A Case of Multiple Brain Infarctions Associated With *Erysipelothrix rhusiopathiae* Endocarditis

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A 63-year-old woman was admitted to our hospital because of fever and altered mentality. Brain magnetic resonance imaging showed multiple infarctions at the basal ganglia, cerebellum, and subcortical white matter with petechial hemorrhage, which was more easily seen on gradient echo images. *Erysipelothrix rhusiopathiae* was cultured from her blood, and echocardiography showed septic vegetations in the mitral valve. She recovered fully after 6 weeks of appropriate antibiotic treatment.

Organisms of *Erysipelothrix rhusiopathiae* usually colonize in the tonsils and gastrointestinal tract of various animals, such as swine, chicken, dogs, eels, and fish. Because these animals are continuously shedding *E. rhusiopathiae* through urine or fecal materials, human infection usually occurs to persons at risk such as veterinarians, butchers, farmers, and fishermen, who are in intimate contact with these animals.

Human infections by *E. rhusiopathiae* are rare, although there are some clinical forms of infection, the most common being the self-limiting erysipeloid cellulitis. The others are diffuse cellulitic and septic bacteremic forms, with or without endocarditis. Intracranial manifestation of the *E. rhusiopathiae* infection is rare. To our knowledge, there has been only one case report describing the intracranial manifestation as hemorrhagic infarction, identified from brain computed tomography. Herein we report a case of multiple brain infarctions caused by *E. rhusiopathiae* endocarditis with brain magnetic resonance (MR) imaging findings.
were low (455.8±48.5×10^−6 mm^2/s). These lesions had a hemorrhagic nature, which was confirmed by gradient echo imaging (Figure, D). After this, she was transferred to our hospital for further evaluation.

On admission, her body temperature was 38.5°C; blood pressure, 150/90 mm Hg; and pulse rate, 80 beats/min. There was a diastolic murmur on cardiac auscultation. On neurologic examination, she was comatose. Fundus examination showed multiple hemorrhagic spots on her retina, but results of other cranial nerve examinations were normal. Her motor power was decreased on her right side (Medical Research Council grade 2/5) and she localized the pain to her left hand. Deep tendon reflexes were symmetrically 3+, and plantar responses were bilaterally extensor; neck stiffness was also observed.

Thoracic echocardiography, performed on the day of admission, showed 1-cm vegetations in the aortic valve cusps, with a moderate amount of aortic regurgitation. Diagnostic cerebrosinal fluid tapping demonstrated pleocytosis (white blood cell count, 56 cells/μL) and elevated protein level but normal glucose level (protein, 5.5 g/dL; glucose, 60 mg/dL [3.3 mmol/L]; serum glucose, 116 mg/dL [6.4 mmol/L]). With a diagnosis of multiple infarctions associated with bacterial endocarditis, the patient was treated with nafcillin sodium, 2 g 6 times per day, plus gentamicin sulfate, 120 mg 3 times per day. However, her fever persisted and mental status did not improve. From her blood culture, gram-positive rods compared with gram-negative cocci, were isolated. Clinically significant pathogens are rare among non–spore-forming rods and were identified as hydrogen sulfide production with catalase-negative and su-
cipid valve infections.5 The manifestations also depend on the virulence of the pathogen.5 Nothing was isolated from a cerebrospinal fluid culture. Because *E rhusiopathiae* was sensitive to penicillin G, the antibiotic regimen was changed to penicillin G potassium, 18 million U/d, divided into doses every 4 hours, and ceftriaxone sodium, 2 g twice a day. There was a diastolic murmur on cardiac auscultation. After 6 weeks of antibiotic treatment, follow-up MR imaging and MR angiography, performed on the 18th hospital day, showed no abscess. Echogenicity of the multiple high signal intensities was compatible with liver cirrhosis. On the 28th hospital day, echogenicity, gradient echo imaging demonstrated multiple tiny hemorrhagic foci, which were not detected on the conventional T1- or T2-weighted images. Thus, gradient echo imaging seems to have a role in the diagnosis and management of *E rhusiopathiae* infections.6,7

