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A COMPARATIVE STUDY BETWEEN CONVENTIONAL URETEROSCOPY AND FLUROLESS URETEROSCOPY FOR THE MANAGEMENT OF URETERIC STONES

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ABSTRACT

***OBJECTIVE*:** To evaluate the safety and efficacy of ureteral stenting by fluroless ureteroscopy following lithotripsy for ureteric stones by comparing with conventional image guided ureteral stenting.

***METHODS*:** A retrospective review of 100 consecutive patients with ureteric calculus undergoing fluoroless ureteroscopy and lithotripsy was performed by direct visualization of the PUJ or external visual cues and compared with 100 patients treated with fluoroscopy-guided ureteroscopies.Outcomes were analyzed with appropriate statistical tests and *p* value of <0.05 was taken as statistically significant.

***RESULTS*:** The average operative time,overall stone burden,stone free rate,significant complication rate and repeat procedure rate for fluroless and conventional ureteroscopies were 58.5minutes,88.25mm^2, 92%, 3%, 8% and 60.5minutes,90.25mm^2, 92%, 2.9%,7.5% respectively and there was no significant statistical difference in the above parameters when fluoro-less and conventional stent placements were compared

***CONCLUSIONS*:** This study demonstrates the feasibility and efficacy of the completely fluoroless ureteroscopic lithotripsy for ureteral calculi thereby reducing the radiation exposure to the patient and the healthcare community

KEYWORDS : fluroless ureteroscopy, ureteric stones, lithotripsy, double J stent

INTRODUCTION

During the management of ureteral stones, fluoroscopy is used in multitudes of situations such as stone localization, guidewire placement, active ureteral dilatation by coaxial dilators or balloon dilatation and ureteral stenting thereby subjecting both the patient and the medical personnel to the harmful effects of radiation such as malignancy, dermatologic and fertility issues. In a scenario where ureteroscopy and subsequent ureteral stone management could be performed limiting fluoroscopy, this study determines the efficacy of such an approach of fluroless ureteroscopy and compares the outcomes of ureterocopic lithotripsy with the conventional approach of fluoroscopy guided ureterocopic lithotripsy

MATERIALS AND METHODS

100 consecutive patients with ureteral stones who underwent fluroless ureteroscopy (April 2018 to September 2018) were compared with the same number of ureteral stone patients treated by conventional approach (October 2017 to March 2017- historical cohort) at the Institute of Urology, Madras Medical College and Rajiv Gandhi Government General Hospital. Patients with suspected ureteric stricture, combined ureteral and renal calculi were excluded from the study. Stone location, mean operative time, stone size, complication rates, stone-free rates, need for repeat procedures were the tabulated and analysed by Student's t-test for continuous variables and Fisher's exact test for categorical variables and *p* value of <0.05 was taken as statistically significant.

Fluroless ureteroscopic operative procedure: Under subarachnoid block, using 6 to 7.5 Fr semirigid ureteroscope, uretrocystoscopy was done and 0.025"guidewire (Terumo Medical Corporation, Irvine, CA) inserted (floppy end) until the first point of resistance followed by ureteroscopy insertion to visualize the stone. At this juncture, the guidewire is manipulated beyond the stone to reach the pelvis followed by lithotripsy by pneumatic(ballistic) lithoclast by using 0.8mm probe. If VUJ could not be negotiated using 6Fr semirigid ureteroscope, then 4Fr uretroscope was used. If the impacted stone did not allow the passage of guidewire proximal to it, then lithotripsy was started in a controlled manner to cause minimal fragmentation to create a space just enough for the guidewire to negotiate proximal to it, followed by completion of stone fragmentation so that the procedure is done in a safe manner to prevent ureteric perforation. After complete fragmentation, ureteroscope was passed till the pelvis at which point retrograde 4 Fr Double J stent was placed for all cases and coiling at both ends were done under vision.

RESULTS

Demographic variables between the conventional uretroscopic (Group A) and fluroless techniques (Group B) were compared. The median age, male, female patients, right side only stones, left side only stones, bilateral ureteric stones, proximal and distal ureteric stones and mean stone area for Group A and Group B were 29 years, 62, 38, 41, 48, 11, 40,60, 90.25mm2 and 30 years,59, 41, 44, 46, 10, 38, 62, 88.25mmc respectively. The p Value for all the above described variables were >0.05 and were not statistically significant. The mean operative times between the conventional and fluroless groups were also not statistically significant(60.5 min vs 58.5 min, p=0.71). There was no statistical difference between the two groups in terms of stone free rates, post operative complications, repeat procedure rates(p=1,0.94,0.78 respectively). Post operative complications included urinary tract infections (2% in each group), urosepsis (1% in each group), retroperitoneal collection(1% in Group B) that settled with conservative treatment.

