

Endourology

Gas containing renal stone – case report

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ABSTRACT

Gas-containing stones are extremely rare. The formation of renal stones, including the presence of free gas within the stone, is overall poorly understood. The presence of free gas in the collecting system of the urinary tract indicates emphysematous pyelonephritis, in the absence of prior surgical intervention, gastrointestinal fistula, or urinary bladder catheterization. Here, we present the tenth case of gas-containing renal stones, as detected by computed tomography, and discuss the main diagnostic features to differentiate gas-containing stones from emphysematous pyelonephritis.

Introduction

Gas-containing stones are extremely rare, and to date, only 9 cases have been reported in the literature.¹ Most reported cases have been noted to be associated with recurrent urinary tract infections (UTIs).² Grossly, the stones are observed as having several hollow compartments consistent with gas pockets on imaging.²

Case presentation

We present the tenth case of gas-containing stones in a 32-year-old female patient with no prior surgical intervention or urinary bladder catheterization. The patient presented to the emergency department complaining of right flank pain, microscopic hematuria, and previous history of passing small stones and recurrent UTI. The patient did not have any other significant medical or surgical history. Plain computed tomography (CT) of the kidneys and bladder (Fig. 1) showed 2 × 1 cm radio-opaque stone surrounded by faint high attenuation at the lower pole of the right kidney. Few tiny pockets of air were also observed between the denser part of the stone and the faint peripheral part. Another smaller obstruction stone was noted at the uretero-pelvic junction, causing subsequent moderate hydronephrosis. There was no air within the renal parenchyma or at the ureter as well as the urinary bladder lumen or wall. CT of the abdomen and pelvis in the excretory phase (Fig. 2) revealed a large filling defect at the lower pole of the right kidney, corresponding to the radiopaque stone and the sur-

rounding faint attenuation. In addition, multiple cortical scars were noted. There was no perinephric fat stranding or free fluid. The remaining findings of the study were unremarkable. Urine analysis showed significant increase in the white blood count and the urine culture demonstrated > 100,000 CFU/mL growth of *E. coli*.

Discussion

The presence of free gas in the collecting system of the urinary tract indicates emphysematous pyelonephritis, in the absence of prior surgical intervention, gastrointestinal fistula, or urinary bladder catheterization.³ The formation of renal stone, including the presence of free gas within the stone, is overall poorly understood.⁴ The first case of a gas-containing stone was reported by Simpson et al., in 1998 in a 68-year-old non-diabetic man with a history of ipsilateral untreated uretero-pelvic junction obstruction.² Since then, 9 other cases have been reported.^{1,2} The present case is the tenth such case. UTI appears to play a major role in the development of gas-containing renal stones. All patients reported in the literature, including the presently described patient, had evidence of hydronephrosis at presentation and UTI.²

In the present case, the location of the evident gas, whether within the stone or the collecting system, was difficult to determine because of the stone size and different attenuation of the different components (Fig. 3). However, having the gas adherent to the core of the stone, not in the independent portion, revealed the presence of gas within the stone. Enhanced CT confirmed the location of the stone and despite

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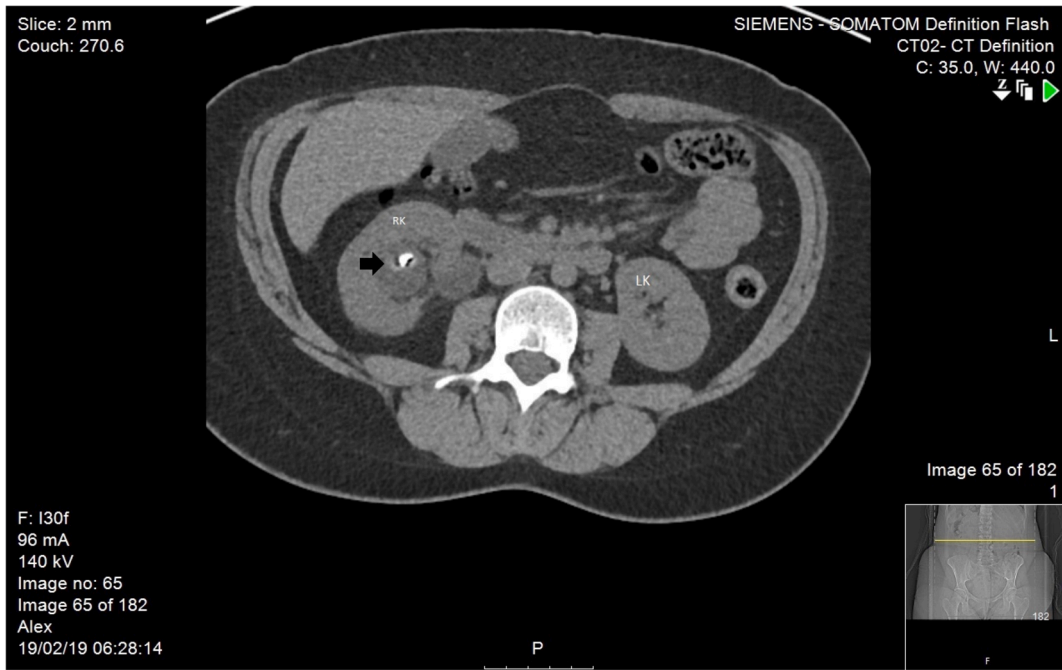


