Clinical, Cosmetic and Investigational Dermatology

Dovepress

open access to scientific and medical research

Open Access Full Text Article

ORIGINAL RESEARCH

Clinicopathological Characteristics and Outcome of Cytophagic Histiocytic Panniculitis: A Single-Center, Retrospective Study

Ting Su, Wentong Wang, Xixi Xiong, Meihua Zhang, Yan Lu*, Zhonglan Su*

Department of Dermatology, The First Affiliated Hospital of Nanjing Medical University, Nanjing, People's Republic of China

*These authors contributed equally to this work

Correspondence: Yan Lu; Zhonglan Su, Department of Dermatology, The First Affiliated Hospital of Nanjing Medical University, 300 Guangzhou Road, Nanjing, Jiangsu Province, People's Republic of China, Email luyan6289@163.com; alice_su2595@126.com

Background: Cytophagic histiocytic panniculitis (CHP) is a rare panniculitis associated with systemic features characterized by the infiltration of subcutaneous adipose tissue by benign-appearing T lymphocytes and phagocytic histiocytes, mimicking hemophagocytic lymphohistiocytosis (HLH) and subcutaneous panniculitis-like T-cell lymphoma (SPTCL).

Purpose: To establish the clinicopathological features and response to treatment of CHP and evaluate the prognosis of patients and guide therapy based on the current state of knowledge.

Material and Methods: Clinical, laboratory, histopathological, and outcome data of 12 patients with CHP were retrospectively collected between 2009 and 2022.

Results: All the patients presented with plaques or nodules, mostly located in the lower extremities (11/12). Fewer cases involved systemic symptoms (9/12) and laboratory abnormalities (6/12), and none were positive for serum Epstein-Barr virus (EBV)-DNA. Histopathological examination revealed mixed septal and lobular inflammatory infiltration of histiocytes and lymphocytes. Large or atypical lymphocytes were rarely present (2/12). In some patients, varying proportions of plasma cells, neutrophils, and eosinophils were observed. The extent of histocytophagy was mild (9/12), moderate (2/12), and severe (1/12). HLH was not observed in any of our cases, none of which were fatal.

Conclusion: The uniqueness of our study lies in the presence of neutrophil-rich dermal and subcutaneous infiltrates, associated with connective tissue disorders (CTD) and streptococcal infections. Our study reveals that EBV-negative CHP tends to a better prognosis than previously research, filling the gap in the much-needed details of CHP in the Chinese population. Moreover, CHP may present as a reactive process in combined primary diseases; further studies are required to validate these findings.

Plain Language Summary: Cytophagic histiocytic panniculitis (CHP) is a rare panniculitis associated with systemic features characterized by the infiltration of subcutaneous adipose tissue by benign-appearing T lymphocytes and phagocytic histiocytes, also may be present in hemophagocytic lymphohistiocytosis and subcutaneous panniculitis-like T-cell lymphoma.

The presence of neutrophil-rich dermal and subcutaneous infiltrates, associated with connective tissue disorders and streptococcal infections. In addition, EBV-negative CHP has a better prognosis than previously thought and provides knowledge of its prognosis in the Chinese population.

With changes in the disease pedigree supported by the development of medical technology, CHP may present as a reactive process of a combined primary disease.

Keywords: Cytophagic histiocytic panniculitis, Epstein-Barr virus, hemophagocytic lymphohistiocytosis, retrospective study

Received: 23 January 2024
Accepted: 10 May 2024
Published: 30 May 2024

Introduction

Cytophagic histiocytic panniculitis (CHP) is a rare panniculitis associated with systemic features, including fever, hepatosplenomegaly, lymphadenopathy, pancytopenia, hepatic abnormalities, hypertriglyceridemia, and coagulopathy.[1] CHP may be an isolated skin disorder, associated with other conditions, such as connective tissue disorders (CTD), infections, and malignancies. Histologically, it is characterized by the infiltration of subcutaneous adipose tissue by benign-appearing T lymphocytes and phagocytic histiocytes ("bean bag cells"),[2] which has also been identified as a typical manifestation of hemophagocytic lymphohistiocytosis (HLH) and subcutaneous panniculitis-like T-cell lymphoma (SPTCL). HLH is a life-threatening condition characterized by uncontrolled activation and proliferation of T cells, resulting in hypercytokinemia, proliferation of histiocytes, and hemophagocytosis.[3] SPTCL is a rare primary cutaneous lymphoma of mature cytotoxic T cells that simulates panniculitis and is often complicated by HLH. Patients with CHP may have different clinical courses depending mainly on their isolated presentation or association with HLH.[3] Some patients progress rapidly and often die within one year, due to sepsis, coagulation disorders, and multi-organ failure.[1] Other patients experience recurrent bouts of reactivation and may survive for years.[3]

