Percutaneous transrenal retrieval of fractured nephrostomy tube under fluoroscopic guidance

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ABSTRACT

Percutaneous nephrostomy is a safe procedure, performed routinely by interventional radiologists, and has a low complication rate. We report an unusual case of a fractured nephrostomy tube, retained within the kidney, having its fractured end trapped within the healed retroperitoneal tract. The catheter was retrieved by snaring it, using a percutaneous access to the collecting system. We describe the technique used and the alternative management options.

CASE REPORT

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A 91-year-old female patient with a past medical history of coronary artery disease, arthritis, diabetes mellitus type II, hypothyroidism, hypertension, and nephrolithiasis presented to the emergency department of our institution from a short term nursing facility with the chief complaint that her nephrostomy tube "fell out".

The patient had initially presented to our emergency department three weeks earlier complaining of fever and left flank pain, and was diagnosed with two obstructive left ureteral stones complicated by pyelonephritis and left perinephric collection, consistent with an abscess (Fig. 1a,b). She subsequently had a left nephrostomy tube (8 French, Flexima™ Boston Scientific) placed by the interventional radiology team under ultrasound (US) and fluoroscopic guidance (Fig. 1c), and was scheduled to have a computed tomography (CT)-guided drainage of the perinephric abscess. Following the nephrostomy, the patient's clinical condition improved significantly and the perinephric abscess drainage was postponed. The patient was then discharged on antibiotics and the plan was to follow-up with the urology team. In the interim, the nephrostomy tube had been functioning well and the patient was asymptomatic until it "fell out".

On physical examination, the patient was slightly confused, but in no acute distress. The exact date when the nephrostomy tube came out is not clear. Over her left flank, in the presumed region of the prior nephrostomy tube, there was a small skin dimple with a small overlying scab. Her exam was otherwise unremarkable. Urine analysis revealed elevated leukocyte esterase, pyuria, hematuria, and hyaline casts. Results of other routine hematologic tests, electrolyte levels and renal function were within normal limits.

Given the patient's history, a non-contrast CT of the abdomen and pelvis was ordered to follow-up on the patient's left kidney, perinephric collection, and left ureteral stones. The CT-scan demonstrated no hydronephrosis, unchanged left ureteral stones still seen at the ureterovesical junction, and stable appearance of the perinephric collection. Unexpectedly, the nephrostomy tube placed three weeks prior to presentation was found to be fractured, and a sizable component of the catheter was retained in situ - the pigtail in the left renal pelvis and the straight portion extending across the renal cortex retained within the retroperitoneal fat (Fig. 2).

The decision was then made by her healthcare team and her health care proxy (daughter) to drain the perinephric abscess and remove the fractured nephrostomy tube. Initially, under US-guidance, a drainage catheter (8 French, SKATER® Angiotech), was placed within the perinephric abscess, and left

for dependant drainage. Approximately 10 ml of purulent material was aspirated from the collection and sent for microbiology; the sample grew vancomycin resistant enterococcus and enterococcus species. The patient was subsequently treated with Linezolid and Ertapenem. Attention was then brought to the fractured nephrostomy tube; the interventional radiology team was consulted and planned on percutaneous retrieval of the retained catheter fragment.

Under ultrasound and fluoroscopic guidance, access was gained into the upper pole calyx hosting the fractured catheter as in a standard nephrostomy access (Fig. 3a,b) using a 21-Gauge x 15 cm needle, a 0.018 inch x 60 cm nitinol guide wire with platinum tip, and a 6 French x 20 cm coaxial introducer with dilator and stiffening canula (Mini Access Kit, MERITMEDICAL™). Next, the 6 French introducer sheath was exchanged for a 10 French x 13 cm introducer sheath (Check-Flo® Introducer Set, Cook Medical), through which a snare (EN-Snare® system, 27 x 40 mm, Angiotech) was introduced and manipulated to catch the tip of the pigtail catheter that was pulled out through the 10 French sheath (Fig. 3c,d,e). Following this portion of the procedure, a nephrostomy tube (10 French, Flexima™ Boston Scientific) was left in good position within the renal pelvis (Fig. 3f). The patient tolerated the procedure well without complications.

DISCUSSION

First described in 1955, percutaneous nephrostomy became a relatively safe and effective procedure for the management of obstructive uropathy (1,2). Potentially serious complications may occur, including severe bleeding, septicemia, and injury to renal pelvis and adjacent organs particularly the colon and spleen (3).

