Granulocytic sarcoma of the breast: A case report

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Abstract. Granulocytic sarcoma (GS) is an unusual type of tumor composed of immature cells outside the bone marrow. The disease exhibits a correlation with acute myeloid leukemia and other myeloproliferative disorders. Although it can invade a number of areas of the body, the involvement of the breast is uncommon. The present study reports the case of a 58-year-old female with a mildly tender lump in the left breast that had been apparent for one year. Available diagnostic techniques, including ultrasound, magnetic resonance imaging and mammography, were systematically used to determine a diagnosis of GS, and lumpectomy and systemic chemotherapy were performed. The patient was satisfied with the result of no local recurrence at the one year follow-up examination. The present study discusses the clinical and pathological characteristics of the present case of GC.

Introduction

The term granulocytic sarcoma (GS) designates an extramedullary manifestation of acute myeloid leukemia (AML). The tumors generally present with a green tint due to the presence of myeloperoxidase (MPO). GS occurs with an incidence of 2-14% in AML (1). The bones, lymph nodes, soft tissues and skin are the most common sites of presentation of GS, with involvement of the breast being rare (2,3).

A previous study reported patients without bone marrow infiltration may succumb to leukemia 16.5 months after the initial diagnosis (4). In order to eliminate diagnostic errors, mammography and magnetic resonance imaging (MRI) are commonly used. However, GS of the breast is often indistinguishable from benign tumors or lymphoma. For example, previous studies have reported patients presenting with an asymptomatic lump (5-8), while other studies have reported patients presenting with a tender lump (9-11). Therefore, it is difficult to define typical features of affected patients. In addition, diagnosis can only be confirmed through pathological examination with immunohistochemistry (12). Although a standard therapeutic approach for GS of the breast remains undefined, lumpectomy may be received as a good treatment strategy (13). The current study presents a case of GS of the breast and associated literature is reviewed. Written informed consent was obtained from the patient for inclusion in the present study.

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Case report

A 58-year-old female presented to the Yuyao People's Hospital of Zhejiang (Yuyao, Zhejiang, China) on September 1, 2013, with an enlarged, painless and palpable mass in the left breast that had been present for one year. According to the French-American-British classification system (14), a primary diagnosis of AML-M6 had been made in another institution two years previously. Subsequently, the patient was treated with five cycles of an idarubicin and ara-C (cyarabine) regimen (10 mg/m^2 idarubicin daily on days 1-3 and 200 mg/m^2 cytarabine daily on days 1-7) without improvement. Upon physical examination, a movable mass 4.0x3.0 cm in diameter was palpated on the left breast, with no palpable axillary lymph nodes. The chest radiography was normal. Mammography showed a single, irregular, poorly-defined mass without calcification (Fig. 1A). The T2-weighted coronal images showed a single ill-defined inhomogeneous hyperintense mass compared with the breast parenchyma (Fig. 1B and C).

Gross examination revealed a relatively well-demarcated nodular lesion, which was green in color, measuring 4x3 cm in width and covered by fibroadipose tissues (Fig. 2A). Histopathology revealed that the tumor was composed of small-sized cells with oval or round hyperchromatic nuclei and scant cytoplasm (Fig. 2B). Immunohistochemical analysis revealed that the tumor was positive for MPO and cluster of differentiation 68 (CD68), but negative for estrogen receptor, progesterone receptor, human epidermal growth factor receptor-2 and p120 (Fig. 2C).

Postoperatively, the patient received three cycles of consolidation chemotherapy (1 g/m^2 cytarabine per 12 h on days 1-3 and 12 mg/m^2 idarubicin daily on days 1-2) and achieved complete remission. The patient also received ultrasound scans of the breast, chest X-ray and bone marrow aspiration every three months.

Discussion

GS usually occurs in multiple locations and exhibits rapid growth. GS in the breast is uncommon and may be

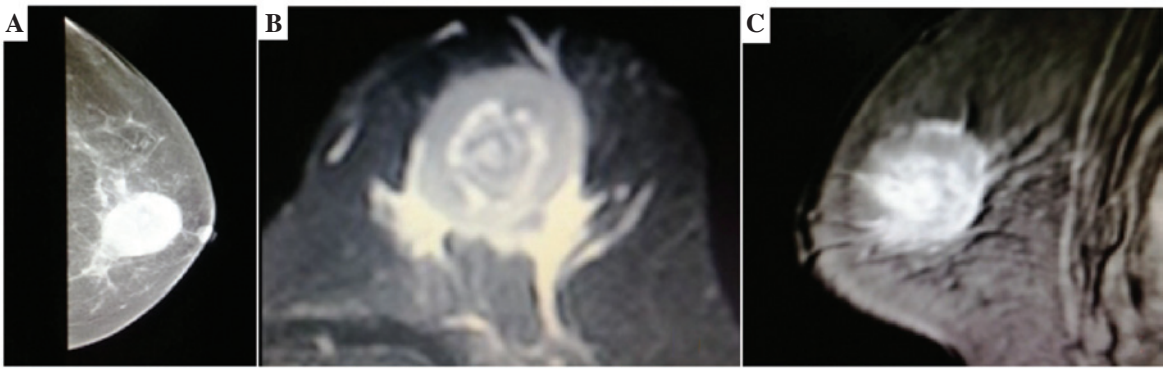

Figure 1. Mammography and T2-weighted coronal images. (A) Mammography showing a single, ill-defined, non-calcified mass in the left breast. (B and C) T2-weighted coronal images showing a single, ill-defined, inhomogeneous, hyperintense mass.

