

ROLE OF FLEXIBLE URETERORENOSCOPY WITH HOLMIUM LASERS IN TREATMENT OF 15-20MM LOWER CALYCEAL STONES; AN OPTIMUM TREATMENT MODALITY

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ABSTRACT

Background. Management of lower pole stones has always being a dilemma for every urologist owing to its peculiar anatomic details. Recent advances in endourology have introduced different treatment modalities for these stones. Flexible ureterorenoscope(fURS) with holmium lasers has shown promising results in terms of stone clearance and safety

Objective To determine the efficacy of flexible URS with Holmium lasers in 15-20 mm lower calyceal stones in terms of stone clearance and safety

Methods. It was a descriptive study conducted in the department of Urology at Institute of Kidney Diseases, Peshawar from June 2014 till December 2017. Patients included had lower calyceal stones ranging from 15-20 mm in size. Non-probability consecutive sampling technique was used. All patients underwent flexible URS with lasers by the same qualified surgeon. Data was collected on a structured proforma and was analyzed on SPSS

Results Mean age of patient was 35.55 years. 38 patients had primary stones in the lower calyx, 13 patients had post ESWL residual segments, while 14 patients had residual stones after PCNL. The mean size of stones was 17.26mm. Complete stone clearance was performed in 58 patients (89.2 %). No significant complication such as calyceal perforation or bleeding occurred in the procedure.

Conclusion Flexible URS with Holmium laser is an enormously safe and effective technique for the management of moderate size stones of lower calyx of kidneys.

Key words. Flexible ureterorenoscopy, Holmium lasers, lower pole stones

INTRODUCTION

The prevalence of renal stones in a lifetime is 10% and is increasing ¹. The lower pole stones are much common and are the most difficult to manage due to variation in anatomy ². Since 1990, lower pole stones incidence has been 30-40% ³.

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In the last 30 years, there has been a significant development in flexible ureterorenoscopy(URS),

thereby flexible URS has been widely used for upper urinary tract diseases especially renal stones ⁴. Marshal was the first to report flexible URS in urology in 1965 ⁵. In 1994, after the miniaturized flexible ureteroscope was utilized the next advancement was with a tip diameter and working channel of 7.5Fr and 3.5 Fr respectively ⁶. At present an addition of Holmium (Yttrium Aluminum Garnett) lasers as flexible intracorporeal lithotripter which has an immense safety margin, and yet grabbed great interest in renal stones management ⁷.

With the passage of time and advance technology 270-degree deflection of flexible URS ⁸ and increased durability up to 50 therapeutic procedures can be performed before maintenance is required ⁹.

In 2006 the advent of digital flexible URS ⁽⁴⁾, which needed a ureteral access sheath due to large caliber as compared to conventional fiber optic endoscopes¹⁰. According to a study the

ureteral access sheath has a 13 % chance of
 With the evolution of modern technology, small diameter endoscopes are designed with high quality image, long lasting durability and easy handling 4. Robotic URS was started in 2014 and still further study is needed ¹².

In 2012, a study was conducted which compared flexible URS with extracorporeal shock wave lithotripsy(ESWL) in treating 10-20mm stones located in the lower pole. It showed flexible URS had significantly higher stone free rate i.e. 86.6% while ESWL had 67.7% and flexible URS had lower retreatment rate i.e. 8% as compared to ESWL 60% ¹³. A retrospective study compared flexible URS to percutaneous nephrolithotomy(PCNL) and miniperc, patients who went under PCNL and miniperc had a short per-operative time, increased radiation exposure and prolonged hospital stay than flexible URS. Both procedures had the same success rates and no difference in complications ¹⁴.

Hence flexible URS with holmium lasers plays important role in management of less than 2 cm stones in the lower pole.

The treatment of 10-20mm sized stones in the lower pole lies in a grey zone as PCNL being over treatment and ESWL being under treatment. Our rationale is flexible URS with holmium laser as optimum treatment modality for 15-20mm lower calyceal stones in terms of safety of patients and the operating team and stone free rates post procedure.

ObjectiveTo determine the efficacy of flexible URS with Holmium lasers in 15-20 mm lower

ureteral injury in old males ¹¹.

calyceal stones in terms of stone free rate and safety.

Methods

It was a descriptive study conducted in the department of Urology at Institute of Kidney Diseases, Peshawar from June 2014 till December 2017. We included patients above 13 years of age with lower calyceal stones ranging from 15-20 mm in size; though irrespective of gender. We conducted the study on 65 patients by non-probability consecutive sampling technique. The patients were stented a week before the procedure. All the patients underwent flexible URS with lasers by the same qualified surgeon. Data was collected on a structured proforma and was analyzed on SPSS.

Results:

Mean age of patient came out to be 35.55 years. Male patients were 44 while female patients were 21. 38 patients had primary stones in the lower calyx, 13 patients had post ESWL residual segments, while 14 patients had residual stones after PCNL. The mean size of stones was 17.26mm. Complete stone clearance was performed in 58 patients (89.2 %). No significant complication such as calyceal perforation or bleeding occurred in the procedure. Table 1 shows stone clearance by RIRS in patients with primary stones, post ESWL and PCNL residual stone. Table 2 shows reasons for incomplete clearance of stones. Table 3 shows minimum, maximum and mean stonesize

Table 1: STONE CLEARANCE BY RIRS FOR PRIMARY STONES, POST ESWL AND PCNL STONE

PROCEDURES	RIRS		Total
	STONE CLEARANCE		
	Yes	No	
PRIMARY STONES	6(15.8)	32(84.2%)	38
POST ESWL RESIDUAL	0	13(100%)	13
POST PCNL RESIDUAL	1(7.1)	13(92.9%)	14
Total	7	58	65