CHP represents a clinical challenge because, in addition to difficulties in its diagnosis, no standardized therapeutic approach currently exists. Here, we describe the results of a retrospective review of 12 patients with CHP. This study aimed to establish the clinicopathological features and response to treatment more precisely, compare our findings with those from previous case series in other populations, and evaluate the prognosis of patients and guide therapy based on the current state of knowledge.

Materials and Methods

Histopathological reports mentioning hemophagocytosis in subcutaneous fat were collected from the database of the Department of Dermatology, The First Affiliated Hospital of Nanjing Medical University, China, from 2009 to 2022. Eight patients diagnosed with SPTCL, extranodal natural killer/T-cell lymphoma, or Rosai-Dorfman disease were excluded. This study was approved by the Ethics Committee of the First Affiliated Hospital of Nanjing Medical University (2023-SR-381) and was conducted in accordance with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was waived by our Institutional Review Board because of the retrospective nature of our study. Clinical figures of the patients provided informed consent for the publication of the images.

We reviewed all clinical information of the patients, including the original history of presentation and diagnosis, descriptions of physical examinations, histopathology, treatment, and clinical course. The histological features of the hemophagocytic cells were analyzed for extent (described as mild, moderate, or severe, and indicated as +, ++, and +++, respectively).[4] Other pathological features of concomitant skin diseases, if present, were also noted. HLH was defined according to the Hemophagocytic Lymphohistiocytosis-2004 criteria. However, due to unable to perform NK activity and sCD25 level, some publication used HLH-like systemic illness instead of HLH to direct the treatment.[5] We also evaluate the diagnosis of HLH-like systemic illness in the study. The duration of follow-up was calculated from the date of pathological diagnosis to the date of the last follow-up.

Results

Demographics and Clinical Presentations

Twelve formalin-fixed skin biopsy specimens from 12 patients were included in the study (male-to-female ratio, 9:3; mean age, 30.5 years; median age, 28.5 years; range, 6–67 years). The clinical findings of all patients are listed in Table 1.

Clinically, the majority of patients (6/12) presented with features of CTD including systemic lupus erythematosus (SLE) (5/12, one with a known history of SLE), Sjogren's syndrome (SS) (1/12) and unclassified connective tissue disease (UCTD) (1/12). Streptococcal infection was observed in two patients, and an unknown reaction was noted in four. The lesions were most commonly plaques or nodules of varying sizes that either remained discrete or coalesced to form large, indurated plaques up to 5.6 cm in diameter, located mostly on the lower extremities (Figure 1a and b). Most patients (5/12) with CTD received systemic steroids and immunomodulators, such as thalidomide and hydroxychloroquine. Three of these patients experienced intermittent recurrence in the following years, and two retained persistent

Table 1 Demographics and Clinical Presentations of CHP Patients

Case No.	Age, y	Sex	Diameter, cm	Distribution of the Lesions/Site of Biopsy	Clinical Diagnosis	Treatment	Outcome/Follow-Up, y
1	14	M	2.6	Generalized/lower limb	CHP	None	Withdraw
2	7	F	3.2	Lower limbs/lower limb	CHP	None	No recurrence, 9
3	36	F	3.5	Generalized/lower limb	SLE/CHP	Systemic steroids and hydroxychloroquine	Persistent resolution, 8
4	52	F	2.1	Lower limbs/lower limb	SLE/CHP	Systemic steroids, thalidomide, and hydroxychloroquine	Intermittent recurrence, 8
5	6	M	3.6	Generalized/lower limb	CHP	None	No recurrence, 8
6	47	F	2.7	Lower limbs/lower limb	Streptococcal infection/CHP	Penicillin, systemic steroids and hydroxychloroquine	Persistent resolution, 7
7	39	F	2.9	Lower limbs/lower limb	SLE /CHP/SS	Systemic steroids, thalidomide and hydroxychloroquine	Intermittent recurrence, 7
8	67	F	5.6	Lower limbs/lower limb	SLE/CHP	Systemic steroids, thalidomide and tripterygium glycosides	Persistent resolution, 6
9	50	M	5	Lower limbs/lower limb	SLE/CHP	Loxoprofen sodium and tripterygium glycosides	Intermittent recurrence, 6
10	11	F	3.7	Buttock/buttock	CHP	Systemic steroids, tacrolimus and methotrexate	Intermittent recurrence, 2
11	17	F	2.9	Lower limbs/lower limb	Streptococcal infection/CHP	Penicillin, systemic steroids and hydroxychloroquine	Persistent resolution, 1
12	21	F	3.6	Lower limbs/lower limb	UCTD/CHP	None	No recurrence, 1

