

Original Articles

"Is upper ureteric kink a real nightmare for the Urologists while performing Flexible Ureteroscopy (fURS)? A single center experience of 15 cases of Retrograde Intra Renal Surgery (RIRS) in unstented patients with upper ureteric kink".

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KEY WORDS : UU Kink, RIRS, FURS, PCNL, DLC, SFR, RGP

ABSTRACT:

INTRODUCTION: As a successful Initial Puncture defines the success of Percutaneous Nephro Lithotripsy (PCNL), similarly successful deployment of the Flexible Ureteroscope (fURS) defines the success of Retrograde Intra Renal Surgery (RIRS). We report our experience of 15 cases of RIRS in upper ureteric kink in unstented patients and evaluate the feasibility, technical difficulties, outcome and follow up. **METHODS:** Out of 16 patients with upper ureteric kink, RIRS could be performed in 15 patients (94%). Intra operative maneuvers required, Stone free rates (SFR) at 1 month post-operative follow up and number of auxiliary procedures required was noted. **RESULTS:** In 13 patients (87%), sensor guide wire was placed through semi-rigid Ureteroscope. In 2 patients (13%), guide wire was negotiated across the ureteric kink with fURS placed distal to ureteric kink. We placed Double Lumen Ureteric Catheter and safety guide wire in 11 patients (69%) which helped keeping the ureter straight. SFR after 1st procedure was in 10/15 patients (67%) and in 14/15 patients (94%) after 2nd procedure. SFR after 1st RIRS in stone burden < 2 cm is 9/11 (82%) as compared to ¼ (25%) in stone burden > 2 cm ($p < 0.01$). 5/15 patients (33%) developed contrast extravasation, successfully managed with DJ stenting. No serious complication was noted. **CONCLUSION:** RIRS is feasible and safe for upper tract calculi in patients with ureteric kink for stones < 2cm. Maneuvers such as Retro Grade Pyelography (RGP), Double Lumen Ureteric catheter, safety guide wire improve the success rate.

INTRODUCTION

"Well begun is half done." This holds true in Urology especially in surgeries like Percutaneous Nephrolithotomy (PCNL) and Retrograde Intra Renal Surgery (RIRS). As a successful Initial Puncture is vital for a successful PCNL, successful deployment of Flexible Ureteroscope (fURS) across the ureter defines the success of RIRS. Anatomical difficulties such as upper ureteric kink however sometimes challenge the Urologist. Manoeuvres such as using a Double Lumen Ureteric Catheter, parking a safety guide wire, placing guide wire with the help of flexible ureteroscope may be required. We report our experience of 15 cases of RIRS in upper ureteric kink in unstented patients and evaluate the feasibility, technical difficulties and outcome and follow up of RIRS in such cases.

AIM

To evaluate the feasibility and success of Retrograde Intra Renal Surgery (RIRS) in unstented patients with Upper ureteric kink.

Ethics: The study protocol was reviewed and approved by ethics committee of our hospital. Each patient was informed about the merits and demerits of RIRS and was given the option between PCNL and RIRS. All patients opted for RIRS and informed consent was taken.

MATERIALS AND METHODS

Out of 96 patients operated by RIRS for single/multiple renal and/or upper ureteric stones at our institute between February 2017 to December 2017, 16 patients were identified with upper ureteric kink by pre-operative imaging with NCCT KUB Scan and were confirmed on intra operative Retro Grade Pyelography (RGP). RIRS could be successfully performed in 15/16 patients while 1 patient required Open Ureterolithotomy. The data included clinical history, pre-operative work up, NCCT KUB Scan and Urine culture. Intra operative events such as Retro Grade Pyelography (RGP), technical difficulties faced and the maneuvers required to overcome them were noted. Immediate post-operative course and follow up at 1 month with repeat NCCT KUB were noted.

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Figure 1. Fistulous tract between esophagus and pleura

