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Original article

Transperitoneal laparoscopic ureteric reimplantation for lower ureteric strictures and ureterovaginal fistulas: A study from north India

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KEYWORDS
Laparoscopic;
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Abstract
Introduction: Incidence of lower ureteric injuries has increased due to proliferation of complex pelvic laparoscopic and ureteroscopic procedures.
Objective: To describe our experience of laparoscopic ureteric reimplantation for lower ureteric strictures and ureterovaginal fistulas due to different aetiologies.
Patients and methods: A total of 42 patients underwent laparoscopic ureteric reimplantation from January 2007 to December 2013 after preoperative evaluation by intravenous urography or CT urogram to delineate the site and length of stricture or ureterovaginal fistula. All the patients were followed up with ultrasonography and micturating cystourethrogram at 3 months. Out of the total 42 patients, 22 patients (group 1) underwent laparoscopic ureteric reimplant for lower ureteric stricture and 20 patients (group 2) underwent laparoscopic ureteric reimplant for ureterovaginal fistula.
Results: There were 5 male and 37 female patients. The mean patient age was 43.5 ± 12 (range 24–62 yrs), mean operating time was 129 ± 11 (range 110–160) minutes, mean hospital stay was 2.8 (range 2–6) days and mean follow up period of 16 months (range 6–70). Two procedures had to be converted to open (one each in both groups). There were no major (Clavien grade III and above) intra-operative or post-operative complications. One of the failures in lower ureteric stricture group was managed by open reconstruction with boari flap.
Conclusion: Laparoscopic ureteric reimplantation is an excellent modality for both lower ureteric strictures and ureterovaginal fistulas with long term good outcomes in addition to the advantage of lesser hospital stay and lesser comorbidities.

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Introduction

The incidence of ureteral injuries has been increasing due to proliferation of complex pelvic laparoscopic and ureteroscopic procedures [1,2]. Short ureteric strictures may be managed endoscopically but long ureteric strictures fare poorly when managed by the same method. Long ureteric strictures have traditionally been managed by open surgical procedures which may be morbid in terms of long hospital stay and convalescence. Results comparing laparoscopic to open ureteroneocystostomy are similar with lesser morbidity reported for laparoscopic ureteroneocystotomy [3,4]

One of the frequent complications of pelvic surgery is ureteral stricture. Ureteral stricture is caused by surgical trauma, impacted ureteral stone, pelvic tumour, extrinsic compression or congenital anomalies [5].

Herein, we describe our experience of patients who underwent laparoscopic ureteric reimplantation for lower ureteric strictures due to different etiologies.

Subjects and methods

From January 2007 to December 2013, 42 patients (37 female and 5 male) with a mean age of 43.5 (24–62) years underwent laparoscopic ureteric reimplantation for various aetiologies. Out of the total 42 patients, 22 patients (group 1) underwent laparoscopic ureteric reimplant for lower ureteric stricture due to pelvic surgeries ($n = 15$) like hysterectomy ($n = 10$) and pelvic mass excision ($n = 5$), ureterolithotomy for impacted ureteric calculus ($n = 4$) and obstructed labour ($n = 3$). The other 20 patients (group 2) underwent laparoscopic ureteric reimplant for ureterovaginal fistula formation following lower segment caesarean section (LSCS) ($n = 6$), following hysterectomy ($n = 10$) and following obstructed labour ($n = 4$). The indications for ureteric reimplantions are summarised in Table 1. All the patients had an initial failed retrograde JJ stent placement attempt and 22 patients of lower ureteric stricture were on ipsilateral percutaneous nephrostomy till the reimplantation procedure. All the cases had a preoperative evaluation by intravenous urography or CT urogram to delineate the site and length of stricture or ureterovaginal fistula. Stricture length and location were determined in all the cases by appropriate antegrade and retrograde studies. All the patients were operated by same laparoscopic surgeon (Tables 2 and 3).

Surgical technique

All patients underwent transperitoneal laparoscopic ureteric reimplantation by *Trendelenburg* modified Lich Gregoir technique. Patients were placed in flat dorsal trendlenburg position and a small infraumbilical incision was given to establish pneumoperitoneum using Veress needle. A blunt tip 10 mm infraumbilical trocar was inserted to act as camera port. Subsequently, one 5 mm and other 10 mm trocar were placed according to shown in Figs. 1 and 2 respectively.