Table 2 reasons for incomplete stone clearance

	FREQUENCY	PERCENT
COMPLETE CLEARANCE	58	89.2
FAILURE TO ACCESS	4	6.2
FAILURE TO FRAGMENT	3	4.6
Total	65	100.0

Table 3 minimum, maximum and mean stone size

	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Stone Size	65	15.00	19.20	17.2675	.14544	1.17255

stone fragmentation. The tip deflection of fURS into acute angles allows access to lower calyces

Discussion

The increasing prevalence of urolithiasis is a matter of concern in the developing field of urology. Lower pole stones (LPS) are commonly found renal calculi and require treatment in certain cases. Their optimal treatment continues to be a dilemma for urologists.

Over the past decades, the mainstay of treatment is to completely clear the stones with the minimum morbidity possible. With evolving technology in the current times, new flexible ureterorenoscopes (fURS) and effective lithotripters like holmium laser are introduced. Keeping in view retrograde intrarenal surgery (RIRS) gained popularity as an efficient and safe option. Thereby, RIRS can be utilized as a preliminary treatment option in <2 cm renal stones, prior unsuccessful shock wave lithotripsy (SWL), infundibular stenosis, musculoskeletal and bleeding disorders and in obese as well as pediatric group¹⁵.

Flexible URS is a safe and efficient therapeutic modality regarding reduced size of its ureteroscope, increased size of working channel, small baskets for extraction of stones and additional availability of holmium lasers for

stone fragmentation¹⁶. Aim of our study was to facilitate reduction in the use of fluoroscopy in all patients undergoing ureteroscopic lithotripsy. Previously attempts to execute fluoroscopyless methods have been made by various urologists. Mc Gee et al attempted on sacral neuromodulation without fluoroscopic guidance¹⁷. Some preferred ultrasound-guided percutaneous nephrolithotomy (PCNL) technique instead of fluoroscopy¹⁸.

The annually reported cancer cases which are globally linked to ionising radiation due to imaging raise the need for fluoroscopyless methods to clear stones. Therefore, we made an effort to quantify our results to determine the efficacy of such procedures. Radiation levels of 0.01sv above background cause 1 in 1000 patients to develop neoplasia which can also be caused from fluoroscopy for the treatment of urolithiasis¹⁹. With the advent of holmium laser this hazard of radiation exposure can be reduced immensely which is the basis of our study too. The procedure can also reduce operative time in several ways.

In one of the studies, comparison in SWL, RIRS and PCNL in the management of < 20mm LPS in adults was conducted. Thereby, meta-analysis for stone free rate (SFR) at < 3 months favored PCNL over SWL and RIRS over SWL. Considering the size of stones PCNL and RIRS labeled more effectual than SWL for > 10mm stones yet less effective for < 10mm stones ²⁰.

According to another meta-analysis and systematic review the three main treatment options were searched in different terms. RIRS found to offer a relative increased SFR with a longer per-operative time. Whereby, PCNL gives highest SFR but longest hospital stay. SWL carries shorter per-operative time but increased SFR and higher re-treatment rate ²¹.

The objective of our study was to further evaluate the efficacy of fURS with holmium laser to clear stones in the lower calyx to keep the operating team and patients at a lower risk of radiation hazards by all means. The mean age of our patients came out to be 35.55 years. 38 patients with primary stones in the lower calyx, 13 patients with post SWL residual fragments while 14 patients with post PCNL residual stones. Mean size of stone was 17.26mm. In 89.2% cases complete stone clearance was successfully achieved with no complications reported. Failure was recorded in 7 cases whereby 4 to access and 3 to fragment. The clearance in primary lower pole stones was 84.2%, post ESWL were 100%, and post PCNL were 92.9%.

While in literature it was concluded that access sheath insertion without fluoroscopic guidance is practicable; it supported our objective strongly. The mean age was 48.2 years, mean stone burden was 13mm, mean operative time was 71.5 minutes, and mean hospital stay was almost 10 hours. They performed 95% cases successfully without fluoroscopy. After a single session SFR of 87.9% was achieved in stones in the lower calyx, with SFR of 91.7% for post SWL failure cases. The perioperative complication rate was 15%. A single session of the procedure was successful in 93.3% in <15mm stones and 62.5% in >15mm stones ²².

Nevertheless, stone-free status after a single session of the procedure is directly related to stone burden. Grasso et al reported a study of 45 patients who underwent URS and concluded 76% to be stone free after a single session of procedure in case of >20mm stones. After second-stage procedure, the success rate increased to 91%, with no intraoperative complications in 15 patients ²³.

The stone clearance rate of 89.2% with no hazards of fluoroscopy is a hallmark in itself and the objective of our study achieved dramatically as no complications were seen either. The patients were satisfied with results of the procedure so was the operating team as the operating time was also reduced regarding the fast preparation for surgery with no extra arrangements to avoid radiation exposure or the incorporation of the fluoroscope again and again.

The drawback though very less includes the involvement of experienced hands in surgery for excellent results and avoiding injuries correspondent to the blind insertion of access sheath. In certain situations the procedure can be costly too. The sample size of our study is not very big and parameters such as operative time and hospital stay were also not reported. Nevertheless further trials are needed to be performed to ascertain operative times and complication rates.

CONCLUSION:

Flexible URS with Holmium laser is an enormously safe and effective technique for the management of moderate size stones in the lower calyx of kidneys.

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