represent the onset of this disease. The size of the vessels involved and the histopathology, however, suggest that the current case is also different from these atypical types of conventional systemic vasculitis, because the condition was restricted to the medium-sized vessels and involved necrotizing granulomatous vasculitis.

IgG4-related kidney disease was also suspected in the present case due to the elevated serum IgG4. This disease is characterized by high serum IgG4 and dense infiltration of IgG4-positive plasma cells into multiple tissues, including the tubulointerstitial area. The characteristic tubulointerstitial findings of IgG4-related kidney disease include marked lymphoplasmacytic infiltration and storiform fibrosis surrounding infiltrating cells, without any necrotizing angiitis or granulomatous lesions.[8] The main histopathological finding in the present case, however, was the necrotizing granulomatous vasculitis limited to the medium-sized renal blood vessels without any dense infiltration of IgG4-positive plasma cells; furthermore, no extrarenal complications were present. Thus, these data do not support a diagnosis of IgG4-related disease in the present case. Therefore, the mechanisms underlying the association between elevated serum IgG4 and vasculitis in the present case remain unclear.

The left–right asymmetry of vasculitis is a noticeable feature of the present case. Conventional vasculitis usually affects both kidneys symmetrically, but, in the present case, the left kidney had increased in size.

Conclusion

Herein we have described a case of necrotizing granulomatous vasculitis of the medium-sized renal arteries in a child. The features of this case differ significantly from those of conventional vasculitis, and therefore it may represent a new disease entity.

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Staphylococcus aureus endocarditis and pyomyositis: Rare complications of rotavirus gastroenteritis

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Abstract Rotavirus may cause life-threatening complications in untreated patients during the course of gastroenteritis. Electrolyte imbalance, bacteremia and sepsis are the most common complications of rotavirus gastroenteritis (RG). It is believed that translocation of intestinal microorganisms as a result of intestinal epithelium dysfunction is the underlying mechanism of bacteremia in RG. Although Gram-negative bacteremia has been noted as a complication in RG, *Staphylococcus aureus* bacteremia and endocarditis have not been reported previously. A 22-month-old boy was admitted with complaints of fever, diarrhea and dehydration. He was diagnosed with RG complicated with *S. aureus* bacteremia, pyomyositis and endocarditis. We call attention to these complications in patients with prolonged or late-onset fever during RG as rare complications of the disease.

Key words bacteremia, complication, endocarditis, myositis, rotavirus.

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Rotavirus is the most common agent of severe gastroenteritis in infants and young children in both the developed and developing countries. It may cause severe complications such as sepsis and death.[1] The most common agents responsible for bacteremia are Gram-negative enteric microorganisms. There are only few case reports in the literature currently regarding septicemia after Rotavirus

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gastroenteritis, so exact incidence of septicemia during the disease is not known. Gözmen et al.[2] reported the incidence as 0.79%. Bacteremia rate varied between 0.5%–0.79% in the previous literature.[2,3] We found the septicemia complication rate of Rotavirus gastroenteritis as 6.5% in 276 patients according to our seven years clinical experience. The duration of fever is generally 1–3 days in the course of RG. If fever persists or re-occurs, it can be a sign of bacteremia as a result of bacterial translocation.[1–4]

Staphylococcus aureus bacteremia and sepsis may be primary or associated with any localized infection. Asymptomatic colonization is frequent, and the skin and gastrointestinal tract are common regions. Colonization with *S. aureus* can result in severe infections in children.[5] *S. aureus* is the most common cause of pyomyositis (PM) and infective endocarditis (IE) in children.[5–7] PM is a bacterial infection of striated muscle and *S. aureus* is the most common causative agent. Although the exact etiology of primary PM is not clearly understood, it is thought that it results from a hematogenous spread from an occult source.[6,7] *S. aureus* is a common cause of acute endocarditis in patients with native valves. *S. aureus* endocarditis primarily involves the left side of the heart and is associated with a high mortality rate of 25%.[5,8] For that reason, early diagnosis, immediate cultures and appropriate antibiotic treatment are essential.