While selection of the initial needle puncture site and access to the pelvicalyceal system is generally performed using ultrasound guidance and fluoroscopy, the latter has been preferred for guide wire and catheter manipulations (4). Percutaneous nephrostomy with only ultrasound guidance has been reported in pregnant women and children to avoid radiation exposure, and in cases of severe hydronephrosis (5-8).

Usually, the local care and removal of the nephrostomy tubes are considered simple tasks, as long as the care provider is familiar with them. Instructions for catheter removal available in the nephrostomy kits using locking pigtail catheters, as well as in the literature (9), recommend unlocking of the catheter by either cutting it distal to the hub or by releasing the unlocking mechanism. Following unlocking, the catheter can be pulled at the bed side as long as no resistance is encountered by the operator; if any resistance, this usually means that the pigtail remained locked and needs to be removed over guide wire, under fluoroscopic guidance.

In our case the patient was staying at a nursing facility and the circumstances that led to the fractured catheter remain vague without reasonable explanation. The caring personnel at the facility insisted that the catheter "fell out" and no further investigations were made. Biyani et al. have reported a similar occurrence after pulling on the catheter aiming to retrieve it by someone not familiar with nephrostomy tubes [10].

Percutaneous transrenal catheter retrieval procedure is a well known and a relatively safe technique for retrieval, or exchange, of ureteral stents; reported complications include bleeding and clot formation within the collecting system, injury to the kidney and renal pelvis, injury of adjacent organs, wound infection, and septicemia [11,12]. This same retrieval technique was used in the management of our fractured nephrostomy tube, having a sizable component of the catheter lying outside of the renal parenchyma in the retroperitoneal tract. Gunther et al. had reported, in 1984, the retrieval of three broken nephrostomy tubes that were entirely contained within the collecting system using Dormia basket, and foreign body forceps [13]. The only similar case reported in the literature involved the fractured end of the catheter lying in the perinephric space and this was managed endoscopically - the authors did not consider the percutaneous transrenal approach since half of the catheter was outside the kidney and particularly the collecting system [10]. We feel that not having the entire catheter within the collecting system does not preclude a simple less invasive retrieval technique employing a percutaneous transrenal access, leaving more invasive approaches (e.g., open surgical and laparoscopic techniques) as a back-up options.

TEACHING POINT

Although extremely rare, fracture of percutaneous nephrostomy tubes can occur during their removal, or other circumstances. The retained fragment can be successfully retrieved percutaneously, by interventional radiologists, as long as a portion of the tube remains within the collecting system.

