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COMPARATIVE EVALUATION OF SUPRACOSTAL AND INFRACOSTAL APPROACHES: UPPER POLE ASSESS FOR PCNL

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ABSTRACT

Introduction: Renal stone disease is a challenging problem in urological practice because of large stone burden and recurrence. The goal of stone treatment is to use a less morbid, minimally invasive and effective modality There are a lot of uncertainty with renal stone management, many factors impact on management course, stone up to 10 mm can be pass on their own, roughly, the chance of a stone passing spontaneously is inversely to the size in millimeters. **Objectives:** The aim of this study was to compare the safety and efficacy between suprscostal and infracostal upper pole approaches for PCNL. **Methods:** This Quasi experimental study was carried out in the Department of Urology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Bangladesh Medical College Hospital, Popular Medical College and Hospital; and Barakah Kidney Hospital & Research Institute, Dhaka, during the period of February 2011 to January 2013, to compare the safety and efficacy between supracostal and infracostal upper pole approaches for PCNL. **Results:** The mean duration of operation time was found 80.9±31.7 minutes in group I and 76.5±29.2 minutes in group II. The mean length of hospital stay was 3.98±0.70 days and 4.12±0.65 days in group I and group II respectively. The mean duration of operation were higher in group I but not statistically significant (p>0.05). **Conclusion:** With the development of instruments and increased experience, judiciously made supracostal tracts in a single session percutaneous nephrolighotomy for treating complex stones in selected cases is safe, feasible and effective within acceptable morbidity in achieving a greater stone clearance.

KEYWORDS: Nephrolithotomy, supracostal, infracostal, upper pole.

INTRODUCTION

The goal of stone treatment is to use a less morbid, minimally invasive and effective modality There are a lot of uncertainty with renal stone management, many factors impact on management course, stone up to 10 mm can be pass on their own, roughly, the chance of a stone passing spontaneously is inversely to the size in millimeters. A 1mm stone passes 90% of the time, a 5 mm stone 50% of time, a 9 mm stone 10% of the time and so on. ESWL is most appropriate for small stone in the kidney or upper ureter. URS is the choice of procedure for stone in the ureter. The management of the staghorn calculi somewhat challenging, the most accepted choice at present a combination of PCNL and ESWL, which is called sandwich therapy. Over time, modification of the techniques of percutaneuos renal access and improvement of the instruments PCNL is considered standard therapy for large and complex renal calculi (Honey 2011).[1]

Extracorporeal shockwave lithotripsy (SWL) has problems of potential retained stones and residual fragments with subsequent "steinstrasse" formation Conversely, percutaneous techniques have attained a stone free status up to 98.3% of targeted renal stones. Approach through the upper pole posterior calyx is useful for direct visualization to the superior calyx, inferior calyx, pelvis, PUJ and upper ureter. Successful removal requires the accurate placement of a percutaneous tract that provides direct access for stone manipulation. The advantage of upper-pole access is direct access to most of the intrarenal collecting system and upper ureter, so upper- pole access is the most direct means of ensuring good stone clearance.[2] Upper-pole access can be achieved via both supracostal and infracostal approaches. Stone clearance rate is higher in supracostal approach than that of infracostal. The pulmonary complications are a potential complication for supracostal approach because the anatomic relation of upper pole of the kidney to the diaphragm and the pleura. Supracostal supra 11th rib access has a particularly high

rate of complications; haemo-pneumothorax and calyceal-pleural fistulla have been repoted in upto 23.1%.[3] And the incidence of hydro-pneumothorax occurring with supracostal access has been reported as a rate of 4-15%; and pleural effusion was reported in 8-12.5% with intercostal approach. (Narasimham 1991, Sampaio 1987 and Sukumar 2008).[4,5]

OBJECTIVE

General objective

- To compare the safety and efficacy between suprscostal and infracostal upper pole approaches for PCNL.

Specific objective

- To find out the stone clearance rate, complications, operating time and hospital stay in supracostal group.
- To find out the stone clearance rate, complications, operating time and hospital stay in infracostal group.

