Tubeless percutaneous nephrolithotomy with double-J stent compared with external ureteral catheter to decrease postoperative complications

Khaled A. Telha, PhD, *Twfik H. Alba'adani,* MD, *Khaled M. Alkohlany,* MD, *Abdulelah O. Al-Adimy,* Arab Board, *Ibrahim H. Alnono,* MD.

ABSTRACT

الأهداف: إجراء مقارنه بين استخدام دعامة الحالب الداخلية (double J–stent) و دعامة الحالب الخارجية (external ureteral catheter) من أجل تقليل المضاعفات بعد عملية استخراج حصوات الكلية عن طريق الجلد من دون ترك أنبوبة كلوية.

الطريقة: أجريت هذه الدراسة الاستطلاعية العشوائية في قسم المسالك البولية بمستشفى ابن سيناء ومستشفى الثورة العام، صنعاء، اليمن وذلك خلال الفترة من يناير 2008م إلى يناير 2010م. شملت الدراسة 148 مريضاً مُصاباً بحصوات كلوية وقد تم استخراجها عن طريق الجلد ومن دون ترك أنبوبة كلوية أو استخدام أي مواد لسد الأنسجة أو كي مسار المنظار. تم تقسيم الحالات إلى مجموعتين: المجموعة الأولى وشملت 72 حالة (54 ذكراً و18 أنثى) أُجريت لهم عملية إدخال دعامة الحالب الداخلية، وشملت المجموعة الثانية 76 حالة (56 ذكراً و20 أنثى) أُجريت لهم عملية إدخال دعامة الحالب الخارجية، وقد تم عمل مقارنة بين المجموعتين على أساس المضاعفات المُترتبة بعد العملية.

النتائج: أسفرت الدراسة عن وجود فوارق إحصائية واضحة بين المجموعتين وذلك لصالح مجموعة دعامة الحالب الداخلية حيث كانت نسبة المضاعفات فيها أقل من مجموعة دعامة الحالب الخارجية، وقد ترتب على العملية التي أُجريت للمجموعة الأولى المضاعفات التالية: تسريب بولي في 4 مرضى (5.6%)، بول دموي لأكثر من 48 ساعة في 6 مرضى (8.3%) ، ارتفاع درجة الحرارة في مريضين (2.8%)، وطول مدة البقاء في المستشفى لمدة تتراوح مابين 48–36 ساعة. فيما ترتب على العملية التي أُجريت للمجموعة الثانية المضاعفات التالية: تسريب بولي في 13 مريضاً (17.1%)، بول دموي في 9 مرضى (11.8%)، ارتفاع درجة الحرارة في 5 مرضى (6.6%)، وإصابة القولون بجروح في مريض واحد، وتجمع السوائل حول الكلية في 8 مرضى (10.5%)، وطول مدة البقاء في المستشفى لمدة تتراوح مابين 72–48ساعة، وكان هناك اختلافاً واضحاً بين المجموعة الأولى والثانية فيما يخص نسبة التسريب البولي (p=0.028).

خاتمة: أشارت الدراسة بأن أفضل طريقة لاستخراج حصوات الكلية عن طريق الجلد من دون ترك أنبوبة كلوية هي استخدام دعامة الحالب الداخلية وذلك لتقليل المضاعفات بعد هذه العملية وتقليل مدة البقاء في المستشفى.

Objectives: To compare the efficacy of tubeless percutaneous nephrolithotomy (PCNL) using double-J stent and tubeless PCNL with external ureteral catheter in decreasing post-PCNL complications.

Methods: This prospective randomized comparative study includes 148 cases with kidney stones. They were operated by either tubeless PCNL with double-J stent (Group 1) or tubeless with ureteric catheter (Group 2). Group 1 consists of 72 cases (54 males and 18 females). Group 2 consists of 76 patients (56 males and 20 females). Both groups were compared from the point of post-PCNL complications without using tissue sealants or tract cauterization. The study was carried out in the Department of Urology, Al-Thawrah Modern General and Ibn-Seena Hospital, Sana'a, Yemen between January 2008 and January 2010.

