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African Journal of Urology (2023) 29:15
https://doi.org/10.1186/s12301-023-00346-6

African Journal of Urology

CASE REPORTS Open Access

Retrograde Intrarenal Surgery for Partial Staghorn Calculus in Thoracic Kidney: Case Report

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Abstract

Background Thoracic kidney (TK) presenting with symptomatic urolithiasis is a rare case scenario. Retrograde intrarenal surgery (RIRS) for calculus in TK is not reported in the literature. We report a case of partial staghorn calculus in TK managed by RIRS.

Case presentation A young adult male presented with back pain and was found to have right TK and bilateral partial staghorn calculus. He also had right cryptorchidism with intraabdominally located testis. He underwent staged bilateral RIRS and laparoscopic right orchiectomy. Follow-up ultrasound imaging showed complete stone clearance in both kidneys.

Conclusions RIRS is safe and effective treatment option, in the management of urolithiasis in TK. The anatomical abnormalities in TK did not play any hindrance role in the ureteral access, renal maneuverability of the flexible ureterorenoscope and subsequent drainage of the stone dust after RIRS.

Keywords Thoracic kidney, Ectopic kidney, Diaphragmatic eventration, Partial staghorn calculus, Retrograde intrarenal surgery, Stone dusting

1 Background

Thoracic kidney (TK) is a rare form of renal ectopia [1]. The literature regarding TK is limited to case reports and a few case series. The literature with focus on urolithiasis in TK is even more limited. Case reports on successful performance of percutaneous nephrolithotomy (PCNL) in TK are available [2], but no literature is available regarding the feasibility of retrograde intrarenal surgery (RIRS) in TK. We report a case of partial staghorn calculus in TK managed by RIRS and present the outcome.

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2 Case presentation

A 23-year-old male presented with the complaints of back pain of three months of duration. There were no complaints of vomiting, difficulty in breathing or chest pain. There was no history of respiratory tract infections in the past. There was no history of any surgery or significant trauma in the past. Abdominal examination was normal. The right testis was not palpable in the scrotum, whereas his left testis was palpable in the scrotum and was normal in volume.

CT (Computed tomography) abdomen showed bilateral partial staghorn calculi. Right partial staghorn calculus was measuring 36×20 mm (Hounsfield unit 1340) (Fig. 1a and b), and left partial staghorn calculus was measuring 24×18 mm (Hounsfield unit 1135) (Fig. 1a and c). CT also showed smooth elevation of diaphragm on right side and was suggestive of diaphragmatic