Fig. 1. Axial (A and B) and coronal (C and D) CT scan of the abdomen at the level of the kidneys without IV contrast demonstrating the right kidney (RK) and left kidney (LK). Note the different attenuation of the stone at the right kidney (solid black arrow). The stone showed three different components. The inner core is the densest component (*). The outer cortex of the stone has a fainter intensity (empty white arrow). Multiple air pockets were also observed (solid white arrow). Note the obstructing stone at the pelvis ureteric junction (empty black arrow).

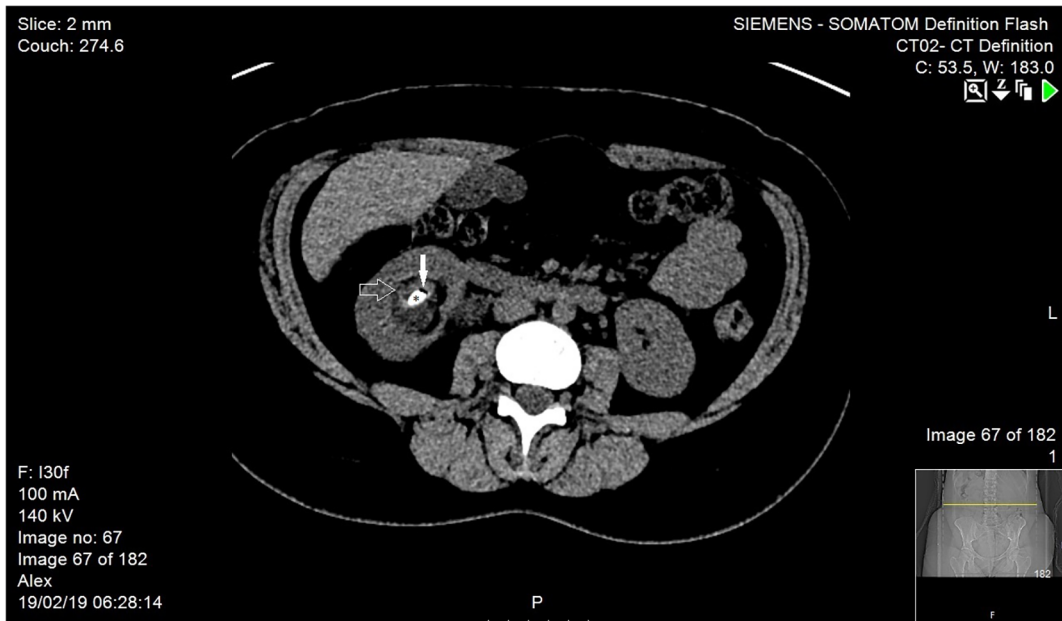


Fig. 1. (continued)

changing the position of the patient from prone to supine, no free gas was observed, which is characteristic of emphysematous pyelonephritis. The absence of perinephric fat stranding and fluid is an important negative finding, which is not the case in emphysematous pyelonephritis.

Conclusion

Gas-containing stones are extremely rare compared to emphysematous pyelonephritis, yet it should be clearly distinguished by performing CT for determining the gas location, mobility, and signs of severe infection.

