

## Endovascular snare kit in the combined antegrade and retrograde management of ureteral avulsion: report of two cases

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**Abstract** We report the feasible and safe use of the Amplatz Goose Neck® Snare kit for avulsed ureter retrieval during ureteroscopy. A 49-year-old lady and a 61-year-old man complaining of urolithiasis underwent ureteroscopy; following stone fragmentation, and basketing avulsion of the ureter occurred. Using the Amplatz Goose Neck® Snare kit it was possible to place an indwelling ureteral catheter in both cases aiming at restoring the urinary upper tract continuity. The snare-assisted endovascular technique may be an interesting tool even in endourology for the management of ureteral avulsion. This endoscopic mini-invasive procedure makes it possible to avoid an immediate invasive surgical approach often resulting in nephrectomy, having time for planning a possible durable conservative treatment.

**Keywords** Ureter avulsion · Endovascular snare kit · Goose Neck

### Introduction

Ureterorenoscopy (URS) has a few complications including bleeding, ureteral perforation, urinoma, false passage, strictures and ureteral avulsion. This dramatic complication, ranging between 0 and 0.8% of all the procedures [1–4], became quite rare in the last 20 years because of both the new devices and the improved urologists' experience [1].

When the damage is promptly identified and the patient is in a stable condition, surgical intervention is indicated in order to restore the ureteral continuity, whenever possible [3]. Sometimes a suitable urinary drainage may be obtained inserting a percutaneous nephrostomy or an indwelling ureteral catheter, in order to have time to choose the best final resolution. The latter drainage offers better patient compliance compared to the former. The double J (DJ) insertion always needs the presence of a guidewire well positioned in the upper urinary tract. When the guidewire is displaced during ureteral avulsion, it is still possible to restore the upper urinary tract continuity through a combined percutaneous and retrograde procedure.

Herein we describe a combined antegrade and retrograde procedure in the conservative management of two cases of ureteral avulsion, using an endovascular snare kit usually employed in cardiovascular and biliary systems.

The Amplatz Goose Neck® Snare is a surgical device, useful to retrieve and manipulate foreign bodies. This kit includes a snare (with a nitinol cable and a gold plated tungsten loop), a catheter with a platinum–iridium radiopaque marker band, a snare introducer and a torque device. The catheter size is variable from 4 up to 6 Fr and the loop diameter ranges from 5 up to 35 mm. Moreover, Microsnare Kits are available with a catheter size of 2.3–3 Fr and a loop diameter of 2, 4 and 7 mm.

After positioning of the snare catheter near the foreign body through a guidewire, the latter must be retrieved and the snare must be loaded into the catheter and pushed forward, outside the distal end of the catheter, to completely open the loop. Under fluoroscopic control, using anterior–posterior and oblique projections, the loop is then slowly advanced forward and around the foreign body. By advancing the catheter, the snare loop is closed to grab the foreign body (it is important to avoid closing the loop pulling the

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snare into the catheter because it will move the loop from its position around the foreign body). Pulling the snare and the catheter together, the foreign body will be withdrawn.

## Case report

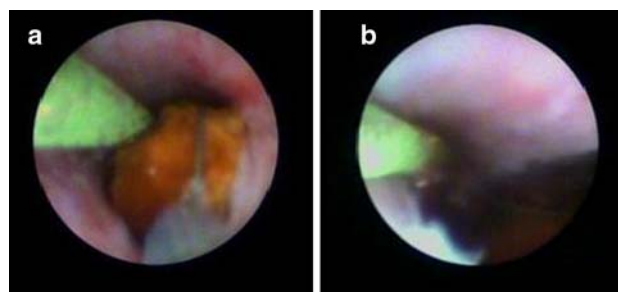
We report two cases whose ureteral avulsion after ureteroscopy was successfully treated using the Amplatz snare kit to place an indwelling ureteral catheter, aiming at restoring upper urinary tract continuity [5].

### Case 1

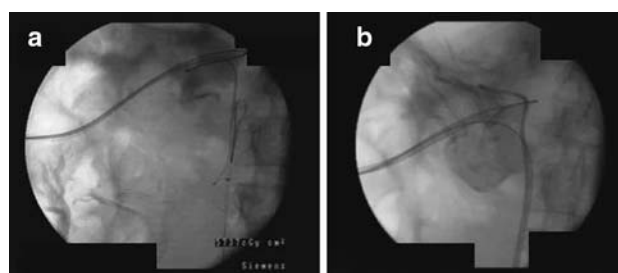
A 49-year-old female, with a symptomatic 8-mm-diameter stone in the left renal pelvis, unsuccessfully treated with two consecutive ESWL, underwent flexible URS, breaking the stone with the holmium:YAG laser. During stone fragments basketing (Fig. 1a), the ureteropelvic junction (UPJ) was damaged (Fig. 1b), with the complete disinsertion of the ureter below and the displacement of the guidewire. Using a rigid ureteroscope, it was impossible to retrogradely detect the UPJ. A hydrophilic guide was inserted into the instrument and left in the retroperitoneal space. Turning the patient in a prone position, a nephrostomic access was created through the lower calyx, introducing a second guidewire throughout the UPJ into the retroperitoneal space. Then, the “Goose Neck®” catheter [5] was introduced over the guidewire, which was removed later on. A “slip knot” was introduced into this catheter and pushed till the retroperitoneum (Fig. 2a). Through suitable rotation maneuvers and under fluoroscopic control the guidewire retrogradely placed into the retroperitoneal space was successfully entrapped into the knot and finally pulled outside, through the transnephrostomic catheter, making possible a correct ureter alignment with the UPJ. A single J catheter was introduced in the renal cavities (Fig. 2b), replaced by a DJ a few days later. The 3-month follow-up ureteroscopy showed an apparently normal ureter resulting in the DJ removal. A few weeks later, a CT scan documented a large hydronephrosis requiring a prompt nephrostomic diversion. The following retrograde pyelogram demonstrated a long proximal ureteral stricture treated some weeks later with open pyeloplasty and bladder psoas hitching.

