

## Research on Cardiovascular System Injury by Neutrophilic Dermatoses

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**Abstract:** Neutrophilic dermatosis includes a group of skin diseases characterized by neutrophil infiltration. The common types include Sweet syndrome, gangrenous pyoderma, Behcet's disease, etc. Neutrophilic dermatosis is mostly associated with multisystem manifestations, and cardiovascular system is one of them. This article summarizes the common systemic manifestations of the disease in order to broaden clinical thinking and promote systematic diagnosis and treatment of the disease.

### Introduction

Neutrophilic dermatosis (ND) is a group of diseases with similar histopathological changes, pathogenesis and treatment methods [1]. Histologically, ND is characterized by perivascular and diffuse neutrophil infiltration without any definite infection factors. Skin lesions can be localized or generalized in a variety of ways. Sweet syndrome, gangrenous pyoderma, Behcet's disease and subcutaneous pustulosis are common types. It is worth noting that besides skin damage, neutrophils also have extracutaneous aseptic neutrophil infiltration. The affected organs include lungs, bones and joints, digestive tract, liver, spleen, pancreas, central nervous system, cardiovascular system and so on. In 1964, Sweet reported 8 cases of female patients with acute febrile neutrophilic dermatosis, namely Sweet syndrome. The common characteristics of Sweet syndrome were red plaque, infiltration of neutrophils in lesion tissues with neutrophilic leukocytosis in peripheral blood, and sensitivity to glucocorticoid therapy. In 1971, Shapiro et al. reported for the first time a case of malignant disease-related syndrome. The patient was a 58-year-old male with left testicular embryonic cancer. Half a month later, he developed sweet syndrome-like lesions. In 1973, a patient with acute leukemia was reported. Since then, there have been many reports of Sweet syndrome complicated with malignant diseases or solid tumors of the hematological system. In 1983, a case of myelodysplastic disease with Sweet syndrome and pyoderma gangrenosum was reported, suggesting that these diseases may be intrinsically related and belong to a group of continuous pedigree diseases. In 1986, Su et al. reported a case of Sweet syndrome induced by compound sulfamethazine. Subsequently, other drugs causing Sweet syndrome were reported successively, including antibiotics, antiepileptic drugs, antihypertensive drugs, oral contraceptives and retinoic acid. However, most drug-induced Sweet syndrome was related to the use of granulocyte colony stimulating factor (G-CSF). Until 1991, Wallach put forward the concept of neutrophilic dermatosis as a group of continuous pedigree diseases, noting the lesions outside the skin, and pointed out that there were transitional (variant) and overlapping forms of conditions for diagnosis; similar histological manifestations, i.e., normal neutrophil infiltration; and possible neutrophil immersion outside the skin. Run; often associated with systemic diseases [2].

### Pathogenesis of Neutrophilic Dermatoses

The mechanism of neutrophils invading human skin and extracutaneous tissues and organs is still unclear [3]. As systemic use of glucocorticoids and immunosuppressive agents is effective rather than

aggravating, local infection factors can be excluded. Nor did we find abnormalities in neutrophils in the blood of the patients. The causes of these diseases can be divided into the following categories. Vascular lesions such as Behcet's syndrome, persistent prominent erythema and gangrenous pyoderma deposit immune complexes on the surface of endothelial cells, which can adsorb and activate neutrophils when combined with complements, eventually leading to vascular damage or destruction. The infiltration and activation of neutrophils is the core. Interleukin-1, tumor necrosis factor, anti-neutrophil cytoplasmic antibody and anti-endothelial cell antibody also play an important role. Autoantibodies and complement dermatoses such as Scar, Scar-like Scar, Scar-like Dermatitis, Linear and Scar Dermatitis are typical representatives of neutrophil infiltration caused by autoantibody-activated complements. Neutrophils play a key role in the formation of hydronephrosis, while antibody-binding and activating complements are the activation of neutrophils. Prerequisites. A series of subsequent events caused by degranulation of mast cells, which release transmitters from mast cells, can lead to infiltration of neutrophils and eosinophils. In neutrophilic measles, once mast cells release immunoreactive substances and tryptase [4]. In addition, the intercellular adhesion molecule, a leukocyte function-related antigen, also plays an important role in the recruitment of neutrophils in the skin. Lymphocyte and cytokine mediate the activation of neutrophils in psoriasis, syndrome, subcutaneous purulence, gangrenous pyoderma, neutrophilic eccrine adenitis, etc. Lymphocyte is the first inflammatory cell involved, which can induce the activation and infiltration of neutrophils by inducing cytokines and chemokines such as leukotrienes. In these diseases, cytokines and chemokines are important reasons for selective leukocyte aggregation. In addition, the chemotactic characteristics of Bibi may play an important role in the pathogenesis of Tianscar, keloid dermatitis and linear keloid dermatosis. Other important factors include granulocyte macrophage colony-stimulating factor, herpes attachment molecule and so on. At present, it is believed that the occurrence of these diseases is due to immune dysfunction and abnormal cytokine signaling pathways which lead to the recruitment and activation of normal neutrophils, and ultimately lead to tissue damage.