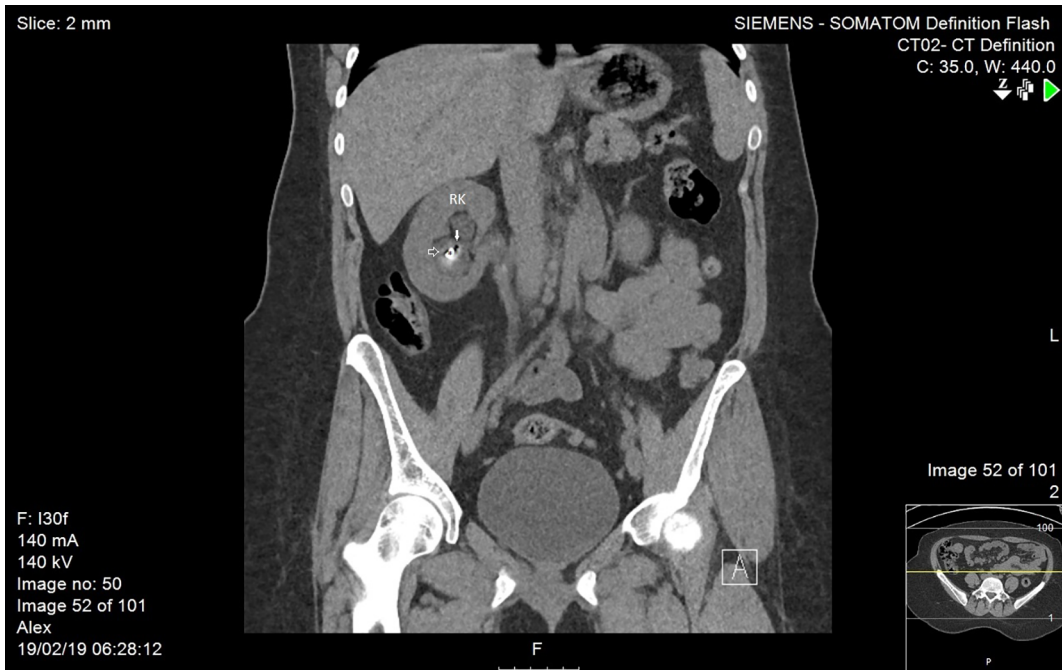


Fig. 1. (continued)



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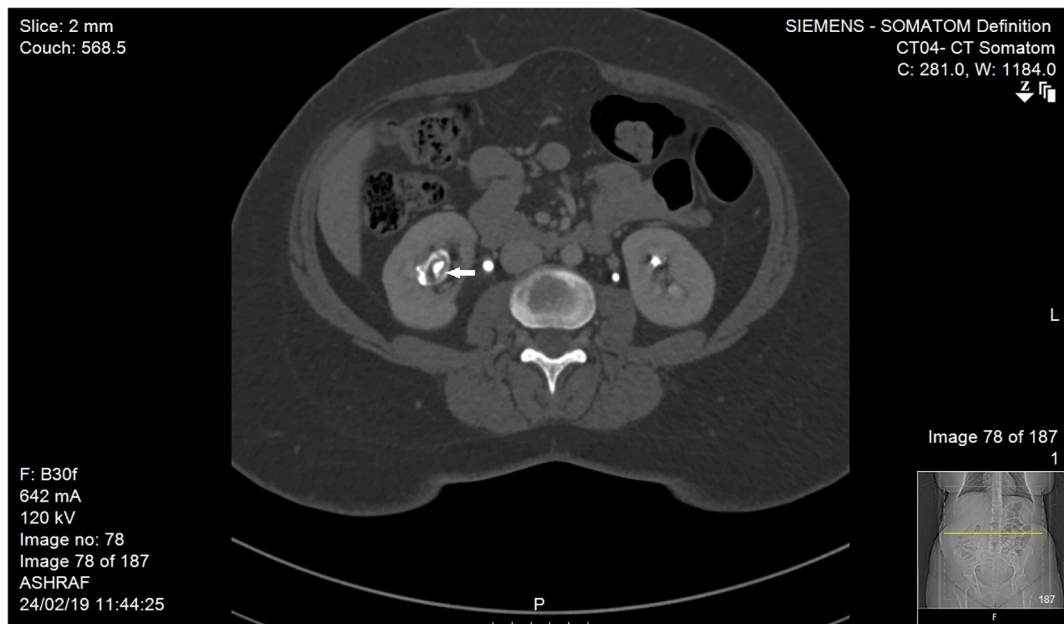


Fig. 2. Enhanced axial (A) CT scan of the abdomen at the level of the kidneys with coronal (B) and sagittal (C) reformats at the excretory phase demonstrating a large filling defect corresponding to the previously described stone (white arrow). An upper cut (D) at the level of the upper pole of the right kidney demonstrating cortical thinning involving the upper pole of the right kidney (solid black arrow) and consistent scarring.

