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Percutaneous Retrieval of Internal Double-J Ureteral Stents Using a Snare

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ABSTRACT

Objective: In this paper, we aim to report our experience in percutaneous ureteral stent retrieval using a loop snare under fluoroscopic guidance and to assess the efficacy and safety of the method.

Materials and Methods: Between February 2009 and December 2016, electronic records of the patients who underwent percutaneous ureteral stent retrieval were reviewed. A total of 12 patients (8 males, 4 females; age range, 6 months–75 years; mean age, 39.71±32.3 [standard deviation] years) were included in the study. A loop snare was used to retrieve the ureteral stent from the calyx, renal pelvis, and upper or distal ureters via the vascular sheath. The stent retrieval was performed for endoscopic failure (n=5), proximal stent migration (n=3), early occlusion of the stent (n=2), and stent fragmentation (n=2). A complete percutaneous removal of the ureteral stent with the snare was considered a technical success.

Results: Our technical success rate was 100%. There were no major complications. One patient (8.3%) had minor hematuria that resolved spontaneously.

Conclusion: Percutaneous ureteral stent retrieval using a loop snare under fluoroscopic guidance is a safe and effective procedure, especially when the cystoscopic removal has failed and stent-related complications occurred.

Keywords: Stents, ureter, fluoroscopy, percutaneous nephrostomy

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INTRODUCTION

Ureteral stents have been widely used to provide urinary drainage in both malignant and benign conditions (1, 2). Internal double-j ureteral stents have many advantages over external nephroureteral stents and nephrostomy catheters; there are no external components that may adversely affect patient comfort, or cause skin infection and catheter displacement. The primary benefit of a double-j ureteral stent is maintaining the normal route for urinary drainage (2).

Double-j ureteral stents should be replaced periodically, due to an increased risk of stent encrustation with indwelling time (3). Also, they should be exchanged if stent-related complications occur, such as an occlusion, migration, fragmentation, and infection. Conventionally, the indwelling ureteral stents are retrieved via the retrograde transurethral (cystoscopically) route under the guidance of cystoscopy or fluoroscopy (2, 4). In some cases, the transurethral way may be impossible because of proximally migrated or fragmented stents. Ureterovesical strictures due to surgery also make the transurethral approach unfeasible. Percutaneous ureteral stent retrieval is an alternative technique used for the management of these patients. A variety of techniques and materials have been utilized for percutaneous ureteral stent removal, such as forceps, snare, basket, and dedicated stent removal devices (5–9).

In this paper, we aim to report our experience in percutaneous retrieval or exchange of internal double-j ureteral stents using a loop snare under fluoroscopic guidance.

MATERIALS and METHODS

Technical Aspects

This study was approved by our Institutional Research Ethics Board (2017/483), and it included a retrospective review of the medical records of the patients who underwent percutaneous ureteral stent retrieval between February 2009 and December 2016, which were obtained from the interventional radiology division database.

The demographic data, indications for the procedure, and technical details of the procedure and post-procedural complications were collected from the relevant records retrospectively. Technical success was accepted as com-

plete removal of a ureteral stent percutaneously with the snare. Major complications were defined as those requiring prolonged hospitalization or further treatment, and according to the Society of Interventional Radiology guidelines, minor complications were defined as spontaneous recovery (10).

Methodology Results

The patients and/or their relatives gave their informed consent. All procedures were performed with fluoroscopy guidance under intravenous sedoanalgesia or intravenous sedation, and local infiltration anesthesia was used as well. We used previously placed nephrostomy catheters in some patients (n=2), while percutaneous nephrostomy catheter placement was performed in others (n=10). We used a nondilated 6-French (F) (n=1), 8-F (n=10), and 10-F (n=1) percutaneous nephrostomy route for the procedure (Table 1).

Initially, a conventional nephrostogram was performed in all patients. A small guidewire was inserted into the calyx or renal pelvis, and nephrostomy catheter was replaced with a vascular introducer sheath (Super Arrow-Flex percutaneous sheath, Teleflex Medical, Athlone, Ireland; and Zyron introducer sheath, Zoersel Antwerpen, Belgium). We used a 5-F (n=1), 8-F (n=4), 9-F (n=6), and 10-F (n=1) introducer sheath for stent retrieval. Retrieving of the ureteral stent from the calyx, renal pelvis, and upper or lower ureter via the vascular sheath was performed by a loop snare. We grasped the pigtail part or shaft of the stent with the snare (SeQure Snare system, Lifetech Scientific, Shenzhen, China) under fluoroscopic guidance. The stent was then withdrawn through the sheath. The snare and the stent were removed together via the sheath; however, before completely removing the stent, a guidewire was left in the collecting system to place the nephrostomy catheter and/or a new ureteral stent. The sheath was removed in the end. After the removal of the stent, when indicated, a new stent was inserted at the same session (n=8) (Fig. 1). We performed balloon dilatation of the ureteral stricture using an angiographic balloon dilatation catheter through the same route when necessary. At the end of all procedures, we placed a nephrostomy catheter to prevent urine stasis and bleeding, and control antegrade nephroureterography was conducted via the nephrostomy catheter to check for urine leakage.

