ORIGINAL ARTICLE

Comparison of efficacy between supra-costal access and sub-costal access in patients underwent Percutaneous nephro-lithotomy for renal pelvic calculus

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Abstract:

Objective: To compare the efficacy of percutaneous nephro-lithotomy between supra-costal and sub-costal access in patients with renal calculus.

Study design: Randomized controlled trial

Material and Methods: A total of 62 (62) subjects aged 20 to 50 years undergone PCNL (percutaneous Nephro-lithotomy) from 12th April 2014 to 30 November 2014 for the treatment of renal stone were included in this study. Patients were divided into two groups. Group-A patients were treated with supra-costal access and group-B patients were treated with sub-costal access. Patients were assessed for stone clearance on 1st post-operative day with x-ray KUB for radiopaque stones. Data was analyzed using SPSS version 17.0.

Results: Out of 62, 45 (72.5%) patients were males while 17 (27.5%) were females. The mean age of patients in supra-costal and sub-costal was 37.81±9.58 years and 39.42±8.94 years respectively. Over all duration of surgery was 46.13±8.91 and 45.65±8.63 minutes respectively and was not statistically significant (P-value= 0.057). The mean stone size in group-A was 3.28±1.12 cm and in group-B was 2.92±0.80cm (P-value =0.157). Over all stone clearance was 96.77% and 87.09% with P-value was 0.177 that is insignificant. 05 patients required 01 session each of extra-corporeal shock wave litho-tripsy (ESWL) for residual stones. Overall complications was seen in 09 patients (14.51%) in both groups. In supra-costal access, 04(12.90%) patients developed complication of whom 02 patients developed bleeding complication (01 required angio-embolization and 01 patient managed conservatively). 02 patients developed high grade fever required intravenous antibiotics and anti-pyretics. In sub-costal group, 5 patients (16.12%) developed complications (3 developed high grade fever, 2 developed urinary leakage from puncture site) which was managed conservatively. No major complications like pneumo-thorax and other visceral injury was seen with P-value= 0.177 that is statically insignificant.

Conclusion: Efficacy and safety of supra-costal access for percutaneous nephro-lithotomy in experience hands is comparable with sub-costal access in terms of renal pelvic stone clearance and has acceptable complications rate and should not be avoided.

Keywords: Percutaneous nephro-lithotomy, extra-corporeal shock wave litho-tripsy (ESWL), supra-coastal, sub-coastal, bleeding during PCNL, angio-embolization

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Introduction:

Human existence has been plagued by uro-lithiasis since ancient times. It prevalence and recurrence rates is considered as a major health care problem considering its over all cost burden on health care system. Management of renal stone disease has revolutionized from open surgery to minimally invasive options.[1]

Since the advent of percutaneous nephro-lithotomy (PCNL) by Fernstrom and Johansson[2] in 1976, it revolutionalized the management of re-

nal stone disease and improved the outcome of PCNL and preferred as the most useful surgical treatment for large and complex renal stones.[3]

American urology association (AUA) and European Association of Urology (EAU) has considered PCNL as the first surgical option for large, complex, multiple, inferior calyceal kidney and upper ureteric stones due to its reduced morbidity, cost-effectiveness, short operative time, lower post-operative complications, short hospital stay and early return to work.[4,5]

An ideal access during percutaneous nephrolithotomy (PCNL) is one that provides easy access to the renal system avoids major vascular and visceral injuries and lies along the axis of the calyx and causes minimal parenchyma damage.[6]

Renal calyceal system can be accessed from both supra-costal (above 12th rib) and sub-costal (below 12th rib) approach. Worldwide citations advocates the efficacy of supra costal access in PCNL for the clearance of renal stones over subcostal access. Unfortunately, Current clinical practices reflect reluctance in surgeons for supra-costal access mainly due to fear of complications.[7]

We conducted the randomized control trial to establish the efficacy of supra-costal PCNL access over more conventional subcostal PCNL access in our population.

Objective: To compare the efficacy of percutaneous nephrolithotomy between supra-costal and sub-costal access in patients with renal calculus.

Material and Methods:

We conducted randomized controlled trial in Department of Urology, The Kidney Centre PGTI, Karachi from 12th April 2014 to November 2014 (seven months). Sampling technique was non-probability, consecutive sampling. Sample size was calculated using computer software" sample size determination in health sciences, WHO". Sample size was calculated by using values of stone clearance from reference (previous) study.[8] By using proportions of stone clearances in supra-costal and sub-costal access of 94% and 73%(8), respectively, a sample of 31 subjects is calculated in each arm at 5% level of significance (two sided) and 95% power.

