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Case Report

Paediatric cystolitholapaxy using mini PCNL-kit through the Mitrofanoff stoma

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ABSTRACT

Bladder stones are a common complication after augmentation cystoplasty and urinary diversion. However, the treatment of recurrent cystolithiasis in neuropathic children remains a real challenge for urologists and open procedures may be associated with significant morbidity. Currently, mini-invasive management options are available in the therapeutic armamentarium. Herein, we reported a case of Mitrofanoff cystolitholapaxy using a mini PCNL-kit, in a 14-year-old patient with the history of neurogenic bladder due to myelomeningocele managed by bladder augmentation. This technique has been previously described but we have added a unique modification using Nelaton catheter for carefully dilating the Mitrofanoff stoma before inserting an Amplatz sheeth and we report tips and tricks to guarantee a stone free status with one single procedure. Using high energy Holmium laser, this approach is safe and effective even with large stone burden.

1. Introduction

Bladder calculi are a common and recurrent complication after bladder augmentation.

The treatment of cystolithiasis in neuropathic patients with bladder-neck closure poses challenges for the urologist.

In the literature, multiple techniques have been modified and described to reduce complications in patients with long-term bladder management issues.

We report a case of mini-invasive access to a reconstructed bladder and cystolitholapaxy of a large calculi through the Mitrofanoff stoma using a mini PCNL-kit.

This technique has been previously reported [1]. In this case, we describe a unique modification using Nelaton catheter for carefully dilating the Mitrofanoff stoma before inserting an Amplatz sheeth and we cite tips and tricks to guarantee a stone free status.

The patient was discharged stone free after one single procedure.

The report has been arranged in line with SCARE guidelines [2].

2. Presentation of the case

Our case is about a 14-year-old patient with the history of a neurogenic bladder due to myelomeningocele. Since the age of 8 years, he had been complaining from urgency, burning sensation during urination and severe urinary incontinence. Urodynamic investigations have shown a low bladder capacity of 90 mL, inadequate compliance and sphincter incompetence. No functional improvement has been noticed inspite of a well conducted medical treatment. Blood serum analysis has shown a renal function deterioration.

A clam ileocystoplasty and Mitrofanoff formation with bladder neck closure was performed at the age of 9 years. After the procedure, a bladder cystogram revealed an improvement of bladder capacity. The patient achieved a good continence and he did not require a stomal revision.

Currently, the patient was referred by family physician to the Department of Urology, Tahar Sfar Hospital, complaining of bladder discomfort, pelvic pain and difficulty to self-catheterize. He reported recurrent urinary tract infections.

The physical examination revealed flaccid paraplegia with multiple scars on the abdominopelvic region.

A plain abdominal radiograph (Fig. 1A) revealed 4 cm calcification in the area of the bladder.

Then, a CT-scan was indicated to characterize the stone burden and the surrounding anatomy which confirmed the presence of a large calculi measuring 36 *26 mm with an average 802 HU of density. (Fig. 1B).

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Fig. 1a. Plain abdominal radiograph revealing calcification in the area of the bladder.

Fig. 1b. Computed tomography showing a large bladder stone in the coronal plane measuring 36 *26 mm with an average 802 HU of density.

3. Techniques and results

Under general anesthesia, the patient was positioned supine and draped with the Mitrofanoff tract exposed.

The procedure was performed under fluoroscopic control. We used serially Nelaton catheter (10-16Fr) for carefully dilating the channel before inserting a15/16 Fr Amplatz sheeth with an introducer. This trick allowed minimal trauma to the Mitrofanoff tract with minimal disturbance to the mucosal lining. Then, a 12 Fr mini-nephroscope (Karl Storz) was introduced through the Mitrofanoff stoma to visualize the calculi.

We used a Holmium-YAG laser generator with 550 u fiber. The Laser energy was set at 2.0 J with 10 Hz of frequency.