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FIGURES

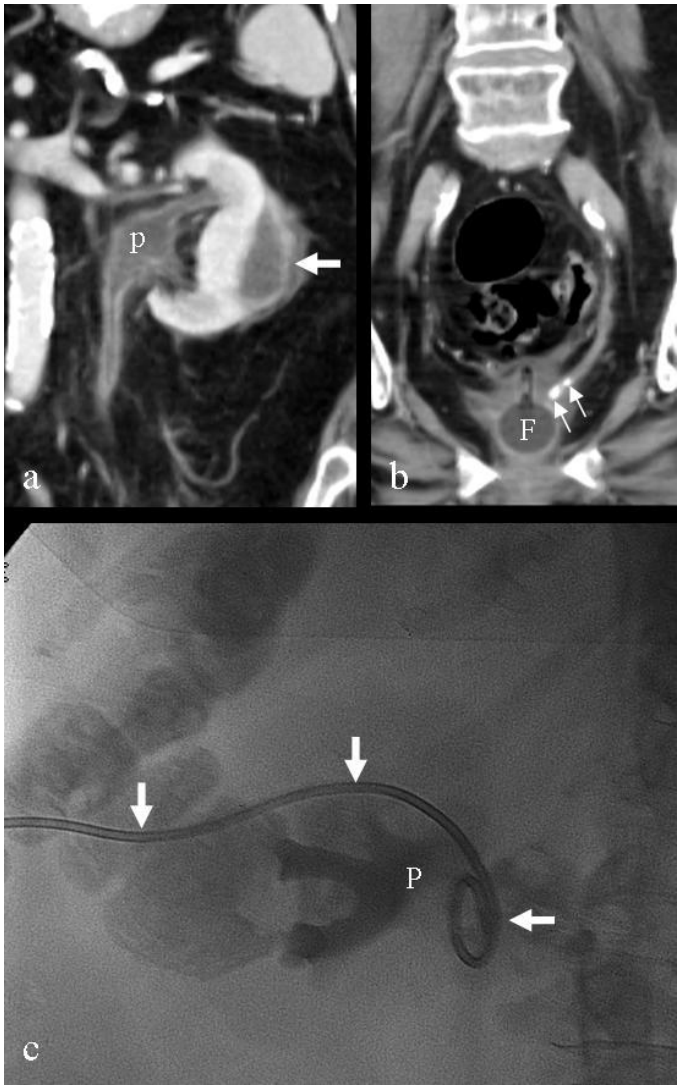

Figure 1: 91-year-old female patient presented to the emergency department of our institution from a short term nursing facility with the chief complaint of fever and left flank pain. Coronal (a,b) contrast enhanced (IV and PO) CT images through the kidneys and bladder obtained in the equilibrium phase demonstrate the presence of mild hydroureteronephrosis, secondary to two left distal ureteral stones (thin white arrows). Noted, is linear enhancement of the urothelial lining of the pelvicaliceal system due to inflammation. There is, in addition, a 3 x 4 cm perinephric collection with enhancing walls (thick white arrows) suggestive of a perinephric abscess. (c): Spot radiographic image obtained after placement of nephrostomy tube (thick white arrows), Flexima™ 8 French (Boston Scientific). Note the presence of oral contrast from prior contrast enhanced CT outlining the colon. P: Renal pelvis; F: Foley catheter. [CT Technique: KVp = 140; mA = 314; Slice Thickness = 5 mm; Dose of intravenous contrast: Iopamidol (Isovue-370), 100 ml].

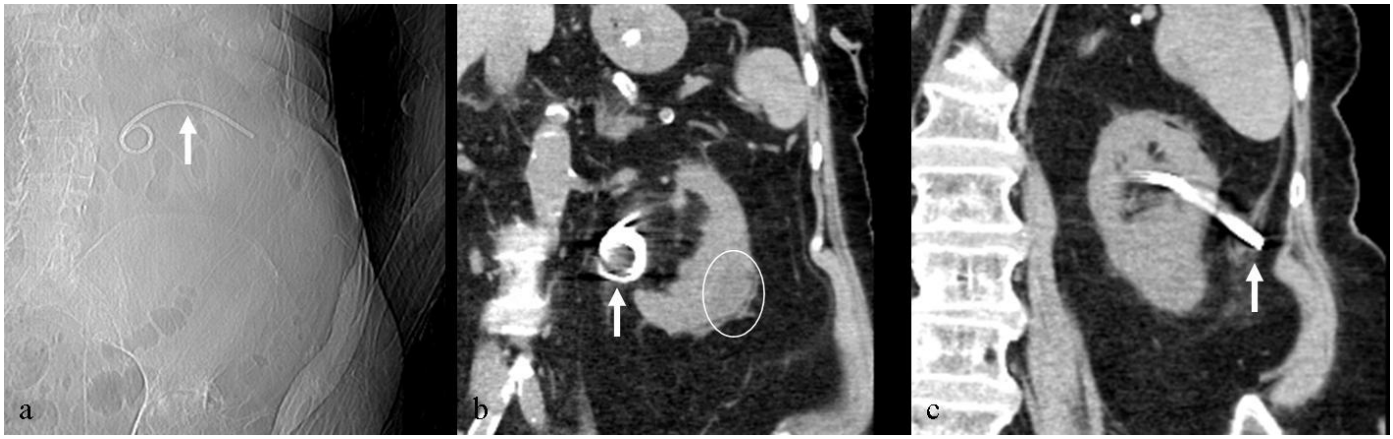

Figure 2: 91-year-old female patient presented to the emergency department of our institution from a short term nursing facility with the chief complaint that her nephrostomy tube "fell out". (a): Anteroposterior scout image and (b,c,): coronal non-enhanced CT images through the kidneys and bladder; images demonstrate a retained intra-abdominal piece of the previously placed left nephrostomy tube (thick white arrow). Perinephric fluid collection (white cursor) stable compared to prior CT examination, shown in Fig. 1. [Technique: KVp = 120; mA = 356; Slice Thickness = 4 mm; No intravenous or oral contrast].