METHODOLOGY

Type of study	Quasi experimental study
Place of study	Department of Urology, Bangabandhu Sheikh Mujib Medical University, Dhaka and Some other private hospitals in Dhaka City
Study period	1 Year February, 2011 to January, 2012.
Study population	Patients with renal stone admitted in the Department of Urology, Bangabandhu Sheikh Mujib Medical University, Dhaka and Some other private hospitals in Dhaka City, for PCNL according to inclusion and exclusion criteria.
Sampling technique	Purposive sampling
Study sample	70 cases were included in this study

Selection Criteria

Inclusion criteria

1. Age - 18 to 70 years.
2. Large (>20mm) or multiple calculi in upper calyx, lower calyx and renal pelvis
3. Staghorn stone

Exclusion criteria

1. Patient with uncorrectable bleeding disorder.
2. Patient with anatomical abnormality of the kidney (horseshoe kidney, Malrotated kidney or pelvic kidney).
3. History of previous surgery on the proposed PCNL side.
4. Multiple puncture
5. Conversion to open

Procedure of Study

A total of 105 patients with renal stone were admitted for PCNL via upper pole access during the study period, out of which 90 cases were enrolled in this study according to inclusion criteria (50 cases in Bangabandhu Sheikh Mujib Medical University and 20 cases other private hospitals). Among them 20 cases were excluded due to multiple puncture (14 cases) and conversion to open (6 cases). Finally 70 cases were included in this study, out of them 35 patients were supracostal (Group I) and 35 patients were infracostal (Group II).

Data collection Methods: Patient's data collection form (Appendix-IV) includes along with address of the patient, age, sex, size and location of the stone and preoperative investigation findings were documented.

Data Processing and Analysis

Statistical analyses were carried out by using the Statistical Package for Social Sciences version 16.0 for Windows (SPSS Inc., Chicago, Illinois, USA). The mean values were calculated for continuous variables. The quantitative observations were indicated by frequencies and percentages. Chi-Square test with Yates correction were used to analyze the categorical variables, shown with cross tabulation. Student t-test was used for continuous variables. P values <0.05 was considered as statistically significant.

RESULT

Table I. Distribution of the study patients according to age (n=70).

Age (years)	Group I (n=35)		Group II (n=35)		P value
	n	%	n	%	
≤30	4	11.4	6	17.14	
31-40	14	40.0	12	34.28	
41-50	10	28.75	10	28.75	
51-60	4	11.4	5	14.28	
>60	3	8.57	2	5.71	
Mean±SD	43.7	±9.1	41.5	±10.6	**0.359^{ns}**
Range (min-max)	(22	-68)	(26	-65)	

Group I- Supracostal
Group II- Infarcostal
s=significant
P value reached from unpaired t-test.

The study included 70 patients and the mean age was 43.7±9.1 years with ranged from 22 to 68 years in group I and 41.5±10.6 years with ranged from 26 to 65 years in group II. Maximum number was found in the age group of 31-40 in both groups. The mean age difference was not statistically significant (P>0.05) between two groups in unpaired t-test.

Table II. Distribution of the study patients according to sex (n=70).

Sex	Group I (n=35)		Group II (n=35)		P value
	n	%	n	%	
Male	20	57.63	21	60.0	0.808^{ns}
Female	15	42.85	14	40.0	

ns=not significant
P value reached from chi square test.

Regarding the sex distribution of the study patients, male were predominant in both groups, which was 20(57.63%) in group I and 21(60.0%) in group II. The difference was not statistically significant (P>0.05) between two groups.

Table III. Distribution of the study patients according to side of the stone (n=70).

Side	Group I (n=35)		Group II (n=35)		P value
	n	%	n	%	
Left side	22	62.86	19	54.29	0.466^{ns}
Right side	13	37.14	16	45.71	

ns=not significant
P value reached from chi square test.

Regarding the side of the stone, left side stone was found 22(62.86%) in group I and 19(54.29%) in group II. Right side stone was found 13(37.14%) and 16(45.71%) in group I and group II respectively. The difference was not statistically significant (P>0.05) between two groups.

Table IV: Distribution of the study patients according to stone size (n=70).

Stone size	Group I (n=35)		Group II (n=35)		P value
	n	%	n	%	
3 or <3 cm	16	45.71	17	48.58	
>3 cm	19	54.29	18	51.42	
Mean±SD	4.2	±1.4	4.5	±1.2	0.201^{ns}
Range (min-max)	(2.5	- 6.5)	(2.3	-6.4)	

Regarding the stone size of the study patients. Majority 19(54.29%) in group I and 18(51.42%) in group II patients stone size was > 3 cm. The mean stone size was 4.2±1.4 cm in group I and 4.5±1.2 cm in group II. The difference was not statistically significant (P>0.05) between two groups.

