



## CASUISTIC PAPER

Krzysztof Balawender <sup>1,2(ABCD,FG)</sup>, Stanisław Orkisz <sup>1(ABCD)</sup>, Przemysław Biela <sup>1,2(ABFG)</sup>,  
Anna Sęk-Mastej <sup>1(ABFG)</sup>

# A renal abscess in the isthmus of horseshoe kidney

<sup>1</sup> Morphological Sciences Department of Human Anatomy, Medical Faculty, University of Rzeszów

<sup>2</sup> Pope John Paul II Regional Hospital Zamość, Urology Department

## ABSTRACT

Horseshoe kidney (HSK) is the renal fusion anomaly caused by disturbances in embryonic development when the kidneys are fused together in the lower or upper pole forming an isthmus. The most common disorders in urinary tract related to horseshoe kidney are ureteral pelvic junction obstruction, urinary tract infection and urolithiasis. In our study, we present a rare case of an abscess in the isthmus of horseshoe kidney after extracorporeal shockwave lithotripsy on the right kidney was performed. The patient has had recurrent urolithiasis and underwent 4 treatments on the left kidney in the past without complications.

**Keywords.** horseshoe kidney, renal fusion, urinary tract infection, renal abscess

## Introduction

Horseshoe kidney (HSK) is one of the most common renal fusion anomalies. It occurs in approximately 1 of 400 women and occurs twice as frequently in men.<sup>1,2</sup> This abnormality is caused by disturbances in embryonic development. The kidneys are fused at their lower or, more rarely, upper poles.<sup>4</sup> The kidneys are connected by an isthmus formed of either parenchyma (80–85% of cases) or fibrous tissue (15–20%).<sup>2</sup>

There are three anatomical anomalies that characterize HSK: ectopia – the kidneys are located more inferiorly than a normal, malrotation – the renal pelvis is forward facing; vascular changes – the HSK is supplied by additional arteries, originating from the abdominal aorta or the common iliac arteries.<sup>1,4</sup> HSK is associated with certain urinary tract disorders. The most common are ure-

teral pelvic junction (UPJ) obstruction (35%), urolithiasis (20–60%) and infection (27–41%).<sup>2</sup> A rare complication of upper urinary tract infections are purulent lesions of the kidney. In fact, urinary tract infections occur in approximately 30% of patients with horseshoe kidney.<sup>2</sup>

In our work we present a rare case of abscess formation in the isthmus of a horseshoe kidney after performing extracorporeal shockwave lithotripsy (ESWL).

## Case report

A 65 year old patient with recurrent urolithiasis in a HSK came to the emergency room with a fever increasing to 40°C over 3 days. He reported being at 12 days post-ESWL of the right kidney. ESWL were carried out using a Dornier Compact Sigma device with an electromagnetic shock wave generator. During the pro-

**Corresponding author:** Krzysztof Balawender, e-mail: balawender82@gmail.com

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cedure, 3000 pulses with 14.2 J of energy were used with a 1 Hz pulsation frequency. Four successful ESWLs of the left kidney were performed in the patient over the two previous years with no complications. The size of crushed stones in both kidneys did not exceed 10 mm.

In the physical examination at admission there were no significant deviations from the norm. In laboratory studies there was no significant changes except slightly elevated procalcitonin (0.59 ng/ml) and C-reactive protein (10.30 mg/L). Urine culture with  $10^2$  CFUs/mL of *Streptococcus* spp. blood was negative. Transabdominal ultrasonography (TAUS) revealed several 4–6 mm stones in the right kidney and a 5 mm stone in the middle calyx of the left kidney. Abdominal obesity of the patient (BMI 26) and intestinal gases prevented assessment of isthmus using TAUS.

Empirical antibiotic therapy (1500 mg cefuroxime twice a day), painkillers and hydration therapy were initiated on the day of admission.

Due to persistent fever, a CT scan of the abdomen was performed. CT revealed horseshoe kidney (renal merging with each lower pole), with a hypodense area in the isthmus  $38 \times 25$  mm in size, undergoing heterogeneous contrast enhancement, a finding corresponding with abscess formation (Fig.1–2). CT angiography showed supernumerary renal vessels of both kidneys. On the right side two renal arteries and renal veins were visualized, while on the left side early division of the renal artery trunk was observed.

Based on the results of laboratory tests and CT scans, the antibiotic therapy was modified. The patient received 1000 mg of cefotaxime 3 times a day for 7 days and after 3 days, gentamicin 160 mg once a day for four days. Hydration therapy and painkillers were also used. The patient's condition improved as a result of treatment – the pain subsided and the fever abated.

After 4 months, follow-up tests were performed. CT scans show HSK with a few stones, an isthmus areas without contrast enhancement and a total regression of the abscess.