### **Cardiovascular System Injury by Neutrophilic Dermatoses**

**Materials and Methods.** From June 2016 to June 2018, 100 patients with neutrophilic dermatosis without cardiovascular history were selected as group A, 100 patients with neutrophilic dermatosis without cardiovascular history and 100 patients without cardiovascular system injury were selected as group B. The diagnosis of all patients was consistent. The diagnostic criteria were established in June 2000 by the Medical Surgery Group of the Surgical Branch of the Chinese Medical Association. There were 33 males and 67 females in group A and 38 males and 62 females in group B. The age of the two groups ranged from 25 to 75 years, with an average of 46 years. There was no significant difference in age and sex between the two groups ( $P > 0.05$ ). Clinical manifestations: Abdominal pain, fever, nausea, vomiting, abdominal distension and other typical neutrophilic skin reactions were found in most of the two groups. In group A, 78 cases had abnormal clinical manifestations of cardiovascular injury with palpitation, chest tightness and cryptic pain in the precordial area (7 cases of palpitation, 3 cases of chest tightness, 1 case of pain in the precordial area, and the rest had abnormal cardiovascular system manifestations); 92 cases had positive physical signs. Among the patients with positive signs found by paving-aid examination, 89 cases were electrocardiogram positive, 46 cases were chest X-ray, 24 cases were myocardial zymogram positive, and 38 cases were B-ultrasound positive. Methods: Blood routine, urine routine, liver and kidney function, blood urine amylase, serum lipase, ratio of endogenous creatinine clearance of amylase, serum calcium, blood sugar and electrocardiogram, abdominal B-mode ultrasound, myocardial enzymology (creatinine kinase, lactate dehydrogenase, troponin T qualitative) and cardiac color Doppler ultrasound, chest were performed in both groups. The blood pressure, respiration, heart rate, abnormal heart sound and heart murmur were observed.

**Result.** The course of disease in group B was 98 cases (98%) less than one month and 2 cases more than one month. All patients were cured. The course of disease in group A was 86 cases (86%) less

than one month and 14 cases. Five cases (5%) died and the rest were cured, as shown in Table 1. There were significant differences in cure rate, mortality and course of disease between the two groups ( $P < 0.05$ ).

**Discussion.** Whether the patients with neutrophilic dermatosis cause cardiovascular system damage directly affects the course and curative effect of the disease. Neutrophilic dermatosis is an inflammatory disease of the pancreas. It often causes pericardial effusion and arrhythmia after cardiovascular system damage. Hypovolemia, shock and hyperdynamic circulation occur when blood circulation is affected. The clinical manifestations were palpitation, chest tightness, angina pectoris and dyspnea. The main manifestation of paving test for patients without previous heart disease is arrhythmia. The electrocardiographic changes of prolonged QT interval caused by hypocalcemia are rare. Pericardial effusion is common, and the volume of effusion is usually small. So cardiovascular complications are often one of the important causes of death from neutrophilic dermatosis.

Neutrophilic dermatosis is caused by a variety of etiologies. Only when some links of its own defense mechanism are destroyed can the pancreas self-digestion chain reaction occur, in which pancreatic protease is activated in the pancreatic parenchyma, which plays a major role; kallikrein enhances vasodilation and permeability, causing edema and shock. Cytotoxicity of phospholipase A2 causes coagulation necrosis, adipose tissue necrosis and hemolysis. Elastase can dissolve vascular elastin fibers causing hemorrhage and thrombosis. The production of chymotrypsin destroys the capillary bed and thrombin leads to acute disseminated intravascular coagulation. Thus, abnormally activated trypsin activates a variety of inflammatory response cells in the body while causing pancreatic self-injury, releasing a large number of inflammatory response mediators and cytokines, such as interleukin, tumor necrosis factor, oxygen free radicals, phospholipase A, platelet activating factor, etc., which can cause ionic electrorheological changes in cardiac myocytes. Chemicals lead to myocardial damage. Inflammatory exudation stimulates celiac plexus, reflex causes coronary spasm, leads to myocardial ischemia, angina, and induces apoptosis of myocardial cells. Infection is the main cause of death in patients with neutrophilic dermatosis. Infection after pancreatic tissue necrosis and sepsis caused by infection are the main causes of death in patients with neutrophilic dermatosis. In addition, neutrophilic dermatosis often results in hypovolemia due to the loss of body fluids, which can easily lead to shock.

