Original Article

SUCCESS RATE OF MICRO-PERCUTANEOUS NEPHROLITHOTOMY IN THE TREATMENT OF RENAL CALCULI

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ABSTRACT:

BACKGROUND: The gold standard treatment option for moderate to huge sized kidney stones has been percutaneous nephrolithotomy for many years. Micro-percutaneous nephrolithotomy (microperc) has been done progressively for medium-sized renal calculi. It is really important to completely clear the renal stones because of high recurrence rate and morbidity in both conventional PNL, and microperc techniques.
PURPOSE: To determine the frequency of success in terms of stone free state 4 weeks after micro-PNL among patients with renal stones
STUDY SETTING: Urology Department, Shaikh Zayed Hospital, Lahore.
PERIOD OF STUDY: August 17, 2016 to February 17, 2017.
SUBJECTS & METHODS: A total of 60 patients with kidney stone of <2 cm in size and between 18 to 60 years of age were enrolled. Micro-PNL was done after accomplishment of all investigations. All patients were given prophylactic antibiotics. Stone free rate at 1st post-operative day and 1 month post-operatively was assessed by Xray or Ultrasound KUB. The stone free rate after one month was the endpoint of this study.
The data were entered and analyzed by using SPSS 23.0. Data were stratified for age, gender and stone size to address the effect modifiers. Post stratification, Chi-square test was applied to check the significance with p-value ≤ 0.05 as significant.
RESULTS: Sixty patients with renal calculi were enrolled. Among these patients, 39(65%) were males, while 21(35%) were females. Age range in this study was from 18 to 60 years with mean age of 39.35±13.56 years. Mean size of the stone was 0.93±0.13. Most of the patients 42(70%) had the size of stone <1 cm, while 18(30%) patients had the size of stone >1 cm. Overall success rate of micro-PNL was 86.7% in patients with renal calculi.
CONCLUSION: The micre-PNL technique is efficaceous and safe for stones with low morbidity, significant success rate and acceptable operative time span. .
KEY WORDS: Percutaneous nephrolithotomy (PNL), Renal stones, Effectiveness.

INTRODUCTION:

The prevalence and incidence of renal stone disease is rising all over the world and is noticed across age, sex, and race[1]. There is a parallel progress in rate of surgical interventions due to escalation in stone disease worldwide. Advancement in techniques have permitted a shift towards minimizing the complication rate and the time span of hospital stay, with a minimization in invasiveness and size of surgical tools[2].
A stability is required between stone clearance and morbidity associated with techniques used. Multiple management schemes that includes invasive and minimally invasive techniques have been suggested to deal with urolithiasis that includes extracorporeal shock wave lithotripsy (ESWL), conventional percutaneous nephrolithotomy (PNL), mini-PNL, retrograde

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intra-renal surgery (RIRS) and micro-PNL[3].
Percutaneous nephrolithotomy has turned into the gold standard treatment for renal stones[4] but after sufficient affirmation in the studies, it was recommended that reducing the size of tract for PNL could reduce morbidity and bleeding. "Microperc" was described by Desai et al. in which an all-seeing needle was used in a tract size of 4.85Fr without a working sheath to do PNL[5,6].
As compared to minimally invasive PNL and conventional PNL, this technique is divergent. In this approach, some steps of the procedure are omitted, and pelvicalyceal system is punctured through single step while no need of dilatation of tract. This technique is minimally invasive and has speedy recovery time[7].
In an article directed by Karataq T. and workmates, micro-percutaneous nephrolithotomy was considered an efficaceous, safe and practicable technique for urolithiasis[8]. Abdel hafez MF et al. reported similar results and showed that micro-PNL technique was efficacious and secure for kidney stones with scarce morbidity, sound success rate and acceptable operative time span[9].
Desai MR et al. described that micro-PNL was technically workable, secure and efficacious for renal calculi. A success rate of 88.9% in terms of stone free patients four weeks after micro-PNL, was attained in this study. Sample size in this article was 10 patients[6].
Regarding the efficacy, micro-PNL has been expressed formerly in a confined numeral of patients[4]. The focus of my study was to judge the success rate of micro-percutaneous nephrolithotomy for kidney stones as no local statistics were obtainable.

MATERIALS AND METHODS:

We carried off micro-percutaneous nephrolithotomy on 60 patients from August 17, 2016 to February 17, 2017 at Department of Urology and Renal Transplant, Sheikh Zayed Hospital Lahore.

