UIJ UroToday International Journal®

Analysis of the Feasibility and Efficacy of Ambulatory/Day Care Percutaneous Nephrolithotomy: An Initial Experience

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Submitted May 20, 2013 - Accepted for Publication June 16, 2013

ABSTRACT

Purpose: Tubeless percutaneous nephrolithotomy (PCNL) is a well-accepted procedure for uncomplicated renal calculi. We prospectively evaluated the safety, feasibility, and efficacy of day care/ambulatory PCNL (totally tubeless, discharge within 24 hours) for selected patients for which only few case series have been reported.

Materials and Methods: Total tubeless PCNL was planned in 40 easily accessible patients with uncomplicated renal calculi, with single infracostal punctures, normal intraoperative events, and acceptable postoperative parameters (visual analogue pain score, parenteral analgesic requirement, bleeding, urinary soakage, hemodynamic stability), allowing an early discharge within 24 hours. Parameters like pain score and analgesic requirement, any complications, and return date to normal work were evaluated at follow-up. Ultrasonography was performed after a week to document stone clearance.

Results: Mean patient age was 38.6 years (22 to 62), stone size was 21.4 mm (15.4 to 30), and operating time was 72 minutes (42 to 106) without blood transfusion. Regional anesthesia was used in 13 cases while general anesthesia was used in the rest of the patients. Average pain score after 6 hours of surgery was 2.3 (1.8 to 3.6) with vitals in the normal range, and hospital stay was 12.5 hours (5.5 to 23.5). Six patients were excluded due to peri- and postoperative events (2: multiple punctures, 1: hematuria, 1: urine leak, 2: pain). This data was taken with the intention to treat the analysis with a successful application of study protocol in 34 (85%) of preoperatively selected cases. Out of 34 patients that qualified for a complete study protocol, 11 were discharged on the same day of surgery while the rest were discharged the next morning. Postoperative USG confirmed no residual calculus, and all patients had uneventful recoveries. Three patients had minor complications (mild hematuria/urine leaks), which were managed conservatively.

Conclusion: Our experience with ambulatory PCNL in properly selected cases suggests it as a feasible and effective option that can safely be offered to patients, providing uncomplicated surgery and favorable postoperative parameters.

INTRODUCTION

Renal calculi pose major health issues in our society with percutaneous nephrolithotomy (PCNL) and shock wave lithotripsy (SWL) being standard treatments of choice. SWL is the procedure of choice for most renal stones up to 2 cm except selected cases with unfavorable factors. PCNL is the choice for calculi larger than 2 cm without any absolute contraindication to the procedure [1]. While the former gives the advantage of being noninvasive, day care later gives predictable stone clearance in a single sitting. Various modifications (supine PCNL, lateral PCNL) [2,3] in conventional prone PCNL have been tried to reduce operative time, postoperative morbidity, and allows for early discharge. After the first report of outpatient PCNL by Preminger et al. [4], in the past few years there have been various case series reporting day care/ambulatory PCNL with discharge on the same or following day within 24 hours [5-8]. We decided to evaluate the feasibility and efficacy of

KEYWORDS: Percutaneous nephrolithotomy, nephrolithiasis, kidney calculi

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CITATION: *UroToday Int J*. 2013 August;6(4):art 44. http://dx.doi.org/10.3834/uij.1944-5784.2013.08.03

ambulatory/day care PCNL defined as PCNL done for simple renal calculi and planned early discharge within 24 hours in an attempt speed early postoperative recovery and return to normalcy.

