Abstract

Background: Urinary stones affect 8%–15% of the world population. In Nigeria, contemporary reports have shown that the incidence of urinary stones is rising. The distal ureter has been described as the most common location of ureteric stones. This study seeks to review our experience in the ureteroscopic management of distal ureteric stones with a view to appraising the stone clearance rate and the complications seen in our patients. Patients and Methods: This descriptive study reviewed the record of 21 patients, who had semirigid ureteroscopy and pneumatic lithotripsy for distal ureteric stone between October 2015 and September 2018. All patients had computed tomography urography preoperatively to locate the stone. Data on patients' demographics, indication for the surgery, location and size of stone, preoperative double-J (DJ) placement, postoperative DJ stent placement, intraoperative and postoperative complications, and status of stone clearance were retrieved and subjected to statistical analysis. Results: The mean age of the patients was 37.95 ± 11.09 (range, 21–67) years. The mean stone size was 8.06 ± 2.87 mm with a range of 4.8 mm–15.0 mm. Out of the 21 patients, 20 (95.2%) had the procedure for recurrent ureteric colic and 1 (48%) was for hematuria. Four (19.0%) patients had DJ stent preoperatively, whereas 17 (81.0%) patients did not have. Fourteen (66.7%) patients had intraoperative ureteric dilatation. Postoperative DJ stent was placed in 17 (81.0%) patients, whereas 4 (19.0%) patients did not have. Three (14.3%) patients had mucosal flap, 6 (14.3%) had mucosal abrasion, 2 (9.5%) had bleeding, 1 (4.8%) patient had transient hematuria postoperatively, and 2 (9.5%) patients had urinary tract infection. Nineteen (90.5%) patients had complete clearance in a single surgery. Two (9.5%) patients had symptomatic residual fragments that required repeat ureteroscopy. Conclusion: Our study has shown that ureteroscopy is a useful and safe technique in the removal of stones in distal ureter.

Keywords: Pneumatic lithotripsy, stones, ureteroscopy

Résumé

Contexte: Les calculs urinaires affectent 8% à 15% de la population mondiale. Au Nigéria, des rapports contemporains ont montré que l’incidence des calculs urinaires augmente. L’uretère distal a été décrit comme l’emplacement le plus courant des calculs urétéraux. Cette étude vise à faire le point sur notre expérience dans la prise en charge urétéroscopique des calculs urétéraux distaux en vue d’évaluer le taux d’élimination des calculs et les complications observées chez nos malades. Les malades et les méthodes: Cette étude descriptive a examiné le dossier de 21 malades, qui avaient une urétéroscopie semi-rigide et une lithotripsie pneumatique pour la pierre urétérale distale entre octobre 2015 et septembre 2018. Tous les malades avaient calculé l’urographie tomographique préopératoire pour localiser la pierre. Les données démographiques des malades, l’indication de la chirurgie, l’emplacement et la taille de la pierre, le placement préopératoire du double J (DJ), le placement du stent DJ postopératoire, les complications peropératoires et postopératoires et l’état de la clairance des calculs ont été récupérés et soumis à une analyse statistique. Résultats: L’âge moyen des malades était de 37,95 ± 11,09 ans (extrêmes: 21–67). La taille moyenne de la pierre était...
INTRODUCTION

Urinary stones affect 8%–15% of the world population. In Nigeria, earlier reports suggested that urinary stones were rare. Contemporary reports have, however, shown that the incidence is rising. Ureteric stones account for 20% of urinary stones. The distal ureter has been described by some authors as the most common location of ureteric stones accounting for 70% of the stones in the ureter. Ureteral stone may present with ureteric colic and hematuria and could be complicated by recurrent urinary tract infection and in the worst case scenario, renal failure.

While extracorporeal shock wave lithotripsy (ESWL) and laparoscopic ureterolithotomy are current operative options for the management of mid and distal ureteric stones, complete stone clearance, cost-effectiveness, and reduced trauma to the ureter have made ureteroscopy a more appropriate first-line choice for many urologists. Indeed, with small semirigid ureteroscope and availability of holmium: YAG laser, ureteroscopy has been increasingly used for the treatment of stones in any location.

