

# Tubeless percutaneous nephrolithotomy without losing the possibility of second-look nephroscopy: The perfect combination<sup>u</sup>

## NefrolitECTomía percutánea tubeless con posibilidad de reexploración: la combinación perfecta

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### ABSTRACT

**OBJECTIVES:** To evaluate an alternative approach to tubeless surgery that allows a second percutaneous procedure using the same nephrostomy tract.

**METHODS:** Twenty patients underwent percutaneous nephrolithotomy from September 2012 to May 2013 at our institution. Inclusion criteria were: absence of urinary infection, single puncture and operative time less than 2 h. Following the procedure the initially placed ureteral catheter was exteriorized through the working sheath by tying a non-absorbable suture to its end. On postoperative day 1 all patients were studied with non-enhanced CT or X-ray film. If the patient was rendered stone free, the stent was removed along with the urethro-vesical catheter. If a residual stone was present, we recovered the ureteral catheter and used the same nephrostomy tract for a second endoscopic procedure. Patients were assessed for pain, postoperative complications, length of stay, stone free rate, hematocrit and creatinine variations.

**RESULTS:** Thirteen patients met the inclusion criteria. No major complications related to the stent placement and its exteriorization were seen. Two patients required a second percutaneous procedure successfully achieved recovering the ureteral catheter through the nephrostomy tract.

**CONCLUSION:** We present a safe and simple modification of tubeless percutaneous nephrolithotomy, with its well-known clinical benefits but maintaining a safe path for an eventual second look procedure if necessary.

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**Keywords:** Nephrolithiasis; Percutaneous nephrolithotomy; Percutaneous nephrostomy

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## RESUMEN

**OBJETIVOS:** Evaluar una sencilla modificación de la nefrolitotomía percutánea tubeless que permita un segundo procedimiento endoscópico utilizando el mismo trayecto percutáneo.

**MÉTODOS:** Veinte pacientes fueron sometidos a nefrolitotomía percutánea en decúbito supino modificado entre septiembre de 2012 y mayo de 2013 en nuestro centro. Los criterios de inclusión para el estudio fueron: ausencia de infección urinaria, punción única y tiempo operatorio menor de 2 h. Al finalizar el procedimiento se instaló una rienda de sutura en el extremo del catéter ureteral, quedando exteriorizada a través del trayecto de nefrostomía para su recuperación en caso de necesidad. Se realizó tomografía computarizada o radiografía simple a todos los pacientes el primer día postoperatorio. Si el paciente estaba «libre de cálculos», el catéter ureteral fue retirado junto con la sonda Foley. En caso de litiasis residual se realizó un segundo procedimiento percutáneo, utilizando el mismo trayecto inicial, exteriorizando el catéter ureteral a través del trayecto de la nefrostomía. En todos los pacientes se objetivaron las complicaciones postoperatorias, la estancia hospitalaria y la presencia de litiasis residual, además de la caída del hematocrito y la creatinina.

**RESULTADOS:** Trece pacientes cumplieron los criterios de inclusión. No hubo complicaciones mayores relacionadas con la colocación del catéter ureteral y su exteriorización. Dos pacientes requirieron una segunda intervención percutánea, lograda con éxito mediante el uso del catéter ureteral reexteriorizado.

**CONCLUSIÓN:** Se presenta una modificación segura y sencilla de la nefrolitotomía percutánea tubeless sin renunciar a la posibilidad de recuperar el trayecto de nefrostomía original.

**Palabras clave:** Nefrostomía; Nefrolitotomía percutánea; Nefrostomía percutánea

## BACKGROUND

Percutaneous nephrolithotomy (PCNL) is currently the treatment of choice for managing complex or large kidney stones.<sup>1</sup> Traditionally, PCNL is performed leaving a nephrostomy tube in place after completing the procedure. This enables urine drainage, reduces the possibility of bleeding and maintains the option of future endoscopic procedures.<sup>2,3</sup> In recent years, there has been an increase in the number of percutaneous surgeries that, once the procedure has been completed, dispense with the use of nephrostomy, leaving internal drainage through a double-J or ureteral catheter. This modality, known as tubeless, has been shown to cause less postoperative pain, reduce analgesic requirements and shorten hospital stays.<sup>2-6</sup> The major disadvantage of this technique is losing the option to perform an early second-look nephroscopy in case of residual kidney stones, considering that up to 16 % of tubeless PCNL require some type of auxiliary procedure to free the patient of stones.<sup>3,7</sup> The aim of our study is to describe a simple modification to the tubeless technique, which would permit reentry if necessary, using the same trajectory and without losing the benefits of this modality.

## MATERIALS AND METHODS

Of a total of 20 patients undergoing PCNL between September 2012 and May 2013 at our institution, 13 met the inclusion criteria for this study.