A total of sixty two (62) subjects aged 20 to 50 years underwent PCNL (Percutaneous Nephrolithotomy) for the treatment of renal stone fulfilling the inclusion criteria were included in this study. Patients were divided into two groups by lottery method randomization done by the researcher. Group-A patients were treated with Supra-costal access and Group-B patients were treated with sub-costal access. Patients were assessed for stone clearance on 1st post-operative day with x-ray KUB for radiopaque stones. Statistical analysis was performed with chi-square test.

Inclusion criteria was patient's age from 20 years to 50 years, have single procedure (PCNL only), solitary radio-opaque renal pelvic stone of more than 2cm on X-ray KUB, duration of having stone up to 1 year.

Exclusion criteria was stone size less than 2 cm, age more than 50 years, have two surgical procedures simultaneously. Positive urine culture, prior history of renal intervention, previous history of ESWL, additional/multiple calyceal calculi, restricted mobility of patient, patients with solitary functioning kidney, patients with coagulopathy.

All procedure were done in prone position and under general anesthesia. All patients underwent standard retrograde ureteric catheter insertion and tract dilatation via Elkin's dilators and both combined ultrasonic and Pneumatic lithoclast, with 1mm probe was used to fragment the stone with single or multiple pulse and pressure set at 2 bars. Percutaneous nephrostomy were inserted at the end of procedure.

Post-operatively, all patients were evaluated with X-ray KUB on first post-operative day for clearance. Both groups were observed for efficacy for clearance of calculi. Patients will be discharged

Table-1: Demographic and treatment characteristics of patients underwent supra-costal and sub-costal access (n=62)

Characteristics	n (%)
Age	
Gender	
Male	45 (72.5%)
Female	17 (27.5%)
Type of Surgery	
Supracostal Access	31 (50.0%)
Subcostal Access	31(50.0%)
Duration of Surgery	
Mean (SD)	45.83 (+/- 8.70)
Size of Renal Stones	
Mean (SD)	3.10 (+/- 0.99)
Clearance of renal stones	
Clear	57 (92%)
Non-clear	05 (08%)
Additional procedure (ESWL)	05 (08%)
Complication	09(14.5%)

Table-2: Factors assocaited with supra-costal and sub-costal access (n=62)

Characteristics	Supra-costal Access	Sub-costal Access	P-value
Age	37.81± 9.58	39.42±8.94	0.496
Gender			
Male	25 (80.64)	20 (64.51)	-
Female	06 (19.36)	11 (35.49)	
Renal Stone Size	3.28 ± 1.12	2.92± 0.80	0.157
Duration of Surgery	46.13± 8.91	45.65± 8.63	0.057
Stone Clearance			
Yes	30 (96.77%)	27 (87.09%)	0.177
No	01 (3.22%)	04 (12.91%)	
Complication	04(12.90%)	05 (16.12%)	0.177

Table-3: Complications rates in both groups

Characteristics	Supra-costal Access	Sub-costal Access
Bleeding	02	00
High grade fever	02	03
Urinary leakage	00	02

if they have achieved stone clearance (residual stone size less than 0.4cm will be considered as insignificant).

Data were analyzed using SPSS version 17.0. Means and standard deviations were calculated for age and duration of surgery. Proportion was computed for gender, efficacy between groups. Chi-square test were applied to compare efficacy between taken groups (p value less than 0.05 will be consider significant). Effect confounders were controlled through stratification of age, gender, duration and size of the calculus and duration of surgery P value of less than 0.05 will be considered significant.

Results:

Socio-demographic and patient characteristics of both groups were comparable. Out of 62, 45 (72.5%) patients were males while 17(27.5%) were females The mean age of patients in supra-costal group was 37.81±9.58 years and in sub-costal group was 39.42±8.94 years (Table-1). Overall duration of surgery was time in Group-A (supra-costal access) was 46.13±8.91 minutes and in Group-B (sub-costal access) was 45.65±8.63 minutes and was not statistically significant (P-value=0.057). The mean stone size in group A was 3.28±1.12 cm; whereas, the mean stone size for group B was 2.92±0.80cm (P-value=0.157). Overall stone clearance in Group-A was 96.77% and in Group-B, it was 87.09% with P value was 0.177 that is insignificant. 05 patients required 01 session each of ESWL for residual stones.

