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Case Report

Acute Border Zone Infarcts in Hypereosinophilic Syndrome

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INTRODUCTION

Hypereosinophilic syndrome (HES) is a rare condition characterized by peripheral eosinophilia that leads to multi-organ damage.[1] The underlying cause of eosinophilia may be identifiable, such as parasitic infections or autoimmune diseases, or it may be idiopathic.[2] HES can present with various neurological manifestations, including acute ischemic stroke, cerebral venous sinus thrombosis, encephalopathy, and peripheral neuropathy.[3] Ischemic strokes associated with hypereosinophilia typically occur in a watershed border zone distribution but can occasionally present as major arterial territorial infarcts.[3,4] Recognizing the ischemic stroke pattern on neuroimaging in the context of hypereosinophilia is crucial for guiding diagnostic and treatment strategies.[5]

CASE REPORT

A 30-year-old male with no prior medical history presented to the emergency department with acute chest pain and bilateral upper and lower extremity weakness. Neurological examination revealed decreased strength in both upper and lower extremities, with more pronounced weakness in the proximal muscle groups. Specifically, shoulder abductors and elbow extensors had a strength of 2/5, finger muscles were 4/5, and hip flexors were 3/5, while distal lower extremity muscles remained intact at 5/5. An electrocardiogram showed nonspecific ST changes without ST elevation. Initial laboratory tests revealed elevated troponin and D-dimer levels, along with peripheral eosinophilia, with an absolute eosinophil count of approximately 4,000/µl.

A computed tomography (CT) angiogram of the chest ruled out acute aortic pathology and pulmonary embolism but revealed a small, indeterminate hypodense mass in the right hepatic lobe. Noncontrast CT of the head showed small hypodensities in the bilateral internal and external border zone territories (Figure 1). A follow-up CT angiogram of the head ruled out large vessel occlusion (Figure 2). Brain magnetic resonance imaging (MRI) revealed multiple small, acute to early subacute infarcts in the bilateral internal and external border zones, as well as scattered throughout the bilateral cerebral cortices (Figure 3). Echocardiography and cardiac MRI were normal, with no evidence of cardiac abnormalities or intracardiac thrombus. Extensive infectious, autoimmune, and neoplastic workups were negative, leaving idiopathic HES as the diagnosis.

A contrast-enhanced MRI of the abdomen was performed to further evaluate the hepatic mass, revealing several heterogeneously enhancing hepatic lesions (Figure 4). Histopathologic examination of one lesion showed a focal lymphohistiocytic infiltrate with scattered eosinophils.

The patient was treated with a single 100 mg dose of intravenous methylprednisolone, which resulted in the resolution of peripheral eosinophilia and significant improvement in extremity weakness. He was discharged home on a short-term maintenance regimen of prednisone and hydroxyurea.

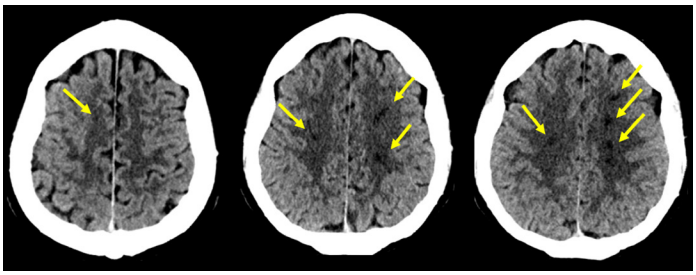

Figure 1. Axial noncontrast CT of the head demonstrates scattered small hypodensities in the bilateral border zones (Yellow arrows).

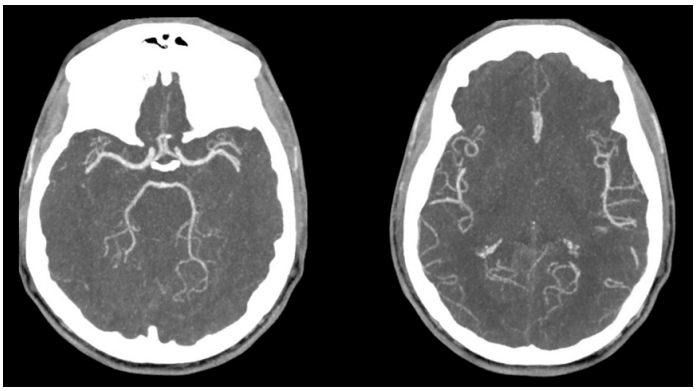

Figure 2. Axial CT maximum intensity projection (MIP) reformats of the head demonstrating patency of the major intracranial arteries.

