

Mini Review

Tubeless Percutaneous Nephrolithotripsy: When it should be done?

Almeida G^{1,2*}, Mota G² and Busato W^{1,3}¹Department of Urology, University of Vale do Itajaí, Brazil²Instituto Catarinense de Urologia, University of Vale do Itajaí, Brazil³Department of Urology, University of Vale do Itajaí, Brazil

*Corresponding author

Almeida, Gilberto Laurino. Av Marcos Konder, 1120 Centro, Itajaí, Santa Catarina, Department of Urology, University of Vale do Itajaí, Brazil, Zip Code: 88301-302; Tel/Fax: 55-47-3348-9628; Email: glalmeida@ibest.com.br

Submitted: 26 November 2015

Accepted: 14 December 2015

Published: 16 December 2015

ISSN: 2379-951X

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Abstract

Percutaneous Nephrolithotripsy (PCNL) has become a standard method to approach large urinary stones (over 2cm) located in the kidney or proximal ureter. Among the minimal invasive urological procedures, PCNL still remains as the most morbid treatment. The routine of using post-operative nephrostomy is still controversial, and some authors supports that tubeless PCNL could be as safe as standard PCNL, with beneficial to decrease pain and hospital stay. Other specialists advocate "total tubeless PCNL" to selected cases, to reduce even more morbidity. This mini-review article has the objective to summarize referenced articles and studies, and provide a conclusive result for clinical practice.

Keywords

- Percutaneous nephrolithotripsy
- Kidney stones
- Urolithiasis
- Tubeless

ABBREVIATIONS

PCNL: Percutaneous Nephrolithotripsy; AP: Anterograde Pyelography; JJ Stent: Double pigtail urinary stent

INTRODUCTION

Percutaneous Nephrolithotripsy (PCNL) is an endoscopic approach in surgical management of renal calculi, usually indicated in treatment of large kidney stones (over 2, 0 cm) and was developed in order to reduce morbidity associated with open renal surgery, previously the only method available. PCNL is considered a safe and resolute procedure, but is still the most morbid technique between other minimal invasive approaches [1]. In standard PCNL technique, it is customary the placement of a nephrostomy tube in the end of procedure [2], and the advantages of this care are adequate renal drainage, bleeding tamponade and the maintenance of tract access for a second-look procedure, when necessary. The routine use of nephrostomy drain, despite mentioned advantages, is controversial and questioned by several studies, which showed that patients with a post-operative nephrostomy tube has more pain, discomfort and hospital stay [3,4]. With better knowledge of the technique and its complications, some authors initiated the practice of tubeless PCNL (e.g. nephrostomy-free, but using JJ stent) and proved the safety of this care, as showed by Wang in his meta-analysis [5]. In his randomized study, 1365 patients selected with non-complicated renal calculi (e.g. stones with 2.0 cm size without obstruction, no noticeable hemorrhage during the operation and no requirement for programmed second-look approach) were

treated with tubeless PCNL and compared with standard method. Wang concluded that tubeless PCNL is a good option, reducing the hospital stay and postoperative pain. Yates, from the Royal College of Surgeons in England in 2009 [6] compared 55 standard PCNL with 46 tubeless PCNL, in patients with independent personal and stone risk factors. He showed that tubeless PCNL is a safe and feasible alternative, independent of patients and stone factors, decreasing postoperative pain and hospital stay. To support and evaluate these surgery alternatives, Mishra in 2010 [2] performed an intermediate method: he practiced standard PCNL following premature removal of the nephrostomy (12-24 hours post-operative), and compared with tubeless PCNL. Mishra concluded that premature removal of nephrostomy can even be a standard of care, allying the advantage of bleeding tamponade in immediate post operative time, and still providing the benefits of tubeless PCNL (pain decrease and early hospital discharge).

The benefits in decreasing morbidity of tubeless PCNL in selected patients (procedures without complications or low risk of Clavien score [7] - Table 1) were summarized by the CROES - Clinical Research Office of the Endourology Society - in an observational study finished in 2009 [8,9]. This multicentric prospective study evaluated approximately 6000 patients, treated in 96 different medical centers around the world. The CROES reinforced the cited advantages of tubeless PCNL, and concluded that preoperative characteristics of the patients and clinical course of the surgery were the main drivers of complication rates when considering the type of exit strategy (standard or tubeless PCNL). In addition, postoperative pain was less with small diameter tubes.