The clinical data of related cases show that most cases are accompanied by fever and peripheral leukocytosis. To a certain extent, it can be considered that the disease is a sepsis process, and a large number of leukocytosis suggests that leukocyte tropism is one of its pathogenesis. Sweet syndrome is easily confused with persistent elevated erythema, allergic vasculitis and erythema multiforme, because its clinical symptoms are similar. Persistent eminence erythema is characterized by slow onset, no systemic symptoms such as fever, no pain in the skin lesions, and histopathological features of leukocytic vasculitis, which is easy to distinguish from Sweet syndrome. The lesions of allergic vasculitis are pleomorphic, including macular papules, purpura, ulcer, erosion, etc. The total number of white blood cells is basically positive. The lesions of erythema multiforme are symmetrical, mucosal involvement, typical iris-like lesions, subepidermal blisters and lymphocyte infiltration in dermis. Sweet syndrome usually has specific laboratory examinations and histopathological changes besides typical lesions. The patient found a red papule on the back of his neck, the size of which was soybean, without discomfort. After that, some edematous patches and joints appeared in the waist, back, upper limbs and lower legs of the patients. The size was different. The color ranged from light red to deep purple red, and the boundary was clear. Pseudoblisters appeared on some damaged skin surfaces. The distribution of edematous plaques and nodules and related damaged skin is scattered, and the lesions are accompanied by varying degrees of tenderness and itching. On the 7th day after the onset of the disease, he went to the local hospital for treatment and was identified as erythema nodosum. The related symptoms were slightly improved by intravenous infusion of 8 million units of penicillin daily for 3 days, but there was no significant change in edematous plaques and nodules and related damaged skin. This disease is mainly treated with 810 nm semiconductor laser, which has photopressure, photochemistry and electromagnetic effects. Laser can be absorbed by tissues and transformed into bioenergy. Local irradiation can stimulate and regulate the body, improve local

blood circulation, promote the absorption of inflammation and edema, and alleviate pain. In the process of nursing, we should strengthen psychological nursing, pay attention to local skin care, earnestly do a good job of health guidance, so that patients actively cooperate with the treatment, improve the treatment effect.

After infection caused by neutrophilic dermatosis, cardiac index increases and peripheral vascular resistance decreases. If further developed, sepsis will occur, eventually leading to death of patients. Therefore, cardiovascular system damage ultimately affects the course of the disease and the outcome of the development of the disease. Cardiac involvement in Sweet syndrome is extremely rare. However, some scholars reported that the incidence of cardiovascular infiltration increased the mortality rate of Sweet syndrome from 9% to 40%.

Therefore, the cardiovascular involvement of neutrophilic dermatosis is still worthy of attention. Recently, a pregnant woman with Sweet syndrome complicated with neutrophilic myocardial pericarditis was reported in the United States. The patient developed chest pain, pericardial frictional sounds and elevated troponin 3 days after the lesion. Vascular involvement in Sweet syndrome is usually manifested as aortic sclerosis, aortitis, aneurysm and coronary artery occlusion. It is worth noting that neonatal Sweet syndrome patients may have arteritis and thoracic aortic aneurysm. In addition, Behcet's disease also has cardiovascular involvement, including coronary vasculitis, valvular disease, myocarditis and arrhythmia, aneurysms, obstructive arteriopathy, superficial or deep venous thrombosis. Antineutrophil cytoplasmic antibody (ANCA) was negative in vasculitis caused by Behcet's disease. Anticardiolipin antibody could be positive, but it had no correlation with disease activity, which might be related to recurrent thrombosis.

## Conclusion

Systematic manifestations of neutrophilic dermatosis are extensive and diverse. A comprehensive and in-depth understanding of the systemic manifestations of neutrophilic dermatosis is helpful for us to quickly and accurately detect and diagnose the disease. When dermatologists encounter dermatosis with neutrophil infiltration as the main factor, besides the factors of infection, they should pay attention to inquiring about the systemic symptoms of neutrophilic dermatosis and carrying out corresponding examinations.

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