Numerous improvements in the design of ureteroscope and the technique of ureteroscopy have combined to increase the safety and success of ureteroscopy as well as reduce serious complications. Complications rates, most commonly ureteral perforation and ureteral stricture, have reduced to <5%.

Currently, ureteroscopy applies four primary techniques for intracorporeal lithotripsy, namely, electrohydraulic lithotripsy, ultrasonic lithotripsy, pneumatic lithotripsy, and laser lithotripsy. Each of these lithotripsy techniques has inherent advantages and disadvantages. The selection of these modalities in a particular setup is dependent on several factors: availability, effectiveness in stone fragmentation, overall complications, and cost benefits are the most important factors.

Pneumatic lithotripsy uses ballistic forces to transfer kinetic energy from the handheld probe to the stone surface. It is cost-effective, and it is effective in the fragmentation of hard stones and therefore widely used. The other advantages of pneumatic lithotripsy are its durability, simplicity, and ability to reuse its components.
dilated the ureter with plastic serial dilator up to 10-Fr with serial plastic dilators. Ureteroscopy was then carried out using size 8/9.8-Fr semirigid ureteroscope (Richard Wolf medical instrument). Stones were fragmented using 0.8-mm pneumatic lithotripter probe (Lithomed) and fragments were removed using triprom forceps. Irrigation was achieved with normal saline mostly under gravity with pressure only increased with pressure bag when vision became poor. The bladder was kept empty throughout the procedure with size 6-Fr feeding tube. In all patients, C-arm (general electric) was used to guide the steps of the procedure where necessary, particularly guidewire insertion, ureteric dilatation, some steps of ureteroscope manipulations, and placement of DJ stents. The principle of ALARA (as low as reasonably achievable) was duly followed, and all theater personnel had adequate protection by wearing lead apron and thyroid shield.

DJ stent was placed where the patient had ureteral complications or when there was excessive manipulation of the ureter.

Foley catheter inserted to rest the bladder at surgery was removed on the first day after the operation before the patient was discharged home. Intravenous antibiotics were given for 24 h postoperative and subsequently oral antibiotics. DJ was removed at 4 weeks. Postoperative analgesia consisted mainly of oral paracetamol.

At follow-up, radiological investigations were tailored to postoperative clinical evaluation of the patients and included plain abdominal X-ray and CT urography. Complete stone clearance was defined as a complete resolution of symptoms that warranted the procedure and absence of stone on radiological evaluation.

**RESULTS**

A total of 31 patients had ureteroscopy and pneumatic lithotripsy during the period under review. Ten patients had the procedure for middle and upper ureteric stones and were therefore excluded from the study. Data from the 21 patients who had the ureteroscopy with pneumatic lithotripsy for distal ureteric stones were analyzed. Of the 21 patients, 16 (76.2%) were male and 5 (23.8%) were female, giving a male-to-female ratio of M:F = 3.2:1. The mean age of the patients was 37.95 ± 11.09 (range, 21–67) years.

The mean stone size was 8.06 ± 2.87 mm with a range of 4.8 mm–15.0 mm. Most (66.7%) of the stones were located distal to the sacroiliac joint, whereas in 4 (19.0%) patients, the stones were located at the inferior border of the sacroiliac joint [Table 1].

Out of the 21 patients, 20 (95.2%) had the procedure for recurrent ureteric colic and only 1 (48%) was for hematuria. Four (19.0%) patients had DJ stent placed preoperatively, whereas 17 (81.0%) patients did not have preoperative DJ stents. Moreover, of the 17 (81.0%) patients who did not have preoperative DJ stent, 14 (66.7%) of them had intraoperative ureteric dilatation to facilitate ureteroscope placement.

### Table 1: The distribution of stones in the distal ureter for the 21 patients

| Location of stone                                    | n (%) |
|-----------------------------------------------------|-------|
| Intramural part of the ureter                        | 3 (14.3) |
| Above the intramural part of the ureter but below the sacroiliac joint | 14 (66.7) |
| At the sacroiliac joint                              | 4 (19.0) |
| Total                                               | 21 (100) |

**DISCUSSION**

The advancement in endourological armamentarium, the downsizing of the ureteroscopes, and increased expertise have combined to push the indications for ureteroscopy to any location in the upper urinary tract, even in most complicated circumstances.[20] The patients in our series were carefully selected to include uncomplicated cases, and their presentations were mainly ureteric colics and hematuria.

