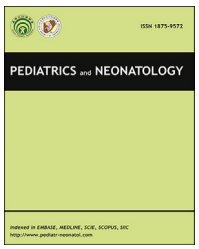
Pediatrics and Neonatology (2016) xx, 1–2

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: http://www.pediatr-neonatol.com



BRIEF COMMUNICATION

Acute Myeloid Leukemia Presenting with Sweet Syndrome: A Case Report and Review of the Literature

Shu-Huey Chen [a], Yung-Ting Kuo [b], Yen-Lin Liu [c], Bo-Jung Chen [d], Yuan-Chieh Lu [e], James S. Miser [f,*]

[a] *Department of Pediatrics, Shuang Ho Hospital, Ministry of Health and Welfare, Taipei Medical University, Taipei, Taiwan*
[b] *Department of Nursing, Shuang Ho Hospital, Ministry of Health and Welfare, Taipei Medical University, Taipei, Taiwan*
[c] *Department of Pediatrics, Taipei Medical University Hospital, Taipei Medical University, Taipei, Taiwan*
[d] *Department of Pathology, Shuang Ho Hospital, Ministry of Health and Welfare, Taipei Medical University, Taipei, Taiwan*
[e] *Department of Laboratory Medicine, Shuang Ho Hospital, Taipei Medical University, New Taipei, Taiwan*
[f] *College of Medical Science and Technology, Taipei Medical University, New Taipei, Taiwan*

Received Jan 11, 2016; received in revised form Apr 14, 2016; accepted May 16, 2016
Available online ■ ■ ■

1. Introduction

Sweet syndrome (SS), or acute febrile neutrophilic dermatosis, is a rare inflammatory disorder characterized by painful cutaneous nodules and neutrophilic infiltrate in the dermis without vasculitis. Malignancy-associated SS (MASS) comprises 15–20% of SS cases, in which acute myeloid leukemia (AML) is the most commonly related malignancy.[1] We report a case of a 15-year-old girl with AML who initially had MASS as a paraneoplastic syndrome.

2. Case Report

A 15-year-old obese (weight: 101 kg, height: 162 cm) girl was admitted to our hospital with a 3-day history of fever up to 39°C, malaise, arthralgia, and painful erythematous nodules sized from 1 × 1 cm to 3 × 3 cm over bilateral feet and calves (Figure 1A). She had a history of congenital hydrocephalus, epilepsy, and mental retardation without a specific congenital syndrome. Her hemogram revealed a white blood cell (WBC) count of 5.3×10^9/L (segmented neutrophils 23%, lymphocytes 45%, and monocytes 32%), hemoglobin of 8.9 g/dL, and platelets of 106×10^9/L. Her C-reactive protein level was 14.5 mg/dL, and erythrocyte sedimentation rates were 140 mm/h and >140 mm/2 h.

The initial diagnosis was severe cellulitis. A skin lesion culture and blood culture yielded no bacterial growth. Due to the poor response to empiric antibiotic treatment with vancomycin and ceftriaxone, hypersensitive vasculitis was suspected and levofloxacin and an antihistamine were administered, to which the skin lesions showed a partial response. A skin biopsy revealed dense neutrophilic infiltration in the dermis and subcutaneous fat without vasculitis (Figure 1B). A diagnosis of SS was made.

Ten days after biopsy, the girl had recurrent fever and her WBC count increased to 14.1×10^9/L with blasts comprising 39%. A bone marrow aspiration revealed hypercellular marrow with intensive infiltration of myeloblasts (>90%). Flow cytometry was positive for CD13 and CD33. Further molecular studies revealed normal cytogenetics with *FLT3* internal

* Corresponding author. College of Medical Science and Technology, Taipei Medical University, New Taipei, Taiwan.
E-mail address: jamesmiser@gmail.com (J.S. Miser).

http://dx.doi.org/10.1016/j.pedneo.2016.05.002

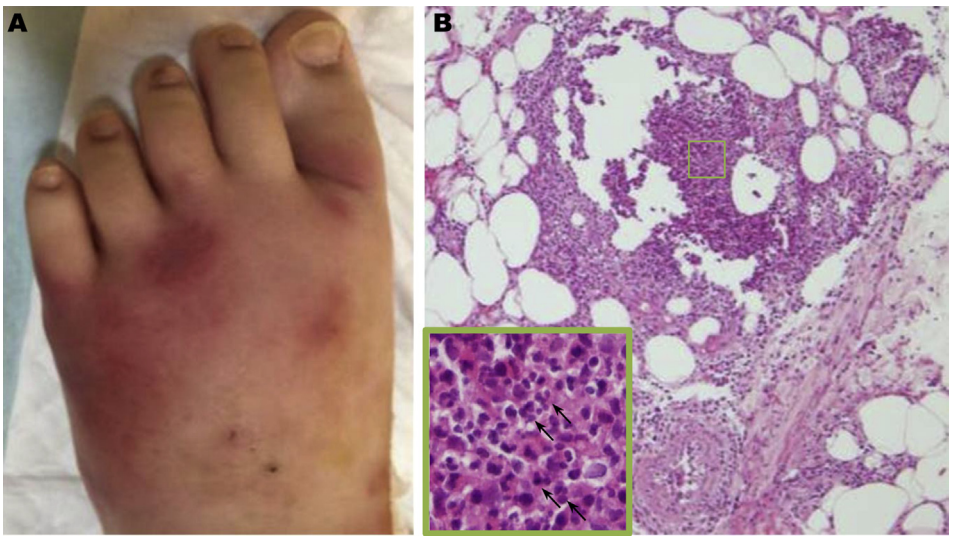


Figure 1 Clinicopathological features of Sweet syndrome in our patient: (A) nodular skin lesions localized at the lower left foot; (B) skin biopsy showed neutrophilic infiltration (arrows) of the subcutaneous adipose tissue and dermis (hematoxylin and eosin stain, 200×; inlet, 400×).

tandem duplication (by reverse transcriptase polymerase chain reaction) and *NPM1* type A mutation (by direct sequencing).