Table V: Distribution of the study patients according to stone location (n=70).

Stone location	Group I (n=35)		Group II (n=35)		P value
	n	%	n	%	
Staghorn	14	40.0	18	51.42	0.337^{ns}
Upper calyceal	11	31.42	9	25.71	0.596^{ns}
Lower calyceal	3	8.17	2	5.71	0.500^{ns}
Renal pelvis	4	11.42	4	11.42	0.645^{ns}
Pelvis+calyx	3	8.17	2	5.71	0.500^{ns}

ns=not significant
P value reached from chi square test.

Regarding the stone location of the study patients. Staghorn stone was found in 14(40.0%) group I and 18(51.42%) in group II. Upper calyceal stone was found in 11(31.42%) and 9(25.71%) in group I and group II respectively. The difference was not statistically significant (P>0.05) between two groups.

Table VI. Distribution of the study patients according to stone clearance (n=70).

Stone clearence	Group I (n=35)		Group II (n=35)		P value
	n	%	n	%	
Failure	2	5.71	5	14.3	0.241^{ns}
Success	33	94.29	30	85.7	
Stone free	30	85.7	28	80.0	-
Stone<4mm	3	8.6	2	5.7	

ns=not significant
P value reached from chi square test.

Regarding the stone clearance of the study patients. Success stone clearance was found in 33(94.29%) group I and 30(85.7%) group II. Which was statistically not significant (P>0.05). Complete stonefree status was found in 30(85.7%) group I and 28(80.0%) group II. Stone <4 mm was found in 3(8.6%) and 2(5.7%) group I and group II respectively.

DISCUSSION

The success of PCNL depends on many steps during the procedure such as the puncture site and technique; tract dilatation, and nephroscopy. The first step of success is achieved by proper positioning of the nephrostomy tract. The upper pole of the kidney is aligned medially and posterior to the lower pole, making a shorter and easier access route. The upper-pole approach provides a straight tract along the long axis of the kidney and ensures the ability to reach most of the collecting system while providing easier manipulation of the rigid nephroscope and other rigid instruments. The limitation of the lower-pole approach for the treatment of upper-calyceal and upper-ureteral calculi is difficulty of reaching the upper calyceal infundibulum and the upper ureter; such access may lead to trauma and bleeding during nephroscopy and stone fragmentation because of the angulation and torque on the kidney.

In this current study it was observed that the mean age were 43.7+9.1 with range from 22 to 68 years and 41.5+10.6 years with range from 26 to 65 years in Group-I and Group-II respectively, which was almost similar between two groups. A large number of the patients were in 4th decade in both groups, that was 40.0% in group I and 34.28% in group II. Similarly, Sukumar et al. (2008) showed the mean age of their study was 44.2 years in supracostal and 43.34 years in infracostal group.[5] Hossain et al. (2011) and Gupta et al. (2002) obtained the mean age were 39 years with ranged from 23 to 55 years and 44.5 years with range from 22 to 62 years respectively, which are closely resembled with the current study.[6,7] The age range of the present study is comparable with the study done by John et al. (2011) where the authors found the age range of the patients belonged to 22–76 years and 22 -81 years in group I and group II respectively.[1] In another study, Lojanapiwat and Prasopsuk (2006) showed the mean age was 51.64±11.93 years in group I and 52.05±12.52 years in group II, which is higher with the current study, this may be due to long life expectancy, geographical and racial influence had significant impact on development of renal stone of their study patients.[2]

In this present study it was observed that male predominant in both group, which were 57.63% and 60.0% in group I and Group II. Male to female ratio was 1.4:1 in the whole study patients. Shaikh et al. (2009) found male predominant in their study, where 70.7% and 29.3% patients were male and female respectively, which is closely resembled with the current study.[8] Similarly, Hossain et al. (2011); Gupta et al. (2002); Lojanapiwat and Prasopsuk (2006) showed renal stone was more common in male subject, which is consistent with the current study.[2,6,7]

Regarding the side of the stone, it was observed in this current series that renal stone was more common in left side, which was 62.86% in group I and 54.29% in group II. Stone found right side in 37.14% and 45.71% in group I and group II respectively, which was almost similar between two groups. On the other hand, Hossain et al. (2011) found 57.0% and 43.0% renal stone were in right-sided and left-side respectively of their study patients.[6]

