10.5152/turkjnephrol.2022.21137

Case Report

Turkish Journal of Nephrology

Mild Encephalopathy with a Reversible Corpus Callosum Splenium Lesion Associated with Acute Focal Bacterial Nephritis in a Boy

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ABSTRACT

Acute focal bacterial nephritis is a localized, nonliquefied bacterial inflammatory kidney mass affecting one or more lobes of the kidney. It is a midpoint between pyelonephritis and the formation of a kidney abscess. Mild encephalopathy with a reversible splenial lesion is identified by a temporary diffusion restriction in the selenium of the corpus callosum in magnetic resonance imaging. Neurological symptoms sometimes seen in mild encephalopathy with a reversible splenial lesion include changes in consciousness, behavioral changes, and seizures. Many infectious agents, particularly viruses, may be associated with the diagnosis. In recent years, the association between mild encephalopathy and a reversible splenial lesion has been described in some cases with acute focal bacterial nephritis. We present a case of a 9-year-old pediatric patient admitted to the pediatric emergency department with fever and seizures. Even though his urine sample revealed normal findings, he had higher levels of acute-phase reactants. With the aid of the computerized tomography and the magnetic resonance imaging scan, he was diagnosed with mild encephalopathy with reversible corpus callosum splenium lesion associated with acute focal bacterial nephritis. After appropriate treatment, he was discharged home successfully. As a conclusion, mild encephalopathy with reversible corpus callosum splenium lesion should be kept in mind for patients with neurological signs or symptoms accompanied by acute focal bacterial nephritis.

Keywords: Acute focal bacterial nephritis, contrast-enhanced abdominal computed tomography, encephalopathy, corpus callosum splenium lesion, seizure

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Received: July 29, 2021 **Accepted:** January 13, 2022

Cite this article as: Elibol P, Erfidan G, Çiçek A, et al. Mild encephalopathy with a reversible corpus callosum splenium lesion associated with acute focal bacterial nephritis in a boy. *Turk J Nephrol.* 2022;31(3):261-264.

INTRODUCTION

The spectrum of urinary tract infections ranges from lower urinary tract infections to frank abscess formation.[1] Acute focal bacterial nephritis (AFBN), formerly known as lobar nephronia, is localized bacterial and inflammatory involvement of the renal lobules without liquefaction and represents the midpoint between pyelonephritis and renal abscess.[2] The diagnosis is often delayed or missed due to nonspecific symptoms. In recent years, the rate of diagnosis has increased with the development of imaging methods such as ultrasonography (US) and computed tomography (CT). Previous studies have shown that some cases of AFBN have accompanying infections.[3] Acute focal bacterial nephritis may present with seizures, confusion, and meningeal irritation. This condition is called mild encep halopathy/encephalitis with a reversible splenial lesion (MERS).[4] Although the pathogenesis is not clear, intramyelin edema is considered a possible mechanism.[5] In this article, we present a patient who was admitted to the pediatric emergency department with intractable fever and convulsions and was diagnosed with MERS with AFBN.

CASE PRESENTATION

A 9-year-old boy was brought to the emergency department (ER) with complaints of twitching in the mouth and squinting in the eyes. He had a high fever that started

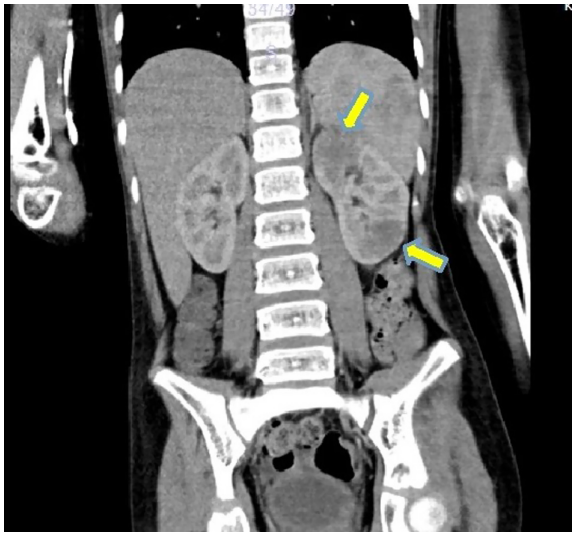

Figure 1. Hypodense patchy areas compatible with acute focal bacterial nephritis in the upper and lower poles of the left kidney in contrast-enhanced abdomen computed tomography.