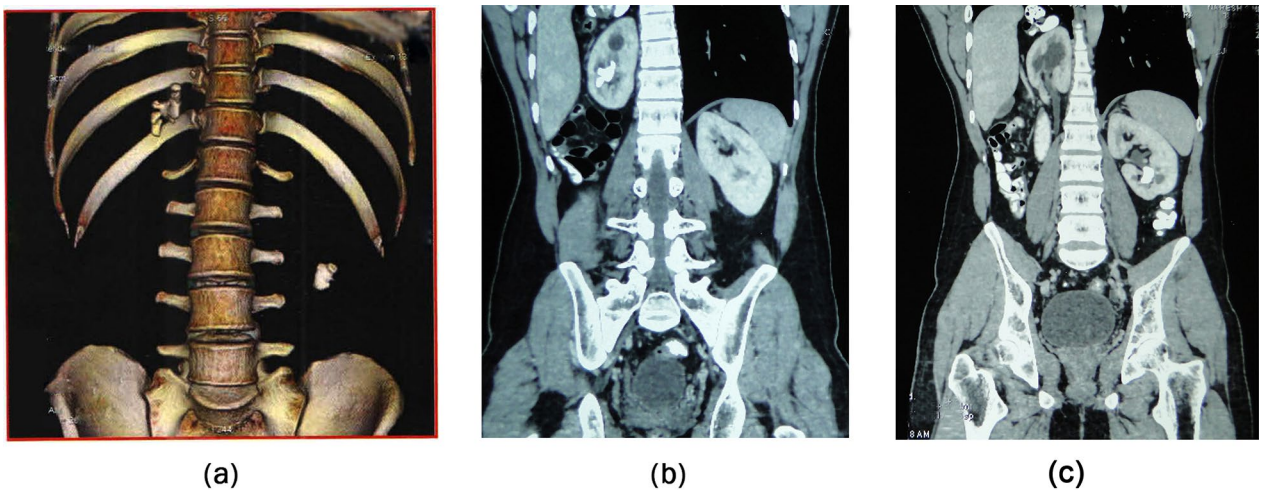

Fig. 1 **a** CT showing bilateral partial staghorn calculus with right partial staghorn calculus located in the thoracic cavity. **b** CT showing partial staghorn calculus in right thoracic kidney. **c** CT showing partial staghorn calculus in orthotopic left kidney

eventration. The right kidney was displaced superiorly with simultaneous upward displacement of right lobe of liver and colon (Fig. 2a). A well-defined soft tissue density structure measuring 23 × 18 mm was noted lateral to and abutting right psoas muscle at L4 level (suggestive of intraabdominal testis in the given case scenario) (Fig. 2b). Mild caliectasis of the upper pole calyces with normal sized pelvis in the right TK was noted (Fig. 2c). The TK

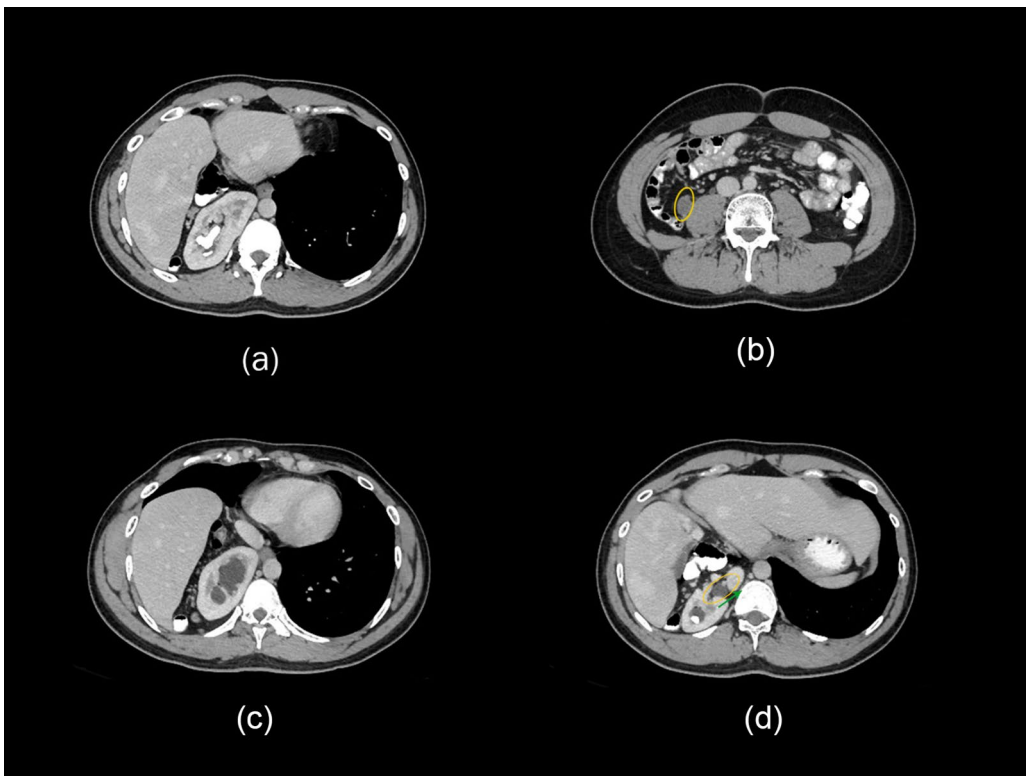

Fig. 2 **a** CT showing superiorly displaced right kidney, liver and bowel loops. **b** CT showing right testis (encircled in yellow) lateral to and abutting right psoas muscle at L4 level. **c** CT showing right thoracic kidney upper pole calyectasis. **d** CT showing malrotated right thoracic kidney with the renal hilum facing anteromedially (hilar structures are encircled in yellow and the direction is shown by a green arrow)

was malrotated, with the renal hilum facing anteromedially (Fig. 2d). Elongated right ureter of TK showed unobstructed drainage in excretory phase of the CT urogram. The left kidney was positioned normally in the renal fossa.