The nature of the intracranial lesions was thought to be multiple infarctions caused by septic emboli. In addition, gradient echo imaging demonstrated multiple tiny lesions with dark signal intensity, suggesting hemorr-

We report on a case of multiple brain infarctions associated with endocarditis, caused by *E rhusiopathiae*. To our knowledge, this is the first report describing MR imaging findings, including gradient echo and diffusion-weighted imaging, of multiple brain infarctions with *E rhusiopathiae* endocarditis. There has been a report about intracranial manifestation of *E rhusiopathiae*.3 In general, neurologic manifestations of infective endocarditis are related to sites of endocarditis and are more common in patients with mitral valve infection than with aortic or tricuspid valve infections.5 The manifestations also depend on the virulence of the pathogen.3 *Erysipelothrix rhusiopathiae* endocarditis is common in the aortic valve, but its virulence is low. Taken together, these may explain the rarity of intracranial manifestations. In our patient, her general condition may have played a role in the pathogenesis.

Chronic alcohol ingestion is accepted as the most common underlying medical condition in *Erysipelothrix* infections,9 and there are many cases of *Erysipelothrix* infections in patients with a poor general condition, such as renal transplantation,1 acute leukemia,8 or terminal cancer.4 Our patient was a heavy drinker and a carrier of hepatitis B, which, together with her liver cirrhosis, may have facilitated her systemic *Erysipelothrix* infection.

The patient's mental status improved to a drowsy state on her 10th hospital day, and she became alert on the 16th hospital day. On follow-up blood cultures, which were performed on the 7th and 14th hospital days, *E rhusiopathiae* was no longer isolated. Follow-up MR imaging and MR angiography with diffusion-weighted imaging were performed on the 18th hospital day. There were multiple high signal intensities at the left frontal cortex, bilateral basal ganglia, and thalamus on the T2-weighted image (Figure, E), which were better observed on the gradient echo images (Figure, F). Corresponding lesions showed intermediate to high signal intensities on diffusion-weighted imaging, and apparent diffusion coefficient values were low (left thalamus, 556.2±68.5×10^−6 mm^2/s). An MR angiogram was normal, and there was no evidence of mycotic aneurysm. Abdominal ultrasonography, performed on the 20th hospital day, showed no abscess. Echogenicity of the liver was increased with hepatosplenomegaly, which was compatible with liver cirrhosis. On the 28th hospital day, follow-up transthoracic echocardiography was performed and did not show any septic vegetation.

After 6 weeks of antibiotic treatment, follow-up brain MR imaging was performed. The size and numbers of the multiple high signal intensities were decreased. Results of follow-up cerebrospinal fluid examinations were normal. The antibiotic treatment was discontinued and the patient was discharged without significant neurologic deficit.

**COMMENT**

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The nature of the intracranial lesions was thought to be multiple infarctions caused by septic emboli. In addition, gradient echo imaging demonstrated multiple tiny lesions with dark signal intensity, suggesting hemorrhagic foci, which were not detected on the conventional T1- or T2-weighted images. Thus, gradient echo imaging seems to have a role in the diagnosis and management of *E rhusiopathiae* infections.

On the initial blood cultures, gram-positive rods were isolated. Clinically significant pathogens are rare among gram-positive rods compared with gram-negative cocci,
gram-negative rods, or gram-positive coccobacilli. Usually, gram-positive rods that grow in cultures are regarded as contamination. However, there are some possible pathogens, such as Corynebacterium, Listeria, Nocardia, Actinomyces, and Erysipelothrix species. Therefore, when gram-positive rods are isolated in cultures, we should consider E rhusiopathiae as one of the possible sources, especially in immunocompromised patients and persons at high risk, such as fishermen, butchers, farmers, and veterinarians.

The mortality rate for E rhusiopathiae infection can be as high as 38%, from the literature, under appropriate antibiotic treatment. Fortunately, our patient recovered fully after the appropriate antibiotic treatment was given. Although Erysipelothrix infection is rare, we should think of it as part of the differential diagnosis and start appropriate antibiotics in patients in the high-risk category when gram-positive rods are isolated.

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