In the present case report we describe a rare combination of complications during RG: bacteremia, PM and IE caused by *S. aureus*.

Case report

A 22-month-old boy was admitted with complaints of fever lasting for 5 days and watery-bloodless diarrhea lasting for 7 days. He was hospitalized with the diagnoses of acute RG and second-degree dehydration. His medical history was unremarkable. He had normal weight, height and head circumference percentiles, and on physical examination he was found to have sunken eyes, poor skin turgor and a few maculopapular rashes on the trunk. Heart rate was 144 beats/min, respiratory rate was 40 breaths/min, blood pressure was 100/60 mmHg and body temperature was 38.6°C. Laboratory findings were as follows: hemoglobin, 12.7 mg/dL; white blood cell count, 4100/mm^3; platelet count, 125 000/mm^3; erythrocyte sedimentation rate, 10 mm/h; and C-reactive protein, 12.2 mg/L. Biochemistry and coagulation parameters were normal. Stool microscopy was normal, and fecal rotavirus antigen was positive. Fluid replacement therapy was started immediately. Fever persisted, and parenteral ceftriaxone treatment was started with the diagnosis of bacteremia after obtaining the blood, urine and stool cultures. Chest and abdominal X-rays were normal. Fever persisted on the second day of admission, and physical examination indicated swelling, redness, warmth and restriction of movement around the distal part of the left femur and knee joint. Fasciitis and myositis findings were shown by the CT and MR images (Fig. 1a) and septic arthritis and osteomyelitis were excluded. Blood and stool cultures obtained on admission were positive for methicillin-sensitive *S. aureus*. Methicillin sensitivity was confirmed on both pulsed-field gel electrophoresis and polymerase chain reaction. Panton–Valentine leukocidin was negative. The antibiotic regimen was changed to parenteral sulbactam/ampicillin and clindamycin. Because of the blood culture positivity and persistent fever, echocardiography was performed on the third day of admission, which showed vegetation and minimal regurgitation on the aortic valve (Fig. 1b). There was no cardiac valvular anomaly, including of the bicuspid aortic valve. Osler nodules and Janeway lesions were detected on the feet on the fourth day of admission (Fig. 2). Parenteral gentamycin was added to the treatment for IE. Diarrhea and fever resolved on the fifth day of admission. Blood cultures were sterile after a total of three positive blood cultures for *S. aureus*, obtained on three consecutive days. PM completely resolved on the ninth day. The vegetation regressed during the first month of therapy and was not seen on the 35th day of the antibiotic treatment. Gentamycin was discontinued after 1 week and clindamycin was stopped on the 12th day of treatment. Treatment was continued with only ampicillin/sulbactam and lasted a total of 6 weeks. The patient recovered and was doing well at 6 month follow up.

Discussion

Although Gram-negative bacteremia has been noted as a complication in RG, *S. aureus* bacteremia and endocarditis have not been reported previously. The present 22-month-old patient was admitted with fever and diarrhea. He had an atypical disease course and