The patient underwent staged bilateral RIRS under general anesthesia. During the first stage, on the normally positioned left renal unit a ureteral stent was placed initially. Afterward, in the thoracic right renal unit, the patient underwent sequential ureteral dilatation and ureteral access sheath placement. RIRS was then performed with flexible ureterorenoscope—Flex-X^{2s} (Karl Storz, Germany) and holmium laser lithotripsy. A 100W high-power holmium/YAG system (Lumenis, Israel) and a reusable 200-µm laser fiber were used. We routinely prefer stone dusting rather than fragmentation, and the partial staghorn calculus was dusted with a laser setting of 0.2–0.4 J energy and 30-40 Hz frequency. The operative time of RIRS in right TK (from the initiation of sequential ureteral dilatation to placement of ureteral stent) was 120 min. After complete dusting, a ureteral stent was placed on the right TK as well (Fig. 3a–e). The surgical technique and principles of RIRS have been explained in detail in the literature [3]. After completion of right RIRS, we proceeded with laparoscopic removal of the right intraabdominal atrophic testis [4]. The postoperative period was uneventful. The histopathology examination of right orchiectomy specimen showed no evidence of testicular malignancy.

The second stage of RIRS was performed 4 weeks after the initial surgery. Initially, diagnostic RIRS was performed on thoracic right renal unit and complete stone clearance was confirmed. Ureteral stent was not replaced on right side. Afterward, we proceeded with RIRS and laser dusting of the partial staghorn calculus in the left renal unit. Ureteral stent was replaced in the left side. The postoperative period was uneventful. The ureteral stent that was placed on the left renal unit was removed after 4 weeks by office flexible cystoscopy under local anesthesia.

An ultrasound of the abdomen and pelvis performed at 6 weeks after left ureteral stent removal (10 weeks after second-stage surgery of RIRS) did not show any residual calculi in either of the kidneys. Additionally, as stone clearance in right TK had already been confirmed by endoscopic visual assessment during second-stage surgery of RIRS, no additional imaging other than ultrasound was performed. The patient is under follow-up for 3 years. He is stone free and he does not have any stone/surgery related symptoms.