All selected patients underwent PCNL in a modified decubitus supine position described by Ibarluzea et al.,<sup>8</sup> under general anesthesia and appropriate antibiotic coverage. Our inclusion criteria were the absence of a urinary tract infection, single puncture and a surgical time less than or equal to 2 h.

## SURGICAL TECHNIQUE

The procedure was started by placing a simple 6 Fr ureteral catheter up to the renal pelvis to contrast the urinary pathway. A 18 Fr urethrovaginal Foley catheter was inserted, and

the ureteral catheter was then attached to it. An intraoperative ultrasound of the flank to be operated on was performed to rule out the presence of the colon in the trajectory. The renal puncture was performed under radioscopia, and the dilation of the trajectory to 27 Fr was performed using an Alken telescopic metal dilator or with the use of a balloon. Once the surgery was complete, we performed radioscopia and explored all cavities with a rigid nephroscope, in search of residual kidney stones. For those cases in which the decision was made to perform tubeless surgery, the ureteral catheter was exteriorized using an Amplatz sheath, and a strand of synthetic nonabsorbable suture was attached to the catheter tip (Figs. 1 and 2). Subsequently, the tip of the catheter ureteral was reinserted up to the renal pelvis, leaving the reins of the suture externalized through the trajectory (Fig. 3). During the first postoperative day, in cases in which the patient was categorized as calculi-free, the ureteral catheter was withdrawn, along with the Foley catheter, through the urethra after cutting the externalized strands of polypropylene. In the presence of residual kidney stones and the need for second-look nephroscopy,



Figure 1. Externalization of the ureteral catheter through the Amplatz sheath.



Figure 2. Fixation of the suture to the externalized end of the ureteral catheter.

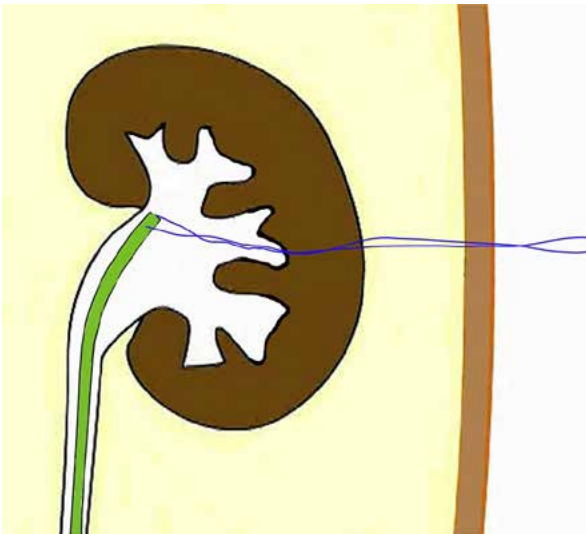


Figure 3. Diagram representing the externalized polypropylene reins after completing the procedure.

the patient was taken to the operating room, placed under general anesthesia and injected with contrast through the ureteral catheter. Once the renal pelvis was contrasted, the rein was tractioned, externalizing the catheter through the flank. A flexible guide was inserted through the catheter lumen up to the distal ureter, recovering the trajectory. The postoperative complications were classified according to the Clavien---Dindo scale.<sup>9</sup> Postoperative pain was determined using the visual analog scale for pain on the day of surgery and the first and second day after surgery.<sup>10</sup> We determined creatinine and hematocrit levels presurgery and at 24 h after surgery. To determine the presence of residual kidney stones, we used computed tomography scans without contrast or plain radiography on the first postoperative day, using the following criterion: for a single stone we used plain radiography; otherwise, we used noncontrast computed tomography. The patient was considered calculi-free if they lacked residual stones or had stones less than or equal to 2mm.

## RESULTS

The calculi-free rates were 77 % for the first procedure and 92 % after a second procedure. Two patients required second-look percutaneous nephroscopy after 48 h to achieve this state. A single access was used in all patients; 11 patients had a subcostal access and 2 had an intercostal access. There were no vascular or colon lesions.

The median hospital stay was 3 days (range, 2---4). We observed a reduction in hematocrit levels of  $42.6 \pm 4.6$  % in the preoperative period and  $37.4 \pm 5.2$  % in the postoperative period ( $p = .0078$ ). Although this difference was statistically significant, it had no significant clinical repercussion, and none of the patients required red blood cell transfusions. There were no differences between the preoperative and postoperative creatinine levels, which were  $1.10 \pm 0.38$  mg/dL and  $1.08 \pm 0.37$  mg/dL, respectively ( $p = .9792$ ). Two patients (15 %) experienced grade I complications according to the Clavien---Dindo scale, consisting of vomiting in one patient and transient fever in the other. The set of perioperative variables is detailed in Table 1. Externalization of the ureteral catheter through the flank was performed for 2 patients, using this successfully as an access for a second percutaneous procedure.