Table 1: The Clavien-Dindo Classification for Surgical Complications.

Grade	Definition
Grade I	Any deviation from the normal course without the need for pharmacological treatment or surgical, endoscopic and radiologic interventions Allowed therapeutic regimens are: drugs as antiemetics, antipyretics, analgetics, diuretics, electrolytes and physiotherapy. This grade also includes wound infections opened at the bedside
Grade II	Requiring pharmacological treatment with drugs other than such allowed for grade I complications Blood transfusions and total parenteral nutrition are also included
Grade III	Requiring surgical, endoscopic or radiological intervention
III a	Intervention not under general anesthesia
III b	Intervention under general anesthesia
Grade IV	Life-threatening complication (including CNS complications)* requiring IC/ICU management
IV a	Single organ dysfunction (including dialysis)
IV b	Multiorgan dysfunction
Grade V	Death of a patient

DISCUSSION

The search for morbidity lessening in PCNL procedures remains between Urologists. Tubeless PCNL is an evolution from the standard technique, emerged with the aim of decrease pain, discomfort and hospital stay after surgery. In patients with low risk disease an even no complications during surgery, tubeless PCNL (no nephrostomy, with JJ stent) has the same output results as standard PNCL, as proved by many studies [2-6,12]. Some factors, specially per-operative events are important in deciding of placement or not a nephrostomy tube. Patients that presented residual calculi, need of a second-look or even important bleeding during surgery must be elected to standard care. The number of punches sites to establish surgery tract was evaluated by Zilberman *et al.* [9], and he supported that PCNL procedures that required two or more punches, evolved with complications during procedure or even when demands a programmed second-look, must have a nephrostomy placed. Still proposing the reduction of morbidity, decreased caliber of nephrostomy tubes was purposed and proved to be as effective as large drains, with the benefit in decreasing pain and discomfort in pos-operative time [8-10].

With the advance and recognizing the safety of tubeless PCNL, a “totally tubeless PCNL” (with no nephrostomy an even no JJ stent) was evaluated. Istanbulluoglu *et al.* in 2010 showed a study of 176 patients after PCNL procedures [11]. 43 patients underwent totally tubeless PCNL, 41 tubeless PCNL and 92 standard PCNL. They concluded that procedures without significant operative bleeding and no calicinal perforation has a good outcome with tubeless PCNL, decreasing pain, demand for drugs (analgesia) and hospital stay. Surgery time, blood transfusion and hematocrit

decrease were similar in all procedures. Totally tubeless PCNL must be performed only in selected cases.

Nirmal and Samira in 2009 published a controversial study [13] and had similar conclusions as Istanbulluoglu: totally tubeless must be performed in selected cases, with only one punch site, stone free and few operative bleeding. Kara C *et al.* [14] published a study comparing the totally tubeless PCNL and standard PCNL in elderly patients, and the opinion of the surgeon during the course of the surgery remains the most important data to decide the pos-operative conduct (standard, tubeless or totally tubeless PCNL). Even so, specialists searched an objective data to decide between tubeless or standard PCNL, beyond surgeon opinion. Once that operative course become more related to complications that renal drainage itself, Cormio *et al.* [8] and Lee *et al.* [15] proposed anterograde pyelography (AP) as a method to decide placing or not a nephrostomy, based on the collecting system damage. After procedure has finished, maintaining security wire and after amplatz removal, AP is realized and the surgeon observes the site of renal punch. A major damage in renal collecting system or tract bleeding must be formal indications for nephrostomy.

CONCLUSIONS

PCNL is the first-line treatment for large renal calculi or refractory external lithotripsy stones. It is a safe and effective procedure, less-invasive than the open renal surgery, but still has major morbi-mortality rates than other minimal invasive treatments (as ureterolithotripsy). Variations of standard technique emerged to reduce morbidity. Tubeless PCNL is a good alternative, and must be elected based on trans-operative conditions. This exit strategy can be safely performed when no important bleeding or tissue damage is noted and no second-look intervention is planned. Instead, it is even important to know when a standard-care PCNL must be done: difficult punches with more than 2 sites to establish a track, major renal tissue damage (specially collector system), trans-operative or tract bleeding, or a planned second-look procedure. The option for totally tubeless PCNL remains controversial, and must be performed only in selected cases.

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Cite this article

Almeida G, Mota G, Busato W (2015) Tubeless Percutaneous Nephrolithotripsy: When it should be done? *J Urol Res* 2(4): 1039.