Ureteroscope-aided Reinsertion of Dislodged Pigtail Nephrostomy Tube Through Collapsed Tract

Shun-Kai Chang[1]#, Bo-Jung Chen[1]#, Yeong-Chin Jou[1]*, Min-Chun Li[1], Pei-Yi Chen[1]

Purpose: To introduce an alternative method for the reinsertion of pigtail catheter for collapsed nephrostomy tract.

Materials and Methods: Between January 2013 and October 2016, a total of ten patients with collapsed nephrostomy tract underwent ureteroscope-aided reinsertion of the pigtail catheter after the failure of manual reinsertion by guidewire. Under local anesthesia, the ureteroscope was inserted through a percutaneous nephrostomy (PCN) opening. The access path was obtained by careful tracing for prior placement of pigtail catheter. The clinical features of these ten patients, including operation time, success rate and complications, were evaluated by retrospective chart review. The Clavien classification was applied to define the grade of complications after one-month follow-up.

Results: Among the ten cases of difficult PCN revision, eight underwent the procedure within 24 hours of the dislodgement. The remaining two patients underwent the procedure within 2 days and 8 days. The period of pigtail tube dwelling ranged from 2 weeks to 10.5 months. The procedure was successful in nine cases and the operation time ranged from 10 to 30 minutes. No fluoroscope was used in any patient. All of the nine patients had a good drainage function after tube reinsertion. Complications occurred only in one patient who had postoperative fever classified as Clavien grade 2.

Conclusion: Reinserting the dislodged pigtail nephrostomy tube with the aid of an ureteroscope is an alternative method that may decrease the necessity of new tract creation.

Key words: dislodgement; kidney; nephrostomy; percutaneous; ureteroscopy

INTRODUCTION

Since 1955, when Goodwin and colleagues published the first therapeutic percutaneous nephrostomy (PCN), there has been a worldwide application of PCN in either relief of urinary obstruction, urinary diversion, access for endourologic procedures, or diagnostic tests[1]. Approximately 10% of the combined major and minor complication rates of PCN insertion with 0.05%–0.3% mortality rate were reported in most publications[2,3]. The incidence of tube dislodgement ranges from 11%– 30% in the months after the procedure[4,5]. Pigtail catheters are the smallest nephrostomy tubes available for urinary drainage or diversion. If a pigtail tube dislodges, it is sometimes too difficult to pass the guidewire through the collapsed tract. These cases are addressed by either performing a radiology-guided nephrostomy tractogram to pass a guidewire or a renal puncture for new PCN creation. In order to reinsert the dislodged nephrostomy tube through the original tract, a novel method was used at our hospital. Ureteroscopy was performed to identify the missing tract for replacement of the pigtail catheter. This procedure may significantly decrease the necessity of new PCN creation and hence could diminish the complications of PCN. The aim of this study is to evaluate the efficacy and outcome of performing ureteroscope-aided reinsertion through the collapsed tract in patients with PCN tube dislodgement. To our knowledge, this method has never been reported in the literature before.

MATERIALS AND METHODS

Study Population

Between January 2013 and October 2016, 10 patients underwent ureteroscope-aided pigtail catheter reinsertion after the manual reinsertion of a new catheter into the collapsed tract failed. The study procedures were well explained to each patient and informed consent was obtained. The institutional review board of Chia-Yi Christian Hospital approved this study.

Inclusion and Exclusion Criteria

Patients with PCN tube dislodgement underwent tract re-establishment by a straight tipped guidewire and dilating sheath. Patients with failed PCN tube reinsertion subsequently received ureteroscope-aided reinsertion and were enrolled in this study.

Procedures

The patients lay in a prone or decubitus position initially without any anesthesia. Lidocaine (2%) instillation into the PCN tract was given to patients who indicated feeling pain during the procedure. All ten patients had

[1] Department of Urology, Ditmanson Medical Foundation Chia-Yi Christian Hospital, Chia-Yi, Taiwan.

*Correspondence: Department of Urology, Ditmanson Medical Foundation Chia-Yi Christian Hospital, Chia-Yi, Taiwan.

Tel: +886-5-2765041. Fax: +886-5-2774511. E-mail: b729@cych.org.tw.

