Laparoscopic Uretero-Neocystostomy, Antireflux Technique: Is it Feasible

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Abstract

Objective: To assess the feasibility and outcome of laparoscopic antireflux ureteral reimplantation.

Material and Methods: Eleven laparoscopic ureteral reimplantations were performed between June 2011 and December 2013 for ureteral strictures (3 men, 8 women). The mean age was 39 years (range 19-72). Nine patients had unilateral lower ureteric stricture, 2 patients had bilateral lower ureteric stricture. The etiology of stricture formation was bilharziasis in 4 patients, previous ureteroscopy in 4 patients, tuberculosis in 1 patient and unknown in 2 patients. 9 patients underwent laparoscopic modified Lich-Gregoir, 2 patients underwent modified laparoscopic Lich-Gregoir on the right side and simple anastomosis on the left side.

Results: Mean operative time for all patients was 287 minutes (range 90-350).

Post-operative stay was 2-3 days.

Postoperative radiological imaging showed hydronephrosis in 1 patient at a follow-up interval of 6 months.

Conclusions: Laparoscopic antireflux ureteral reimplantation is a feasible procedure with good medium-term results. Although it needs more laparoscopic skills and time than simple anastomosis.

Key Words: Uretero – Neocystostomy – Ureteral stricture.

Introduction

LAPAROSCOPY is now a major domain of urological surgery. During the last decade laparoscopy has evolved from being a diagnostic tool to being applied to almost every abdominal and pelvic urological procedure. Although many ablative laparoscopic techniques for benign and malignant pathologies are now well on their way to become established procedure, reconstructive laparoscopic procedures are still evolving, this is mainly due to the complexity and technical skill intensity inherent to such procedures. With the accumulation of laparoscopic experience and expertise, a new field of advanced laparoscopic reconstructive procedures has been developed in the laboratory and carried to clinical application. Patients now have the opportunity to benefit from this minimally invasive approach, with decreased postoperative morbidity, and potentially the same surgical efficacy as the open surgical approach.

In urology, open uretero-neocystostomy has been the gold standard for treatment of ureteral stricture disease. However, as the urologist’s experience with laparoscopy grows, there has been a dramatic increase in the laparoscopic applications for the management of diseases of the ureter. The various conditions where laparoscopic procedures have been used for benign conditions of the ureter are primary vesicoureteral reflux, retro-caval ureter, retroperitoneal fibrosis and ureteral stricture disease.

Uretero-neocystostomy in adults is indicated in the management of distal ureteral strictures or ureteral obstruction and ureteral injury as a result of gynecological or pelvic surgery as well as management of cases of high grades vesico-ureteral reflex.

Patients and Methods

This prospective clinical study was done in Kasr Al-Aini Hospital, Cairo University and Al-Shorouk Hospital Cairo from June 2011 till December 2013.

It included 11 patients; 8 females and 3 males. Age ranged from 19y to 72y with an average age of 39y.
4 patients had right lower ureteric stricture, 5 patients had left lower ureteric stricture, 2 patients had bilateral lower ureteric stricture.

The etiology of stricture formation was bilharziasis in 4 patients, previous ureteroscopy in 4 patients, tuberculosis in 1 patient and unknown in 2 patients.

All patients were subjected to:
1- History taking.
2- General and local examination.
3- Laboratory investigations in the form of: Urine analysis, urine culture and sensitivity when required, kidney and liver functions, complete blood picture, bleeding profile and fasting blood sugar.
4- Radiological investigations in the form of: KUB, US, IVU and CT scan.

The ureteric stricture was diagnosed by I.V.U. in 5 patients, C.T.U.T. in 4 patients [an example shown in Fig. (1)], retrograde pyelography in 2 patients.

Inclusion criteria:
Any patient with benign ureteral stricture.

Exclusion criteria:
A- Malignant ureteric strictures and ureteric strictures resulting from or associated with complicated intra-abdominal surgery.
B- Contraindication to laparoscopic surgery.
C- Redo ureteroneocystostomy.

Technique:
Under general anesthesia, a 16F Foley catheter was inserted in the bladder with the patient placed in Trendelenburg position. After creation of a pneumoperitoneum (15mmHg maximum flow: 15 L/min), a 12-mm optic port was placed just above the umbilicus. Another 10-mm trocar was placed under direct vision at the level of the umbilicus along the lateral edge of the rectus muscle on the contralateral side of the stricture. Two 5-mm working trocars were placed under direct vision, with one in the midline halfway between the umbilicus and the anterior inferior iliac spine. The ureter was isolated at the bifurcation of the common iliac vessels until the stricture site could be identified. The ureter was dissected from the intramural segment till the junction of the dilated and the diseased part, where it was ligated and transected.

The bladder was filled with 250ml normal saline and the peritoneum incised anteriorly, exposing the Retzius space by blunt dissection, followed by division of both medial umbilical ligaments.

