Supine percutaneous treatment of reno-ureteral lithiasis in a tetraparetic patient with scheletal deformity

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Abstract

Patients with skeletal deformities represent a challenge during surgical management of renoureteral lithiasis. We present a case of supine percutaneous treatment in a 24-year-old female with spastic tetraparesis and complex skeletal deformity. A diagnosis of left ureterohydronephrosis caused by a 7mm distal ureteral calculus and 18mm left renal pelvis lithiasis was established. A lower pole ultrasound-fluoroscopy-guided percutaneous nephrostomy tube was inserted into the dilated pyelocaliceal system for the immediate relief of the obstructive nephropathy. Afterwards, a definitive approached with a mid pole puncture was performed. The pyelic stone was removed using a rigid nephroscope and a Swiss lithoclast for stone fragmentation. Then, anterograde flexible ureteroscopy combined with holmium:YAG laser was used in order to approach the ureteral stone for intracorporeal lithotripsy. The fragmented stones were passed down to the bladder by irrigation and a 6 nephroureteral catheter was left in place at the end of the procedure.

Key words: anterograde flexible ureteroscopy, holmium YAG laser, percutaneous nephrolitotomy, renoureteral lithiasis, spastic tetraparesis

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Introduction

Patients with skeletal deformities represent a challenge during surgical management of renal ureteral lithiasis due to respiratory dysfunction and anatomic variations [1]. Here, we present a case of renal ureteral lithiasis in a patient with musculoskeletal anomalies in which a percutaneous antegrade approach was chosen in supine position. The diagnosis and management of this condition are discussed briefly. To our knowledge, this is the only report in which supine percutaneous nephrolithotomy (PCNL) was combined with antegrade flexible ureteroscopy for complete stone removal.

Case report

A 24-year-old female [Fig. 1], weighing 26 Kg and 54 cm in height, with no previous history of urinary lithiasis, was referred to our department with a 5-day history of fever, nausea, and emesis. She also complained of tolerable, left-flank and left-lower quadrant abdominal pain in the past two months. She suffered from hereditary spastic tetraparesis and presented complex skeletal deformity. A complete blood count and serum chemistry profile revealed leukocytosis (14.700/mm$^3$) with neutrophilia (76%) and normal serum creatinine level.

The day before admission, based on ultrasound, plain film radiography and urography (IVU) [Fig. 2], a diagnosis of left ureterohydronephrosis caused by a 7mm calculus lodged in the distal ureter and 18mm left renal pelvis lithiasis was established at a local community hospital. We have completed the imagistic investigations with a 3D computed tomography scan that provided the accurate pelvi-calyceal system anatomy and better calyceal orientation display.

A lower pole ultrasound-fluoroscopy-guided percutaneous nephrostomy tube was inserted into the dilated pyelocaliceal system of left kidney for the immediate relief of the obstructive nephropathy. After this intervention and appropriate antimicrobial therapy, the patient’s symptoms subsided and she decided to undergo a supine PCNL combined with antegrade flexible ureteroscopy for complete stone removal.

After general anesthesia, we were unable to perform standard cystoscopy and retrograde ureteropyelography due to flexed spasticity of his legs that interfered with patient positioning. The pyelocalyceal system was definitive approached with a mid pole puncture of an 18-gauge Chiba needle, using a fluoroscopy-guided access under percutaneous antegrade pyelography (contrast was injected via the nephrostomy tube). The tract was dilated with serial metal Amplatz dilators (MarFlow®, Switzerland) through a guidewire. Following serial telescopic dilatation, a 30 Fr Amplatz sheath was positioned allowing the insertion of a 26 Fr nephroscope [Fig. 3]. Afterwards, rigid nephroscopy was performed. A Swiss lithoclast was used for stone fragmentation and the resulted fragments were extracted by a grasper.

Then, a 0.035 inch guidewire was manipulated down the ureter under fluoroscopic guidance and an access sheath of 12 F is passed over it to allow for safe introduction of the flexible ureteroscope. Anterograde flexible fiberoptic ureteroscopy was performed in order to approach the ureteral stone and holmium: YAG laser (200 µm) was used for intracorporeal lithotripsy. The fragmented stones were passed down to the bladder by irrigation and a 6 Ch internal-external nephroureteral catheter was left in place at the end of the procedure due to difficulties in removing a JJ stent [Fig. 3].
The patient was discharged on the third day after surgery and she returned after seven days for catheter extraction. Upon analysis, the stone was reported as a whewellite-weddellite-apatite stone. No residual fragments were detected in a kidney-ureter-bladder radiograph on the three months postoperatively radiological examination [Fig. 4].

Fig. 3. Pielocaliceal system puncture, antegrade nephrostogram and nephroureteral stent placement

Fig. 4. Postoperative month 3 plain radiography and intravenous urography

Discussion

Traditionally, PCNL has been performed in the prone position as it was thought to be the safest approach to the kidney. In the last years, various modifications of original patient positioning were reported to be safe and effective, including supine [2, 3], reverse lithotomy [4], lateral decubitus [5] and split-leg positions [6]. Although severe skeletal deformity is accepted as one of the few contraindications of PCNL, our technique, using accurate imagistic evaluation of the renal cavities and ultrasound-fluoroscopy-guided puncture in supine position, is a feasible and effective treatment modality for the patients with musculoskeletal anomalies.

3D computed tomography with multiplanar reconstructions surpass a monoplanar IVU, providing the entire pelvicalyceal system anatomy, demonstrating calyceal orientation and the best route of access to ensure complete calculus removal. Spatial relationships are better represented and mentally assimilated permitting discussion between urologist and radiologist on endourological navigation. For the nephrostone tube insertion we have used an ultrasound-fluoroscopy-guided access that helped in increasing puncture accuracy and decreasing radiation exposure for the surgical team and the patients [7]. Then, a percutaneous antegrade nephrostogram provided better delineation of pyelocalyceal system anatomy and helped to definitive approach the mid-calyceal group.

Retrograde ureteroscopy can be substituted in select cases with percutaneous antegrade ureteroscopy. This case illustrates the role of antegrade flexible ureteroscopy combined with the holmium:YAG laser as a minimally invasive, safe, and effective technique for the management of stones in a patient who is unsuitable for retrograde ureteroscopy. Although percutaneous antegrade ureteroscopy has been reported in the past, the supine position was used only in pediatrics for upper and mid ureteric stones [8]. Percutaneous entry into mid-calyceal group allows for a better control of the ureteroscope than that into the lower pole calyx and increases its maneuverability and success. A Ho:YAG laser can fragment stones, regardless of composition and can be used with smaller caliber, flexible instruments. The biggest advantage of the Ho:YAG laser is pulverization of stones such that lesser ancillary procedures like baskets, are not required, leading to shorter operation times [9]. His limited tissue penetration makes it one of the safest lithotripters and a very good tool for treating impacted calculi, with a decreased risk of mechanical mucosal damage by stone fragments compared with other lithotripters.

The key advantage of using an internal-external nephroureteral stent at the end of the procedure is that it can be removed in the clinic, thus not exposing the patient to another anesthetic or cystoscopy for removal, minimizing the patient discomfort. It can also promote drainage, particularly in the face of clot or residual stone fragments.

Ethical approval

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Acknowledgment Statement

This corresponding author certifies that:

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Conflict of interest

None of the contributing authors have any conflicts of interest, including specific financial interests and relationships and affiliations relevant to the subject matter or materials discussed in the manuscript. No funding or other financial support was received.

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