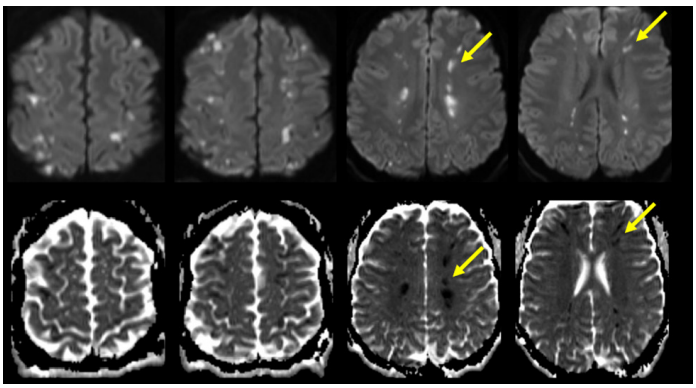

Figure 3. Axial Diffusion Weighted Imaging and ADC maps showing multiple foci of diffusion restriction in the bilateral internal and external border zones (see arrows).

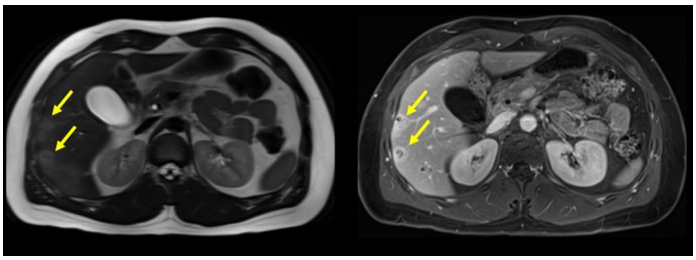

Figure 4. Axial T2 HASTE (left) and axial, gadobenate dimeglumine (MultiHance®)-enhanced postcontrast T1 (right) images of the abdomen demonstrate several small focal hepatic lesions with heterogenous intermediate T2 signal and postcontrast rim-enhancement (arrows).

DISCUSSION

Hypereosinophilic syndrome is a rare multisystem disorder characterized by a sustained elevation in absolute eosinophil count greater than 1500/µL for six months.[6] Based on its etiology, HES can be classified as either primary, caused by clonal proliferation of eosinophils associated with an underlying hematopoietic neoplasm, or secondary, resulting from parasitic, allergic, or autoimmune diseases.[1] In some cases, HES is idiopathic, with no identifiable cause.[2]

HES can present with acute or chronic symptoms affecting various organs and systems, including the brain, heart, lungs, liver, spleen, and bone marrow.[3,7] Neurological manifestations include ischemic stroke, venous sinus thrombosis, peripheral neuropathy, seizures, and encephalopathy.[3] Among these, HES-associated ischemic stroke is the most severe complication, occurring in 12% of patients with HES, with 10-15% of these cases affecting young adults.[8]

The primary pathophysiology of HES-associated stroke is believed to be cardiac emboli resulting from eosinophil-mediated cardiac damage.[3,9] In a study by Tennenbaum et al.,[9] 50% of patients with HES-associated ischemic stroke showed cardiac involvement, though only one had a detectable cardiac thrombus. The absence of cardiac thrombi, as seen in our patient, suggests the possibility of microemboli as the cause of infarcts. Other less common mechanisms include medium- or small-vessel vasculitis and blood hyperviscosity, both of which can lead to in-situ thrombus formation and occlusion of small perforating arteries.[6,10]

In some cases, an initial noncontrast CT of the head (NCCT) may appear normal in hypereosinophilia-associated stroke, though it can also reveal multiple small infarcts in the bilateral internal and external border zone territories.[3] Less commonly, HES may cause a large infarct in a major cerebral arterial territory.[3,4,11] Rarely, patients may present with venous sinus thrombosis, where NCCT reveals increased density and expansion of the dural venous sinuses or major cerebral veins.[12] Intracranial hemorrhage is another rare complication, which may result from venous infarction in the context of cerebral venous sinus thrombosis or hemorrhagic transformation of an ischemic infarct.[12,13] CT angiography of the head may be negative, as in our patient, or may show major cerebral arterial occlusion in cases of large territorial infarcts.[4] MRI typically reveals foci of diffusion restriction in a border zone distribution or in a major cerebral arterial territory.[11]

Hepatic involvement in HES may present as focal lesions, as seen in our patient, or as eosinophilic cholangitis, chronic hepatitis, or Budd-Chiari syndrome.[14] The sparse eosinophilic presence on histopathology, as noted by other authors such as Minola et al.,[15] suggests that hepatic involvement may result from mediators secreted by peripheral eosinophils rather than direct eosinophilic infiltration.[14,15]

Treatment for HES-associated stroke focuses on rapidly reducing peripheral eosinophilia with high-dose glucocorticoids and addressing any underlying pathology if identified. Second-line therapies include hydroxyurea, methotrexate, interferon-alpha, and cyclosporine.[1,5]

CONCLUSIONS

In summary, HES can present with a broad spectrum of neurological manifestations, ranging from encephalopathy and seizures to more severe conditions such as cerebral venous sinus thrombosis and ischemic stroke. Early diagnosis of hypereosinophilia-associated stroke and prompt initiation of eosinophil-reducing therapy are crucial for improving clinical outcomes.

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Keywords: hypereosinophilic syndrome, stroke, ischemic stroke, embolic stroke, thromboembolism