### Case 2

A 61-year-old male, with a 7-mm-diameter stone just below the left UPJ and a dilated and functional excluded renal cavity system, underwent a left flexible ureterorenoscopy, breaking the stone using the holmium:YAG laser. During fragments basketing, the ureter below the junction detached



**Fig. 1** Endoscopic pictures showing a stone fragment entrapped into a basket at the level of the UPJ (a) and the initial damage of the ureteral wall (b)

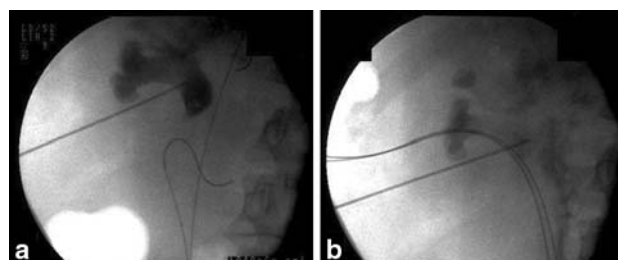


**Fig. 2** The “Goose Neck” snare catheter was percutaneously introduced, through the renal pelvis, in the retroperitoneal space, to retrogradely grasp the guidewire (a) and a single J ureteral catheter was finally placed after the canalization of the upper urinary tract (b)

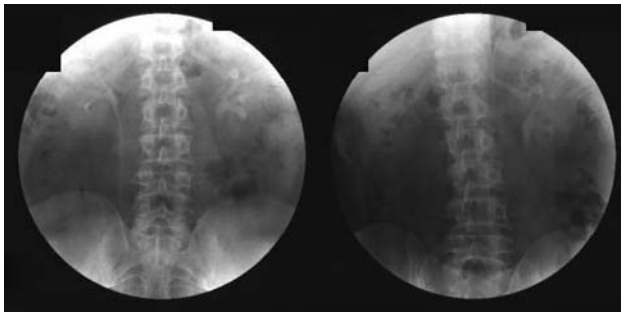
itself from the pelvis with guidewire displacement. Two hydrophilic guidewires were retrogradely inserted into the ureterscope and left into the retroperitoneal space (Fig. 3a, b). The same maneuvers as described in the previous case were performed. A 3-month follow-up retrograde ureteropyelography and ureteroscopy showed ureteral integrity, confirmed by 1-year IVP (Fig. 4).

## Discussion

Ureteral avulsion is a rare dramatic event complicating ureteroscopic procedures. When it occurs, an immediate



**Fig. 3** Ureteral avulsion occurred immediately below the UPJ. The original safety guidewire was dislocated and two guidewires were introduced in the retroperitoneum. A needle was inserted in the renal pelvis in order to visualize the renal cavities (a). Two trans-nephrostomic guidewires documented the restored ureteral continuity (b)



**Fig. 4** One year after URS, the IVP showed the integrity of the left upper urinary tract

repair of the injury is suggested [3, 6]. Sometimes, after providing an adequate drainage of the upper urinary tract, a delayed repair may be scheduled with no urgency.

Despite immediate surgical management, often resulting in nephrectomy [6], it may be necessary in case of large retroperitoneal diffusion of irrigating solution and/or blood or when a stone is entrapped in a basket without any removal possibility, a delayed surgery might make possible a better evaluation of the ureter damage in order to choose the appropriate treatment under elective conditions.

A possible option to re-align the ureter, making possible the introduction of a DJ stent, may be represented by the introduction of a guidewire through the nephrostomy with the subsequent guide retrieval by a ureteroscope throughout the avulsed ureter. This approach may account for two main problems: difficulty in finding a guidewire antegradely put into the retroperitoneum using the ureteroscope and possible intussusception of the avulsed ureter into the instrument during repeated retrograde maneuvers.

In the management of our cases we used a minimally invasive technique named “Amplatz Goose Neck<sup>®</sup> Snare (ev3, Plymouth, MN)” usually employed as a standard device in complex endovascular and biliary interventions for lumen recanalization [7]. This combined rendezvous procedure works with a loop moved around the foreign body; the shaft is held stationary while the catheter is advanced; when the catheter is advanced further, the loop is compressed and the distal end of the loop tightens around the foreign body.

Using this technique, we achieved an over-the-wire pyelo-ureteral cannulation by withdrawing a wire passed retrogradely via the ureteroscope in the retroperitoneum. The retrograde guidewire must be slowly advanced in the retroperitoneum towards the UPJ, under anterior–posterior and oblique fluoroscopic control, in order to avoid any wire kinking. Furthermore, it is important to use a snare with a loop diameter of at least 20 mm.

This technique might be a useful tool for the ureteral avulsion management, aiming at avoiding an immediate invasive surgical approach in order to plan the most appropriate treatment. However, we believe that this maneuver should be attempted just once.

In order to prevent similar difficult situations, it is mandatory to take care to pull or push the instruments gently into the ureter. If resistance to ureteroscope advancement is encountered, the procedure should be aborted and rescheduled for the operating room, leaving a double J stent in situ. Moreover, also important is a fine stone scattering, removing fragments through Nitinol baskets that seem to be safer than steel ones.

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