VARIABLE	'A'GROUP CONVENTIONAL URETROSCOPY (n=100)	'B' GROUP FLUROLESS URETROSCOPY (n=100)	p VALUE
Age(Median)	29 years (18-64)	30 years (18-61)	0.81
Male	62	59	0.58
Female	38	41	0.60
Right side only	41	44	0.54
Left side only	48	46	0.51
Bilateral stones	11	10	0.49
Proximal ureteric stones	40	38	0.62
Distal ureteric stones	60	62	0.54
Stone area (mean)	90.25mm^2	88.25mm^2	0.59
Mean time of Fluroscopy	33 seconds	0	<0.001
Mean operative time (minutes)	60.5	58.5	0.71
Stone-free rate	92%	92%	1
Postoperative complications	2.9%	3%	0.94
Repeat procedure	7.5%	8%	0.78

DISCUSSION:

The stochastic effects of radiation may result in various malignancies[1] as the patient is subject to radiation at various times right from the point of diagnosis (CT scan, x-rays) through the treatment part(fluoroscopy) upto the follow up(x-ray). Hence the reduction of the radiation exposure is mandatory to reduce the risk of radiation-associated morbidity[2]. Fluoroscopy was quintessential for the urologists to treat

upper tract calculi. Performing the procedure with reduced amounts of fluoroscopy represents a significant departure from the conventional endoscopic technique. Georges and colleagues (interventional cardiology) reported a 50% reduction in radiation exposure with a 15-hour educational course and standardized radiation reduction technical recommendations[3]. Interventional cardiologists are now performing cardiac ablations for the correction of atrial fibrillation and tachycardia using a completely fluoroless technique in children, pregnant women, and obese patients[4]. In gastroenterology, studies have shown that ERCP could be performed without fluoroscopy[5]. Spinal surgeons are now performing craniosacral posterior spinal instrumentation using a fluoroless technique with similar outcomes to the conventional technique[6]. Greene and colleagues reported a reduced fluoroscopy protocol that allows to reduce the average fluoroscopy time from 82 to 15.5 seconds forsimple uncomplicated ureteroscopy[7].

Mandhani et al. showed that complete clearance of distal ureteral stones, below the sacroiliac joint, could be achieved without the use of fluoroscopy in 99 out of 110 patients by direct visual balloon dilatation without fluroscopy[8]. Tepeler et al. performed ureteroscopy in 93 consecutive patients, avoiding immediate intraoperative fluoroscopy in 92% of their patients, but obtained a x-ray on first post op day in all patients with an estimated radiation dose of 1.1mSv[9]. Hsi and Harper avoided the need for a KUB by using two taps of fluoroscopy at the time of the procedure, thus getting real-time evaluation of stent placement and reducing the median effective dose to 0.05 mSv[10]. Hence the writing was on the wall that ureteroscopy could be performed entirely without fluoroscopy in carefully selected patients.

One alternative to the use of fluoroscopy during ureteroscopy is the use of intraoperative ultrasound. A prospective study by Deters et al. randomized 50 patients who had been previously stented for symptomatic ureteral stone to either ultrasound or fluoroscopy-guided ureteroscopy[11,12]. There was no difference in stone-free rates, operative time, or complication rates between the two study groups. However, ureteral stents may be difficult to identify using ultrasound.

Fluroscopy also risks the surgeon and the paramedics in the operating room to the harmful effects of radiation and the musculoskeletal problems associated with wearing the heavy lead aprons[13].

Our study includes proximal and distal ureteroscopy and stent placement without fluoroscopy or ultrasound. Our study demonstrates equal stone-free rates (92%), complication rate, mean operative times between the two cohorts with the fluoroless ureteroscopy patients having a comparable stone burden(88.25mm^2 vs 90.25mm^2) with the conventional technique group. Thus, this study demonstrates that a fluoroless technique is feasible and effective for treatment of ureteral stones.

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