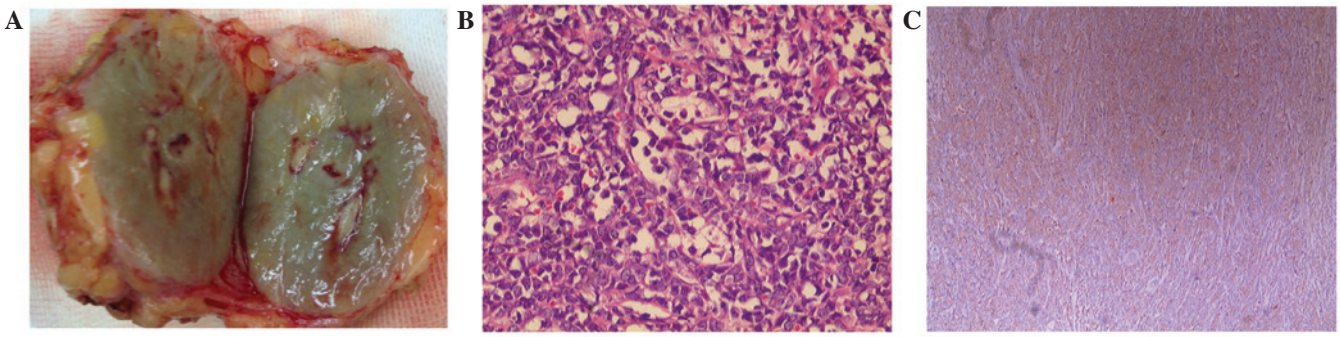

Figure 2. Gross examination and histopathology. (A) Gross appearance: Cut surface of the solid, green and well-demarcated tumor. (B) The cells are of small size with scanty cytoplasm, hyperchromatic nuclei and small nucleoli (hematoxylin and eosin stain; magnification, x200). (C) Myeloperoxidase reactivity is strongly positive in the tumor cells (immunohistochemistry with hematoxylin counterstain; magnification, x40).

misdiagnosed as lymphoma or carcinoma, particularly in the absence of invasion of the bone marrow. Viadana *et al* (15) reported only 4 cases (1.7%) of breast involvement among 235 patients with AML.

Patients with GS of the breast mainly present with a painless mass and exhibit no other associated symptoms, such as nipple discharge or inversion (16). In the present case, the patient exhibited no evident symptoms, with the exception of a rapidly growing mass. Following MRI, T2-weighted coronal images showed the GS as a single ill-defined inhomogeneous hyperintense mass compared with the breast parenchyma. GS is difficult to distinguish from other types of tumor using mammography or breast ultrasonography (17).

D'Costa *et al* (18) identified small, hyperchromatic round- to oval-shaped cells exhibiting a high nuclear:cytoplasmic ratio, scant basophilic cytoplasm and coarse chromatin (18,19), as was also observed in the present study. However, hematoxylin and eosin staining can reveal a range of changes in morphology, leading to the general misdiagnosis of GS as lymphoma or sarcoma (20). To confirm the final diagnosis of GS, the immunohistochemical detection of MPO-positive cells is useful. Mourad *et al* (21) and Pileri *et al* (22) reported that the expression levels of MPO-positive cells in GS were 66 and 83.6%, respectively. Specific CD markers can also be useful. Mourad *et al* (21) compared 15 GS cases with non-Hodgkin's lymphoma (NHL) cases, and concluded that CD34 was positive in 46% of GS cases and negative in all NHL cases. By combining these observations with the history of AML, GS of the breast can be confirmed.

The therapeutic approaches for GS of the breast remain controversial. The majority of studies have concluded that all patients with GS should receive mastectomy or lumpectomy plus standard systemic chemotherapy (3,4,23,24). Imrie *et al* (25) reported that the overall survival was longer in chemotherapy-treated patients compared with those who did not receive chemotherapy. The case presented in the current study was treated with lumpectomy and systemic chemotherapy, and no local recurrence was identified in the breast one year later.

In conclusion, it is difficult to make a clinical decision for the treatment of GS of the breast. The present study indicated that lumpectomy combined with systemic chemotherapy results in a good outcome for patients with GS of the breast. However, it is presumptuous to suggest that this is the most favorable treatment strategy for all patients. Further prospective, randomized, long-term follow-up investigations are required to validate our proposal.

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