After placement of the trocars, colon was mobilised medially along the line of Toldt. Ureter was identified above the bifurcation of iliac vessels. Careful ureterolysis was done distally to avoid devascularisation of ureter. All ureteric reimplantation were done utilising extra-vesical modified Lich Gregoir technique. The ureter was transected and spatulated near the stricture or ureterovaginal fistula. The bladder was distended with sterile normal saline up to 300–400 ml. Detrusor muscle was opened lengthwise for 3–4 cm to expose the mucosa of the bladder. Ureterovesical anastomosis was achieved over JJ stent after opening the bladder mucosa with 4–0 vicryl suture. Buttressing by detrusor muscle was done for creation of anti-reflux mechanism by taking 3–4 interrupted sutures for

Table 1 Indications for laparoscopic ureteric reimplanation.

	Lower ureteric stricture			Ureterovaginal fistula		
	Pelvic surgeries (like hystrectomy and pelvic mass excision)	Ureterolithotomy	Obstructed labour	Following LSCS	Following hysterectomy	Following obstructed labour
No. of cases	15 (10 + 5)	4	3	6	10	4

Table 2 Characteristics of the patients and operative data.

Criterion	Group 1 (lower ureteric stricture)	Group 2 (uretero-vaginal fistula)	Total
Number of patients	22	20	42
Female/male	18/4	20/0	38/4
Mean age in years (range)	47 (24–58)	38 (26–62)	43.5 (24–62)
Mean stricture length in cm	2.6	2.1	2.4
Mean operative time in minutes	174 (122–242)	152 (114–210)	169 (122–242)
Mean hospital stay in days	2.9 (2–6)	2.6 (2–5)	2.8 (2–6)
Mean drop in haemoglobin	0.6	0.3	0.4
Open conversion	1 (difficult adhesions)	1 (difficult adhesions)	2
Mean analgesic requirement (tramadol in mg)	156.3 ± 13 (range 100–250)	146.6 ± 12 (range 100–250)	152.7 ± 13 (range 100–250)
Psoas hitch	2	1	3
Recurrence	1 (4.54%)	0	1 (2.38%)
Success in %	95.46%	100%	97.62%
Mean Follow up in months (range)	18.2 (6–56)	13.8 (6–70)	16.4 (6–70)

Table 3 Post-operative complications.

Complications	Group 1 (lower ureteric stricture)	Group 2 (uretero-vaginal fistula)	Total
Clavien grade I			
Pain	5	3	8
Fever	2	2	4
Bladder spasm	3	2	5
Vomiting	2	1	3
Ileus	1	1	2
Complications Clavien grade II			
Blood transfusion	1	Nil	1
Complications Clavien grade III and above	Nil	Nil	nil

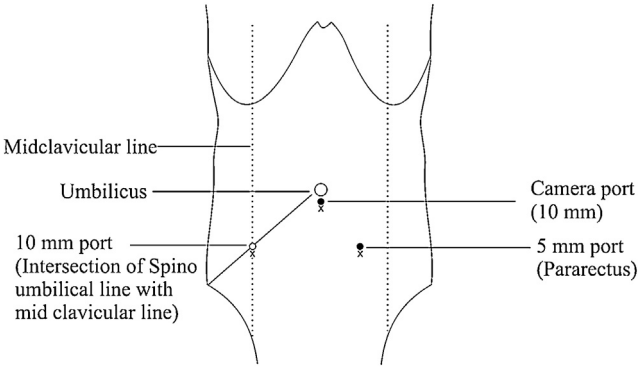

Fig. 1 3 Ports placement for right ureteric reimplantation.

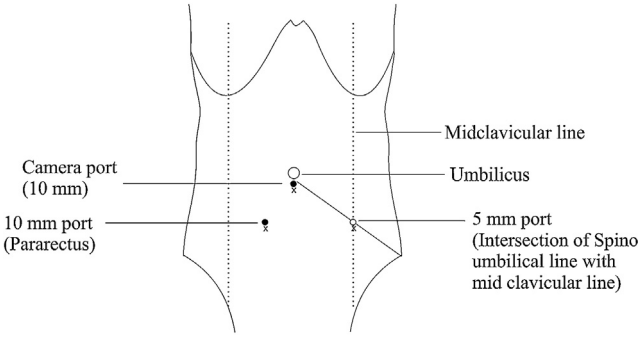

Fig. 2 3 Ports placement for left ureteric reimplantation.