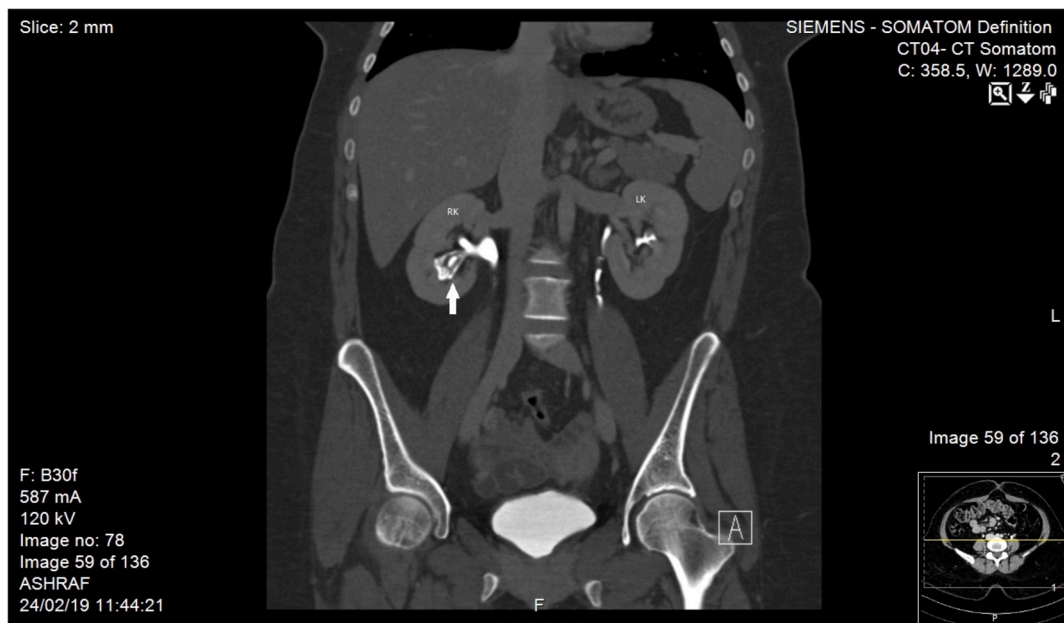


Fig. 2. (continued)



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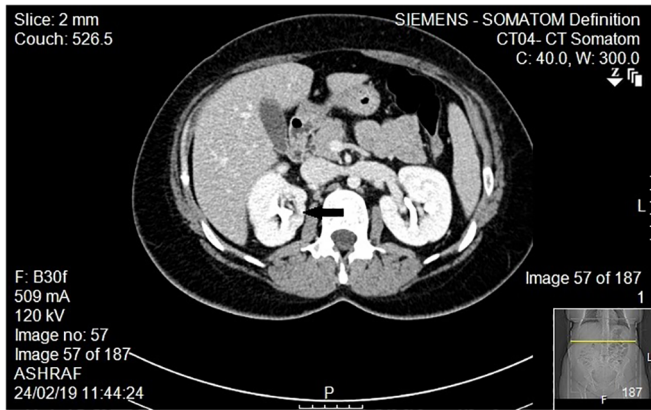


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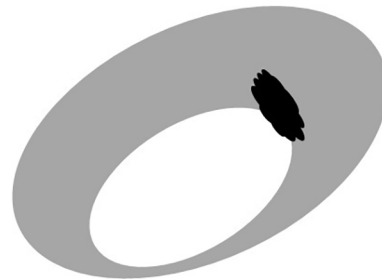


Fig. 3. (continued)

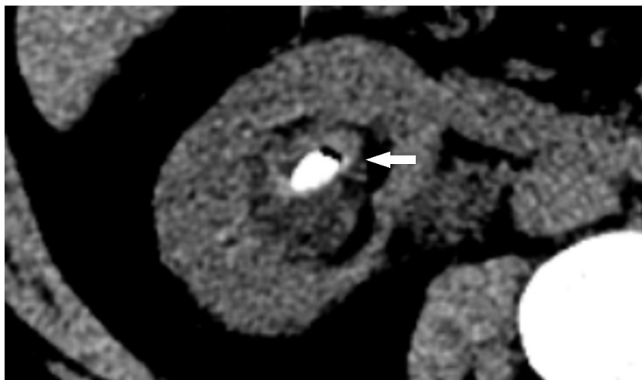


Fig. 3. Magnified view of axial CT scan at the right kidney (a) and a sketch of the stone (b) demonstrating three components (solid white arrow). Note the central core dense component with an adjacent air pocket surrounded by a fainter density stone component.

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