Overall complications was seen in 09 patients out of 62(14.51%) in both groups. in supra-costal access, 04 out of 31(12.90%) patients developed complication of whom 02 patients developed bleeding complication (01 required angio-embolization and 01 patient managed conservatively). 02 patients developed high grade fever required intravenous antibiotics and antipyretics. In subcostal group, 5 out of 31 patients (16.12%) developed complications (3 developed high grade fever, 2 developed urinary leakage from puncture site) which were managed conservatively. No major complications like pneumothorax and other visceral injury was seen with P-value= 0.177 that is statically insignificant (Table-2, 3).

Discussion:

Before the advent of PCNL, the management option for renal stone disease was open surgery. With the advent of endo-urology and litho-tripsy, almost all renal stones treated successfully. Since Fernstrom and Johansson first removed a renal calculus through a nephrostomy tract in 1976, percutaneous nephrolithotomy (PCNL) has significantly changed and is continuing to evolve.

PCNL has advantage of removing large renal stones and achieving excellent results with minimal morbidity. The point of transition for the term "large stone" for the renal stones is 2 cm. partial or complete staghorn stones may need more than one puncture for clearance or the combination of PCNL and ESWL followed by Re-do PCNL (sandwich therapy).[9]

The supra-costal access is considered ideal for PCNL for the management of renal stones as the posterior upper pole calyxes are the most posterior portion of the kidney, thus provides simultaneous approach to the renal pelvis, upper ureter and lower-pole calyces.[10]

Renal calyceal system during PCNL can be accessed either through supra-costal access or sub-costal access. Supra-costal access is an ideal puncture to approach the whole calyceal system of kidney and upper ureter and it is also shown better stone clearance than sub-costal access. While supra-costal puncture is ideal for stone clearance, however, due to proximity of pleura and inter-costal vessels, it is often avoided by the surgeons unless the stone located in upper calyces. Applied surgical anatomical knowledge around the supra-costal access and applying expertise surgical technique while making renal access can reduce these complications.[11]

International citation also advocated the superiority of supracostal access over subcostal access for the renal stone disease regarding stone clearances provided expertise surgical techniques during access.[8,10,11]

Though there are many study comparing both supra-costal and sub-costal access for PCNL, there is scarcity of randomize control trials. We did randomize control trial for the above mention purpose.

In our study, 72.5% of patients in both groups were males and 27.5% of patients in both groups were females. 81% of patients in group-A (supra-costal access) and 64.5% of group-B (subcostal access) were males, which is, as per literature suggested that stones are more common in males 3:1.[12]

Both groups were comparable according to stones parameters. 100% of stones in group-A and 100% in group-B were radiopaque. All the stones in our study were in renal pelvis.

Duration of surgery has been under reported in available literature. There is no single study randomized between supra-costal and infra-costal access to assess duration of stone. In our study, we calculated the duration of surgery in both groups. The mean duration of surgery in group -A was 46.13±8.91 min and in group-B was 45.65±8.63 min.

A study done in USA showed stone clearances in supra-costal and sub-costal access of 94% and 73% respectively.[10] In our study, in supra-costal group, 30(96.77%) had cleared stones and in sub-costal group, 27(87.09%) of the patients had clear stones which shows same efficacy of supra-costal access for renal calculi.

That same study[10] showed the complication rate of 9.1% in supra-costal group and 10% in subcostal group. In our study, 04(12.90%) patients developed complications in supra-costal group of whom 02 patients developed bleeding complication (01 required angioembolization and 01 patient managed conservatively). 02 patients developed high grade fever required intravenous antibiotics and antipyretics. In sub-bcostal group, 5 patients (16.12%) developed complications (3 developed high grade fever, 2 developed urinary leakage from puncture site) which was managed conservatively. No major complications like pneumothorax and other visceral injury was seen with P-value= 0.177 that is statically insignificant.

Conclusion:

Efficacy and safety of supra-costal access for PCNL in experience hands is comparable with sub-costal access in terms of renal pelvic stone clearance and has acceptable complications rate and should not be avoided. The significantly higher rate of achieving stone-free rates, acceptable rates of complications, and reduced oper-

ating time when using supra-costal access make this the access of choice for renal stoen disease. The supra-costal approach provides optimum access for the percutaneous removal of renal stones. Appropriate attention to the technique and to monitoring before and after surgery can detect major complications.

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Role and contribution of authors:

Dr Ali Haider, collected data, references, and prepared the write-up.

Dr Waqar Ahmad Memon, helped in collecting references, writing introduction, methodology and discussion.

Dr Salman el Khalid, critically reviewed the article and made final changes.

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