Figure 1. CT scans of the horseshoe kidney

## Discussion

Horseshoe kidney is an asymptomatic developmental anomaly, which is usually detected incidentally during imaging studies performed for other indications.<sup>1</sup> 20–60% of patients develop nephrolithiasis.<sup>2,19</sup> An increased risk of infection is the result of vesicoureteral reflux, urinary obstruction and nephrolithiasis.<sup>1</sup>

The basic diagnostic test to assess nephrolithiasis is TAUS. The limitations of ultrasound as a diagnostic test in HSK include difficult test conditions (for example, obesity) and an isthmus composed of fibrous connective tissue.<sup>1</sup> In the presented case, the density of the isthmus was the same as that of the renal parenchyma. The patient's abdominal obesity (BMI 26) made it impossible to precisely evaluate the isthmus using TAUS.

Digital subtraction angiography, MRI, CT and especially CT- 3D, are considered the best imaging methods for horseshoe kidney.<sup>1,3</sup> In our case, the diagnosis was performed on the basis of enhanced CT.

HSK may be formed by midline fusion (42%) or lateral fusion (58%, with 70% on the left).<sup>4</sup> In the presented case, the horseshoe kidney showed asymmetrical, left-sided fusion of the lateral part of the kidney with the external pelvis of the right kidney. Presumably, this could have caused the complications after ESWL on right kidney, while the 4 previous treatments performed on the left kidney did not cause any complications.

Minimally invasive treatment methods of nephrolithiasis on horseshoe kidney include ESWL, PCNL and RIRS.<sup>17,18</sup>

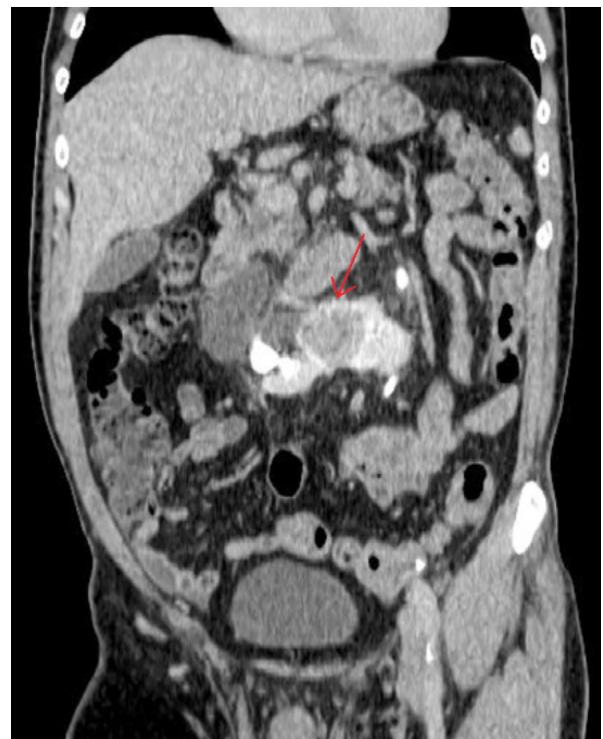


Figure 2. CT scans of the horseshoe kidney

A factor significantly limiting the effectiveness of ESWL and other endourologic treatments is the structure of the renal collective system – this is especially significant in horseshoe kidney. In the case described above, ESWL treatment was effective, stone-free rate (SFR) of the individual treatments based on ultrasound follow-up was high at >60–70%. An alternative to extracorporeal lithotripsy for the treatment of kidney stone disease in HSK is Retrograde intrarenal surgery (RIRS), especially in the case of calculi in the lower pole calyces (SFR for ESWL ranges from 25–95%).<sup>9,14,15</sup>

Urinary tract infections occur in approx. 30% of patients with horseshoe kidney.<sup>1</sup> The most important contributing factors to infection in HSK are reflux disease, stasis and stone formation.<sup>2</sup> Post-ESWL infection affect 7% to 23% of patients.<sup>8,16</sup> Suppurative infections of the kidney are uncommon. Renal abscesses are three time more common in males.<sup>10-12</sup> Another predisposing factor for the development of purulent changes in the kidneys during the course of infection is impaired glucose levels.<sup>5</sup> In our case we observed impaired fasting glucose (118 mg / dL).