Fixation of the bladder to the psoas muscle was performed with three to four interrupted sutures (vicryl 0) in all patients. A submucosal tunnel was then made in the bladder using electrocautery. The direction of the tunnel was oriented vertically in the dorso-lateral aspect of the bladder and the detrusor fibers were antero-laterally divided with the tip of the hook. An opening was made in the mucosa in the distal part of the tunnel and the ureter was spatulated and anastomosed to the mucosa by 4-0 vicryl continuous sutures. Before completion of the anastomosis a 6F 26-cm Double-J stent was passed into the ureter and advanced to the renal pelvis over a 0.038 inch guide wire. The guide wire was inserted through a puncture needle from the skin and the distal end of the stent was placed in the bladder.

The edges of the detrusor muscle were approximated over the ureter and the tunnel was closed by interrupted 4-0 vicryl. The anastomosis was tested by refilling the bladder and further sutures were placed if necessary.

A nelaton drain was then placed in the paravesical space via the 5-mm laparoscopic port, and the anastomosis was covered using perivesical fat.

The drain was removed after 2 days at which time all the patients were discharged.

Cystography was done after 7 days to exclude urinary leakage before catheter removal.

Ureteric stents were removed after 3 weeks.

Follow-up ultrasound was done after 3 and 6 months and results were tabulated.
Results

Our prospective study was conducted in Kasr Al-Aini Hospital, Cairo University and Al-Shorouk Hospital, Cairo from June 2011 till December 2013. This study comprised 11 patients, 8 females and 3 males. They were all subjected to thorough history taking, physical examination, laboratory and radiological investigations.

Procedure:

Nine patients had unilateral lower ureteric stricture, 2 patients had bilateral lower ureteric strictures.

9 patients underwent laparoscopic modified Lich-Gregoir uretero-neocystostomy, 2 patients underwent modified Lich-Gregoir on the right side and simple anastomosis on the left side.

Operative time:

The mean operative time was 287 minutes with range from 90 to 350 minutes.

The wide range of the operative time was due to a patient who had bilateral ureteric strictures.

The operative time was calculated just after the pneumoperitoneum till the end of the urereal anastomosis.

Hospital stay:

The post-operative hospital stay was two days in three patients and three days in eight patients.

Drains were removed before discharging the patients and only urethral catheters were left for later cystography.

Follow-up:

The first visit was after one week during which a cystogram was done with no extravasation in any patient and the urethral catheter was removed.

Follow-up ultrasound after 3 months revealed backpressure changes in two patients only and they were not symptomatic and the backpressure changes were residual.

Patients had follow-up ultrasound at 6 months. By this time, only one patient showed residual backpressure changes.

Discussion

Laparoscopy has been widely used in urologic surgery, and its application is ever widening with excellent clinical results. Laparoscopic ablative surgery is now well settled in urologic practice and has clear advantages to the patient in terms of both cosmesis and decreased hospital stay.

Reconstructive urologic surgery however remains largely performed by open techniques. One of the reasons for this is the technical demands faced by the surgeon in undertaking a reconstructive procedure laparoscopically, a complexity that is reflected in the lengthy operative times reported to date.

Despite the technical challenge of undertaking reconstructive techniques laparoscopically, the advantages to patients of the minimally invasive approach remain a great motivator.

The increase in surgeons' experience and practical skills in addition to technological advancement have motivated urologists to proceed to more complex reconstructive procedures such as laparoscopic uretero-neocystostomy.

Laparoscopic uretero-neocystostomy was first described in children by Ehrlich and his coworkers for high-grade vesico-ureteral reflux [1]. The first laparoscopic uretero-neocystostomy in adults was reported by Reddy and Evans for the treatment of 1 cm distal ureteral stricture that developed as a delayed complication of transurethral resection of prostate [2].

This is followed by many studies including different techniques of laparoscopic uretero-neocystostomy [3-6].

In this study, three types of laparoscopic uretero-neocystostomy are included, simple anastomosis, modified Lich-Gregoir and Boari flap. This may be due the variability present in our patients regarding the site and side of the stricture, as there were two patients had bilateral lower ureteric strictures, and one patient had long segment ureteric stricture due to urinary tuberculosis.

The various techniques available for uretero-neocystostomy have a high success rate of 92 to 98%; with the Lich-Gregoir extravesical approach is the most commonly performed laparoscopic procedure for the treatment of uretero-neocystostomy [6].

Laparoscopic surgery has the advantages of less pain, early ambulation and rapid convalescence compared to open surgery, while the disadvantage is the longer operative time [7,8].

In fact, a number of authors have published their experience with laparoscopic uretero-neocystostomy such as Rassweiler and colleagues in 2007 who compared the results of laparoscopic surgery...
ureteral reimplantation with a previous series of open surgery. They compared ten patients who underwent laparoscopic uretero-neocystostomy with psoas-hitch with or without Boari-flap technique for ureteral obstructions with ten patients treated by open uretero-neocystostomy for similar pathologies.

