Case Report

Rapidly progressing blastic plasmacytoid dendritic cell neoplasm causing diffuse skin thickening: A case report with sequential computed tomography examinations

Kyohei Yoshioka, Ryo Kurokawa, Shiori Amemiya, Hiroaki Koyama, Kensuke Matsuda, Akira Honda, Mineo Kurokawa, Aya Shinozaki-Ushiku, Osamu Abe

Department of Radiology, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan
Department of Hematology and Oncology, Graduate School of Medicine, The University of Tokyo, Japan
Department of Pathology, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan

A R T I C L E   I N F O
Article history:
Received 19 June 2021
Revised 5 July 2021
Accepted 6 July 2021

Keywords:
Blastic plasmacytoid dendritic cell neoplasm
Skin
Computed tomography

A B S T R A C T
Blastic plasmacytoid dendritic cell neoplasm is a rare aggressive myeloid malignancy thought to be derived from precursor plasmacytoid dendritic cells. Rapid progression and poor prognosis have been known. We herein present a case of BPDCN in a previously healthy man who presented with suddenly developed multiple deep purple skin rashes, with sequential computed tomography examinations. The follow-up computed tomography demonstrated that multiple skin nodules observed in the initial MRI fused, resulting in a thickening of the entire skin, with some surface erosions and crusting. Blastic plasmacytoid dendritic cell neoplasm should be considered in the differentials in patients with a sudden onset and rapidly progressing skin rash or thickening.

Introduction

Blastic plasmacytoid dendritic cell neoplasm (BPDCN) is a rare aggressive myeloid malignancy classified under World Health Organization (WHO) 2016 guidelines in its own category [1]. It mainly affects patients over 60 years old, and skin is the most frequently involved organ with frequent involvement of the bone marrow, lymph nodes, and peripheral blood [2]. Rapid progression to the terminal leukemic phase is common, resulting in a short mean survival of 12–16 months [3]. To our knowledge, there have been at least 11 reports with CT findings [4–14], including 4 18F-fluorodeoxyglucose positron emission tomography / CT (18F-FDG PET/CT) reports, associated with BPDCN; however, knowledge of chronological changes on sequential CT examinations have been limited [13,14]. We herein report a case of a patient with rapidly progressing BPDCN with a sequential evaluation on CT.

© 2021 The Authors. Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/)

* Corresponding author:
E-mail address: rkurokawa-tky@umin.ac.jp (R. Kurokawa).
https://doi.org/10.1016/j.radcr.2021.07.010
1930-0433/© 2021 The Authors. Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/)
Fig. 1 – Multiple deep purple skin rashes are observed all over the body (A, B). Axial contrast enhanced CT shows multiple skin nodules (arrowhead) and skin thickening (arrow) of the body (C, D).

Case report

A 56-year-old previously healthy man presented with a skin rash that started suddenly. There are many deep purple skin rashes. (Fig. 1). Blood tests showed no abnormal findings except for high soluble interleukin-2 receptor levels (672 U/ml). His past medical history and family history were unremarkable. CT showed multiple skin nodules extending into the subcutaneous tissue were observed (Fig. 1). Lymphadenopathy or involvement of other organs was not found. A skin biopsy from the right upper arm was performed, and the histopathological exam found a monoclonal proliferation of the tumor cells. Immunohistochemical tests are positive for CD4, CD56, and CD68, and negative for CD3 and CD20. Markers specific for BPDCN are negative for CD123, but positive for CD303. These led to the diagnosis of BPDCN (Fig. 2). The patient received chemotherapy with hyper-fractionated cyclophosphamide, vincristine, doxorubicin, dexamethasone alternating with high-dose cytarabine and methotrexate regimen for 4 courses, which improved the skin lesions. The scheduled bone marrow transplant was decided not to be performed due to the patient’s refusal, and the patient was placed on observation. 5 months later (7 months since onset), the patient presented with generalized pain, insufficient oral intake, and decreased renal function with an estimated glomerular filtration rate of 10.6 ml/min/1.73m², and was readmitted to the hospital. Multiple enlarged skin nodules fused to each other, resulting in a thickening of the entire skin, with some surface erosions and crusting (Fig. 3). Histopathological examination again confirmed BPDCN. Given the patient’s poor general condition, palliative treatment was performed. Unfortunately, the
patient died ten days after readmission due to worsening disease and progressive decline in renal function.