Successful treatment of renal abscess requires prolonged intravenous and oral antibiotics while surgical or percutaneous drainage is reserved for non-responders.<sup>10</sup> In our case due to anatomical anomaly of the kidney and atypical localization of abscess the first choice treatment was empirical antibiotic therapy. The duration of antibiotic treatment is determined by the patient's clinical response and the current recommendations are to continue parenteral antimicrobial therapy for at least 24 to 48 hours after clinical improvement and oral antibiotic therapy (an additional two weeks of therapy).<sup>13,20</sup>

## Conclusions

Horseshoe kidney (HSK) is one of the most common renal fusion anomalies. HSK is associated with urinary tract disorders especially urolithiasis and infection. A rare complication of upper urinary tract infections are purulent lesions of the kidney. A renal abscess in the kidney after ESWL is an unusual case with need immediately intervention. Successful treatment of renal abscess requires prolonged antibiotics or surgical percutaneous drainage. In our case due to anatomical anomaly of the kidney and atypical localization of abscess the first choice treatment was empirical antibiotic therapy.

## References

- Natsis K, Piagkou M, Skotsimara A, Protogerou V, Tsitouridis I, Skandalakis P. Horseshoe kidney: a review of anatomy and pathology. *Surg Radiol Anat.* 2014;36(6):517-526.
- Schiappacasse G, Aguirre J, Soffia P, Silva CS, Zilleruelo N. CT findings of the main pathological conditions associated with horseshoe kidneys. *Br J Radiol.* 2015;88(1045):20140456.
- Morelle M, Jaillard A, Bellevre D, Collet G, Petyt G. 18F-FDG PET/CT in Renal Infections. Evidence of Acute Pyelonephritis in a Horseshoe Kidney. *Clin Nucl Med.* 2017;42(2):112-3.
- Taghavi K, Kirkpatrick J, Mirjalili SA. The horseshoe kidney: Surgical anatomy and embryology. *J Pediatr Urol.* 2016;12(5):275-80.
- Gargouri MM, Boulma R, Kallel Y, Chelif M, Rhouma SB, Nouira Y. Conservative management of emphysematous pyelonephritis in a horseshoe kidney. *Afr J Urol.* 2014;20:88-90.
- Blackburne AT, Rivera ME, Gettman MT, Patterson DE, Krambeck AE. Endoscopic Management of Urolithiasis in the Horseshoe Kidney. *Urology.* 2016;90:45-49.
- Blackburne AT, Krambeck AE. Reply to Letter to Editor Re: Endoscopic Management of Urolithiasis in the Horseshoe Kidney. *Urology.* 2016;95:222-224.
- Skolarikos A, Alivizatos G, de la Rosette J, et al. Extracorporeal shock wave lithotripsy 25 years later: complications and their prevention. *Eur Urol.* 2006;50(5):981-990.
- Auge BK, Dahm P, Wu NZ, Preminger GM. Ureteroscopic management of lower-pole renal calculi: technique of calculus displacement. *J Endourol.* 2001;15(8):835-838.
- Rai RS, Karan SC, Kayastha A. Renal and Perinephric Abscesses Revisited. *MJAFI.* 2007;63(3):223-225.
- Yen DH, Hu HC, Tsai J, et al. Renal abscess: Early diagnosis and treatment. *Am J Emerg Med.* 1999;17(2):192-197.
- Patterson JE, Andriole VT. Renal and Perinephric abscesses. *Infect Dis Clin North Am.* 1987;1(4):907-926.
- Dembry LM, Andriole VT. Renal and Perinephric abscesses. *Infect Dis Clin North Am.* 1997;11(3):663-680.
- Srisubat, A, Potisat S, Lojanapiwat B, Setthawong V, Laopai-boon M. Extracorporeal shock wave lithotripsy (ESWL) versus percutaneous nephrolithotomy (PCNL) or retrograde intrarenal surgery (RIRS) for kidney stones. *Cochrane Database Syst Rev.* 2014;24(11):CD007044.
- Donaldson, JF, Lardas M, Scrimgeour D. Systematic review and meta-analysis of the clinical effectiveness of shock wave lithotripsy, retrograde intrarenal surgery, and percutaneous nephrolithotomy for lower-pole renal stones. *Eur Urol.* 2015;67(4):612-616.
- Muller-Mattheis, VG, Schmale D, Seewald M, Rosin H, Ackermann R. Bacteremia during extracorporeal shock wave lithotripsy of renal calculi. *J Urol.* 1991;146(3):733-6.
- Locke DR, Newman RC, Steinbock GS, Finlayson B. Extracorporeal shock-wave lithotripsy in horseshoe kidneys. *Urology.* 1990;35(5):407-411.
- Somani, BK. E33 Outcome of ureteroscopy for stone disease in patients with horseshoe kidney (HSK): Results from a systematic review of literature. *Euro Urol Suppl.* 2013;12(3):29-98.
- Muttarak M, Sriburi T. Congenital renal anomalies detected in adulthood. *Biomed Imaging Interv J.* 2012; 8(1):e7.
- Meng MV, Mario LA, McAinch JW. Current treatment and outcomes of perinephric abscesses. *J Urol.* 2002;168(4 Pt 1):1337-1340.