Following standard induction chemotherapy with cytosine arabinoside 100 mg/m^2/d for 7 days and idarubicin 9 mg/m^2/d for 3 days, the skin lesions completely resolved. The girl had transient remission in her peripheral blood with platelet recovery and underwent a second cycle of induction chemotherapy.

3. Discussion

SS was originally described by Dr Robert D. Sweet in 1964, when he reported on eight middle-aged women who manifested pyrexia, painful erythematous plaques, neutrophilia, and a dense dermal infiltration with mature neutrophils.[2] SS responds rapidly to systemic corticosteroids. The diagnosis of SS should fulfill two major and two minor criteria.[3,4] Major criteria include: (1) abrupt onset of tender erythematous papules or nodules; and (2) predominant neutrophilic infiltrate in the dermis without leukocytoclastic vasculitis. Minor criteria include: (1) presence of fever $\geq$ 38°C; (2) at least two of four abnormal laboratory values (WBC $>$ 8 $\times$ 10^9/L, neutrophil $>$ 70%, erythrocyte sedimentation rates $>$ 20 mm/h, and abnormally elevated C-reactive protein); (3) a disease/condition associated with SS (e.g., malignancy, inflammatory disorder, pregnancy, etc.); and (4) excellent response to glucocorticoid therapy or potassium iodide.[4] Our patient met two major criteria and two minor criteria (fever and malignancy).

The pathogenesis of SS, although not yet clear, may be hypersensitivity to an underlying infectious, inflammatory, or malignant condition that stimulates the production of cytokines, including granulocyte colony-stimulating factor. As a result, neutrophils are activated and they abnormally migrate into dermal tissues.

Hematologic disorders account for more than 85% of MASS cases. AML and myelodysplastic syndrome are the most common.[5] Kazmi et al[6] reported that SS occurs in 1% (21/2178) of adult AML patients: two-thirds were women and only one out of 21 patients with SS had presented prior to the diagnosis of AML, similar to our patient. Risk factors for MASS in AML include deletion of chromosome 5 or 5q, presence of *FLT3* mutations, and AML with myelodysplasia-related features. The median overall survival for AML patients with SS was not significantly different from the rest of the AML patients without SS. Consistent with the common features reported by Kazmi et al,[6] our case was a girl who had a *FLT3* mutation, thrombocytopenia, and anemia. Levofloxacin was reported to have an anti-inflammatory effect in an animal study.[7] This may have contributed to the initial improvement of our patient's skin condition.

In conclusion, SS is rare, it mimics infection, but can be an early sign of a malignancy. Although systemic corticosteroids are the first-line treatment of SS, administration of steroids can be harmful and may obscure the diagnosis of leukemia. When a child has typical skin lesions of SS, the pediatrician should keep a high index of suspicion to search for underlying malignancies and systemic disorders.

Conflicts of interest

The authors have nothing to disclose.

References

1. Cohen PR, Kurzrock R. Sweet's syndrome and malignancy. *Am J Med* 1987;**82**:1220–6.
2. Sweet RD. An acute febrile neutrophilic dermatosis. *Br J Dermatol* 1964;**76**:349–56.
3. Su WP, Liu HN. Diagnostic criteria for Sweet's syndrome. *Cutis* 1986;**37**:167–74.
4. von den Driesch P. Sweet's syndrome (acute febrile neutrophilic dermatosis). *J Am Acad Dermatol* 1994;**31**:535–56.
5. Buck T, Gonzàlez LM, Lambert WC, Schwartz RA. Sweet's syndrome with hematologic disorders: a review and reappraisal. *Int J Dermatol* 2008;**47**:775–82.
6. Kazmi SM, Pemmaraju N, Patel KP, Cohen PR, Daver N, Tran KM, et al. Characteristics of Sweet syndrome in patients with acute myeloid leukemia. *Clin Lymphoma Myeloma Leuk* 2015;**15**:358–63.
7. Tsivkovskii R, Sabet M, Tarazi Z, Griffith DC, Lomovskaya O, Dudley MN. Levofloxacin reduces inflammatory cytokine levels in human bronchial epithelia cells: implications for aerosol MP-376 (levofloxacin solution for inhalation) treatment of chronic pulmonary infections. *FEMS Immunol Med Microbiol* 2011;**61**:141–6.

Please cite this article in press as: Chen S-H, et al., Acute Myeloid Leukemia Presenting with Sweet Syndrome: A Case Report and Review of the Literature, Pediatrics and Neonatology (2016), http://dx.doi.org/10.1016/j.pedneo.2016.05.002