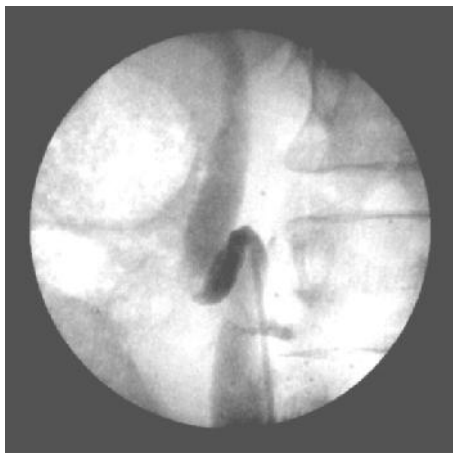


Figure 2: Upper ureteric kink on RGP

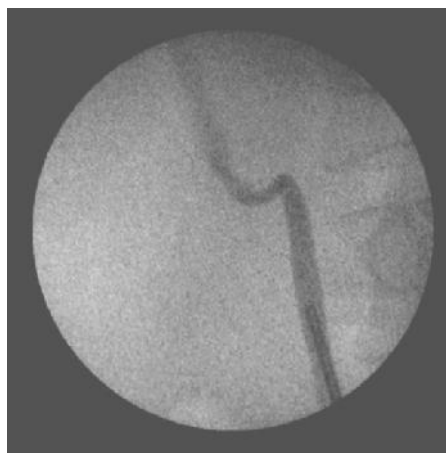
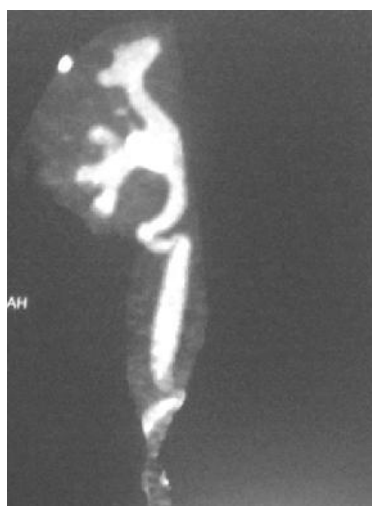


Figure 3: Placement of guide wire across the ureteric kink with help of flexible Ureteroscope.



Figure 4: Ureteric kink on CT Urography



Patients with age > 12 years to geriatric age, with upper ureteric kink, identified pre operatively on imaging studies (NCCT KUB, Intra Venous Urography) and confirmed per operatively on RGP were included. The stone burden was > 5 mm to < 35 mm with single/ multiple renal and /or upper ureteric stones and previous history of stone surgery. Paediatric cases, anatomically abnormal kidneys and stag horn calculi were excluded.

Routinely we don't pre stent the patients for RIRS. Cysto-Urethroscopy followed by semi rigid 4.5 French (Fr) Ureterorenoscopy (URS) was done. Balloon dilatation was required for narrow ureteric orifice or tight ureter. Upper ureteric kink was identified pre operatively by NCCT KUB or IVU and confirmed intra operatively by RGP with undiluted non-ionic water soluble radio-opaque contrast Iohexol (Figure 1, 2). In few cases, when it was difficult to place a guide wire across the ureteric

kink, we used Terumo glide wire. In few instances, putting a guide wire was possible only with the flexible ureteroscope (Figure 3). Next, we passed a Double Lumen ureteric Catheter (DLUC) of 10Fr with floppy tip over the guide wire. Routinely we don't use safety guide wire but in cases with ureteric kink, we preferred two guide wires especially both sensor guide wires.

Then a Ureteric Access Sheath (UAS) of 9.5Fr/11.5 Fr was back-loaded over the guide wire. In cases where the ureter was tight, back loading the flexible ureteroscope (fURS) without UAS was performed. The settings for stone dusting were 0.5 to 0.8 Joules and 12 to 15 Hertz. Once the stone was pulverized, we rechecked all the calyces with fURS and performed RGP again to rule out contrast extravasation suggestive of ureteric or fornycal perforation. Double J Stent was placed at the end of procedure.

Table 1: Stone distribution according to the stone burden, number of stones and stone location

SR. NO.	STONE BURDEN (CM)					HF VALUE		NUMBER		LOCATION OF STONE					
	< 1	1 1.5	> 1.5 2	> 2 3	> 3	<900	>900	SIN GLE	MUL TIPLE	UPPER CALYX	MID CALYX	LOWER CALYX	MULTIPLE CALYCES	PELV IS	UPPER URETER
1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	1
2	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0
3	1	0	0	0	0	1	0	1	0	0	0	0	0	0	1
4	0	1	0	0	0	0	1	0	1	0	0	0	1	0	0
5	0	0	0	1	0	0	1	1	0	0	0	1	0	0	0
6	0	0	0	1	0	0	1	0	1	0	0	0	1	0	0
7	0	0	0	1	0	0	1	0	1	0	0	0	1	0	0
8	0	0	0	0	1	0	1	0	1	0	0	0	0	1	0
9	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0
10	1	0	0	0	0	0	1	1	0	0	0	1	0	0	0
11	0	1	0	0	0	0	1	1	0	0	0	0	0	0	1
12	0	1	0	0	0	0	1	1	0	0	0	0	0	1	0
13	0	1	0	0	0	0	1	1	0	0	0	0	0	1	0
14	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0
15	1	0	0	0	0	0	1	0	1	0	1	0	0	0	0
16	0	1	0	0	0	0	1	1	0	0	0	0	0	0	1
SUM	4	5	3	3	1	2	14	8	8	0	1	2	3	3	4

