

Safety and efficacy of supracostal access in percutaneous nephrolithotomy: our experience

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Abstract:

Objective: To evaluate the safety and efficacy of the supracostal access for percutaneous nephrolithotomy (PCNL).

Material and Methods: From May 2015 till March 2017, 41 patients underwent PCNL, in 26 (63.4%) patients the collecting system was accessed supracostally above the 12th rib. Single tract was used in 24 (93%) patients and 2 (07%) patients required a second tract. Data were analyzed for indications of supracostal access, stone clearance and complications. The indications for a supracostal access were stag horn stones (46.15%), pelvis stones (34.6%), upper calyceal/diverticular stones (15.4%) and upper ureteric stones (3.85%). Post-operative stone clearance was assessed with x-ray KUB for radiopaque stones and ultrasound for radiolucent stones. Stone clearance was defined as residual stone size less than 0.4cm.

Results: Out of 26 patients, who underwent supracostal PCNL, 15 (57.7%) patients were males while 11 (42.3%) were females. The mean ages of patients were 37.81 ± 9.58 years. Overall duration of surgery was 46.13 ± 8.91 minutes. The mean stone size (maximum longitudinal length) was 3.28 ± 1.12 cm. satisfactory stone clearance was seen in 23 patients (88.5%). 3 (11.5%) patients required one session each of ESWL for residual stones. Complications were seen in five patients (19.2%). 2 patients had significant bleeding with 1 patient requiring angio-embolization (3.8%). 2 (7.7%) patients developed high grade fever, required prolonged intravenous antibiotics and anti-pyretics. 1 (3.8%) patient developed urinary leakage from puncture site which was managed conservatively. Other major complications like pneumothorax and other visceral injury were not observed.

Conclusion: Supracostal access above the twelfth rib for PCNL provides a safe access and has the advantage of managing complex renal, diverticular/upper calyceal and proximal ureteric stones.

Keywords: Percutaneous nephrolithotomy (PCNL), supracostal access, subcostal access, pelvic stones, X-Ray KUB.

Introduction:

Urinary stones represent an important problem in every day urological practice, as it has been reported that as many as 15% of population in Western countries suffers from this disease.¹ Urolithiasis constitutes about 40-50% of urological workload in hospitals with prevalence of 12% in Pakistan.²

Endoscopic management of renal stones is a well-established mode of treatment. Advent of

PCNL has revolutionized the renal stone management as safety of percutaneous access to the kidney has been established.³ Percutaneous access is often used for the management of renal stones, uretero-pelvic junction (UPJ) obstruction, proximal ureteric stones/strictures and upper collecting system tumors.

Traditionally, subcostal access is preferred over supracostal access in percutaneous renal surgeries to avoid injury to the lungs and pleura,

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Table 1: Indications for the supracostal approach (n=26)

Indication	Frequency	Percentage
Stag horn stones	12	46.15%
Pelvic stones	09	34.6%
upper calyceal/diverticular stones	04	15.4%
upper ureteric stones	01	03.85%

Table 2: Demographics and treatment characteristics of patients of supracostal access

Characteristics	n (%)
Age (years)	
Mean (SD)	37.81 ± 9.58
Gender	
Male	15 (57.7%)
Female	11 (42.3%)
Duration of Surgery (min)	
Mean (SD)	46.13 ± 8.91
Size of Renal Stones (cm)	
Mean (SD)	3.28 ± 1.12
Clearance of renal stones	
Clear	23 (88.5%)
Non-clear	03 (11.5%)
Additional procedure (ESWL)	03 (11.5%)
Complication	05(19.2%)

Table 3: Complications in supracostal approach (n=05)

Complications	Number	Percentage
Bleeding	02	7.7%
High grade fever	02	7.7%
Urinary leakage	01	3.8%

though the literature favors supra costal access for the renal stones in regards to efficacy and clearance of renal stones.^{4,5} We conducted retrospective cohort study to assess the efficacy and safety of supracostal PCNL access.

Objective: To evaluate the safety and efficacy of the supracostal access for percutaneous nephrolithotomy (PCNL)

Methodology:

We retrospectively reviewed hospital data from 11 May 2015 till 31st March 2017. A total of 41 patient aged 20 to 50 years, who underwent PCNL for the treatment of renal stones were included in study of whom 26 (63.4%) had supracostal access to the collecting system.