Table 1. Procedure details

Patient no	Previous nephrostomy	Nephrostomy route	Introducer sheat	Removal or exchange
1	None	6 F	6 F	Removal
2	None	10 F	10 F	Exchange
3	None	8 F	9 F	Exchange
4	None	8 F	9 F	Removal
5	Available	8 F	9 F	Exchange
6	None	8 F	9 F	Exchange
7	Available	8 F	8 F	Exchange
8	None	8 F	8 F	Exchange
9	None	8 F	9 F	Removal
10	None	8 F	8 F	Removal
11	None	8 F	9 F	Exchange
12	None	8 F	8 F	Exchange

RESULTS

This study included 12 patients (8 males, 4 females; age range, 6 months–75 years; mean age, 39.71±32.3 [standard deviation] years). The majority of patients were referred by urologists and pe-

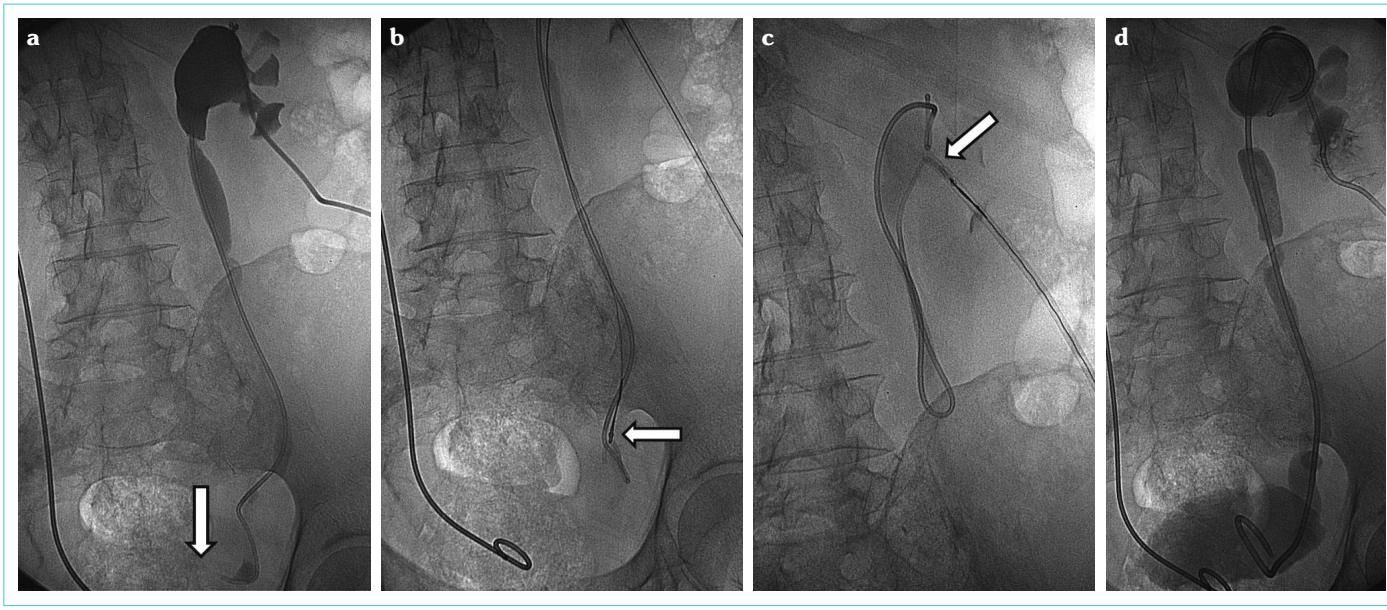

Figure 1. a–d. **A 62-year-old male patient with prostate cancer examined for a regular 3-month ureteral stent exchange and referred by a urologist after an unsuccessful stent revision on the left side. The stent was proximally migrated, and there was stricture on the left ureteral orifice. First, a nephrostogram was performed; there was proximal stent placement, and contrast did not reach the bladder (arrow, a). Then, a loop snare was inserted through the vascular introducer sheath, the pigtail part of the stent was grasped by the loop of the snare, and they were removed together (arrows, b and c). Finally, following dilation of distal ureteral stricture, a new double-j ureteral stent was successfully placed, and a nephrostomy catheter was retained (d)**

Table 2. Patients' characteristics and stent indwelling times

Patient no	Gender	Age	Primary disease	Antegrade ureteral stent retrieval indication	Stent indwelling times
1	Male	2 years	Nephrolithiasis	Stent fragmentation	7 months
2	Male	75 years	Bladder cancer	Endoscopic failure	5 months
3	Male	64 years	Prostate cancer	Proximal stent migration	12 months
4	Female	2 years	Vesicoureteral reflux	Stent fragmentation	3 months
5	Female	56 years	Endometrial cancer	Early occlusion of stent	2 days
6	Male	69 years	Prostate cancer	Proximal stent migration	6 months
7	Male	72 years	Prostate cancer	Early occlusion of stent	2 days
8	Male	6 months	Ureteropelvic junction stricture	Endoscopic failure	46 days
9	Female	9 years	Vesicoureteral reflux	Endoscopic failure	32 days
10	Female	5 years	Vesicoureteral reflux	Proximal stent migration	42 days
11	Male	56 years	Bladder cancer	Endoscopic failure	8 months
12	Male	66 years	Bladder cancer	Endoscopic failure	26 days

diatric surgeons to our Interventional Radiology Department after an ineffective transurethral attempt. All patients were hospitalized at least 1 day before and after the procedure for routine clinical observation.

