

First experience with vacuum-assisted mini percutaneous nephrolithotomy (vmPCNL): Preliminary results

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Introduction & Objectives: Percutaneous nephrolithotomy (PCNL) is commonly performed as an open circuit procedure, in which the medium is passively drained from the renal collecting system through the access sheath. Vacuum-assisted mini PCNL (vmPCNL) is a technique performed using a 16 ch. nephrostomic sheath closed by a sealing plug that integrates vacuum on a lateral arm. This creates a semi-closed circuit which allows an efficient lapaxy of the stone fragments through suction. We aimed to assess the safety and efficacy of this technique in a real-life population.

Materials & Methods: Ethical committee approval has been obtained for this study. We prospectively collected data from all consecutive vmPCNLs performed from September 2017 to September 2018 at our center. All procedures were carried out in the supine Valdivia position, using a 16 ch. Clear Petra® nephrostomic sheath and a 12 ch. nephroscope. Lithotripsy was achieved through Ho:YAG laser in all cases, and baskets were used for litholapaxy in case of need. Postoperative complications were graded according to the CROES PCNL Clavien score. Patients were defined as stone-free (SF) in the absence of residual fragments >4mm on 1-3 months follow up imaging (CT or US).

Results: We performed 60 vmPCNLs in 53 patients, including 3 bilateral and 4 staged procedures. Patients' characteristics and perioperative variables are reported in Table 1. Four patients had a kidney malformation and 2 suffered from severe skeletal malformations with kidney displacement. Nineteen patients (31,7%) experienced a post-operative complication, including 10 grade I (16,7%), 5 grade II (8,3%) and 4 grade III events (6,7%). Two patients needed a blood transfusion (3,3%) and 6 experienced an infectious complication (10%) although no cases of sepsis were recorded. Grade III complications included 1 angioembolization (1,7%), 2 DJ stent positioning (3,3%) and 1 colonic puncture (1,7%). Patients were SF in 88,3% of the cases and none needed further treatment.

Table 1 – Patients' characteristics and perioperative variables

Variables	n = 60
Age mean +/- SD	55,9 +/- 14,5
Sex n (%)	
Male	41 (68,3)
Female	19 (31,7)
Body Mass Index (kg/m ²) mean +/- SD	24,9 +/- 5,9
ASA score n (%)	
1-2	48 (80)
≥3	12 (20)
CCI n (%)	
0-1	50 (83,3)
≥ 2	10 (16,7)
Laterality n (%)	
Right	24 (40)
Left	36 (60)
Stone number n (%)	
Single	21 (35)
Multiple	39 (65)
Stone location n (%)	
Upper calyx	9 (15)
Middle calyx	25 (41,7)
Lower calyx	39 (65)
Pelvis	32 (53,3)
Complete staghorn	6 (10)
Stone Volume (cm ³) median; (IQR)	1,8 (1,0-2,8)
Stone Maximum HU mean +/- SD	1179 +/- 384,5
Operative Time (min) median (IQR)	111,5 (85-150)
Lithotripsy & lapaxy time (min) median (IQR)	35 (19-50)
Access tract number n (%)	
Single	50 (83,3)
Multiple	10 (16,7)
Total laser energy (kJ) mean +/- SD	14,9 +/- 3,1
Litholapaxy modality n (%)	
Suction only	36 (60)
Need for baskets/graspers	24 (40)
Exit Strategy n (%)	
Nephrostomy	44 (73,3)
Nephrostomy + ureteral catheter	11 (18,3)
Ureteral catheter	4 (6,7)
JJ stent	1 (1,7)
Hb drop (g/dL) mean +/- SD	1,49 +/- 1,1
Length of stay (days) median (IQR)	4 (3-5)
Nephrostomy removal (days) median (IQR)	3 (2-4)

Conclusions: vmPCNL appears to be a safe and effective technique for the treatment of kidney stones. Our SF rate is amenable to improvement, however these results reflect the complex population of our tertiary referral stone center with a high rate of multiple and staghorn stones. Moreover, the reduced need for lapaxy devices could help to spare time and costs.