# Shun-Kai Chang and Bo-Jung Chen contributed equally to this manuscript

Received November 2017 & Accepted February 2018

Table 1. Patients' demographics and clinical characteristics

Case	Gender (Female/Male)	Age (years)	Etiology of PCN	PCN Size (French)
1	Female	64	Retroperitoneal leiomyosarcoma invasion to kidney	8
2	Female	81	Ureteral stone	8
3	Female	63	Ureteral stricture	8
4	Male	85	Bladder cancer invasion to UVJ*	8
5	Male	83	Ureteral cancer	10
6	Male	85	Bladder cancer invasion to UVJ	8
7	Female	81	Ureteral stone	8
8	Female	81	Post-radiotherapy ureteral fibrosis	8
9	Female	56	Cervical cancer related	8
10	Female	82	Ureteral stone	8

Abbreviations: PCN, Percutaneous Nephrostomy; UVJ, Ureterovesical Junction

received ultrasound guided PCN drainage with an 8 or 10 F catheter for the relief of urinary tract obstruction. At the beginning of the procedure, we introduced a 6.5 F (Richard Wolf, Germany) semi-rigid ureteroscope into the PCN cutaneous orifice. The access tract was dilated with the infusion of irrigation fluid, and this allowed us to advance the ureteroscope. We approached the renal pelvis with the ureteroscope by careful tracing or in some cases, with the aid of the soft end of a straight guidewire (Angiotech, Denmark) for the tortuous tract (**Figure 1**). After reaching the renal pelvis, we inserted the guidewire in preparation for the subsequent insertion of a new pigtail catheter. No fluoroscope or ultrasound was used as access guidance throughout the whole course of the procedure. After completing the procedure, we checked the drainage patency by irrigation with normal saline. Subsequent KUB was done to confirm the position of the catheter. Cephalexin was prescribed as a prophylactic antibiotic for 3 days following the procedure.

Evaluations

Patient demographics, the cause of PCN, time from PCN creation to dislodgment and dislodgment to procedure, operation time, and postoperative complications were analyzed by a retrospective chart review. The operation time was measured as the time from the completion of surgical site draping to the end of the pigtail tube reinsertion. Postoperative complications were defined as the incidence of any complication within the first month after the procedure. Complications were classified into five grades using Clavien–Dindo classification.

Statistical Analyses

Continuous variables are presented as numbers, whereas the categorical data are presented as means ± standard deviations (SD). SPSS 21.0 was used to perform all statistical analyses.

RESULTS

The mean age of the ten enrolled patients was 76.1 ± 10.73 years (56–85 years); three were male and seven were female. The demographic and clinical characteristics of the enrolled patients are shown in **Table 1**. All the dislodgement events were attributed to accidental pulling. The reasons for PCN catheter insertion included ureteral stones in three patients, ureteral strictures in two patients, and cancer in five patients. The average period elapsed since PCN catheter placement was 5.05 ± 3.73 months (2 weeks–10.5 months). Eight patients received the ureteroscope-aided reinsertion procedure within 24 h after the pigtail nephrostomy tube had been dislodged. The others received the procedure 2 days and 8 days post dislodgement. The time to procedure, operation time, and procedure results are presented in **Table 2**. Upon ureteroscopy inspection, an epithelized access tract was found in most patients. The access tract was usually obscured at the level of the external oblique muscle. Gentle probing with guidewire was used to discover the lost tract. The diameter of the ureteroscope is smaller than that of the access tract; therefore, the excess irrigation fluid usually leaks outside the access tract without significant increase in the pressure of the collecting system. The mean operative time was 21.5 ± 7.09 min with a range of 10–30 min.

In nine of the ten patients (90%), pigtail nephrostomy tube was successfully reinserted with the aid of a ureteroscope. The one failed case was because of the inability to identify the concealed tract in the midway of fascia level. Subsequently, a renal puncture with new PCN creation under ultrasound guide was performed for this patient. During the 1-month postoperative follow-up, the new inserted pigtail functioned well in all patients

Table 2. Results of ureteroscope-aided reinsertion

Case	PCN Creation to Dislodgment (months)	Dislodgment to Procedure (h)	Operation Time (min)	Result	Complication
1	0.5	< 24	25	Success	Nil
2	9.5	48	30	Success	Nil
3	1	< 24	20	Failure	Nil
4	5	< 24	20	Success	Nil
5	5	< 24	20	Success	Nil
6	2	< 24	15	Success	Fever
7	10	192	10	Success	Nil
8	4	< 24	30	Success	Nil
9	3	< 24	30	Success	Nil
10	10.5	< 24	15	Success	Nil