SAMPLE SELECTION:

Inclusion Criteria

- All patients in span of 18-60 years of age
- Patients of both genders (Male & Female)
- Patients with solitary renal stone of ≤ 2 cm

Exclusion Criteria

- Patients unwilling to participate in the study.
- Patients with bleeding tendencies (INR>1.5).
- Patients with anatomical abnormalities (Ectopic or mal-rotated kidneys assessed by CT KUB).
- Urinary Tract Infection diagnosed on urine culture and sensitivity (Bacterial count of $>10^5$ cfu/ml).
- Patients with distal obstruction of urinary tract analyzed by CT KUB.

DATA COLLECTION PROCEDURE:

After approval from the hospital ethical committee, all 60 patients inscribing in the department of Urology OPD fulfilling the inclusion criteria were incorporated in the study after illustrating pros and cons of treatment and fully informed written consent.
Patients were admitted after pre-treatment assessment. After complete medical history and physical examination, all patients underwent investigations like serum urea and creatinine measurement, urine-analysis, X-ray kidney-ureters-bladder film, ultrasound (USG) and computed tomography (CT) and/or intravenous urography (IVU).

TECHNIQUE OF MICRO PERCUTANEOUS NEPHROLITHOTOMY:

Micro-PNL was done after completion of all investigations. All patients were given prophylactic antibiotics. After general anesthesia, a ureteral catheter (open ended) of 6Fr was positioned via cystoscopy in the lithotomy position on fluoroscopic table.
After Foley's catheterization, patient's position was converted to prone and all pressure points were reinforced with pillows. Calyceal anatomy was delineated by delivering contrast through the ureteric catheter. After assortment of an appropriate calyx, under visual control of fluoroscope and/or Ultrasound, an all-seeing

needle of 4.85Fr was approached to the suitable calyx.
An all-seeing needle was used to puncture the pelvicalyceal system. Once the needle was in appropriate calyx, the stylet was withdrawn and a 3-way connector was connected which permitted the entrance of the micro-optic and laser fiber. Third port of the 3-way connector was used for irrigation pump. Disintegration of stone was achieved with Ho:YAG 200micron laser fiber under direct vision.
The operation was concluded without putting off any nephrostomy tube. Stone free rate four weeks post-operatively was assessed by Xray or Ultrasound KUB. The stone free rate at the end of the four weeks was the endpoint of our study.

DATA ANALYSIS PROCEDURE:

All the computations were carried out by using the statistical package, SPSS v 23.0. Some descriptive measures e.g., mean and standard deviation was computed for the variables like age and stone size. Frequency distribution and percentages were calculated for the categorical variables like gender and success rate in terms of stone free state. Data were stratified for age, gender and stone size to address the effect modifiers. Post stratification, Chi-square test was applied to check the significance with p-value ≤ 0.05 as significant.

RESULTS:

In this study, 60 patients with renal calculi were enrolled. Among these patients, 39(65%) were males, while 21(35%) were females.
Age range in this study was from 18 to 60 years with mean age of 39.35±13.56 years. Majority of the patients 22(36.7%) were between 18 to 30 years of age. While 17(28.3%) and 21(35%) patients were between 31-45 and 46-60 years of age respectively.
Mean size of the stone was 0.93±0.13. Most of the patients 42(70%) had the size of stone <1 cm, while 18(30%) patients had the size of stone >1 cm.
Overall success rate of micro-PNL was 86.7% in patients with renal calculi.
For stratification by applying Chi-Square, it was concluded that, there was no significant difference between success rate and gender (p>0.524).
It was also concluded that, there was no significant difference between success rate and age (p>0.494). It was reported that, there was significant difference between success rate and stone size (p>0.000).

Table-1: Frequency distribution of Gender

Gender	Frequency	Percent
Male	39	65.0
Female	21	35.0
Total	60	100.0

Table-2: Frequency distribution of different Stone sizes

Stone Size Groups	Frequency	Percent
< 1 cm	42	70.0
> 1 cm	18	30.0
Total	60	100.0

Table-3: Frequency distribution of Age groups

Age Groups	Frequency	Percent
18-30	22	36.7
31-45	17	28.3
46-60	21	35.0
Total	60	100.0

Table-4: Frequency distribution of Success

Success	Frequency	Percent
Yes	58	96.7
No	2	3.3
Total	60	100.0

Table-5: Stratification of Success rate with respect to Gender (n=60)

Gender	Success		Total	P-value
	Yes	No		
Male	33	6	39	0.524
	84.6%	15.4%	100.0%	
Female	19	2	21	
	90.5%	9.5%	100.0%	
Total	52	8	60	
	86.7%	13.3%	100.0%	