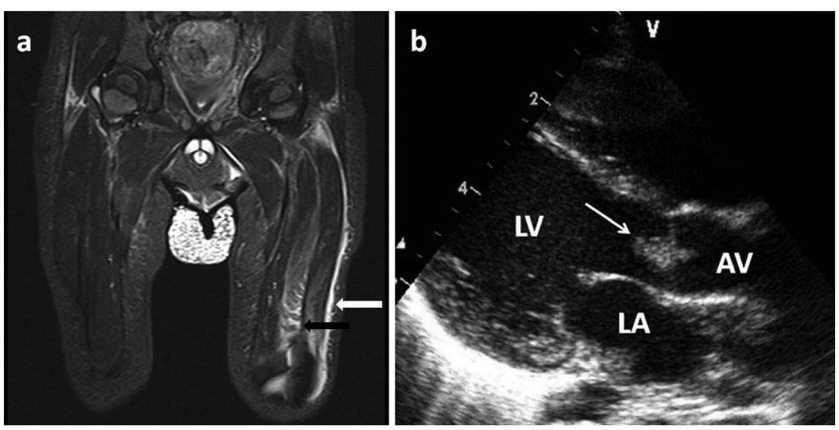


Fig. 1 (a) Fat-saturated T2-weighted coronal magnetic resonance imaging showing high-signal-intensity changes compatible with edema and inflammation in vastus intermedius muscle (black arrow). There is also fluid lateral to the vastus lateralis fascia (white arrow). (b) Echocardiographic image of the vegetation (arrow) on the aortic valve in parasternal long-axis view. LA, left atrium; LV, left ventricle.

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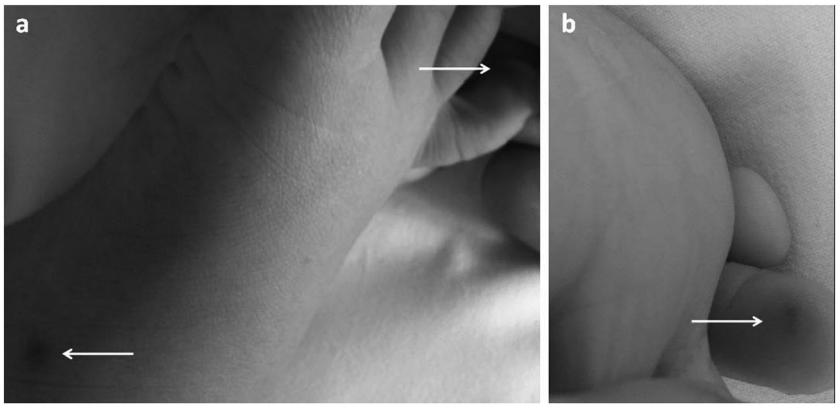


Fig. 2 Classic skin lesions of infective endocarditis. (a) Erythematous and hemorrhagic lesions (Janeway lesions) on the right foot and fifth toe (arrows). (b) Osler's nodule on the fourth toe (arrow).

finally was diagnosed with *S. aureus* bacteremia, PM and IE as complications of RG. At the end of an appropriate antibiotic regimen, he had been successfully treated and was discharged.

Vomiting and fever are predominant symptoms in addition to diarrhea during the first 3 days of RG. Detailed evaluation and cultures are required if fever persists or re-occurs after the third day of RG due to suspected bacterial translocation and bacteremia. Although the exact mechanism is unknown, it is believed that infected enterocytes become more vulnerable to bacterial invasion as a result of intestinal epithelium dysfunction caused by rotavirus.[1–4] For that reason, the primary objective should be to prevent rotavirus infection in children. Safe, efficacious rotavirus vaccines are available in many developed countries and it has been shown that they successfully reduce morbidity, mortality and duration of hospitalization.[1,4]

Case reports regarding RG complicated with bacteremia by various agents are present in the literature. Also, bacteremia due to *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Escherichia coli* and *Candida albicans* has been reported by Çiftçi *et al.*[4] Cicchetti *et al.* reported a *Pantoea agglomerans* sepsis during the course of RG.[9] *Enterobacter cloacae* and *K. pneumoniae* strains were isolated by Lowenthal *et al.*[10] To our knowledge, however, RG complicated with *S. aureus* bacteremia has not been reported. In the present case, fever had persisted during the 5 days of RG, and bacteremia, PM and IE developed as complications, respectively. We think that the PM and aortic valve endocarditis are likely to be complications as a result of bacteremia during RG.

Conclusion

Staphylococcus aureus bacteremia, PM and IE occurred during the present course of RG. Thus, pediatricians should be aware of these rare but potentially serious complications of RG.

Acknowledgment

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