

PCNL in Staghorn Calculi: Our Experience

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Abstract

Background: The treatment of STAG HORN calculi has varied from combination of percutaneous nephrolithotomy (PCNL) and shockwave lithotripsy (SWL) or sometimes open surgery. The goals of treatment of a STAG HORN stone are complete stone clearance with minimal morbidity. Although excellent stone-free rates are universally reported in the literature, complication rates vary widely, especially related to the need for blood transfusion. **Subjects and Methods:** From January 2015 to December 2018, 1400 patients underwent PCNL out of which 392 patients had stag horn stones. Our study included stag horn stones that were present in the renal pelvis and branched into two or more major calyces. All procedures were performed under general or spinal anesthesia by the same surgical team. **Results:** 392 patients (144 women and 248 men) with mean age of 44.2 (range 8yr–72yr) years having partial/complete STAG HORN calculi were treated at our center S.P. Medical college, Bikaner from period of January 2015 to December 2018. 10 patients (10.2%) had pre existing renal insufficiency with a mean (range) serum creatinine of 3.0 (1.5-4.2) mg/dl. **Conclusion:** PCNL using multiple tracts is safe and effective and should be the first option for renal STAG HORN calculi. It must be done by experienced endourologists in a specialized centre with all the facilities for stone management and treatment of possible complications.

Keywords: Pcnl, Stag Horn, Calculi.

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Introduction

The treatment of STAG HORN calculi has varied from combination of percutaneous nephrolithotomy (PCNL) and shockwave lithotripsy (SWL) or sometimes open surgery.^[1] Percutaneous nephrolithotomy (PCNL) for STAG HORN calculi is one of the challenging endourologic procedures. We present here our experience of PCNL in patients with STAG HORN calculi.

Subjects and Methods

From January 2015 to December 2018, 1400 patients underwent PCNL out of which 392 patients had STAG HORN stones. Our study included STAG HORN stones that were present in the renal pelvis and branched into two or more major calyces (i.e. partial and complete STAG HORN stones).

- Preoperative laboratory investigations included urine analysis and culture, serum creatinine estimation, a complete blood count, liver function tests and prothrombin time.
- Radiological investigations included IVU or non-contrast CT (NCCT). NCCT was used in patients with a high serum creatinine level (>1.6 mg/dL) or those allergic to the intravenous contrast medium.
- Patients with positive urine cultures were treated

with specific antibiotics for 5 days. All patients received intravenous third-generation cephalosporins 1 hr before surgery and continued for 48 hrs.

All procedures were performed under general or spinal anesthesia by the same surgical team. After giving anesthesia retrograde ureteral catheterization was done in lithotomy position and then the patient was put in prone position. Fluoroscopy-guided punctures were made and tracts were dilation to 24 French using Alken coaxial metal dilators for the primary tract. A rigid nephroscope of 20 F was used through an Amplatz sheath. Number of punctures varied from two to four, which was either a supracostal or subcostal. Stones were fragmented and removed using pneumatic lithotripsy and forceps.

Postoperative stone clearance was documented on X-ray KUB. Residual stones were managed by 'second-look' PCNL, while those stones less than 5mm were left as such and kept for follow up. The stone-free status was re-evaluated after 3 months for patients by X-ray KUB or NCCT.

Results & Discussion

392 patients (144 women and 248 men) with mean age of 44.2 (range 8yr–72yr) years having partial/complete STAG HORN calculi were treated at our center S.P. Medical college, Bikaner from period of January 2015 to December 2018. 10 patients (10.2%) had preexisting renal

insufficiency with a mean (range) serum creatinine of 3.0 (1.5-4.2) mg/dl. Age wise distribution of the patients has been shown in Table 1.

In the primary procedure, number of tracts required per patient were 2 tracts in 192, 3 tracts in 160, 4 tracts in 40 with total of 1024 tracts in 392 renal units.

