# Eosinophilic Granulomatosis With Polyangiitis Triggered by an Arthropod Bite and Complicated by Renal and Hepatic Infarction and Pulmonary Embolism: A Case Report

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Eosinophilic granulomatosis with polyangiitis (EGPA), also known as Churg–Strauss syndrome, is an uncommon condition that causes necrotizing vasculitis in small- and medium-sized blood vessels, leading to inflammation. EGPA is characterized by the presence of asthma and an increased eosinophil count in the bloodstream [1]. However, importantly, larger vessels can also be affected by vasculitis, leading to potentially serious complications such as thromboembolism [2]. We report an infrequent case of renal and hepatic infarction and pulmonary embolism in a man with EGPA. The patient gave his written consent for publication of all photographic materials.

A 34-year-old man with a longstanding history of chronic rhinosinusitis without nasal polyps or asthma was admitted to the infectious diseases department with fever and skin lesions caused by an arthropod bite. The patient had previously received treatment at a different clinic and was receiving week-long treatment with intravenous antibiotics and oral antihistamines. No additional interventions were given prior to this treatment. However, the skin lesions became painful, and the pain in his shins could not be relieved by nonsteroidal anti-inflammatory drugs. There were no remarkable illnesses in his family history, and no instances of toxicity had been reported among the individuals residing with him.

On admission, physical examination revealed that his temperature was 37.7°C, pulse 92/min, blood pressure 136/84 mmHg, and respiratory rate 17/min. He had developed fever and severe skin lesions, especially on the lower extremities. The right shin exhibited notable scabrous lesions, with the largest lesion measuring approximately 5.5×4 cm (Supplementary Figure 1).

Laboratory analysis revealed leukocytosis ($26.9\times10^9$/L) with a marked increase in eosinophils (37.1%) and thrombocytopenia ($30\times10^9$/L) and a high erythrocyte sedimentation rate (66 mm/h). Coagulation testing revealed that the D-dimer concentration was >30 mg/L, the prothrombin time was 13.2 sec, the international normalized ratio was 1.18, and the fibrinogen level was normal. The results of biochemical tests showed no obvious abnormalities. Immunoglobulin G, A, and M levels were normal; however, the immunoglobulin E (IgE) level was elevated (2926 IU/mL). The complement fraction, antinuclear antibody titer, and antineutrophil cytoplasmic antibody (ANCA) titer were normal. The urine dipstick test revealed microscopic hematuria (1+). The results of all viral, bacterial, and parasitological examinations for the assessment of infectious etiologies were normal. No blasts were detected during the bone marrow examination owing to eosinophilia. Skin biopsy revealed the presence of necrotizing eosinophilic vasculitis and eosinophilic panniculitis (Supplementary Figure 2). A computed tomography (CT) scan of the chest revealed a scattered shadow in both lungs.

The patient was diagnosed with EGPA and was initially given intravenous methylprednisolone 1 mg/kg/d. Neither cyclophosphamide nor mepolizumab was given because the Five-Factor Score (FFS) was 0 [3]. The methylprednisolone dose was reduced to 0.5 mg/kg/d at discharge. The patient was readmitted with a 14-day history of syncope. CT revealed multiple embolisms in both main and branch pulmonary arteries (Figure, A) and right renal and hepatic infarction (Figure, B and C). Systemic anticoagulation therapy was initiated with thrombolysis and heparin. In addition, the dose of methylprednisolone was increased to 1 mg/kg/d, as EGPA was still active.

The criteria for the classification of EGPA, as defined by the American College of Rheumatology and European Alliance of Associations for Rheumatology in 2022, are as follows: a maximum eosinophil count $\geq1\times10^9$/L (+5), obstructive airway disease (+3), nasal polyps (+3), extravascular eosinophilic predominant inflammation (+2), mononeuritis multiplex/motor neuropathy not due to radiculopathy (+1), ANCA or anti-proteinase 3 positivity (–3), and hematuria (–1). When a cumulative score of 6 or greater is achieved, EGPA can be diagnosed with a sensitivity of 85% and a specificity of 99%. In the present case, the patient had predominant extravascular eosinophilic inflammation and hematuria. Furthermore, his eosinophil count was $10.01\times10^9$/L. The cumulative score was 6, indicating a suspected diagnosis of EGPA. In addition, factors such as elevated IgE, cutaneous lesions, pulmonary infiltrates, venous thrombosis and renal infarction support the diagnosis of EGPA [4]. More importantly, histopathological findings further support the diagnosis of EGPA.