resolution of the skin lesions. No treatment was administered to the patient with UCTD, who showed spontaneous regression of skin nodules. All patients with streptococcal infections received penicillin treatment in addition to systemic steroids (prednisone, 20–50mg/d) and hydroxychloroquine (200–400mg/d), were in the continuous treatment of prednisone (5–10mg/d). Two of the patients with isolated CHP received no treatment and had no recurrence, and the others received systemic steroids (prednisone, 30–50mg/d), tacrolimus (5–10mg/d), and methotrexate (7.5–15mg/d) with intermittent recurrence in the following two years, were in continuous treatment with prednisone (5–10mg/d) solely or combined with immunosuppressive treatment. One patient was lost to follow-up. HLH and HLH-like systemic illness were not observed in any of our cases, none of which were fatal.

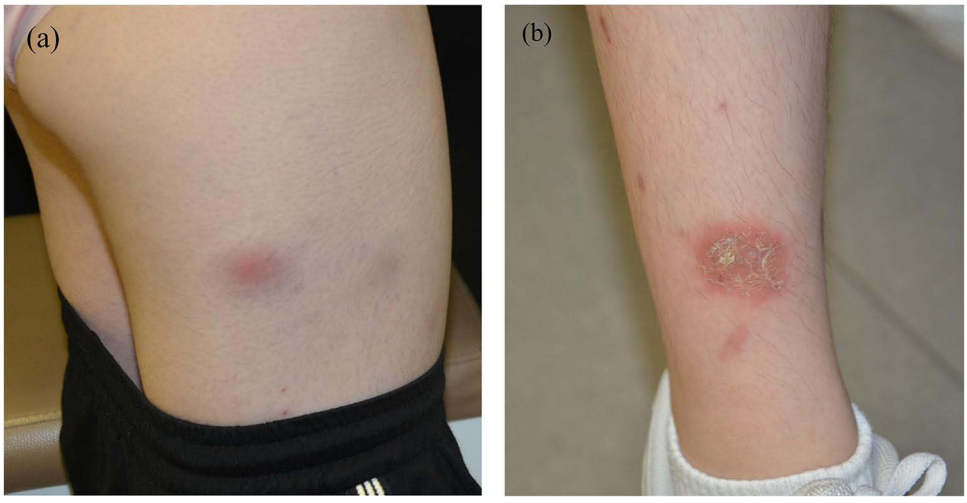

Figure 1 (**a**) Hyperpigmented, indurated plaque over the right thigh. (**b**) Erythematous, indurated plaques with hyperkeratosic central area over the right shank.

Systemic Symptoms and Major Laboratory Findings

The frequencies of all systemic symptoms and major laboratory findings are summarized in Table 2. The most common symptoms were fever (8/12) and polyarthritis (9/12), followed by splenomegaly (4/12), adenopathy (4/12), pericarditis (2/12), and hepatomegaly (0/12). Half of the patients had anemia (6/12), and some had leukopenia/lymphopenia (3/12), thrombocytopenia (2/12), increased lactate dehydrogenase (1/12), elevated fibrinogen (2/12) and ferritin levels (3/12). Serum EBV-DNA was negative in all cases.