Results: In Group 1, the post-PCNL complications were leakage of urine in 4 (5.6%), hematuria >48 hours in 6 (8.3%), fever in 2 (2.8%), and the length of hospital stay was 36-48 hours. In Group 2, the post-PCNL complications were leakage of urine in 13 (17.1%), hematuria in 9 (11.8%), 5 (6.6%) has fever, colonic injury in one, and fluid collections in 8 (10.5%). There was significant difference in urine leakage (p=0.028).

Conclusion: Tubeless PCNL with double-J stent was the best method to decrease the complications and length of hospital stay.

Saudi Med J 2010; Vol. 31 (10): 1137-1140

From the Department of Urology, Al-Thawrah Modern General and Ibn-Seena Hospital, Sana'a, Yemen.

Received 23rd June 2010. Accepted 23rd August 2010.

Address correspondence and reprint request to: Dr. Khaled A. Telha, Department of Urology, Al-Thawrah Modern General and Ibn-Seena Hospital, Sana'a, Yemen. Tel. +967-711661901. Fax. +967 (1) 336999. E-mail: ktelha@yahoo.com

Urinary stone disease is one of the major urological problems affecting millions of people worldwide. Application of percutaneous endoscopic techniques in its management is less morbidity, minimally invasive, and effective modality, but still with complications. The 2008 updated American Urological Association (AUA) guidelines panel recommends percutaneous nephrolithotomy (PCNL) to be the first line treatment for most patients. The standard technique with leaving of a percutaneous nephrostomy tube in the tract at the end of the procedure because of fear of complications of PCNL as: bleeding, bowel perforation, fluid collection, and leakage of urine and less hospital stay.[1-3] Tubeless PCNL with double-J catheter or external ureteral catheter can be performed with one or multiple punctures with complications,[2,4,5] but in our study we try to decrease post-PCNL complications using tubeless PCNL either with double-J stent nor with external ureteral catheter without the use of tissue sealants or tract cauterization.[1,6] In Yemen, urolithiasis is one of the most common diseases affecting the urinary system, and considered the leading cause of acute and chronic renal failure. The aim of this study is to compare the efficacy of tubeless PCNL using double-J stent and tubeless PCNL with external ureteral catheter in decreasing post-PCNL complications.

Methods. A prospective randomized comparative study of 148 patients with single or complex (branching or multiple) renal calculi (**Figures 1 & 2**) was conducted between January 2008 and January 2010. The study took place in the Urology Department, Althawrah Hospital and Ibn-Seena Hospital, Sana'a, Yemen. The local scientific committee for medical ethics approved this study and informed consent was obtained.

The 148 patients were divided into 2 groups: Group 1 consists of 72 cases (54 males and 18 females) and Group 2 consists of 76 patients (56 males and 20 females). Data of the 2 groups such as age and stone size were matched. All cases were managed through one puncture with use of double-J stent in the first group and external ureteral catheter in the second group without using tissue sealants or tract cauterization. Both groups were compared regarding post PCNL complications. The demographic data of patients and characteristics of stones are shown in **Table 1**. All preoperative, intraoperative, and postoperative data were recorded for each patient.

The technique of PCNL in both groups was carried out in prone position with one puncture through the lower or medial calyx (**Figure 3a**) using pneumatic lithoclast, and the fragments were extracted by forceps. After the procedure in the first group, double-J stent was fixed antegradely by pulling out the ureteric catheter from the renal pelvic and inserting a guide wire down to the urinary bladder in which the double-J stent was inserted under the control of fluoroscopy, then we removed the nephroscope and the site of puncture was sutured with one or 2 deep hemostatic zero or one silk sutures (**Figures 3b-3c**).[4-6] The second group underwent the same steps without nephrostomy, but the external ureteral catheter was left at the end of the procedure. Careful endoscopic and fluoroscopic inspection in the collocating system is performed to check for any significant residual stones, if so difficulty to remove latter by extracorporeal shock wave lithotripsy (ESWL). On the next day, all patients were evaluated by clinical examination and investigations (kidney, ureter, and bladder (KUB) x-ray (**Figure 4**), abdominal ultrasound (US) and hemoglobin level) to detect leakage of urine, residual stones, or perirenal fluid collections.