To remove the entire stone burden, the tip of the sheath was angled towards the stone fragments. By using gentle suprapubic pressure whilst withdrawing, the stone fragments were expelled with the irrigant fountain.

Residual fragments were then removed with a zero-tip basket.

Amazingly, we found a surgical metal clip acting as a foreign body nidus for stone formation (Fig. 2). This clip was used probably at initial surgery. No other locations of similar clips were found.

The whole procedure lasted 180 minutes. We did not notice fever or pain in the early postoperative period. Subsequently, the patient was discharged the same day, stone-free, with a Foley catheter.

Third-generation cephalosporin was administrated at induction and continued postoperatively for 5 days.

Stone clearance was confirmed by an abdominal x-ray at the first month after the procedure (Fig. 3).

No damage of the Mitrofanoff ‘s access has been found at follow-up. There have been no leaks, no fistula or difficulties to catheterize the channel.

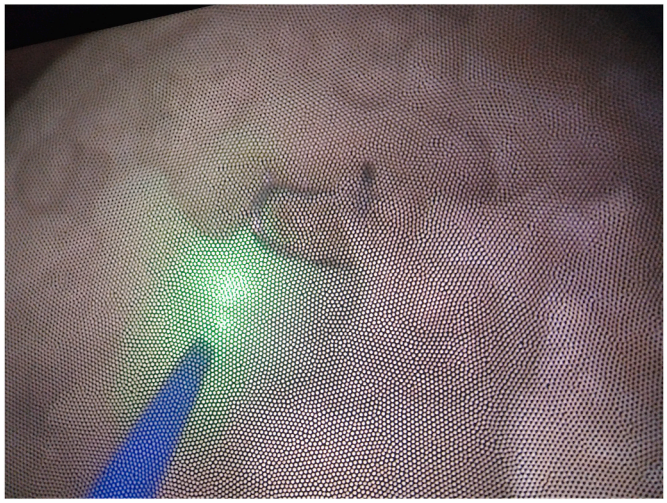

Fig. 2. Endoscopic view demonstrating a surgical metal clip during stone fragmentation by Holmium laser fiber.

4. Discussion

Bladder stones are one of the most common complications seen in patients with bladder augmentation at long-term follow-up. It affects 12%–52% of patients after enterocystoplasty [3]. The mean time to the first formation of calculi varies between 24.5 and 68 months. After the first incidence, the risk of recurrence ranges between 19% and 44% [4].

Frequently, struvite is not the predominant component in the majority of infection-related calculi found in augmented bladders. However, infection is just one feature of lithogenesis ‘s milieu in the augmented patient. There is a high intravesical pressure that may alter

Fig. 3. Stone Free status confirmed by KUB at the first month of follow-up.

the blood flow to the segment of the augmented bowel and then compromise host resistance. Also, urinary stasis and incomplete bladder emptying contribute to potentiate bladder stone formation.

In addition, catheterization through non-dependent access, such as the Mitrofanoff channels, is associated with a higher risk of stone formation [5].

Open procedures for large bladder calculi are technically challenging for multi operated patients due to adherences and difficulties regarding stomal identification.

This problem is compounded if repeat procedures are required as recurrent adhesions may complicate attempts at stone removal resulting in damage to a reconstructed tract.

Open cystolithotomy may also increase morbidity and hospital stay.

Therefore, percutaneous procedures can be a useful option, especially in patients with a closed bladder neck, but, the extravasation of irrigation fluids can occur if the bladder is not adherent to the abdominal wall [6].

In these cases, pre-operative CT-scan provides information about the surrounding anatomy and the characteristics of stones.

Mitrofanoff cystolitholapaxy has been previously described. However, this approach has not been widely reported in the literature. The lack of data is due to concerns about damage to the continence system by instrumentation [7,8]. The earlier case reports have described cystolitholapaxy via Mitrofanoff using a Lawrence Add-a-Cath sheath.

