



Figure 1 Abdominal computed tomography without contrast revealed horseshoe kidney surrounded by fat stranding (arrowheads). The fusion occurred at the lower poles. Figure A-D lie from cranial to caudal. Figure E is a coronal view.

dronephrosis, or swollen appendix. Transthoracic echocardiogram revealed mild aortic stenosis and mild mitral regurgitation without findings suggestive of vegetation. SARS-CoV-2 antigen or polymerase chain reaction test was not performed because we did not have any equipment. She was instructed for observation at home with symptomatic treatment under a provisional diagnosis of acute viral infection. The following day, the blood culture obtained in the ED grew Gram-negative rods; therefore, she came to the ED again for re-evaluation. Repeated physical examination showed the same mild abdominal tenderness which was just above the right kidney evidenced by abdominal ultrasonography. Urinalysis revealed slightly cloudy yellow urine with specific gravity of 1.010, PH 5.5, protein 30 mg/dL, 1+ blood, negative glucose, and negative nitrite. Urine microscopy demonstrated 10-19 red blood cells and 50-99 white blood cells per high power field, and trace hyaline casts. There were no granular or cellular casts. Abdominal computed tomography without contrast revealed a horseshoe kidney (HSK) with enlargement of the right kidney surrounded by fat stranding (Fig. 1). She was diagnosed with acute pyelonephritis in the presence of HSK. She was admitted to the hospital and an empirical intravenous antibiotic was initiated. Pansensitive *Escherichia coli* (*E. coli*) grew in both blood and urine culture on day 3. She

completed 2-week antibiotic therapy successfully. Before discharge, she admitted that she had *E. coli* bacteremia with unknown source treated at another hospital 9 months ago.

Discussion

HSK is one of the most common genitourinary anomalies and its prevalence is approximately 0.15% in the general population³. It is U-shaped fused kidney and crosses over the abdominal aorta anteriorly. Though most cases are asymptomatic, urinary tract infection (UTI) occurs in 30-40% of patients³, and the most common presentation is periumbilical pain radiating to the flank⁴ due to its unusual position. In this case, though the patient did not have any obvious history of UTI in her younger days, she had occult *E. coli* bacteremia 9 months prior to this case. Retrospectively, the source of bacteremia might have been urinary tract; however, we overlooked this important preceding episode at the initial visit. In addition, we could not recognize the presence of HSK which was vital for diagnosis at the initial abdominal ultrasound.

Diagnosis of UTI in the elderly is sometimes challenging. Though approximately 5% of annual ED visit by people > 65 years old in the United States is due to UTI³, typical urinary tract symptoms such as dysuria or CVA tenderness are seen in less than a quarter of

them⁵), and nonspecific symptoms such as altered mental status are often observed instead⁵. Besides, asymptomatic bacteriuria is seen in 10% of healthy patients > 70 years old⁶. Based on these facts, it is challenging for physicians to distinguish true UTIs in the elderly from other febrile diseases with asymptomatic bacteriuria.

This case describes an example of diagnostic delay due to two cognitive biases. We unintentionally ignored the disease prevalence (base rate neglect⁷) and missed atypical presentation of common disease (representativeness heuristic⁷). It is difficult for clinicians to predict the existence of undiagnosed asymptomatic congenital malformation, particularly in the ED setting. Consequently, we could easily overlook significant background information associated with disease prevalence and clinical manifestation without awareness. Missed malformation makes clinical presentation seemingly atypical, and its difference from the typical symptoms could result in premature closure, which leads to diagnostic delay. As a reflection for future similar cases, clinicians should be aware that there is more to a patient's medical history than what is given, and that there are hidden histories that even the patient does not know about. Furthermore, depending on the patient's background, we have to reconsider the weighting of the input information obtained and the differential diagnosis thereby obtained. In such situations, analytical type 2 approach⁸, especially consideration from the anatomical or physiological perspectives, should be warranted as well as intuitive type 1 thinking⁸. We should always be careful of atypical presentation of common diseases mimicking rare ones.

Authors' contributions

All authors had access and a role in writing the manuscript.

Conflict of interest

The authors declare no conflict of interest.

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