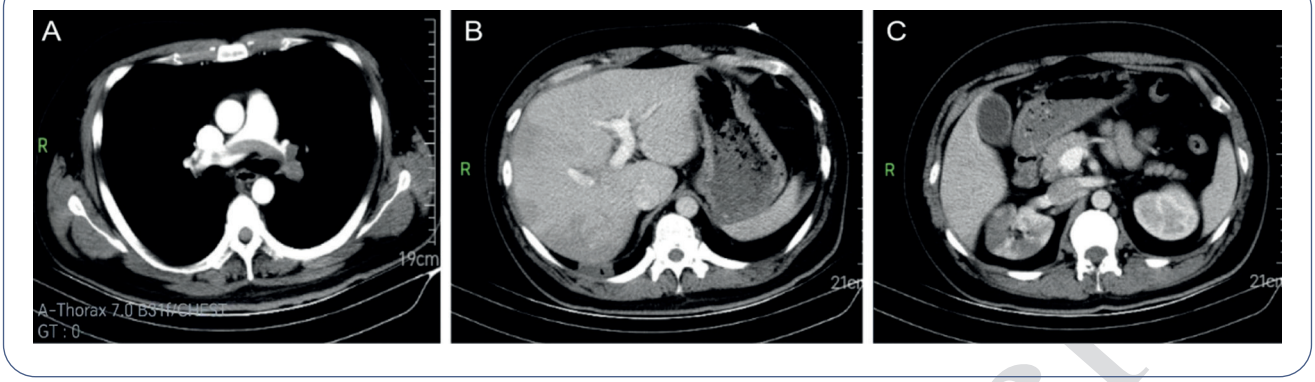


**Figure.** Computed tomography scan showing pulmonary embolism (A), right hepatic infarction (B), and right renal infarction (C).

There is little information on the etiological and causative agents of EGPA. ANCA-negative EGPA involves mucosal/barrier dysfunction rather than autoimmune pathogenesis [5]. We report the first case of a man in whom EGPA was triggered by an arthropod bite. The association between EGPA and the coagulation system is not fully understood. On the one hand, eosinophils can independently produce thrombin and lead to exposure of tissue factor, thus stimulating thrombus formation through the activation of factors VII and X. On the other hand, IL-13 increases eotaxin and vascular cell adhesion molecule 1 levels, promoting the mobilization of eosinophils into the extracellular space by enhancing vascular permeability. After extravasating and encountering activation of tissue factor, eosinophils release cytotoxic granular proteins, including eosinophil cationic protein and major basic protein, which ultimately result in thrombosis. Furthermore, aberrant production of eosinophil-derived reactive oxygen species contributes to thrombosis [6,7]. The few case reports in the literature involve splenic infarction [8], brain infarction [9], and testicular infarction [10]. The occurrence of renal and hepatic infarction in EGPA patients is exceedingly rare, with few reported cases.

Both the FFS and rare manifestations (eg, alveolar hemorrhage) should be considered when choosing remission-induction strategies [6]. The primary FFS was based on renal insufficiency (serum creatinine >1.58 mg/dL), urine protein >1 g/d, cardiomyopathy, gastrointestinal involvement, and central nervous system involvement. The FFS was then adjusted to include age >65 years, kidney failure (serum creatinine ≥150 µmol/L), cardiomyopathy, gastrointestinal involvement and absence of ear-nose-throat involvement. Considering that the FFS of this patient with new-onset, active EGPA was 0, we initially administered corticosteroids. We took into account new manifestations that aggravated the disease during follow-up and proposed adding cyclophosphamide, although the patient refused this option.

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*Conflicts of Interest*

The authors declare that they have no conflicts of interest.

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