Histopathological Findings

The histopathological findings are summarized in Table 3. All patients were confirmed to have CHP by histopathological examination, which revealed numerous mixed septal and lobular inflammatory infiltrates of histiocytes and lymphocytes (Figure 2a), found mostly in the subcutaneous fat (12 biopsy specimens). Large or atypical lymphocytes were rarely present (2/12). In some patients, varying proportions of plasma cells (4/12), neutrophils (8/12), and eosinophils (2/12) were observed. Other manifestations, including fibrinoid necrosis of the vessel walls (5/12) and erythrocyte extravasation (7/12) (Figure 2b) have also been reported. The epidermis was normal in more than half of the patients (8/12). Vacuolar degeneration of the basal cells was observed in several cases (4/12) (Figure 2c), and most with mixed dermal inflammatory infiltration rich in neutrophils was observed in three biopsy specimens from three patients with CTD (two with SLE and one with UCTD). Moderately dense subcutaneous infiltrates rich in neutrophils were found in three biopsy specimens from three cases of streptococcal infection, showing features of mixed eosinophils, epithelioid cells, and erythrocyte extravasation. Isolated CHP cases mostly present with lymphocyte infiltration into the dermis and subcutaneous fat. The dermis was usually uninvolved unless there was mixed inflammatory cell infiltration (3/12). The extent of histocytophagy was mild (9/12), moderate (2/12), or severe (1/12) (Figure 2d).

Table 2 Systemic Symptoms and Major Laboratory Findings of CHP

Gender	
Male	3/12
Female	9/12
Mean age at diagnosis (median, range), years	30.58 (28.5, 6–67)
Male	23.33 (14, 6–50)
Female	33 (36, 7–67)
Mean duration of disease (median, range), months	5.83 (4, 0.25–24)
Systemic involvement, n (%)	
Fever	8/12, (66.67%)
Hepatomegaly	0/12
Splenomegaly	4/12, (33.33%)
Adenopathy	4/12, (33.33%)
Polyarthritis	9/12, (75.00%)
Pericarditis	2/12, (16.67%)
Laboratory findings	
Leukopenia/lymphopenia	3/12, (25.00%)
Anemia	6/12, (50.00%)
Thrombocytopenia	2/12, (16.67%)
Pancytopenia	0/12
Elevated lactate dehydrogenase level	1/12, (8.33%)
Elevated fibrinogen	2/12, (16.67%)
Elevated ferritin level	3/12, (25.00%)
Serum positive EBV-DNA	0/12

Table 3 Histopathological Findings of 12 Patients with CHP

Histopathologic Findings	
Epidermis	
Normal	8/12, (66.67%)
Vacuolar degeneration of basal cells	4/12, (33.33%)
Necrosis	0/12
Dermis	
Mixed inflammatory cells infiltration	3/12, (25.00%)
Subcutaneous fat	
Atypical lymphocytes	2/12, (16.67%)
Neutrophils	8/12, (66.67%)
Plasma cells	4/12, (33.33%)
Eosinophils	2/12, (16.67%)
Fat necrosis	3/12, (25.00%)
Fibrinoid necrosis of vessel walls	5/12, (41.67%)
Extravasation of erythrocytes	7/12, (58.33%)
Extent of histocytophagic cells	
+	9/12, (75.00%)
++	2/12, (16.67%)
+++	1/12, (8.33%)

Discussion

This single-center retrospective study of 12 pathologically confirmed cases of CHP treated with either steroids or immunomodulatory agents is the largest series of cases reported to date. Our study demonstrates that this peculiar and