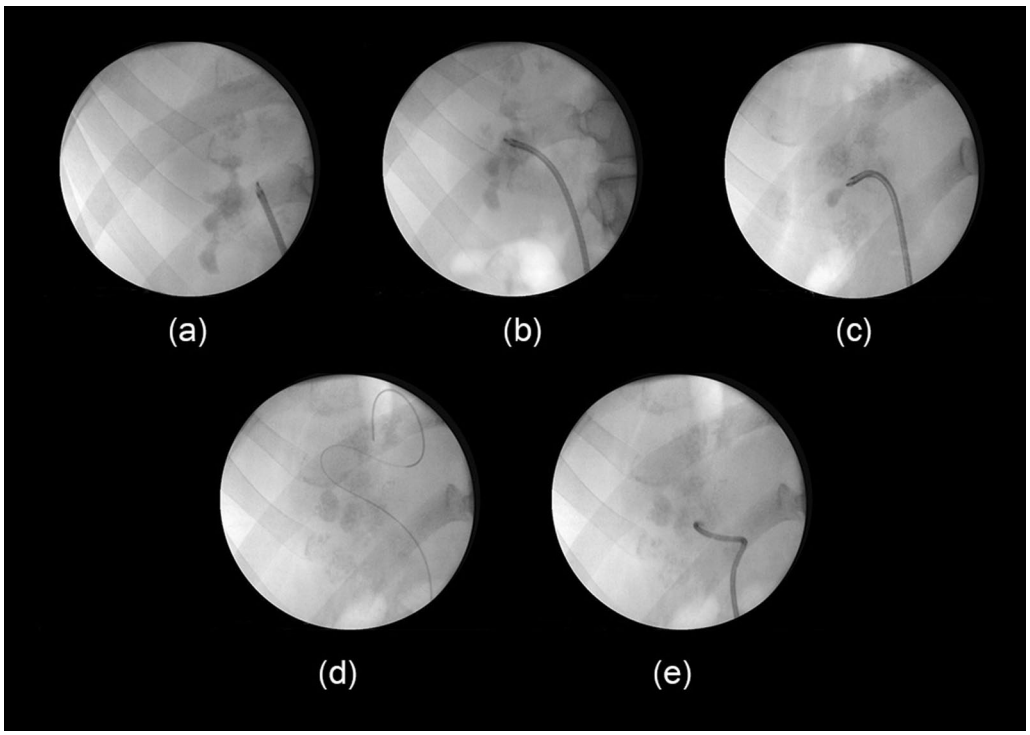

Fig. 3 **a**–**c** Fluoroscopy images showing the flexible ureterorenoscope reaching the desired calyces of right thoracic kidney. **d** Fluoroscopy image showing the placement of guidewire after completion of stone dusting. **e** Fluoroscopy image after ureteral stent placement

3 Discussion

TK can be classified into four categories depending on the cause: True ectopia (normal diaphragm), diaphragmatic hernia, diaphragmatic eventration and traumatic diaphragm injuries [1]. Ours was a case of TK associated with diaphragmatic eventration on the right side. In diaphragmatic eventration, there is no true defect. But due to thinned out and weakened diaphragmatic musculature, the intraabdominal contents are not restrained in the abdominal cavity but displaced upwards into the thoracic cavity. This condition warrants treatment in symptomatic cases, but our patient had no respiratory or gastrointestinal complaints. So, surgical correction of diaphragmatic eventration was not performed for this patient.

We felt performing RIRS in a kidney situated in thoracic cavity with anatomical variations will be safer and easier than performing PCNL. There has been instances in which RIRS could not be performed in TK as the ureter was elongated [2]. Ureteral length was not a problem in our case, and we did not find any difficulty in dilating the ureter and accessing the calculus via the elongated ureter. Despite the malrotated TK, all the calyces could be reached and the calculi could be dusted without much difficulty. The malrotation and malposition of the kidney did not affect the maneuverability of the flexible ureterorenoscope. Also, the elongated ureter did not deter the drainage of the stone dust in the thoracic renal unit. Considering the post-pubertal age of the patient and atrophic status of intraabdominal right testis, we had proceeded with laparoscopic orchiectomy [4].

4 Conclusion

RIRS is a safe and effective treatment option in the management of urolithiasis in the TK. The anatomical abnormalities in TK did not play any hindrance role in the ureteral access, renal maneuverability of the flexible ureterorenoscope and subsequent drainage of the stone dust after RIRS [4].

Abbreviations

CT	Computed tomography
PCNL	Percutaneous nephrolithotomy
RIRS	Retrograde intrarenal surgery
TK	Thoracic kidney

Acknowledgements
Mr Bijoy (visual editor), for editing the photographs. Mr Sarin (operating room nurse) for technical assistance during surgery.

Author contributions
VSV contributed in concept, design, literature search, manuscript preparation and manuscript review. DGP contributed in operating the patient, design, manuscript editing and manuscript review. DMS contributed in manuscript editing and manuscript review. GPA contributed in operating the patient, design, manuscript editing and manuscript review. All authors have read and approved the final manuscript.

Funding
Nil.

Availability of data and materials
Not applicable.

Declarations

Ethics approval and consent to participate
At our institute not needed for this case report.

Consent for publication
Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Competing interests
The authors declare that they have no competing interests.

Received: 10 December 2021 Accepted: 9 March 2023
Published online: 21 March 2023

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