Discussion

BPDCN is a rare, clinically aggressive hematologic malignancy thought to be derived from precursor plasmacytoid dendritic cells (pDCs). BPDCN occurs in patients older than 60, and male predominancy has been known (incidence of 0.05 in males vs 0.02 in females per 100,000 population) [15]. 10–20% of the patients have previous or concurrent hematologic diseases including myelodysplastic syndrome, chronic myelomonocytic leukemia [16]. Clinically, skin is involved in basically every case, followed by the bone marrow, peripheral blood, and lymph nodes [2]. Skin lesions are often a deep purple color, and patients often develop multiple lesions. Rapid and aggressive progression to the terminal leukemic phase is common. The skin rash can be developed suddenly and spread rapidly, as seen in the present case. The diagnosis of BPDCN is based on the identification of clonal cells derived from pDCs. BPDCN is immunophenotypically characterized by the expression of pDCs-specific markers, particularly CD123 and/or CD303 [17].

CT has been mainly used to assess the extent and depth of the skin lesions, as well as the metastases in patients with BPDCN [4–14]. CT shows round and ovoid homogeneous cutaneous mass with soft tissue density with or without subcutaneous invasion as seen in the present case. Although there has been at least eleven reports of BPDCN with CT findings, knowledge of chronological changes of CT findings has been limited. To our knowledge, only two case reports demonstrated the sequential CTs, both of which showed the chronological changes of the involved spleen [13,14], we first report the time course of skin lesions of BPDCN with sequential CT examinations [7]. CT demonstrated that multiple skin nodules fused to each other, resulting in a thickening of the entire skin, with some surface erosions and crusting in this case. Given that the patient was not receiving chemotherapy after the first discharge, changes from the initial CT to the follow-up CT seemed to be the natural history of BPDCN, which has been largely unknown. Other
reported CT imaging findings of BPDCN include pulmonary ground-glass opacity with interlobular septal thickening, indicating diffuse alveolar hemorrhage, in a patient with BPDCN involving the lungs [5], and hepatosplenomegaly resulting in atraumatic splenic rupture [13].

Clinically, differential diagnoses of the skin lesions include insect bites, severe drug eruptions, malignant lymphoma (mycosis fungoides, Sezary syndrome, etc.), Kaposi’s sarcoma, and BPDCN. Since it is often difficult to differentiate BPDCN by visual inspection alone, blood samples and skin biopsies should be taken, as well as detailed history taking.

Given the rarity, no standard of care has existed until tagraxofusp (a CD123-directed cytotoxin consisting of recombinant human interleukin-3 fused to a truncated diphtheria toxin) was approved by the U.S. Food and Drug Administration (FDA) in 2018. Current treatment includes the use of tagraxofusp if available and feasible. If not, patients with good performance status would receive induction chemotherapy, typically with the regimen tailored to acute lymphocytic leukemia with intrathecal prophylaxis followed by stem cell transplantation at first remission. Older patients who are not fit for intense chemotherapy can be considered for lower intensity treatment, typically with a hypomethylating combination regimen. Surgical and radiation options have been tried in patients with limited skin disease with variable results [18]. In the present case, however, BPDCN progressed rapidly without stem cell transplantation at the patient’s request.

Fig. 3 – At the time of readmission (5 months later), multiple masses and skin sclerosis throughout the body has worsened, with some surface erosions and crusting (A-C). The multiple nodules are fused and the skin thickening becomes worse (D, E).
Conclusion

We present a case of progressive BPDCN with sequential CT examinations. The follow-up CT demonstrated that multiple skin nodules fused, resulting in a thickening of the entire skin, with some surface erosions and crusting in this case. BPDCN should be considered in the differentials in patients with a sudden onset and rapidly progressing skin rash or thickening.

Patient consent

Informed consent to include the patient’s information in the publication of this case report was obtained.

Declaration of Competing Interest

None.

REFERENCES

[1] Arber DA, Orazi A, Hasserjian R, Thiele J, Borowitz MJ, Le Beau MM, et al. The 2016 revision to the world health organization classification of myeloid neoplasms and acute leukemia. Blood 2016;127:2391–405. doi:10.1182/blood-2016-03-643544.

[2] Sapienza MR, Pilieri A, Derenzini E, Melle F, Motta G, Fiori S, et al. Blastic plasmacytoid dendritic cell neoplasm: state of the art and prospects. Cancers 2019;11(5):595. doi:10.3390/cancers11050595.

[3] Riaz W, Zhang L, Horna P, Sokol L. Blastic plasmacytoid dendritic cell neoplasm: update on molecular biology, diagnosis, and therapy. Cancer Control 2014;21:279–89. doi:10.1177/107327481402100404.