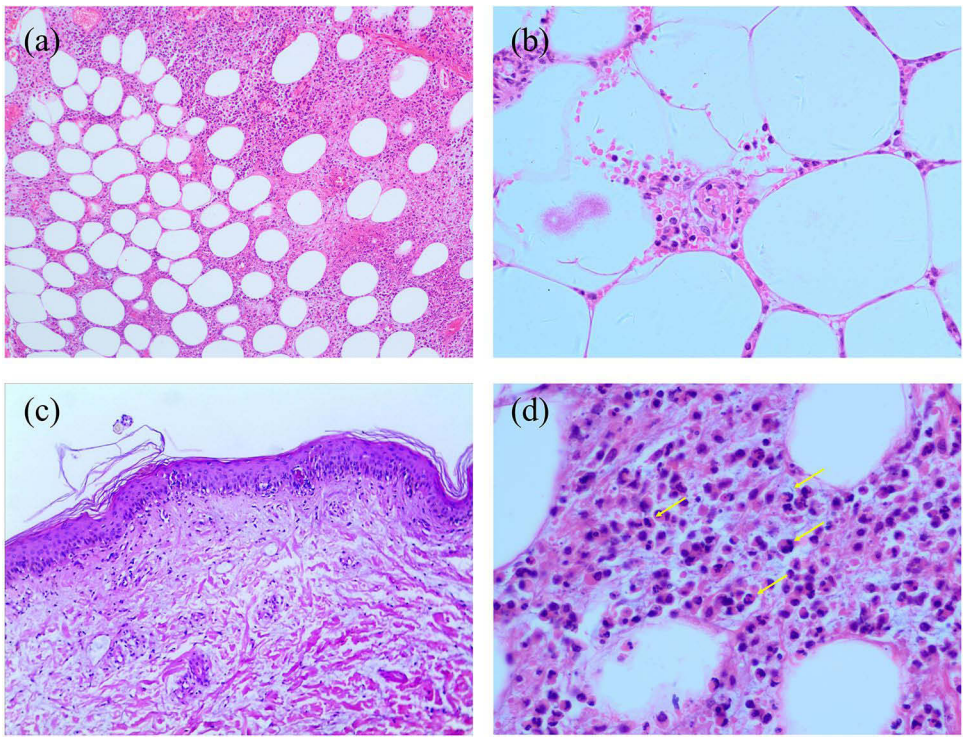

Figure 2 (**a**) Skin biopsy reveals infiltrates of numerous histiocytes, neutrophils, and lymphocytes in subcutaneous adipose tissues that indicate panniculitis (hematoxylin and eosin, ×40). (**b**) Fibrinoid degeneration of vessel walls and extravasated red blood cells were present in the fat lobules (hematoxylin and eosin, ×100). (**c**) Vacuolization of basal keratinocytes with dyskeratotic cells (hematoxylin and eosin, ×100). (**d**) A histiocyte is phagocytosing erythrocytes and lymphocytes (arrow), appearing as "bean bag cells" (hematoxylin and eosin, ×400).

potentially worrisome histopathological finding is mostly associated with signs of CTD, especially SLE, but can also be encountered in other conditions, particularly in the setting of neutrophil-rich dermal and subcutaneous infiltrates associated with streptococcal infections.

CHP is a rare form of panniculitis with less than 100 cases reported in the literature and may be classified as benign or malignant. Benign CHP cases showed no evidence of lymphoma or EBV infection. In contrast, patients with malignant tumors or lymphoma-associated panniculitis had subcutaneous infiltrates of T helper cells with marked atypia, karyorrhexis, and cytophagic histiocytes in the subcutaneous lesions and hemophagocytosis in the bone marrow. Some authors insist that all CHP cases are associated with subcutaneous lymphoma.[1,6] Most cases reported in the English literature presented with a benign form and responded to less aggressive treatment, mainly immunosuppressive treatment rather than cytotoxic therapy in the past 10 years.[3,7–10] Our findings were consistent with those of previous studies. Hence, we consider that CHP tends to be a reactive disorder complicated by protopathic diseases, although the primary disease cannot be determined in some patients due to the limitations of pathologic processes, the opportune moment of biopsy, and detection technology. Malignant cases misdiagnosed as CHP may occur in the early stages of lymphoma or reactive HLH. Cutaneous manifestations of HLH manifesting as CHP have been reported in just one case in a study of 69 patients with reactive HLH.[11]

Compared with previous studies, our study revealed that the mean age at diagnosis was approximately 20–30 years in men and women, respectively (range 6–67), with 9 women and 3 men. Alegre et al reviewed 13 cases, including 13 women and 6 men, with a mean age at onset of 44 years (23–81).[12] In 1998, Craig et al reviewed 36 previous CHP cases and reported an equal ratio of 20 women and 16 men, with an age range of 5–81 years. Most of the patients were older than 30 years.[13] However, these data may be unreliable because of the inaccurate detection techniques that differentiate CHP from cutaneous T-cell lymphomas.

CHP lesions are most commonly plaques or nodules of varying sizes up to 20 cm in diameter. The most frequent site of nodules is the extremities; however, involvement of the buttocks, trunk, breast, shoulders, and neck has also been reported.[1] Similar to previous reports, our cases were mostly located in the lower extremities. None of our patients presented with ulceration or progression to HLH, which is characterized by a constellation of symptoms, such as fever, hepatosplenomegaly, cytopenia, coagulopathy, and abnormal liver function test results. Systemic involvement, including fever, systemic symptoms, and organ abnormalities, is common in patients with CHP. This presentation is similar to those seen in the cases in our study. However, none of the patients presented with hepatomegaly or pancytopenia, indicating insufficient evidence to diagnose HLH. Interestingly, EBV infections in all patients in our study were excluded serologically. Latent EBV infection has been detected in SPTCL[14] and HLH,[3] but not in nonfatal or fatal CHP, using EBV-DNA PCR in serum or EBER1 in situ hybridization studies.[1,15]