Abbreviations: PCN, Percutaneous Nephrostomy

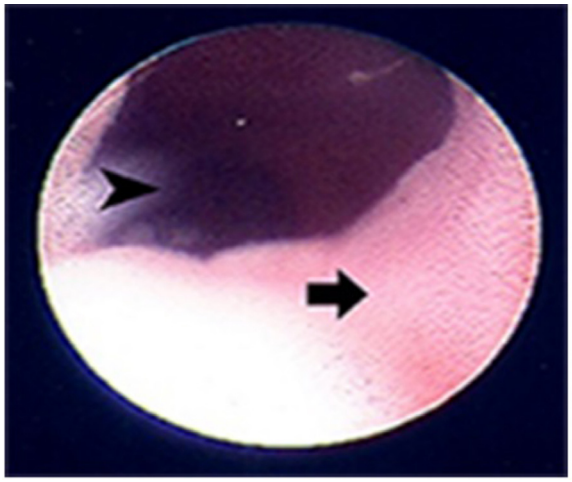

Figure 1. A well-epithelized tract can usually be identified during ureteroscope inspection. (Arrow: epithelialized tract, Arrowhead: renal pelvis)

and only one patient developed postoperative fever 1 day after the procedure. This patient received intravenous antibiotic treatment and recovered well without any sequelae. The postoperative complication was fit with Clavien grade 2, defined as requiring pharmacological treatment with drugs other than such allowed for grade 1 complications[6]. There were no procedure-related complications among the rest of nine patients.

DISCUSSION

PCN is an interventional procedure that is widely used for the drainage of the obstructive upper urinary tract. Catheter-related complications, such as obstruction, infection, and dislodgement, are common[7,8]. In cases of dislodged nephrostomy catheters where passing the guidewire into the collecting system fails, revision may involve having the radiologist perform nephrostomy tractogram to access tract restoration or to create a new access tract. However, an emergency radiologist consultant is not always available to perform catheter reinsertion immediately after catheter dislodgement. Delays in PCN reinsertion may increase the risk of urinary tract infection because of urine retention in the collecting system and decrease the success rate for catheter reinsertion because of tract distortion or healing. The recreation of a new access tract is a more invasive procedure and will carry the risk of major complications. The major complications of PCN placement include hemorrhage, vascular injury, sepsis, bowel transgression, and pleural complications[2]. The rate of major complications was 1.6%–6% in the literature[5,9], whereas that of minor complications was 11%–25 %[5,9]. Ureteroscope-aided catheter reinsertion is a simple modification that the endourologist can perform without the necessity of X-ray exposure. It can also be done promptly after the patient's visit.

In this study, we used 6.5 F ureteroscopes to reinstate the access tract with a high success rate (90%) equivalent to that of tract revision by tractogram performed by the radiologist Felipe et al[10]. They reported 25 cases of reinsertion of PCN tubes with a success rate of 88% when performed within the first 48 h after dislodgement. The procedure in our study is also timesaving and the mean procedure time was only 21.5 min.

Longer PCN catheter indwelling time implies a mature access tract, which will theoretically increase the success rate for the reinsertion of the dislodged catheter. The catheter indwelling time of the patient whose ureteroscope-aided catheter reinsertion failed in the present study was only one month. The access tract heals after the dislodgement of the catheter; a shorter interval between dislodgement and reinsertion increases the success rates of catheter reinsertion. Most patients in our study received the procedure within 24 h after the pigtail nephrostomy tube dislodged. One patient successfully underwent the procedure 2 days after dislodgement; another one had a successful procedure more than one week after dislodgement. On account of the limited number of cases, whether the catheter indwelling time after PCN creation and dislodgement interval may influence the successful rate of replacement needs to be further studied.

The morbidity in this case series was very low. Only one patient experienced transient fever after the procedure. Long-term catheter indwelling tends to harbor bacteria cloning[11,12] in the collecting system and irrigating infusion during ureteroscope manipulation carries a high risk of urinary tract infection. The low infection rate in this report is possibly because of the caliber of the scope being rather smaller than the diameter of pre-existed tract and the infused fluid spilling toward the opening of the access tract. Such an open irrigation system does not increase the hydrostatic pressure in the collecting system, and this might increase the risk of bacteria backflow.