A supracostal tract was developed above the 12th rib. Single tract was used in 24 (93%) patients and 2 (07%) patients required a second

tract.

The data were analyzed for indications, stone clearance and the complications. The indications for a supracostal access were stag horn stones (46.15%), pelvis stones (34.6%), upper calyceal/diverticular stones (15.4%) and upper ureteric stones (3.85%) (Table 1)

All patients had standard retrograde ureteric catheter insertion and tract dilatation via Elkin's dilators.²⁸ Fr Amplatz sheath was employed. Pneumatic lithoclast, with 1mm probe was used to fragment the stone with either single or multiple pulses with pressure set at two bars. Percutaneous nephrostomy was inserted after procedure. Patients were assessed for stone clearance with x-ray KUB for radio-opaque stones and ultrasound for radio-lucent stones. Stone clearance defined as residual stone size less than 0.4cm.

Results:

Out of 26 patients, 15 (57.7%) patients were males while 11 (42.3%) were females. The mean ages of patient's were 37.81±9.58 years (Table-2).

Overall duration of surgery was 46.13±8.91 minutes. Mean stone size (maximum longitudinal length) was 3.28±1.12 cm. Complete stone clearance in was seen in twenty three patients (88.5%). Three patients required one session each of ESWL for residual stones.

Complications were seen in 5 (19.2%) patients. 2 patients had significant bleeding requiring transfusions with one of them requiring angio-emolization. 2 (7.7%) patients developed high grade fever mandating intravenous antibiotics for more than 72 hours. 1 (3.8%) patient developed urinary leakage from puncture site which was managed conservatively. Other major complications like pneumothorax and other visceral injury were not seen (Table 3).

Discussion:

The management strategies for the large renal stones are evolving world-wide for efficacy and

Table 4: Stone clearance rate and complications in international citations

	Stone clearance	Complications
LANG ET AL ⁹	88.3%	11%
EL-KARAMANY ET AL ¹⁰	78%	38%
Our study	88.5%	19.2%

safety. The optimal goal of stone management is to achieve stone clearance with minimum morbidity to the patient. Open stone surgery is now almost obsolete and is replaced by less invasive procedures like extra-corporeal shock wave lithotripsy (ESWL), flexible uretero-reno-scropy (RIRS), and percutaneous nephro-lithotomy (PCNL).⁶

Although, ESWL is preferred modality for treating renal stones, because of its less invasiveness and morbidity. Various factors such as stone size, density, location and patient factors such as obesity may have a strong influence on effectiveness.

With the increase in the popularity for PCNL as the treatment of large renal stones, per-cutaneous nephro-lithotomy has become commonly performed procedure in every day urological practice. Many citations published have shown the efficacy of PCNL over ESWL and found PCNL as a safe and successful modality for renal stones of 2cm or larger. The supracostal approach has the advantage of providing direct access to upper pole calculi, the uretero-pelvic junction, and the proximal ureter.⁷

PCNL puncture can be made either through supracostal access or subcostal access. Supracostal puncture is an ideal puncture to access the whole calyceal system of kidney and upper ureter and has shown better stone clearance than subcostal access. However due to proximity of pleura and intercostal vessels, it is often avoided surgeons unless the stone located in upper calyces. Sound anatomical knowledge expertise in surgical technique while making a puncture can reduce these complications.⁸

In our study, the mean stone size (maximum longitudinal length) in supracostal access was 3.28 ± 1.12 and stone clearance rate was 88.5%.

Lange et al have reported stone clearance of

88.3%,⁹ whereas El-Karamany has reported stone clearance rate around 78% with supracostal puncture.

We report no visceral complications and one patient had bleeding significant enough for angiobolization. Other studies showed complication rates of 11% and 38% respectively^{9,10} (Table 4).

Conclusion:

Supracostal access for percutaneous nephrolithotomy (PCNL) has efficacy and safety with high clearance rate and acceptable complications and should not be avoided for the fear of thoracic complications. Supracostal access for PCNL Above the 12th rib approach provides a relatively safe access and has the advantage of managing complex renal, diverticular/upper calyceal and proximal ureteric stone.

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Role and contribution of authors:

Dr Sobia Rafi, collected the references and data and wrote the initial write up.

Dr Ali Haider, helped in collecting the references and helped in introduction, methodology and discussion writing.

Dr Wajahat H. Wasty, critically review the article and advised the useful changes in introduction, discussion, result and conclusion writing.

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