CHP is mostly lobular panniculitis with inflammatory infiltration of histiocytes and lymphocytes. In some cases, neutrophils, eosinophils, and plasma cells are present in varying proportions. Large or atypical lymphocytes are rarely observed. All the patients had typical histopathological presentations. Other histopathological features differed among the various groups, corresponding to background conditions. Vacuolization of basal keratinocytes, fibrinoid degeneration of the vessel walls and extravasated cells were also present. In this context, lupus panniculitis (LP), which involves adipose tissue with tender subcutaneous indurations and is mostly lobular panniculitis mimicking CHP, should be excluded. However, LP presents with lymphocyte-dominant infiltrates without hemophagocytic cells.[1,10,16] Another typical histological manifestation of our study is dense subcutaneous infiltrates rich in neutrophils. Our data, together with those reported in the literature, suggest that neutrophil-rich infiltration may be related to a process arising in background diseases such as SLE and streptococcal infection.

In the discussion of CHP treatment, STPCL and HLH should first be excluded, because the disease progression and therapeutic agents used for treatment are completely different. Although the pathogenesis of CHP remains unclear, it is believed that macrophages are activated to become cytophagic histiocytes by cytokines secreted from aberrantly immunoregulated T cells. Therefore, the treatment of CHP, including the choice of immunosuppressive, immunomodulating, or cytotoxic agents combined with the treatment of the primary disease, must also decrease the levels of these cytokines. Previously reported cases of SLE and DLE with CHP were successfully treated with immunosuppressants such as glucocorticoids and cyclosporine A.[10,17] In our experience, the primary disease should be treated first, followed by CHP. Hydroxychloroquine and thalidomide may also be preferred therapeutic choices.

Limitations

The limitations of our study include the collection of data from a single dermatological clinic, the retrospective study design, and the small sample size.

Conclusion

In conclusion, the uniqueness of our study lies in the neutrophil-rich dermal and subcutaneous infiltrates associated with CTD and streptococcal infections. Our study reveals that EBV-negative CHP tends to have a better prognosis than previous research.[1] Further, to the best of our knowledge, this is the first Chinese CHP case series dealing with EBV-negative CHP.

It is necessary to outline the essential characteristics of such diseases, represented by plaques or nodules, to distinguish them from other life-threatening disorders, such as SPTCL and HLH. However, with changes in the disease pedigree supported by the development of medical technology, CHP may present as a reactive process of a combined primary disease and neutrophil-rich infiltration may potentially correlate with autoimmune diseases and streptococcal infections. Further studies are required to validate these findings.

Abbreviations

CHP, Cytophagic histiocytic panniculitis; CTD, Connective tissue disorders; EBV, Epstein-Barr virus; EBER, Epstein-Barr virus (EBV)-encoded RNA; HLH, Hemophagocytic lymphohistiocytosis; LP, Lupus panniculitis; SLE, Systemic lupus erythematosus; SPTCL, Subcutaneous panniculitis-like T-cell lymphoma; SS, Sjogren's syndrome; UCTD, Unclassified connective tissue disease.

Data Sharing Statement

No additional data are available.

Ethics Approval and Informed Consent

This study was approved by the Ethics Committee of the First Affiliated Hospital of Nanjing Medical University (2023-SR-381) and was conducted in accordance with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was waived by our Institutional Review Board because of the retrospective nature of our study. Clinical figures of the patients provided informed consent for the publication of the images.

Acknowledgments

The authors would like to express their gratitude to the staff of the department of dermatology, The first affiliated hospital of Nanjing Medical University, who contributed to the study and recruited the subjects, for their professionalism and support during the study development.

Funding

There is no funding to report.

Disclosure

The authors report no conflicts of interest in this work.