Our study revealed a stone clearance rate of 90.5% at first surgery. With open surgery, complete stone clearance defined a successful treatment.[21] However, with the advent of ESWL, ureteroscopy, and percutaneous nephrolithotomy, fragmenting stones and subsequent expulsion of these fragments came into focus.[22] The fragments are described as clinically insignificant...
if they are asymptomatic and <4 mm in size.[23] Depending on the location of stone in the ureter and experience, many authors on semirigid ureteroscopy have demonstrated a stone-free rate of 85%–99%,[24-26] which agrees with our finding. El-Qadhi[26] in a 5-year review of 136 patients who had semirigid ureteroscopy for distal stones recorded a stone clearance rate of 79.4%. His lower stone clearance rate was explained by their initial learning curve, and their stone clearance got better after their first fifty cases.

Ureteral DJ stent placement before ureteroscopy allows the ureter to passively dilate and facilitate passage of ureteroscope.[27-29] In our first few cases, we routinely placed DJ stent to achieve this purpose. This, however, was additional procedure and added cost to the patients. There was also a complaint of stent symptoms. Currently, we now prefer single-step plastic dilatation of the ureter or riding on rail to facilitate ureteroscope placement. We now selectively place preoperative DJ stent where these maneuvers are not possible. Furthermore, 17 (81.0%) of our patients had DJ stent placed postoperatively. DJ stent is thought to decompress obstruction that may result from reactive ureteral edema that may follow ureteroscopy and stone manipulation. Furthermore, it promotes ureteral healing and potentially prevents the risk of ureteral stricture.[30] However, routine placement of DJ stent after ureteroscopy has been challenged in contemporary practice because of its added cost and complications. El-Qadhi[26] advise that DJ is only necessary where there is mucosal damage, ureteral perforation, and stone impaction or high stone burden.

Although semirigid ureteroscopy is a minimally invasive procedure, it has some potential intraoperative and postoperative complications.[31] In our study, we encountered bleeding in 2 (9.5%) patients. The bleeding led to reduced vision but not the termination of the procedure. Geavlete et al.[32] in a retrospective review of 2734 ureteroscopies in a single center between 1994 and 2005 found that only three cases were terminated prematurely due to bleeding leading to poor visualization. They placed DJ stent, and the bleeding resolved postoperatively with no need for blood transfusion. Bleeding, severe enough to lead to termination of ureteroscopy, has been reported in 0.1% and 2.1% of cases.[33-35] We also observed bleeding in 1 (4.8%) patient postoperatively. Again, this was transient and did not require prolonged admission or blood transfusion.

Mucosal abrasion was found in 6 (14.3%) of our patients. Some degree of ureteral mucosal abrasion is inevitable during ureteroscopy and is rarely of clinical significance. Since there is no standard definition of mucosal abrasion, the literature is incomplete and varied in the reportage of this complication. Different authors have reported this complication in 24%, 1.5%, and 6% of their patients.[12,32]

We recorded mucosal flap in 1 (4.8%) of our patient. The procedure was quickly completed and DJ stent left in place. Mucosal flap or false passage may occur when introducing guidewire, ureteroscope, or different working instruments. Geavlete et al.[32] recorded this complication in 2.8% of their patients.

We did not observe ureteral stricture in any of our patients probably because of short follow-up period. Currently, the ureteral stricture is rare. The report in contemporary series is < 0.4%.[32,36-38] Ureteral stricture has been attributed to injury from the instruments used during ureteroscopy, particularly the use of large caliber ureteroscope, and in stone impaction.

The most dreaded complication of ureteroscopy is ureteral avulsion. We did not observe this complication in our patients. In ureteral avulsion, the ureter circumferentially tears apart resulting in total disconnection of the ureter. The most common cause of this is attempted basket extraction of stone or stone fragment too large to safely pass down the ureter.[39] We did not use basket to extract stone in any of our patients. Emergency laparotomy is the rule to rectify this complication.

**Conclusion**

Our study has shown that ureteroscopy is a useful and safe technique in the removal of stones in distal ureter where most stones in the ureter are found.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

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