2 days earlier and reached 40°C. He was diagnosed with acute tonsillitis and prescribed amoxicillin–clavulanate 2 days ago. His Glasgow Coma Scale score was 15 at admission. In physical examination, his height was 142 cm (75–90 p), weight was 26.2 kg (10–25 p), body temperature was 38.4°C, heart rate was 136/min, blood pressure was 119/75 mm Hg (90 p), oxygen saturation was 98%, respiratory rate was 14/min, and blood glucose was 145 mg/dL. Oropharynx examination revealed hyperemic and hypertrophic tonsils, and there was tenderness in the left side of the abdomen. Other findings were normal. Laboratory tests revealed elevated C-reactive protein (CRP) levels and white blood cell counts (CRP: 233 mg/L, white blood cell: 13 600/µL, absolute neutrophil count: 12 300/µL, hemoglobin: 11.9 g/dL, platelet: 224 000/µL). Blood chemistry tests were normal except for hyponatremia (blood urea nitrogen: 11.67 mg/dL, creatinine: 0.9 mg/dL, serum sodium: 131 mmol/L, serum potassium: 4.2 mmol/L). Urinalysis was negative for protein, occult blood, and leukocytes. Urine density was 1.002. Lumbar puncture was performed to exclude the diagnosis of central nervous system (CNS) infection due to the presence of convulsions and accompanying high fever. Cerebrospinal fluid (CSF) examination showed a normal cell count, normal protein, and glucose levels. His US findings

MAIN POINTS

- The most common cause of renal failure is infectious diseases in developing countries and to prevent children from chronic kidney failure, early diagnosis of urinary tract infections is extremely important.
- Children with neurologic findings can be misdiagnosed with neurological problems and renal problems can be ignored.
- As clinicians, we have to be careful about concomitant diagnoses.

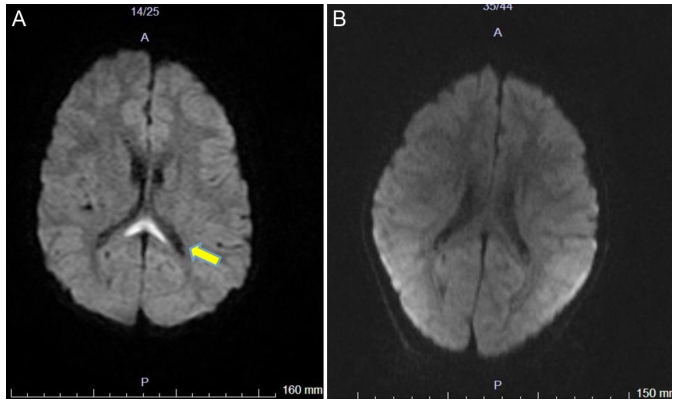

Figure 2. (A) Hyperintensity and diffusion restriction of the corpus callosum splenium in brain diffusion-weighted magnetic resonance imaging. (B) Normal appearance of corpus callosum splenium in brain diffusion-weighted magnetic resonance imaging.

were nonspecific, but abdominal CT recorded hypodense patchy areas compatible with AFBN in the upper and lower poles of the left kidney (Figure 1). Cefotaxime treatment was initiated empirically. Body temperature was normal within the first 24 hours, and CRP regressed on the third day of follow-up. *Staphylococcus warneri* was grown in blood cultures. Brain diffusion-weighted magnetic resonance imaging (DW-MRI) was obtained to exclude any other pathology affecting the CNS. Diffusion restriction and hyperintensity of the splenium of the corpus callosum were recorded (Figure 2A). The pathological signal change in the splenium region of the corpus callosum disappeared in the repeated brain DW-MRI on day 14 (Figure 2B). The patient was discharged after completing 21 days of antibiotic treatment, and advanced urological imaging (renal parenchymal scintigraphy and voiding cystourethrography) was planned.

DISCUSSION

With the development of imaging methods in recent years, awareness of AFBN has increased. It has become clear that it is not a simple urinary tract infection (UTI) and has some features distinct from acute pyelonephritis (APN).[6] Persistent fever with flank and/or abdominal pain are the most striking presenting symptoms. Our case also had persistent fever, high acute-phase reactant levels, and leukocytosis. Vomiting, diarrhea, dehydration, and umbilical pain are other nonspecific symptoms. Therefore, it may not be easy to distinguish this condition from other events causing acute abdominal pain.[2] Seidel et al[3] revealed that 10 out of 25 cases presented with flank pain, 5 had upper respiratory tract infection, 3 had pneumonia, 5 had tonsillitis, 1 had gastroenteritis, 1 had a mandibular abscess, and 4 had a severe dental infection. Our case was diagnosed as tonsillitis before admission.