MATERIALS AND METHODS

With the approval of the institution review board, we selected 40 highly motivated patients based on preoperative selection criteria (Table 1). Patients were educated regarding likely intraoperative difficulties and postoperative complications. Patients were informed about likely complications (significant pain, hematuria, urinary leaks) for which they must revisit the center immediately. Consent was taken with the explanation of the investigative nature of the treatment protocol. Apart from the preanesthetic workup, preoperative evaluation included ultrasonography and intravenous urography (conventional or computed tomography). Patients were planned for total tubeless (no nephrostomy, no stent) PCNL with single-tract infracostal access. Instruments used were a 2-part initial puncture needle (18 G), Alken telescopic metal dilators, an Amplatz sheath (26 Fr), a Karl Storz nephroscope (22 Fr), intracorporeal pneumolithotriptor, and alligator-type stone forceps. All patients were operated on by 2 senior urologists experienced in PCNL. The procedure was performed in the prone position under fluoroscopic guidance after ureteric catheter placement. Stone clearance was confirmed with intraoperative fluoroscopic and ultrasound (USG) imaging. Intraoperative events like hemodynamic stability, fluoroscopy time, degree of blood loss, and ease of stone clearance were noted. Postoperative parameters, which were taken into account, were the visual analogue scale (VAS; 1 to 10) for pain, parenteral analgesic requirements, bleeding, urinary soakage, and hemodynamic stability.

Postoperatively, patients were on injectable analgesics (diclofenac sodium: 75 mg/8 to 12 hourly; tramadol: 50 mg, SOS). As per our study protocol, all patients had planned discharge from the facility within 24 hours of surgery. At follow-up, parameters evaluated were pain score and analgesic requirements, any complication (Clavien Dindo system) [9], and day returning to normal work. An X-ray check-up of the chest and kidney-ureter-bladder (KUB) work-up were done before discharge. Follow-up ultrasonography was performed on day 7 to confirm clearance of any residual fragments.

Table 1. Patient selection criteria.

Inclusion criteria	Easily accessible (within a 30-minute driving distance from institute) No uncontrolled comorbidity (diabetes or hypertension) ASA grade I/II Simple renal calculus cases requiring a single infracostal puncture
Exclusion criteria	Intraoperative complication (significant bleeding or pelvicalyceal injury) Hemodynamic instability (tachycardia/ hypotension) Postoperative pain score > 3 (on analgesics), Hb < 11 gm% Urinary leak, gross hematuria, or signs of infection or incomplete stone clearance

Table 2. Patient characteristics.

Variable		Value
No of Patients		34
Sex	male/female	23/11
Age	Mean (range)	38.6 (22-62)
Side	right	15
	left	19
Stone	single multiple	27 07
Stone size (mm)	mean (Range)	22.4 (15.4-30)
Radiopacity	radiopaque/ radiolucent	31/05
Preoperative Hb	mean (SD)	13.6 (1.24)

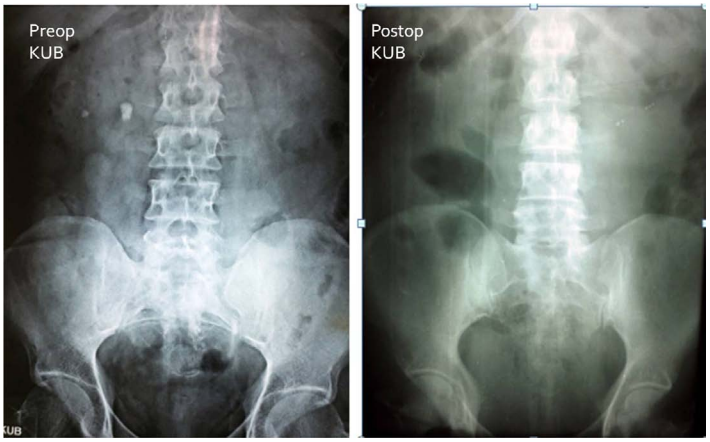
RESULTS

Preoperative patient characteristics are mentioned in Table 2. All patients had preoperative sterile urine cultures. A total of 13 patients were operated under regional anesthesia while others were under general anesthesia. Anesthesia choice was decided by the anesthetist on a case-to-case basis, which also included factors like expected surgical difficulty and the patient's choice. Out of 40 preoperatively selected cases, 6 patients were excluded from final analysis due to intraoperative and postoperative events. Two patients required a second puncture (stone size: 2.8 and 3 cm). Postoperatively, 1 had significant hematuria, another had a urinary leak from the puncture site, and 2 complained of significant postoperative difficulty (mean VAS: 5.5; duration of surgery: 98 and 106 min). All the complications were managed conservatively but prolonged the hospital stay beyond 24 hours, limiting the data of these 6 patients, including complete intention-to-treat analysis.