In this present series it was observed that more than a half (54.29%) in group I and 51.42% in group II patients had stone size > 3 cm. The mean stone size was 4.2±1.4 cm in group I and 4.5±1.2 cm in group II. The difference was not statistically significant (P>0.05) between two groups. Lojanapiwat and Prasopsuk (2006) showed the mean stone size was 4.15±1.8 cm and 3.82±1.55 cm in group I and group II respectively, which is consistent with the current study.[2] Rahman et al. (2011) showed the mean stone size was 3.2 cm with range from 2.5-4.8 cm. In another study Lingeman (1994) recorded stone size between 2 to 7.5 cm.[9] The above mentioned study are almost similar to the size of stone of present study.

In this study it was observed that staghorn stone was 40.0% in group I and 51.42% in group II. Upper calyceal stone was 31.42% and 25.71% in group I and group II

respectively. Lower calyceal stone was 8.17% in group I and 5.71% in group II. Renal pelvis stone was 11.42% in group I and 11.42% in group II. Pelvis+calyceal stone was 8.17% and 5.71% in group I and group II respectively. Hossain et al. (2011) mentioned in their study that a half (50%) of the patients had partial and complete staghorn stones which is comparable with the current study.

In this series it was observed that stone clearance was 94.29% in group I and 85.7% in group II, which was higher in group I but not statiscally significant (P>0.05). Stone were completely cleared 85.7% in group I and 80.0% in group II. Clomplete stone clearance with insignificant residue (<4 mm) was 8.6% and 5.7% in group I and group II respectively. Lojanapiwat and Prasopsuk (2006) found 82.2% and 77.1% stone clearence rate with supracostal and infracostal PCNL respectively.[2]

CONCLUSION

Percutaneous nephrolithotomy is currently the preferred first line treatment for staghorn and large renal calculi. This study was undertaken to compare the safety and efficacy between supracostal and infracostal upper pole approaches for PCNL. It can be concluded that supracostal approach in a single session percutaneous nephrolithotomy is not safe and effective then infracostal approach.

REFERENCES

1. John, DA, Honey, RJ, Joshua, D, Wiesenthal, JD, Ghiculete, D, Pace, S, et al. 2011, 'Comparison of Supracostal *Versus* Infracostal Percutaneous Nephrolithotomy Using the Novel Prone-Flexed Patient Position', Journal of Endourology, 25(6): 947-954.
2. Lojanapiwat, B & Prasopsuk, S 2006, 'Upper-pole access for percutaneous nephrolithotomy: comparison of supracostal and infracostal approaches', J Endourol, 20: 491-494.
3. Munver, R, Delvecchio, FC, Newman, GE 2001, 'Critical analysis of supracostal access for percutaneous renal surgery', J Urol, 166: 1242-1246.
4. Narasimham, DL, Jacobsson, B & Vijayan, P 1991, 'Percutaneous nephrolithotomy through an intercostal approach', Acta Radiol, 32: 162-165.
5. Sukumar, S, Nair, B & Ginil, KP 2008, 'Supracostal access for percutaneous nephrolithotomy: less morbid, more effective', Int Urol Nephrol, 40: 263-267.
6. Hossain, M, Ullah, ATMA, Regmi, S, Rahman, H & Kibria, SAMG 2011, 'Safety and efficacy of the supracostal access for percutaneous nephrolithotomy: Our initial experience', Bangladesh Med Res Counc Bull, 37: 34-38.
7. Gupta, R, Kumar, A, Kapoor, R, Srivastava, A & Mandhani, A 2002, 'Prospective evaluation of safety and efficacy of the supracostal approach for percutaneous nephrolithotomy', BJU Int., 90: 809–813.
8. Shaikh, AU, Biswas, R, Arif, NUM, Miah, N & Zaman, W 2009, 'Percutaneous nephrolithotomy through superior calyceal approach our experience', Orignal article, 3(1): 4-6.
9. Rahman, AU, Ullah, A, Khan, S, Khan, MN, Khan, MK, Jan, MA et al. 2011, 'Percutaneous nephrolithotomy for the treatment of renal stones larger than 2.5 cm', JPMI, 25(4): 362 – 367.