- ❖ Residual stone were noted in 64 patients of whom 40 patients had stone less than 5mm and 24 patients had larger residual fragment and underwent second look procedure.
- ❖ So a total of 416 procedures were performed in 392 renal units (second-look procedures in 24 renal units).
- ❖ In 6 out of 24 (second look procedure) a new tract was needed to remove residual stone, making total number of tracts 1032.
- ❖ The points of entry of these tracts were 390 upper calyx (37.79%), 562 middle calyx (54.45%), and 78 lower calyx (7.55%).
- ❖ 256 puncture were supracostal. Table 2 and table 3 show distribution of total number of tracts and calyx punctured.
- ❖ Mean fall (range) in hemoglobin was 1.2 (0.6 -3.8) mg/dl.
- ❖ Mean duration (range) of the procedure was 384 (60-125) minutes.
 - Complications were
 - Blood transfusion (n = 48), accounting for 12.24 % cases
 - Fever (n = 72) accounting for 18.36% cases
 - Septic shock (n = 4)
 - Hydrothorax (n = 1)
 - Cot retention (n = 1)
 - Death (preexisting renal insufficiency, AKI, septicemia n = 1) as shown in table 4

Table 1: Age wise distribution of patients.

Age (years)	No. of Male	No. of Female
0-10	8	0
11-20	32	8
21-30	20	32
31-40	68	44
41-50	60	48
51-60	28	4
> 60	32	8
Total	248 (63.26%)	144 (36.74%)

Table 2: Distribution of total number of tracts

Number of Tracts required for surgery	Number of cases	% of patients
1	6	1.5%
2	192	48.24%
3	160	40.20%
4	40	10.05%

PCNL monotherapy achieved an 93.87% complete clearance rate at discharge (24 patients had second look procedure). Stone compositions were calcium oxalate (93%), uric acid (2%) and mixed (5%).

Table 3: Distribution according to the calyx punctured

Puncture	Supracostal	Infracostal	% of calyx punctured
Sup Calyx	256	134	37.79%
Mid Calyx	0	562	54.45%
Inf calyx	0	78	7.55%

Table 4: Table showing total number of complications

Complications	Number of patients	% of patients with complications
Blood transfusion	48	12.24%
Fever	72	18.36%
Septic shock	4	
Hydrothorax	1	
Clot retention	1	
Death (pre existing renal insufficiency + AKI+ septicemia)	1	

Discussion

In 1983 Clayman et al.^[2] reported the feasibility and safety of PCNL for treating STAG HORN stones. Currently it is the treatment of choice for patients with large, complex and STAG HORN renal stones.^[3] The goals of treatment of a STAG HORN stone are complete stone clearance with minimal morbidity. Although excellent stone-free rates are universally reported in the literature, complication rates vary widely, especially related to the need for blood transfusion.^[4]

Patient counseling is very important before PCNL for STAG HORN stones. The patient must be aware that the chance of needing multiple interventions to become free of stones might be up to 50%.^[5] Though in our study 24 patients required second look procedure (6.12%).

Potentially significant morbidity or even death has been reported with PCNL in large-scale series.^[6] Furthermore, PCNL is more challenging when used for treating STAG HORN stones. There are many factors that can maximize the benefits of PCNL when treating STAG HORN stones and at the same time minimize the complications. NCCT and contrast-enhanced CT with three-dimensional reconstruction have helped in better planning of percutaneous access.^[7] A supracostal skin puncture is indicated when there is a large branch of the STAG HORN stone in the upper calyx. It has the benefit of providing an easy access to the renal pelvis and in some cases the lower calyx, through one tract because the surgeon works along the longitudinal axis of the kidney. The main concern of supracostal access is the risk of pleural injury.^[8]

In STAG HORN stones with multiple large branches, percutaneous access to all the calyces can be difficult through one tract. In these cases the multi-tract technique has been reported as a viable alternative to single-tract PCNL.^[9]

Most importantly, complete removal of the stone is crucial to eradicate any causative organisms, relieve obstruction and prevent further stone growth.^[10] This can be achieved by multiple tracks during the primary or the second-look PCNL or using ESWL to treat residual stones. The surgeon must gain a balance between complete stone clearance and

acceptable patient morbidity. Therefore, when significant complications develop, e.g. bleeding, the procedure should be terminated and planned for staged PCNL especially if the stone burden is very large.

Conclusion

PCNL using multiple tracts is safe and effective and should be the first option for renal STAG HORN calculi. It must be done by experienced endourologists in a specialized centre with all the facilities for stone management and treatment of possible complications. Attention to accurate tract selection and placement as well as possession of the full array of endourologic equipment are essential to achieving an excellent outcome. The patients must be informed about the ranges of stone-free and complication rates and the possibility of multiple sessions or secondary procedures.

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