Figure 1 - Plain x-ray kidney, ureter, and bladder (KUB) showing the left renal stones (arrow).

Figure 2 - Intravenous urography showing the left renal stones (arrow).

Table 1 - Demographic data of patients, characteristics of stones, and length of hospital stay.

Character	PNL with double-J catheter	PNL with ureteral catheter
Gender		
Male	54	56
Female	18	20
Total	72	76
Age (year)		
Minimum	23	20
Maximum	67	63
Mean	31	29
Renal units		
Right	43	36
Left	29	40
Total	72	76
Stone size (cm)		
Minimum	2.5	2.2
Maximum	6.0	5.3
Mean	4.9	4.3
Hospital stay (hours)	36-48	48-72

PCNL - percutaneous nephrolithotomy

Table 2 - Postoperative complications.

Complication	Tubeless PCNL with double-J catheter n (%)	Tubeless PCNL with uretral catheter n (%)	*P*-value Chi-square test
Urine leak post PCNL	4 (5.6)	13 (17.1)	0.028
Perinephric collection	0	8 (10.5)	
Postoperative hematuria 48 hours	6 (8.3)	9 (11.8)	0.48
Postoperative fever	2 (2.8)	5 (6.6)	0.28
Bowel injury	0	1 (1.3)	
Mortality	0	0	
Total	**12 (16.6)**	**36 (47.3)**	

PCNL - percutaneous nephrolithotomy

In Groups 1 and 2, we removed the Foley catheter of patients if the urine was clear. In both groups, patients were advised to undergo ESWL in case of significant residual stones.

Statistical study was carried out using Chi-square test. A $p<0.05$ was considered statistically significant and the software used during the study was SPSS.

Results. Tubeless PCNL was carried out in both groups. Demographic data of patients and stone characteristics are summarized in **Table 1**. No interaoperative complications were observed. Out of the 148 patients treated by tubeless PCNL with double-J stent and external ureteral catheter, we achieved stone free rate in 96 patients (64.8%) and residual stone in 52 patients (35.1%) in both groups. Postoperative PCNL complications are summarized in **Table 2.** In Group 1, the complications were: leakage of urine, no bleeding from the operation site, hematuria <48 hours, one case needs a 3-way catheter, no fluid collections around

Figure 4 - Post-percutaneous nephrolithotomy plain x-ray showing the double-J stent (arrow).

Figure 3 - a) After removal of nephroscope. b) Post-removal of sheath. and c) Post-tubeless percutaneous nephrolithotomy (PCNL).

the kidneys, fever, hemoglobin drop (0.6-1.2% g), no colonic injury, and the length of hospital stay was 36-48 hours. In Group 2, the complications were: leakage of urine, hematuria >48 hours, hemoglobin drop (0.6-3% g) that one case needs blood transfusion, colonic injury, fluid collections around the kidneys (>50 ml), fever, and the length of hospital stay was 48-72 hours. The complications in Group 2 were managed conservatively, but 9 cases with leakage of urine required a double-J stent, and we treated the colon injury with double-J fixation. In total, the post-tubeless PCNL complications with double-J catheter and with external ureteric catheter decreased using double-J catheter.

Discussion. Early and recent reports on tubeless PCNL showed the advantages of this policy in reducing pain, complications, and length of hospital stay.[1,3,7,8] In general, post-PCNL complications occur everywhere, with different incidence.[3,9] Some authors advised limitation of tubeless PCNL in cases of bleeding, large stones requiring second look, and renal anomaly, however, other authors found no limitations.[1,4,10] In our study, exclusion criteria for tubeless PCNL were severe bleeding during operation, large residual stones requiring second look or solitary kidney. Out of 148 patients treated with tubeless PCNL using double-J and with external ureteral catheter, we achieved stone free rate in 96 patients (64.8%) and residual stone in 52 patients (35.1%), which correspondence with other studies.[3,4,7] The patients in both groups were evaluated by clinical examination and investigations hemoglobin, (KUB and U\S in the next day of operation). To prevent urinary leakage, internal or external ureteral stents were routinely used by other studies.[8,11] In our study, we prefer double-J stent to decrease post-PCNL complications such as leakage of urine, perirenal collections, and also discomfort. According to our comparative study, the complications in the second group with external ureteral catheter were higher compared with the first group (p=0.028). This is so because in this group after removal of the external ureteral catheter there was spontaneous passage of stone fragments to the ureter with subsequent obstruction and urinary leakage or perirenal collection.