Patients had internal double-j ureteral stents for malignant (n=7) or benign causes (n=5). Percutaneous ureteral stent removal was performed in 5 patients (41.7%) because of endoscopic failure. Stent-related complications were the reason for removal in 7 patients (58.3%), such as proximal stent migration (n=3), early occlusion of the stent (n=2), and fragmentation of the proximal stent (n=2) (Table 2).

Our technical success rate was 100%. Endoscopic failure of the ureteral stent removal (41.7%) was the main cause of percutaneous ureteral stent retrieval, and patients with a ureteral obstruction due to malignant causes (58.3%) was the main group of our study. Percutaneous antegrade ureteral stent replacement was performed via the same nephrostomy route for 8 patients. Indications for replacement were stent migration (n=1), occlusion (n=2), and routine exchange every 3 months (n=5). Three of them had strictures, and we performed balloon dilatations successfully at the same session.

There were no major complications. One patient (8.3%) had minor hematuria that resolved spontaneously.

DISCUSSION

Ureteral stents are generally removed cystoscopically under local anesthesia. Rarely, a percutaneous antegrade way may become mandatory in some of the cases. Many techniques of percutaneous stent retrieval have been described. In our study, we confirmed that the percutaneous ureteral stent retrieval using a loop snare under fluoroscopic guidance was feasible and effective.

The largest series (27 patients, 39 procedures) of percutaneous removal or exchange of ureteral stents with a basket catheter or snare was reported by Shin et al. with a technical success rate of 95% (7). Technical failure was reported because of tightly embedded stents in the renal pelvicalyceal system. They used a 9-F introducer or a 6 mm angioplasty balloon catheter, pulling or pushing the stent in the renal pelvis or ureter to manipulate the stent tip into a more suitable position. We also used an introducer sheath to successfully complete our study. Shin et al. stated that a balloon catheter or sheath should be used carefully due to the risk of the urothelial mucosa laceration. They reported hematuria in six procedures, and tract leakage or laceration of the pelvicalyceal system in two procedures. In our study, only 1 patient (8.3%) developed minor hematuria. In another study, Yeung et al. reported minor hematuria with the rate of 30% (6 of 20 procedures) (8). They used a rigid forceps passed through a 12-F sheath as a preferred method; also, they used a snare or flexible forceps. They also reported that two of three procedures of percutaneous ureteral stent removal failed due to surrounding redundant renal pelvic mucosa causing inability to grasp the stents.

Given et al. reported a technical success rate of 95% when using a percutaneous approach with an alligator forceps (9). The authors reported 20% of complications to be minor, and they did not encounter any major complications in their study. They stated that using a snare or a basket for percutaneous retrieval of double-J stents may not be feasible for stents embedded against the renal pelvic or calyceal wall.

The success rate of percutaneous ureteral stent retrieval using a loop snare under fluoroscopic guidance in our study (100%, 12 stents) is comparable to that of fluoroscopic transurethral retrograde removal or exchange reported by de Baere et al. (97%, 161 of 165 stents) and Ozkan et al. (100%, 39 stents) (11, 12).

We found that the failed initial retrograde transurethral retrieval was one of the most common indications for the percutaneous approach. Proximal stent migration was another common indication. Yeung et al. and Given et al. reported similar indications (8, 9). On the other hand, Shin et al. reported that the main reason for the removal or exchange of the percutaneous ureteral stent was the presence of a preexisting nephrostomy pathway (7). We used the preexisting nephrostomy route in 2 patients, but it was not the reason for referral.

A nephrostomy wound infection was the major complication in a previous study on the percutaneous retrieval of ureteral stents,

conducted by Liang et al. (13). One patient required hospitalization for 12 days for antibiotic treatment. No major complications were encountered in our study.

Limitations of this study are the small number of patients and the lack of detailed information due to the retrospective nature of the study.

CONCLUSION

Percutaneous ureteral stent retrieval using a loop snare under fluoroscopic guidance is an effective and safe procedure, especially when the cystoscopical removal has failed, and stent-related complications occurred.

Ethics Committee Approval: This study was approved by Erciyes University, Clinical Research Ethics Committee (2017/483).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – GK, AD; Design – GK, AD; Supervision – GK, NO; Materials – GK, NO; Data Collection and/or Processing – GK, AD; Analysis and/or Interpretation – GK, NO; Literature Search – GK, AD; Writing – GK, AD; Critical Reviews – GK, NO.

Conflict of Interest: The authors have no conflict of interest to declare.

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