By applying Chi-Square test

Table-6: Stratification of Success rate with respect to Age (n=60)

Age Groups	Success		Total	P-value
	Yes	No		
18-30	19	3	22	0.494
	86.4%	13.6%	100.0%	
31-45	16	1	17	
	94.1%	5.9%	100.0%	
46-60	17	4	21	
	81.0%	19.0%	100.0%	
Total	52	8	60	
	86.7%	13.3%	100.0%	

By applying Chi-Square test

Table-7: Stratification of Success rate with respect to Stone size (n=60)

Stone Size Groups	Success		Total	P-value
	Yes	No		
< 1 cm	42	0	42	0.000
	100.0%	0.0%	100.0%	
> 1 cm	10	8	18	
	55.6%	44.4%	100.0%	
Total	52	8	60	
	86.7%	13.3%	100.0%	

By applying Chi-Square test

DISCUSSION:

According to EAU Guidelines, indications for endourological interventions (PNL and other flexible ureteroscopic techniques) are now stretched for kidney stones treatment. A fall in complication rate, morbidity and mortality while no compromise in the success rates have been made possible with the modern endoscopic techniques with miniaturization of the operating tools.

There are studies in which another technique which utilizes compact sized instruments, and minute access tracts (12–18F) comparative to the standard PNL, has been explained is called mini-PNL[10]. In relation to hospital stay and morbidity, mini-PNL is found to be supercilious to the standard PNL[10,11].

A minimally invasive PNL technique was described in which dilation of the tract was performed only in a single step up to 15Fr once the collecting system was punctured. A lithotripter through 12Fr nephroscope was used for fragmentation of stones that were removed via vacuum cleaner effect[10].

Desai et al explained ''ultramini PNL'' as the latest modified PNL technique[12]. Dilatation of the tract was performed up to 11–13Fr. Under direct visualization of a 3.5Fr ultra-narrow telescope, stone fragmentation was done utilizing a laser fiber of Ho: YAG. A specialized sheath was used for evacuation of stone fragments.

In contrast to antecedent procedures, the micro-PNL is unique as tract size is very small that is made by single-step approach[6,10,13,15]. Only small-scale series are available on the micro percutaneous nephrolithotomy[10,14,15].

The principal benefit of the micro-PNL is minimal bleeding. Possibility of intraoperative hemorrhage due to renal puncture and tract dilatation is reduced in microperc because of visually controlled single step renal access.

Complication like intrarenal hemorrhage may lead to ill-timed termination of the operation or nephrectomy or mortality[16,17]. Articles have revealed that intraoperative bleeding is affected by the largeness of the nephroscope and tract[16,17].

For micro-PNL, success rates between 85 and 93% have been observed in foregoing studies, [10,13,15]while a success rate of 90.0% was acquired in our study.

Although the elimination of minute stone fragments is assisted by serial saline irrigation executed during the process, steinstrasse formation and postoperative renal colicky pain can be observed due to stone fragments, especially in patients with large stones.

The microperc procedure has a favorable efficacy rate that ranges from 82% in the huge reported series by Hatipoglu et al.[4] to 100% in the short ones[18]. In our case series, the success rate was 86.7%, in which 52 patients were

completely stone free.
As this technique is derived from conventional PCNL, no further special training is required for microperc because choosing and calyceal access techniques prevail the same. So this technique can be performed by any urologist who is familiarized with conventional PCNL.

CONCLUSION:

The micro-PNL is a beneficial and secure technique for stones with less morbidity, significant success rate and acceptable operative time span.

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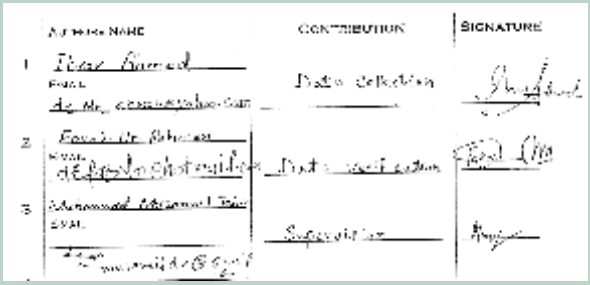

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O son of Adam, when you see that your Lord, the Glorified, bestows His Favors on you while you disobey Him, you should fear Him (take warning that His Wrath may not turn those very blessings into misfortunes).

Hazrat Ali (Karmulha Wajhay)