## DISCUSSION

The objective of PCNL is the complete removal of kidney stones, with the minimum number of procedures.<sup>1---12</sup> Since the first use of PCNL, the use of nephrostomy has been discontinued for quantifying bleeding, producing tamponade of the access trajectory, creating a urine bypass and, if necessary, providing access for a secondary procedure.<sup>13,14</sup> Despite a comprehensive intraoperative inspection at the end of the procedure, there is still up to 15---17 % residual kidney stones.<sup>3,7,15</sup> The importance of the clinically insignificant residual fragments (CIRFs) has been debated, although currently there is consensus in defining them as smaller than 4 mm.<sup>3,16</sup> The natural evolution of CIRFs following extracorporeal lithotripsy has been widely studied, revealing that up to 26 % of patients in these conditions will experience radiographic growth of these calculi.<sup>15</sup> In 1996, Strem et al. studied 160 patients with CIRFs following extracorporeal lithotripsy, who were monitored with pyelography or simple radiology. Some 43.1 % would have symptomatic episodes or require a second procedure, at a median of 26 months after the surgery.<sup>17</sup> The evolution of CIRFs following percutaneous nephrolithotomy was studied by Raman et al. who found that 43 % of these patients experienced a symptomatic event, at a median of 32 months. The authors recommend an endoscopic review for all patients with residual kidney stones larger than 2 mm.<sup>16</sup>

In 1997, Bellman et al. described tubeless PCNL, which used a double-J catheter as an internal bypass, demonstrating lower analgesic requirements, shorter hospital stays and an early return to normal activities.<sup>2</sup> This modality has gained numerous adherents with many variants for urine bypass, from the ureteral catheter to the placement of a

Age <sup>a</sup>	45.4 ± 15.6
Gender	
Men	7 (54%)
Women	6 (46%)
BMI <sup>a</sup>	26.5 ± 4.6
Lithiasis	
Single	8
Multiple	5
Maximum size (mm) <sup>a</sup>	28 ± 13
Side	Left 9/right 4
Access	
Upper calyx	2 (15%)
Middle calyx	3 (23%)
Lower calyx	8 (62%)
Surgical time (min) <sup>b</sup>	90 (48---120)
Hematocrit (%) <sup>a</sup>	
Preoperative	42.6 ± 4.6
Postoperative	37.4 ± 5.2
Creatinine (mg/dL) <sup>a</sup>	
Preoperative	1.10 ± 0.38
Postoperative	1.08 ± 0.37
EVA <sup>b</sup>	
4 h postoperative	2 (0---4)
24 h postoperative	0 (0---2)
48 h postoperative	0 (0---0)

a Average (standard deviation).

b Median (min.---max.).

Table 1. Perioperative variables

double-J catheter. In the most extreme cases, PCNL has been performed without leaving any type of catheter. This technique is known as totally tubeless.<sup>18</sup> Critics of tubeless surgery say that the procedure is ineffective, because the surgeon cannot be sure that the calculi-free condition is achieved within the operating room, and the lack of nephrostomy removes the option for an endoscopic review.<sup>13</sup> An improvement in intraoperative radiological equipment could lead to increased detection and extraction of these residual fragments. In 2008, Portis et al. published a series of 34 patients (39 renal units) who underwent PCNL using high-resolution interventional radiology equipment and a flexible nephroscope examination at the end of the surgery while still in the operating room. Of the patients categorized as calculi-free at the end of the surgery, 27 % had residual kidney stones, although none of the patients had calculi >4 mm. With this intraoperative assessment modality, the author concluded that patients who do not have calculi at the end of the surgery can forego nephrostomy, thereby sparing the need for a second-look nephroscopy.<sup>19</sup>

As far as we know, none of the variants of tubeless surgery provide for reentry. The surgeon is therefore faced with the dilemma of having to choose between nephrostomy (with increased postoperative pain but which ensures a second-look nephroscopy of the collection system) or the benefits of tubeless surgery, which removes the option of second-look nephroscopy. The success and feasibility of ureteral catheter externalization through the flank have been demonstrated in previous publications; however, none of the cases suggested

it as an access port for a second endoscopic procedure.<sup>20,21</sup>

With our modification of the technique, patients will benefit from the lack of nephrostomy and, when faced with residual kidney stones, can be reoperated through an already formed trajectory that is easy to restore.

## CONCLUSION

The use of a ureteral catheter with proximal polypropylene strand suture, extracted through the percutaneous trajectory, enables us to maintain a safe reentry access in cases of residual lithiasis, maintaining the advantages attributed to tubeless surgery.

## CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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