Table 3. Intra- and postoperative parameters.

Intraoperative	Postoperative
operative time: 72 min (42-106)	Hb drop: 1.4 gm% (0.8-2.2)
fluoroscopy: 5.2 min (3-8.5)	VAS at 6 hours: 2.3 (1.8-3.6)
stone clearance: 100%	hospitalization: 12.5 hours (4.5-23.5)

Figure 1. Preoperative and postoperative KUB confirming stone clearance.



In the remaining 34 patients who could complete the study protocol, average pain score after 6 hours of surgery was 2.3 (1.8 to 3.6), with vitals in the normal range. (Table 3). Eleven cases were discharged on the same day of surgery (within 6 hours) while the rest were discharged the next morning. Postoperative X-ray KUB and USG confirmed no residual calculi (Figure 1). Three patients developed complications after initiation of activity, which were not present at the time of discharge. Two patients presented with hematuria (mild) and 1 with a urinary leak. All these complications were Clavien-Dindo grade I and were managed conservatively.

DISCUSSION

The pros and cons of PCNL versus SWL have often been highlighted when one discusses the management of renal stones. An oft-quoted point is that PCNL entails a prolonged hospital stay whereas SWL sessions are day-surgical in nature. However, PCNL has a superior stone clearance rate compared to SWL, especially for lower pole stones [10]. In uncomplicated PCNL, where there is no significant extravasation, significant bleeding, or any need for a second nephroscopy, the placement of the nephrostomy tube may not be necessary (tubeless PCNL) [11-14].

After > 30 years of worldwide experience, PCNL remains a milestone technique in the field of endourology, with a high success rate and acceptably low percentage of major complications [15]. Unlike retrograde intrarenal surgery (RIRS) or SWL, the success of PCNL for the treatment of lower calyceal calculi does not depend on anatomic factors [16] or stone size [17,18]. Routine placement of the nephrostomy tube after uncomplicated PCNL is being seriously questioned. Since its initial description in 1997, there have been increased reports of tubeless PCNL in the literature where percutaneous nephrostomy is replaced by indwelling ureteral stents or a ureteric catheter at the end of an uncomplicated PCNL [14,19]. It is based on the principle that simple closure of the tract with a dressing or parietal suture creates a closed retroperitoneal compartment, which is ideal for achieving self-tamponade. This corresponds to a clamped nephrostomy tube [20]. There are also a few case series on totally tubeless and stentless PCNL in properly selected patients [21].

Krambeck et al. reported long-term outcomes following PCNL mentioned at 19 years of follow-up. The stone recurrences were less frequent following PCNL compared to SWL (36.8% vs. 53.5%) [22]. PCNL was not associated with the development of adverse medical events (new onset renal failure, diabetes mellitus, and hypertension) compared with SWL and conservatively managed stone cases.

With increasing experience with PCNL, the safety and efficacy of PCNL have significantly increased. Our experience with limited but properly selected patients has shown that such cases can be discharged conveniently within 24 hours of surgery or even the same evening on a day care basis. Surely this approach requires vigilant and strict follow-up; hence, only patients within a convenient distance from the facility have been selected so that they can report easily for follow-up, as well as for any unexpected event after discharge.

With the assessment of intention-to-treat analysis, our ambulatory protocol could be successfully applied to 85% of preoperatively selected patients. All patients who completed the protocol had unremarkable intraoperative and postoperative parameters and complete stone clearance with < 9% requiring unplanned revisits for minor complications, which were managed conservatively. Our study has limitations of only 34 cases, and since it is an initial experience, only uncomplicated simple renal calculi were selected. Even after strict patient selection, the chances of complication are still there, as 15% of preoperatively selected patients were excluded due to intra- and postoperative events. Luckily, none of our patients had

any major complications, yet nothing can replace the surgeon's experience and careful patient selection.

CONCLUSION

Ambulatory PCNL, in selected patients, is an advantage for complete and predictable stone clearance with an early return to normal activity. Surely with experience the spectrum can be widened to incorporate more patients. Therefore, patient compliance and understanding about the procedure and unwanted events are highly desirable, and no one but the patient has to take responsibility for the final informed decision for availing ambulatory protocol.

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