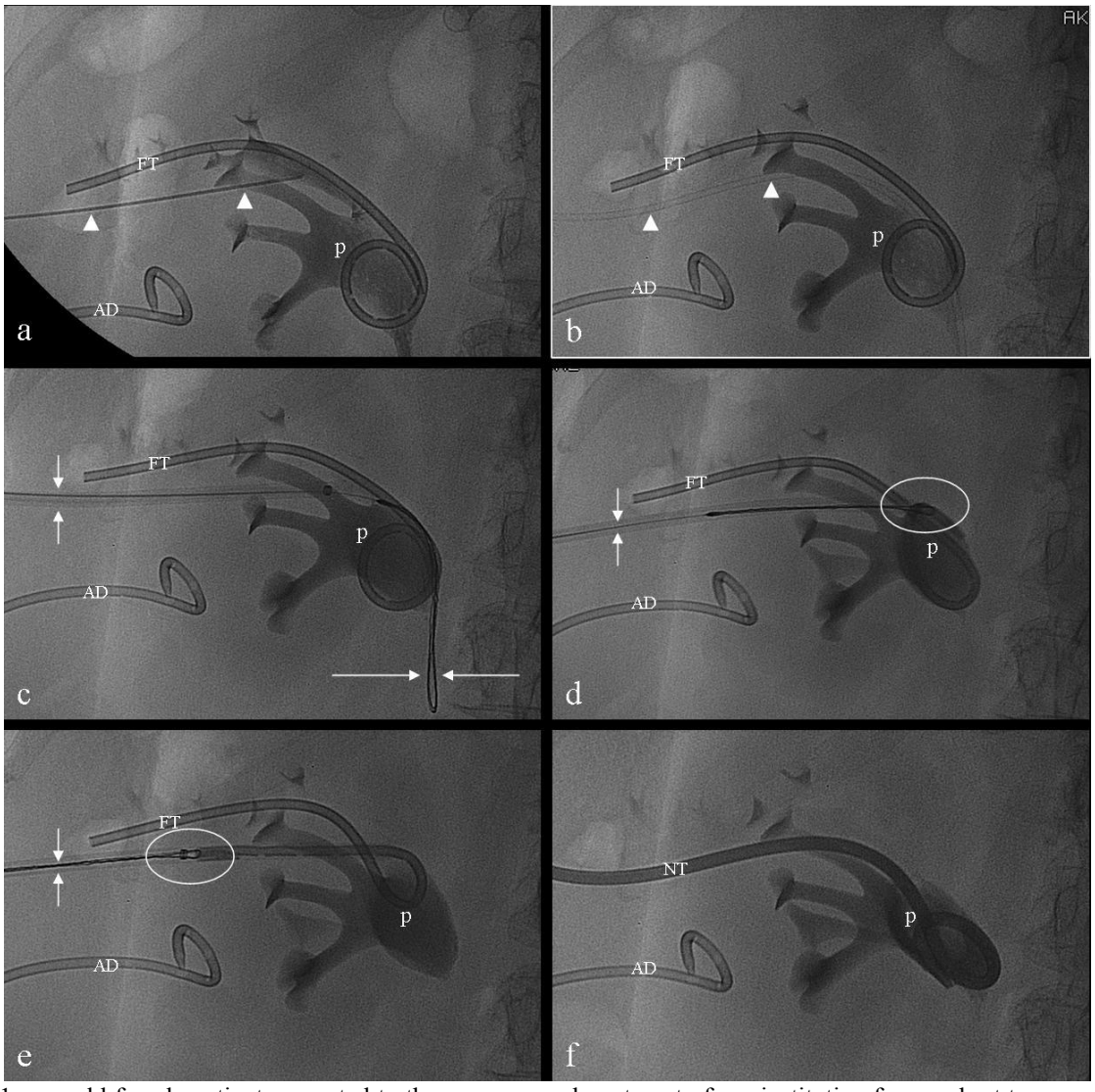

Figure 3: 91-year-old female patient presented to the emergency department of our institution from a short term nursing facility with the chief complaint that her nephrostomy tube "fell out". (a): Initial access into the upper pole calyx made using a 21-gauge x 15 cm needle (white arrowheads). (b): 6 French, 20 cm introducer (white arrowheads) advanced across the upper pole calyx into the renal pelvis. (c): 6 French introducer sheath exchanged for a 10 French x 13 cm introducer sheath (vertical arrows), through which the snare was advanced into the renal pelvis (horizontal arrows). (d,e): snare successfully trapped the tip of the nephrostomy tube (white cursor) that was pulled inside the 10 French x 13 cm introducer sheath (vertical arrows). (f): A new 10 French nephrostomy tube was left in good position following retrieval of the fractured tube. AD: Perinephric abscess drain; FT: Fractured nephrostomy tube; NT: New nephrostomy tube; P: renal pelvis.

ABBREVIATIONS

US = ultrasound
CT = computed tomography
cm = centimeters
mm = millimeters
Fr = French

KEYWORDS

Nephrostomy complication; Nephrostomy tube fracture; Percutaneous retrieval; Snare

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