The advantages of the ureteroscope-aided reinsertion technique include its relative simplicity such that it can be performed easily by the endourologist. It is a highly effective procedure that can be done under local or no anesthesia, and it can be done on an outpatient basis. Nonetheless, there are some limitations and constraints in our study. First, our study had a retrospective nature and was based on a relatively small sample size. Second, in the era of mini-perc for percutaneous renal surgery, many percutaneous procedures can be done by mini nephroscopy with safety and efficacy[13,14]. Whether mini nephroscopy affects the outcomes of the procedures for the restoration of collapsed tract is undetermined in the present study because the mini nephroscope system is not available at our hospital.

CONCLUSIONS

Ureteroscope-aided reinsertion of dislodged PCN through a collapsed tract has a similar success rate compared with that of tractogram-aided catheter reinsertion without an increase in the morbidity. The potential advantages of this modification include that it may be performed by the endourologist soon after the patient's visit, and this would allow an increase in the success rate and preventing the sequels of urinary tract obstruction. It may also decrease the requirement of a new PCN creation, which carries a high risk of major complications. It may be an alternative method for the urologists to manage patients with collapsed tract after the dislodgement of the pigtail PCN catheter.

ACKNOWLEDGMENT

We would like to acknowledge Dr. Ian-Seng Cheong for assistance with statistical analyses.

CONFLICT OF INTEREST

The authors report no conflict of interest.

REFERENCES

1. Dagli M, Ramchandani P. Percutaneous nephrostomy: technical aspects and indications. Semin Intervent Radiol. 2011; 28:424-37.
2. Ramchandani P, Cardella JF, Grassi CJ, et al. Quality improvement guidelines for percutaneous nephrostomy. J Vasc Interv Radiol. 2003; 14:S277-81.
3. Zagoria RJ, Dyer RB. Do's and don't's of percutaneous nephrostomy. Acad Radiol. 1999; 6:370-77.
4. Farrell TA, Hicks ME. A review of radiologically guided percutaneous nephrostomies in 303 patients. J Vasc Interv Radiol. 1997; 8:769-74.
5. Lee WJ, Patel U, Patel S, Pillari GP. Emergency percutaneous nephrostomy: results and complications. J Vasc Interv Radiol. 1994; 5:135-9.
6. Dindo D, Demartines N, Clavien PA. Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg. 2004; 240:205-13.
7. Lewis S, Patel U. Major complications after percutaneous nephrostomy—lessons from a department audit. Clin Radiol. 2004; 59:171-9.
8. Radecka E, Magnusson A. Complications associated with percutaneous nephrostomies: A retrospective study. Acta Radiol. 2004; 45:184-8.
9. Karim R, Sengupta S, Samanta S, Aich RK, Das U, Deb P. Percutaneous nephrostomy by direct puncture technique: An observational study. Indian J Nephrol. 2010; 20:84-8.
10. Collares FB, Faintuch S, Kim SK, Rabkin DJ. Reinsertion of accidentally dislodged catheters through the original track: what is the likelihood of success? J Vasc Interv Radiol. 2010; 21:861-4.
11. Tenke P, Riedl CR, Jones GL, Williams GJ, Stickler D, Nagy E. Bacterial biofilm formation on urologic devices and heparin coating as preventive strategy. Int J Antimicrob Agents. 2004; 23:67-74.
12. Jones SR, Smith JW, Sanford JP. Localization of urinary-tract infections by detection of antibody-coated bacteria in urine sediment. N Engl J Med. 1974; 290:591-3.
13. Jackman SV, Docimo SG, Cadeddu JA, Bishoff JT, Kavoussi LR, Jarrett TW. The "mini-perc" technique: a less invasive alternative to percutaneous nephrolithotomy. World J Urol. 1998; 16:371-4.
14. Kirac M, Bozkurt ÖF, Tunc L, Guneri C, Unsal A, Biri H. Comparison of retrograde intrarenal surgery and mini-percutaneous nephrolithotomy in management of lower-pole renal stones with a diameter of smaller than 15 mm. Urolithiasis. 2013; 41:241-6.