The mean operative time was 228 minutes in the laparoscopic group and 187 in the open group. However, the authors felt that the safety and efficacy of the minimally invasive laparoscopic approach compensated for the longer time taken to perform the procedure when compared to traditional open surgery [8].

The mean operative time for laparoscopic uretero-neocystostomy as reported by various authors ranged from 120 and 322 minutes. Mean operative time in our series was 287 minutes, which can be accepted considering that it is our initial experience and the series included two cases of bilateral ureteric reimplantation.

One of the fundamental principles of uretero-neocystostomy is to achieve tension-free anastomosis, and so we combined the procedure with a psoas hitch in all cases to stabilize the bladder, and to gain additional ureteral length for a tension free anastomosis. Furthermore, we had to adequately mobilize the ureter, preserving the periureteral fat for the purpose of preventing ischemia, as well as adequate dissection of the bladder to allow easy approximation. Laparoscopy allowed us to easily release the bladder, both from the Retzius space and from its lateral sides. In five cases, in order to achieve greater bladder movement, it was necessary to section the contralateral superior vesical artery, which allowed us to treat strictures up to 6-7 cm in length without the need to resort to a Boari flap. It might be a good option in long strictures or in those affecting the lower lumbar ureter. Other series prefer to routinely use the laparoscopic Boari flap [8,9].

The performance of the antireflux technique in uretero-neocystostomy is probably the most complex technical part of this procedure. Although some authors do not perform it [10], most of the series favor some antireflux mechanism.

The feasibility of creating an antireflux mechanism laparoscopically has been well demonstrated by both Simmons and associates and Rassweiler and coworkers. Although Simmons and colleagues noted that its use is limited to patients with adequate ureteral length [5,8].

In all our cases, we stented the anastomosis using a double J stent inserted through a percutaneous needle. Some series prefer not to place a double J stent and do not mention an increase in the appearance of urinary leakage [11]. In spite of this, we believe that placing a double J stent is fast and easy, which is why we perform it routinely without any complications and with no urinary fistula appearing in our series.

In the two patients who underwent bilateral ureteric reimplantation, the operative time was 350 minutes in the first patient, and 170 minutes in the second patient, which denotes an advance in our surgical experience.

No complications were experienced by the patients in our series, and all demonstrated satisfactory results on follow-up ultrasound. Although the follow-up is not extended, John-Paul Capolicchio in his series which included 20 children aged 4-15 years (mean 7.3 years) have undergone laparoscopic extravasical ureteral reimplantation over a 5-year period, all of which were diagnosed with vesico-ureteric reflux and the indication for surgery was breakthrough infection in 18 and persistent high-grade vesico-ureteric reflux in 2, the postoperative follow-up regimen includes a routine abdomino-pelvic ultrasound 1 month after surgery and a voiding cystourethrogram 3 months after surgery, with maintenance of antibiotic prophylaxis until the voiding cysto-urethrography is done. In the absence of new findings on the first post-operative ultrasound, another routine abdomino-pelvic ultrasound is planned 1 year after surgery [12].

There may be an additional advantage of the laparoscopic approach to the distal ureteral stricture. Both Fugita and colleagues and Castillo and coworkers noted that the magnification provided by laparoscopy facilitated ureteral dissection and bladder mobilization despite often extensive pelvic fibrosis in such patients [3,9]. It is our impression also that the visualization gained during laparoscopy simplified ureteral and bladder mobilization, enabling an adequate bladder flap and tension free anastomosis to be created.

In addition to our experience in benign ureteral strictures, and to that of the authors cited, the technique of laparoscopic ureteral reimplantation has now been extended to malignant disease. Uberoi and coworkers described robotic assisted laparoscopic distal ureterectomy and reimplantation in patients with mid-and distal-ureteral tumors that were not amenable to endoscopic resection [13]. We have no experience of laparoscopic ureteral reimplanatation in malignant disease at our center.
Although feasible, we feel long-term follow-up is undoubtedly necessary to determine the safety of such an intraperitoneal approach in transitional-cell carcinoma.

The introduction of robotic surgical systems into the urologic field has facilitated more complex reconstructive laparoscopic procedures. Cascale and colleagues showed the feasibility of robotic ureteral reimplantation for vesico-ureteric reflux in children with excellent outcomes [14]. Dinlenc and coworkers reported the first robotic extravesical ureteral reimplantation for a ureteral injury, during laparoscopic radical prostatectomy [15]. The advantages of robotic surgery like three dimensional visualization and increased degree of freedom in movement especially in the dissection and suturing of the anastomosis in the narrow pelvis can overcome some limitations of conventional laparoscopy.

**Conclusion:**

Laparoscopic ureteral reimplantation using the antireflux technique can be considered a feasible procedure for management of ureteric strictures and has the advantages of early ambulation, rapid convalescence and shorter hospital stay with good functional short-term outcomes. The creation of submucosal tunnel in the urinary bladder require advanced laparoscopic skills, and a definite learning curve exists in mastering such techniques. Larger series with longer follow up are still necessary to validate the results of this procedure against open surgery.

**References**