The increase in cases reported in recent years indicates that AFBN is not as rare as once thought. However, it is difficult to distinguish the signs and symptoms of AFBN from APN. Urine

findings and culture may be masked, particularly in cases that are under antibiotic treatment due to fever. This makes the diagnosis difficult, impeding the provision of optimal care. About 5%-10% of AFBN cases have normal urinary findings even prior to antibiotic treatment. It is explained by the absence of a calyceal connection of the infection localization.[7] Our patient's urine analysis was normal, and the urine culture was sterile. Persistent fever in a patient on antibiotic treatment may provide clues for the clinician. Underlying systemic diseases such as diabetes may play a role in the etiology, as well as anatomical causes such as vesicoureteral reflux, mega ureter, ureteral valve, and unilateral renal hypoplasia.[3] However, cases with hematogenous spread have been reported without anatomic defects.[8] Our case exhibited no urological abnormalities.

Acute focal bacterial nephritis is also a dynamic process. Ultrasonography is the first choice for imaging modality in cases suspected of having a UTI, as it can provide hyper-, iso-, or hypoechogenic image findings according to the stage of the disease. However, the US may lead to false-negative results.[9] There are many articles concerning the use of Doppler US and dimercaptosuccinic acid scan (99mTc-DMSA) to diagnose APN and AFBN, but Doppler US has lower sensitivity and specificity. The 99mTc-DMSA scintigraphic technique is highly sensitive and specific for the detection of acute pyelonephritis.[10] It is sensitive as CT but accessibility is an important issue like in our case. Therefore, advanced imaging methods should be used (CT or MRI) in suspicious cases.[11] A wedge-shaped lesion with reduced contrast enhancement is typical in CT.

The most important reason for presenting our case is the accompanying MERS with the reversible lesion of the corpus callosum splenium, which is characterized by transient diffusion restriction in the brain in DW-MRI. Mild encephalopathy/encephalitis with a reversible splenial lesion is an uncommon clinical-radiological entity in the literature.[12] Clinical findings include neurological symptoms such as behavioral changes, changes in consciousness, and seizures.[13] Our case presented with seizures and isolated corpus callosum splenium involvement. In previously reported cases in which AFBN and MERS were found together, an association with hyponatremia has been reported.[5,14] Hyponatremia can occur with UTI and be more serious in patients with AFBN and renal cortical defect in DMSA scintigraphy, as in patients with high white blood cell and CRP levels. Renal tubular dysfunction in UTI may cause a decreased renal tubular response to aldosterone and decreased urinary concentration capacity. Increased interleukin-6 levels cause inappropriate secretion of antidiuretic hormone, thus both syndrome of inappropriate antidiuretic hormone secretion (SIADH) and pseudohypoaldosteronism can cause hyponatremia.[15] Our patient's sodium level was 129 mEq/L at admission.

The pathogenesis of MERS has not been fully explained. Viruses such as rotavirus, measles, human herpes virus 6, Epstein-Barr virus, varicella-zoster virus, mumps, adenovirus, and influenza virus, as well bacteria such as species of *Salmonella*, *Escherichia*, *Listeria*, *Klebsiella*, *Mycoplasma*, *Staphylococcus aureus*, *Enterococcus faecalis*, *Streptococcus pneumoniae*, and group B streptococci are pathogens that may play a role in the etiology.[16] Although no viral or bacterial agents were detected in urine and CSF cultures in our case, *S. warneri* was grown in blood cultures. The most important issue for the treatment is the duration of antimicrobial therapy. We continued treatment with our patient for 21 days. Lesion regression was followed by renal US. During treatment, the pathological signal change disappeared in repeated brain DW-MRI.

CONCLUSION

Acute focal bacterial nephritis should be kept in mind in cases with a toxic appearance, persistent fever, and high levels of acute-phase reactants. There may be no positive urine or US findings. As in pyelonephritis, the first screening method for AFBN is the US. It may miss the diagnosis of AFBN depending on the device and the radiologist. However, when there is no lesion in the US, patients with very high acute-phase reactant levels and significant costovertebral angle tenderness are candidates for CT. Further imaging is needed in suspected cases. Furthermore, patients with neurological signs or symptoms should be evaluated for MERS. Additional case reports are needed to clarify the association between MERS and AFBN.

Informed Consent: An informed consent form was obtained from the patient's family.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – P.E., D.A., E.B., G.E.; Design – G.E., S.A.Ç., D.A.; Supervision – A.Ç., E.B., B.K.D., D.A.; Resources – G.E., S.A.Ç., B.K.D.; Materials – S.A.Ç., B.K.D.; Data Collection and/or Processing – P.E., A.Ç., E.B.; Analysis and/or Interpretation – E.B., S.A.Ç., D.A. Literature Review – P.E., A.Ç., E.B., D.A.; Writing – P.E., G.E., E.B., D.A.; Critical Review – P.E., G.E., A.Ç., E.B., S.A.Ç., B.K.D., D.A.

Declaration of Interests: The authors declare that they have no competing interest.

Funding: This study received no funding.

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