For fear of bleeding, some authors tried to use deferent hemostatic sealants (fibrin, gelatin) to seal the percutaneous tract,[1] or cauterization or nephrostomy tube.[6] To stop the bleeding from the side of puncture, we used 2 deep 0 or 1 interrupted silk stitches. In most published reports, PCNL was performed in the prone position,[2,8,9] but recently those studies advice supine position in obese patients or with cardiovascular or pulmonary dysfunction.[2,5] In our study, the stones were single to multiple or branching in both groups, but we did not perform any analysis for the removed stones. Fluoroscopy exposure was not calculated and analgesics were given if required. The mean hospital stay was 36-48 hours for the first group, while it was 48-72 hours in the second group, which were comparable to other studies.[2,3,9,11]

In conclusion, post-tubeless PCNL complications are reported everywhere with different incidence. To avoid possible complications such as leak of urine from the operation site, perirenal collection, and discomfort of external ureteral catheter, we advise the use of tubeless PCNL with double-J stent to decrease complications and length of hospital stay.

References

1. Yu DS. Gelatin packing of intracortical tract after percutaneous nephrostomy lithotripsy for decreasing bleeding and urine leakage. ***J Chin Med Assoc*** 2006; 69: 162-165.
2. Al-Ba'adani TH, Al-Kohlany KM, Al-Adimi A, Al-Towaity M, Al-Baadani T, Alwan M, et al. Tubeless percutaneous neprolithotomy: the new gold standard. ***Int Urol Nephrol*** 2008; 40: 603-608.
3. Shah H, Khandkar A, Sodha H, Kharodawala S, Hegde S, Bansal M. Tubeless percutaneous nephrolithotomy: 3 years of experience with 454 patients. ***BJU Int*** 2009; 104: 840-846.
4. Karami H, Gholamrezaie HR. Totally tubeless percutaneous nephrolithotomy in selected patients. ***J Endourol*** 2004; 18: 475-476.
5. Shpall AI, Parekh AR, Bellman GC. Tubeless percutaneous nephrolithotomy with antegrade stent tether: clinical experience. ***J Endourol*** 2007; 21: 973-976.
6. Jou YC, Cheng MC, Sheen JH, Lin CT, Chen PC. Cauterization of access tract for nephrostomy tube-free percutaneous nephrolithotomy. ***J Endourol*** 2004; 18: 547-549.
7. Malcolm JB, Derweesh IH, Brightbill EK, Mehrazin R, DiBlasio CJ, Wake RW. Tubeless percutaneous nephrolithotomy for complex renal stone disease: single center experience. ***Can J Urol*** 2008; 15: 4072-4076.
8. Mouracade P, Spie R, Lang H, Jacqmin D, Saussine C. Tubeless percutaneous nephrolithotomy: what about replacing the Double-J stent with a ureteral catheter? ***J Endourol*** 2008; 22: 273-275.
9. Agrawal MS, Agrawal M, Gupta A, Bansal S, Yadav A, Goyal J. A randomized comparison of tubeless and standard percutaneous nephrolithotomy. ***J Endourol*** 2008; 22: 439-442.
10. Giusti G, Piccinelli A, Maugeri O, Benetti A, Taverna G, Graziotti P. Percutaneous nephrolithotomy: tubeless or not tubeless? ***Urol Res*** 2009; 37: 153-158.
11. Gonen M, Ozturk B, Ozkardes H. Double-j stenting compared with one night externalized ureteral catheter placement in tubeless percutaneous nephrolithotomy. ***J Endourol*** 2009; 23: 27-31.