of treatment.

Discussion

The usual clinical manifestations of CMS include vaginal bleeding, a palpable cervical mass, and cervical enlargement.[11] The pathological examination of MS tissue shows infiltration by myeloid cells at different stages of development. Typically, the cells are of medium size and relatively uniform in shape, with large, round or ovoid nuclei and little

cytoplasm. Immunohistochemistry is an important test for the diagnosis of MS. MS can be diagnosed when tumor cells express at least one myeloid marker (MPO, CD13, or CD33) and no T-cell markers (CD3, CD5, or CD7).[15]

We have reported a rare case of an extramedullary relapse of AML in the form of CMS, which responded remarkably well to radiotherapy. Despite its extremely low incidence, several published case reports have provided valuable insights for clinical practice, by describing the gynecologic manifestations of acute leukemia, and highlighting the variability in clinical presentation and outcomes. Additionally, different treatments were used in these reports. For example, Abu Saadeh et al[16] reported the case of a 40-year-old woman with a history of acute leukemia diagnosed 11 years earlier. A cervical mass was incidentally detected during examination without obvious clinical symptoms. She underwent surgery combined with chemotherapy and radiotherapy, and she survived through a follow-up of 21 months.[16] In contrast, a 36-year-old woman with newly diagnosed AML presented with increased menstrual bleeding. Despite receiving chemotherapy, she was only followed up for 2 months but remained alive during this period.[17] Similarly, another case involved a 23-year-old AML patient who developed vaginal bleeding 3 years after her diagnosis, and was treated with chemotherapy, with survival confirmed at a 2-month follow-up.[18] However, the prognosis was poorer in another case, where a 54-year-old postmenopausal woman experienced irregular vaginal bleeding after treatment with cytarabine; she declined further chemotherapy and died 1.5 months after discharge.[11]

Overall, these cases emphasize that abnormal vaginal bleeding and cervical lesions may represent important gynecologic signs of acute leukemia. Outcomes appear to be closely related to timely diagnosis, disease status, and the patient's acceptance of continued systemic therapy.

Features of MS

MS is a tumor resulting from the extramedullary proliferation of one or more myeloid blasts, which destroys the normal architecture of the affected tissue.[4] The incidence of MS in patients with AML is 2.5% to 9.1%, and it usually occurs at the same time as AML. MS can be divided into 4 groups based on its symptoms and signs: (i) MS complicated with AML, (ii) extramedullary relapse of AML, including after bone marrow transplantation, (iii) myeloproliferative neoplasms or chronic myelomonocytic leukemia in blast crisis, and (iv) isolated MS, with normal bone marrow biopsy and blood analysis results, and no history of myeloid neoplasm.[8,12,19] The extramedullary occurrence of MS in the cervix is extremely rare. In the present case, CMS presented with vaginal bleeding as the first symptom, and the diagnosis was confirmed by pathological examination; this is consistent with the characteristics of isolated MS as the first or recurrent manifestation of AML reported in the literature.[20]

Treatment Options and Efficacy

Various treatment methods have been used for the extramedullary relapse of AML, but chemotherapy, surgery, radiotherapy, and allogeneic hematopoietic stem cell transplantation are the most common treatment methods.[21] Our patient had previously received multiple lines of chemotherapy (venetoclax, PD-1 inhibitor, *etc*.) for AML, but had not undergone HSCT, which suggests that the biological behavior of the disease is complex. We selected IMRT combined with brachytherapy to treat the recurrent tumor (CMS), as the lesion was localized to the cervical region. One month after the treatment, MRI showed that the cervical mass had basically disappeared, which confirmed the effectiveness of radiotherapy for local control. Radiotherapy can produce excellent and durable local control of MS.[10] According to relevant literature reports, radiotherapy is recommended for all patients with isolated MS, all patients with newly diagnosed MS that is refractory to systemic therapy, and patients with isolated relapse who cannot tolerate surgery or hematopoietic stem-cell transplantation. Radiotherapy can also rapidly relieve the emergency caused by the tumor compression of tissues.[22,23]

Prognosis, Management, and Follow-Up

MS patients have a poor long-term prognosis, and are prone to bone marrow relapse. Therefore, patients should be closely monitored for bone marrow and extramedullary lesions, and systemic therapy (such as hypomethylating agents) should be used if necessary. Pelvic effusion may be a response to radiotherapy, and follow-up is needed to exclude disease progression. The present case not only highlights the importance of the long-term follow-up of patients with

AML, but also further confirms the efficacy of radiotherapy for the treatment of MS. There are still many unknowns and challenges in the treatment of the extramedullary relapse of AML, especially at atypical sites such as the cervix. Radiotherapy has been used to effectively control local lesions, but optimization of the overall treatment plan remains the focus of future research. Early diagnosis and active treatment are essential in cases of such rare recurrent tumors.

Limitations and Strengths

Despite demonstrating the potential value of radiotherapy for the local control of CMS, this study has several limitations. This is a single case report, and clinical trials are not feasible given the limited number of cases. However, given the relatively short follow-up of 14 months, continued long-term follow-up is warranted to assess the durability of local control in the cervical region. Given the patient's underlying hematopoietic dysfunction, there were concerns that myelosuppression might develop during radiotherapy, rendering the patient unable to tolerate the entire treatment course. However, with the supportive use of leukopoietic agents, the patient successfully completed the full course of radiotherapy. This finding suggests that active radiotherapy can yield favorable therapeutic effects for such patients in clinical practice.

Conclusion

CMS is an exceptionally rare entity, and is prone to being misdiagnosed. Accurate diagnosis relies on histopathological examination combined with immunohistochemistry. This case highlights that radiotherapy can serve as an effective modality for local disease control, even in patients with a history of multiple prior systemic treatments. Although the overall prognosis of MS remains poor due to the risk of systemic relapse, individualized and multidisciplinary treatment strategies may provide meaningful clinical benefit. Further studies are warranted to better define optimal therapeutic approaches and prognostic assessment for this rare condition.

Abbreviations

MRI, Magnetic resonance imaging; CMS, Cervical myeloid sarcoma; CT, Computed tomography; MS, Myeloid sarcoma; IA, Idarubicin + Cytarabine; HSCT, Hematopoietic stem cell transplantation; MPO, Myeloperoxidase; BCL-2, B-cell lymphoma 2; IMRT, Intensity-modulated radiation therapy; HDR-ICBT, High-dose-rate intracavitary brachytherapy; GTV, Gross tumor volume; CTV, Clinical target volume; PTV, Planning target volume; DWI, Diffusion-weighted imaging; PD-1, Programmed cell death protein 1; CD, Cluster of Differentiation.

Data Sharing Statement

The datasets generated and analyzed during the present study are available from the corresponding author on reasonable request.

Ethics Approval and Informed Consent

All relevant patient information presented in this case report was obtained with the patient's informed consent, and written informed consent was signed. As this report is a case report rather than a clinical study, formal ethics committee review was not required. Therefore, the relevant details of this case may be published. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Written informed consent was obtained from the individual participant.

Consent for Publication

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

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work. Zi-Hong Li and Jia-Xing Guo contributed equally to this work.

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Disclosure

The authors declare that they have no conflict of interest.

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