Table 2: SFR according to stone burden

NUMBER OF PATIENTS OPERATED BY RIRS	STONE BURDEN (CM)				
	< 1	1-1.5	> 1.5 -2	> 2-3	> 3
TOTAL PATIENTS	4	4	3	3	1
PATIENTS WITH RESIDUAL STONES	0	1	1	2	1
PATIENTS WITH STONE CLEARANCE	4	3	2	1	0
STONE FREE RATE	100%	75%	67%	33.30%	0%

RESULTS

Post operatively, the patients were monitored for haematuria, flank pain and signs of septicaemia such as fever, chills or hypotension. All the patients were discharged after 36 to 48 hours. All patients were followed up with NCCT KUB after 4 weeks to evaluate for residual stones and peri-nephric or peri-ureteric collection to rule out residual injury. Re- RIRS is performed for clinically significant residual fragment of size > 3mm. DJ stent is removed under local anaesthesia in case of complete clearance.

STATISTICS : Data evaluation was done under statistician's guidance. Proportion test was used to calculate the p value (p < 0.01 is significant).

Out of 96 patients operated by RIRS between February to December 2017, 16 patients (17%) were identified with upper ureteric kink on pre-operative NCCT KUB. Among them, 12 patients (75%) were males while 4 were females (25%). 11 patients (69%) were of age between 25-50 years, 1 patient (6%) was < 25 years while 4 patients were > 50 years (25%). 2 patients had positive urine culture pre operatively (12.5%). 3 patients (19%) had Ischemic Heart Disease and were on anti-coagulants pre operatively.

Stone distribution according to the stone burden, number of stones and stone location was as follows (Table 1). 14 stones had Hounsfield value (HF) > 900 whereas 2 had HF < 900. The mean stone size was 15 mm. RIRS could be performed in 15 out of 16 patients (94%) either as a

preliminary or staged procedure. In 1 patient, the kink was so severe that even a guide wire could not be negotiated following which Open Ureterolithotomy was performed. 4 patients (25%) had to be stented and RIRS was performed after 2 weeks.

In 13 patients (87%), sensor guide wire was placed through semi-rigid Ureteroscope. In 2 patients (13%), guide wire was negotiated across the kink with the help of fURS placed distal to ureteric kink. We placed Double Lumen Ureteric Catheter and safety guide wire in 11 patients (69%) which helped keeping ureter straight. 9.5 Fr/11.5 Fr Ureteric Access Sheath was deployed in 9 patients whereas it could not be placed in 6 patients (38%). In all 4 patients with ureteric kink and upper ureteric stones, the stone was impacted and semi rigid Ureterscopy could not be performed and RIRS had to be done.

Stone free rate (SFR) Analysis was as follows: 1 patient required open Ureterolithotomy whereas RIRS was performed in 15 patients. SFR after 1st procedure was in 10/15 patients (67%) and in 14/15 patients (94%) after 2nd procedure. 1 patient required 3rd procedure. SFR according to stone burden is shown in Table 2. SFR after 1st RIRS in stone burden < 2 cm is 9/11 (82%) compared to SFR of 1/4 (25%) in stone burden > 2 cm (Z=2.31, P=0.02, p < 0.01). The mean residual stone size was 9.2 mm. SFR among the pre stented and staged patients was in 3/4 (75%) versus 7/11(64%) among unstented patients (Z=0.43, P=0.66, p > 0.01).

5/15 patients (33%) developed contrast extravasation suggestive of mucosal injury on RGP. DJ stent was placed in all patients. Post operatively, 2/15 patients (13%) developed minimal hematuria and 2/15 patients (13%) had early post-operative fever/hypotension which was managed conservatively. No patient required Intensive Care or any serious complication. On follow up NCCT KUB, no patient had peri nephric or peri ureteric collection which ruled out residual ureteric or renal injury. DJ stent was removed after 1 month.

DISCUSSION

Upper ureteric kinks are described in literature. Kamo M et al evaluated 176 CT Scan images and identified Ureteric kinking in around 40 % of patients. [1] Ureteric kinks are identified at or above the level of Crossing Point where ureter crosses over Gonadal vein. Imaging modalities such as NCCT KUB, IVU, RGP, CT Urography and Magnetic Resonance Urography can be used to identify abnormal deviations of ureter including ureteric kinks (Figure 4). [2, 3] Unfortunately, limited literature is available about ureteric kink and no

grading or classification system for diagnosing the tortuosity of the ureter exists till date. No case series of RIRS in upper ureteric kink is reported yet. We performed Retrograde Pyelography in all patients identified with ureteric kink on pre-operative NCCT KUB or IVU.