The approach of the stone through the appendix may traumatize the continence mechanism, especially in case of a stenosis of the channel or anastomosis. There are outpatient based procedures, such as flexible cystoscopy has been modified using guide wires to minimize stomal trauma in patients with bladder neck closure [9].

In our case, using an Amplatz sheath as a fixed channel in place across a delicate continence system is a sure protection from repeated instrumentation. Another advantage that this device permits continuous backflow of irrigation and rapid clearance of stone fragments. A larger Amplatz sheath should not exceed 15/16 Fr, which might be less traumatic for the channel but does facilitate extraction of stone fragments and drainage of irrigation fluid.

In this technique, no suprapubic puncture is needed. The full evacuation of fragments was accomplished through the Amlpatz sheath. Then, there is no risk of peritoneal extravasation.

Using a new generation (Karl Storz) nephroscope ensures that bladder pressure remains below the irrigation pressure, and then minimizing the risk of bladder rupture.

The reduced sheath diameter is one major difficulty of stone retrieval. In fact, the 'Vacuum cleaner' showed a good effect on the continuous hydrodynamic clearance of the stone dust.

A 12 Fr nephroscope with round-shaped extremity and an inner sheath diameter of 15 F provide the maximal effect [10]. Currently, the LithoClast Trilogy lithotripter provides faster fragmentation than Holmium laser with a suction extraction. This device proved a high safety in the treatment of large stones [11].

To ensure complete stone clearance, a full inspection of the augment is required.

Combining all these factors is very important for a stone-free status.

We highlight the fact of leaving a small fragment within the augment represents a nidus for lithogenesis and the recurrence rate reaches 38% after a 4-year follow-up in augmentation cystoplasty [12].

Floyd described atraumatic access using a Flexible cystoscope and back loaded Add-A-Cath sheath inserted through the Mitrofanoff stoma [1].

Szymanski et al. compared the risk of recurrence between open cystolithotomy, percutaneous surgery, and endoscopy via urethra or the Mitrofanoff channel. They found no significant difference between all these approaches [13].

A hybrid approach was described using a combination of laparoscopic and endoscopic instruments. In this technique performed in the supine position, a previous suprapubic cystostomy served to obtain percutaneous access under direct vision and to evacuate calculi after fragmentation [14]. Many devices have been used in spina bifida patients to dilate the suprapubic tract and to create bladder access. In fact, Miller described innovative access in the pediatric population using an entrapment device positioned through a suprapubic laparoscopic port [15]. Elder used an endotracheal tube to dilate the tract [16].

To summarize, open cystolithotomy is a good option to treat large stone burdens or multiple calculi.

For recurrent stones, both percutaneous and via catheterizable channel approach are safe options, especially for patients with a closed bladder neck and low-burden stone.

Mitrofanoff cystolitholapaxy is attractive with less morbid than repeated open surgery or percutaneous procedures and requires minimal postoperative analgesia.

Our modification of dilation step using Nelaton catheter is an innovative method to preserve the Mitrofanoff stoma. This modification offers more postoperative comfort and satisfaction for young patients, with inaccessible urethra, generally suffering from psychological pain. A small 15–16 Fr access sheath, acting as a protective mechanism, allows repeated manipulations through the channel, continuous backflow of irrigation and rapid clearance of stone fragments.

Currently, significant work has been devoted for developing combined endoscopic and laparoscopic approach [14].

5. Conclusion

Cystolitholapaxy through the Mitrofanoff channel using mini-PCNL-kit is a safe and effective technique even in high burden stones. This procedure allows complete stone removal with reduced hospital stay and obviates an open procedure.

Provenance and peer review

Not commissioned, externally peer reviewed.

Ethical approval

Nothing to declare.

Patient consent

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.

Authors' contributions

AS wrote and submitted the manuscript. ZM, WZ and AM provided the images and MB reviewed the manuscript. WS and YL contributed to the writing and the reviewing of the manuscript. All authors read and approved the final manuscript.

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Consent

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.

Declaration of competing interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amsu.2021.01.007.

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