[4] Li Z-G, Mu H-Y. Blastic plasmacytoid dendritic cell neoplasm evaluated by FDG PET/CT. Clin Nucl Med 2017;42:551–2. doi:10.1097/RLU.0000000000001665.

[5] Barros Romão CM da S, Santos Júnior CJD, Leite LAC, Gomes Alves MJR, Araújo NS, Castro AFL, et al. Blastic plasmacytoid dendritic cell neoplasm: correlation of clinical features, laboratory findings and CD4brightCD123high plasmacytoid dendritic cells count. Am J Case Rep 2017;18:692–5. doi:10.12659/ajcr.903059.

[6] Gao NA, Wang X-X, Sun J-R, Yu W-Z, Guo N-J. Blastic plasmacytoid dendritic cell neoplasm with leukemic manifestation and ETV6 gene rearrangement: a case report. Exp Ther Med 2015;9:1109–12. doi:10.3892/etm.2015.2236.

[7] Jeong D, Choi JW, Jeong K, Sokol L. CT findings associated with blastic plasmacytoid dendritic cell neoplasm: a case report. Acta Radiol Open 2016;5(7):2058460116657688. doi:10.1177/2058460116657688.

[8] Nizza D, Simonex SF. Blastic plasmacytoid dendritic cell neoplasm presenting as a subcutaneous mass in an 8-year-old boy. Pediatr Radiol 2010;40:540–2. doi:10.1007/s00247-010-1731-6.

[9] Sugimoto K-J, Shimada A, Yamaguchi N, Imai H, Wakabayashi M, Sekiguchi Y, et al. Sustained complete remission of a limited-stage blastic plasmacytoid dendritic cell neoplasm followed by a simultaneous combination of low-dose DeVIC therapy and radiation therapy: a case report and review of the literature. Int J Clin Exp Pathol 2013;6:2603–8.

[10] Ishibashi N, Maebayashi T, Aizawa T, Sakaguchi M, Abe O, Miura K, et al. Radiation therapy for cutaneous blastic plasmacytoid dendritic cell neoplasm: a case report and review of the literature. Int J Clin Exp Med 2015;8:8204–9.

[11] Kawashima I, Suki Y, Yamamoto T, Hamanaka S, Nozaki Y, Nakajima K, et al. [Non-traumatic splenic rupture during the chemotherapy and successful management by emergency splenectomy in a patient with blastic plasmacytoid dendritic cell neoplasm]. Rinsho Ketsueki 2013;54:584–6.

[12] Magro CM, Ruan J, Grossman M, Hedayat AA. Monoclonal plasma cell infiltrates in the setting of cutaneous follicular helper T cell lymphoproliferative disorders. Ann Diagn Pathol 2019;40:94–104. doi:10.1016/j.anndiagpath.2019.04.013.

[13] Daitoku S, Onimaru M, Tanimoto K, Kuroiwa M. Atraumatic splenic ruptures triggered both remission and death in a single case of blastic plasmacytoid dendritic cell neoplasm. J Clin Exp Hematop 2019;59:40–5. doi:10.3960/jslrt.18021.

[14] Suzuki A, Abe S, Koyama K, Suzuki S, Nagao M, Kobayashi M, et al. Spontaneous regression of blastic plasmacytoid dendritic cell neoplasm following sepsis by serrata marcescens: a case report and literature review. Intern Med 2021;60:927–33. doi:10.2169/internalmedicine.5820-20.

[15] Beirid HC, Khan M, Wang F, Alfayez M, Cai T, Zhao L, et al. Features of non-activation dendritic state and immune deficiency in blastic plasmacytoid dendritic cell neoplasm (BPDCN). Blood Cancer J 2019;9:99. doi:10.1038/s41408-019-0262-0.

[16] Economides MP, Konopleva M, Pemmaraju N. Recent developments in the treatment of blastoid plasmacytoid dendritic cell neoplasm. Ther Adv Hematol 2019;10:2040620719874733. doi:10.1177/2040620719874733.

[17] Sukswai N, Aung PP, Yin CC, Li S, Wang W, Wang SA, et al. Dual expression of TCF4 and CD123 is highly sensitive and specific for blastic plasmacytoid dendritic cell neoplasm. Am J Surg Pathol 2019;43:1429–37. doi:10.1097/PAS.0000000000001316.

[18] Economides MP, Rizzieri D, Pemmaraju N. Updates in novel therapies for Blastic plasmacytoid dendritic cell neoplasm (BPDCN). Curr Hematol Malig Rep Dec 2019;14(6):515–22. doi:10.1007/s11899-019-00556-2.