Semi rigid Ureterscopy before the fURS helped in ureteric dilatation, identifying and dusting any ureteric stone and discovering any surprise pathology like Transitional Cell Carcinoma of ureter. In difficult fURS, DLUC 10 French is yet available very helpful and serves several purposes: ureteric dilatation, performing RGP, parking safety guide wire and straightening the ureteric kink. We preferred two sensor guide wires as Terumo tip of the sensor guide wire prevents mucosal perforation whereas zebra shaft keeps the ureter straight, facilitates repeated introduction of fURS and guide wire doesn't slip out easily. We used UAS of 9.5 Fr/11.5 Fr as successful UAS placement ensures better stone free rates and decreases the ureteric mucosal trauma, intra pelvic pressures, risk of septicemia and damage to the fURS. [4, 5]

Septicemia related events such as fever, hypotension are known complication post RIRS as reported by Berardinelli F et al in 31/403 patients (7-8%). [6] In our series, 2/15 patients (13%) developed early post-operative fever managed conservatively (Z=0.64, P=0.53, p > 0.01). However, no major septicemia complication was noted.

SFR in RIRS is subject to multiple parameters such as stone burden, location, number, hardness, composition, calyceal and ureteric anatomy, use of UAS etc. In patients with upper ureteric kink, stone clearance after fURS is affected due to difficult guide wire and UAS placement, difficult entry and re-introduction of fURS across ureteric kink, difficult stone retrieval with zero tip basket, difficult maneuvering with laser fiber and difficult ureteric stenting.

Sari S et al [7] reported SFR of 74% after 1st RIRS for stones < 2 cm as compared to 82% in our series with ureteric kink (p > 0.01). Javanmard Breported SFR of 19/21 (90.4 %) after 1st RIRS [8] as compared to SFR of 82% (9/11) in our series with kink after 1st RIRS for stones < 2cm (Z=0.65, p>0.01). Thus, similar SFR were achieved for stone size < 2 cm in patients with ureteric kink. For stones > 2 cm, Atis G[9] reported SFR after 1st RIRS in 108/146 (74%) compared to 1/4 (25 %) in our series with kink (Z=2.23, P=0.026, p < 0.01). Thus, statistically low SFR is achieved in stones > 2cm with upper ureteric kink (p < 0.01). After 2nd RIRS, SFR reported by Atis G is in 134/146 (92%) as compared to 3/4 (75%) (Z=0.77, P=0.44, p > 0.01). This signifies similar stone clearance after auxiliary procedure in stones > 2 cm. In our published series of 131 patients operated by RIRS [10], we report SFR in 87/108 patients (81%) for stone burden < 2 cm

without ureteric kink, similar to 9/11 patients (81%) with stone burden < 2 cm and ureteric kink ($p > 0.01$). Whereas, SFR in stone burden > 2 cm in patients with ureteric kink is in ¼ patients (25%) which is significantly low as compared to SFR in 12/23 patients (52%) without kink for stone burden > 2 cm ($p < 0.01$). The complication rate of fever/chills/ hypotension in our series of 131 patients was in 8/131 patients (6%) as compared to 2/15 (13%) patients with ureteric kink ($p > 0.01$).

Out of 4 patients who required to be stented and staged, SFR was noted in ¾ (75%) versus 7/11 patients (7/11= 64%) in unstented patients ($Z=0.43$, $P=0.66$, $p>0.01$). Thus, no significant difference in SFR was noted among the pre-stented and staged patients versus non-stented patients in ureteric kink. Also, ureteric stenting is technically difficult in ureteric kink. Thus, pre DJ stenting does not improve stone clearance in ureteric kink as the kink reappears after stent removal.

The limitations of the study are single center small size study, limited number of patients, lack of adequate literature on the anatomy and pathology of upper ureteric kinks and lack of comparison between RIRS v/s PCNL in Upper Ureteric kink. In the future, an anatomical or radiological classification for ureteric anatomy would guide pre-operative planning and predicting the success in terms of SFR after RIRS.

CONCLUSION

RIRS is a feasible and safe modality for upper tract calculi in patients with upper ureteric kink. Maneuvers such as RGP, use of DLUC, safety guide wire improve the success in technically difficult fURS. Successful and comparable SFR have been achieved by RIRS in patients with ureteric kink for stone burden < 2 cm. With auxiliary procedure, successful stone clearance can be achieved in stone burden < 2.0 cm. Owing to the low complication rate, RIRS is a better option as compared to PCNL even in ureteric kink. Ureteric stenting is technically difficult and prior stenting does not improve the stone clearance in patients with ureteric kink.

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