References

1. Aronson IK, Worobec SM. Cytophagic histiocytic panniculitis and hemophagocytic lymphohistiocytosis: an overview. *Dermatol Ther*. 2010;23(4):389–402. doi:10.1111/j.1529-8019.2010.01339.x
2. Winkelmann RK, Bowie EJ. Hemorrhagic diathesis associated with benign histiocytic, cytophagic panniculitis and systemic histiocytosis. *Arch Intern Med*. 1980;140(11):1460–1463. doi:10.1001/archinte.1980.00330220038015
3. Pasqualini C, Jorini M, Carloni I, et al. Cytophagic histiocytic panniculitis, hemophagocytic lymphohistiocytosis and undetermined autoimmune disorder: reconciling the puzzle. *Ital J Pediatr*. 2014;40(1):17. doi:10.1186/1824-7288-40-17

4. Boggio F, Lora V, Cota C, et al. Cutaneous hemophagocytosis: clinicopathologic features of 21 cases. *J Am Acad Dermatol*. 2018;78(2):377–382. doi:10.1016/j.jaad.2017.08.041
5. Koh J, Jang I, Mun S, et al. Genetic profiles of subcutaneous panniculitis-like T-cell lymphoma and clinicopathological impact of HAVCR2 mutations. *Blood Adv*. 2021;5(20):3919–3930. doi:10.1182/bloodadvances.2021004562
6. Wick MR, Patterson JW. Cytophagic histiocytic panniculitis--A critical reappraisal. *Arch Dermatol*. 2000;136(7):922–924. doi:10.1001/archderm.136.7.922
7. Yoshida A, Sugita K, Yamada N, Goto H, Yamamoto O. Adult-onset still's disease secondary to cytophagic histiocytic panniculitis. *Acta Derm Venereol*. 2022;102:v639. doi:10.2340/actadv.v101.568
8. Moshayedi A, Shea S, Nandan A, Ford S. Cytophagic histiocytic panniculitis and Kikuchi-Fujimoto-like lymphadenitis in a patient with systemic lupus erythematosus. *Cureus*. 2022;14(9):e28951. doi:10.7759/cureus.28951
9. Kimura R, Sugita K, Goto H, Yamamoto O. Cytophagic histiocytic panniculitis associated with myelodysplastic syndrome. *Acta Derm Venereol*. 2019;99(1):97–98. doi:10.2340/00015555-3043
10. Hasegawa H, Mizoguchi F, Kohsaka H, Miyasaka N. Systemic lupus erythematosus with cytophagic histiocytic panniculitis successfully treated with high-dose glucocorticoids and cyclosporine A. *Lupus*. 2013;22(3):316–319. doi:10.1177/0961203313476355
11. Fardet L, Galicier L, Vignon-Pennamen MD, et al. Frequency, clinical features and prognosis of cutaneous manifestations in adult patients with reactive haemophagocytic syndrome. *Br J Dermatol*. 2010;162(3):547–553. doi:10.1111/j.1365-2133.2009.09549.x
12. Alegre VA, Winkelmann RK. Histiocytic cytophagic panniculitis. *J Am Acad Dermatol*. 1989;20(2 Pt 1):177–185. doi:10.1016/s0190-9622(89)70018-9
13. Craig AJ, Cualing H, Thomas G, Lamerson C, Smith R. Cytophagic histiocytic panniculitis--A syndrome associated with benign and malignant panniculitis: case comparison and review of the literature. *J Am Acad Dermatol*. 1998;39(5 Pt 1):721–736. doi:10.1016/s0190-9622(98)70044-1
14. Jiang M, Zhao L, Zheng J, Zhang J, Chen P, Zhou W. Report of eleven patients of subcutaneous panniculitis-like T-cell lymphoma: clinicopathologic features, (18)F-FDG PET/CT findings and outcome. *Front Oncol*. 2021;11:650822. doi:10.3389/fonc.2021.650822
15. Marzano AV, Berti E, Paulli M, Caputo R. Cytophagic histiocytic panniculitis and subcutaneous panniculitis-like T-cell lymphoma: report of 7 cases. *Arch Dermatol*. 2000;136(7):889–896. doi:10.1001/archderm.136.7.889
16. Requena L, Sanchez YE. Panniculitis. Part II. Mostly lobular panniculitis. *J Am Acad Dermatol*. 2001;45(3):325–361, 362–364. doi:10.1067/mjd.2001.114735
17. Miyabe Y, Murata Y, Baba Y, Ito E, Nagasaka K. Successful treatment of cyclosporine-A-resistant cytophagic histiocytic panniculitis with tacrolimus. *Mod Rheumatol*. 2011;21(5):553–556. doi:10.1007/s10165-011-0435-6