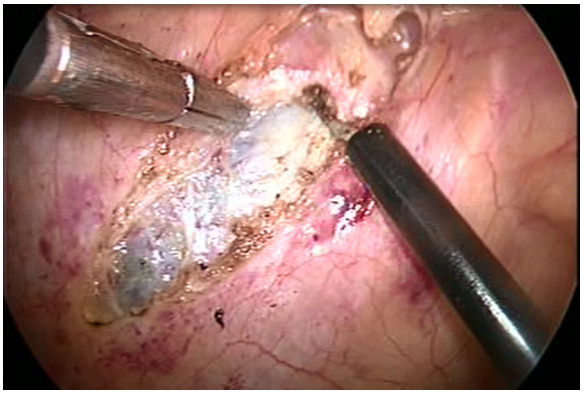

Fig. 3 Detrusor muscle opened to expose the mucosa of the bladder.

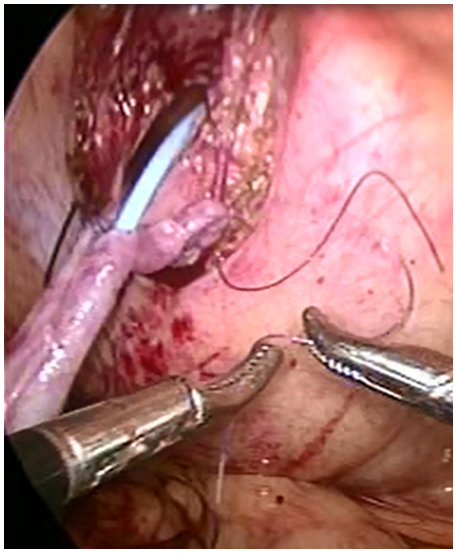

Fig. 4 Ureterovesical anastomosis over JJ stent after opening the bladder mucosa.

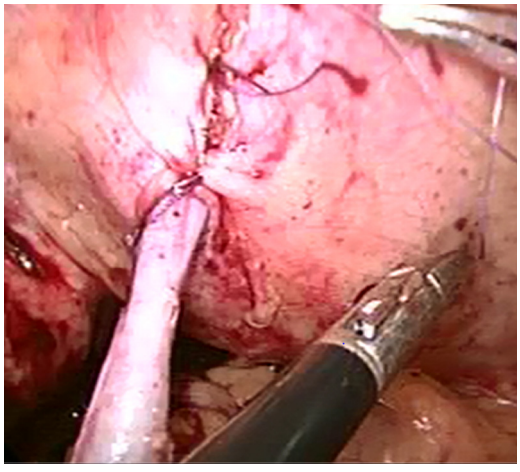

Fig. 5 Closure of sero-muscular wall of bladder over mucosal anastomosis.

closure of sero-muscular wall of bladder over mucosal anastomosis (Figs. 3–5).

In cases of tension due to higher location of ureteral stricture, ureteroneocystostomy with psoas hitch was done in 3 cases. After closing of the detrusor muscle, bladder was filled with 200–300 ml

of normal saline to evaluate for water tight anastomosis and any extravasation. The cavity was drained with an abdominal drain which was removed on second post-operative day if drain fluid was not consistent with urine. Patients were discharged on 2nd or 3rd post-operative day if post-operative period was uneventful. Foley catheter was removed after 7–10 days and JJ ureteric stent was removed after 4–6 weeks.

Results

The mean patient age was 43.5 ± 12 (range 24–62) years with 5 male and 37 female patients. Right ureteroneocystostomy was done in 24 patients and 18 on left side. Two procedures (one each in both groups) had to be converted to open. One case which had to be converted to open in group 1 (lower ureteric stricture group) was the one in which patient had earlier underwent pelvic mass excision leading to ureteric injury. The other case in group 2 (ureterovaginal fistula group) had earlier underwent total abdominal hysterectomy with bilateral salpingo-oophrectomy for carcinoma cervix. The mean operating time was 129 ± 11 (range 110–160) min and mean hospital stay was 2.8 (range 2–6) days. Mean drop in haemoglobin was 0.4 gm/dl and mean analgesic requirement was 152.7 ± 13 (range 100–250) mg of tramadol. There were no major (Clavien grade III and above) intra-operative or post-operative complications. Only one patient in lower ureteric stricture group who had conversion to open procedure needed blood transfusion (Clavien grade II) in post-operative period. All the patients were followed up with ultrasonography and micturating cystourethrogram at 3 months with a mean followup period of 16 (range 6–70) months. One of the patients in lower ureteric stricture group due to previous pelvic mass excision had recurrence of symptoms and hydroureteronephrosis with obstructed pattern on DTPA scan at 3 months of follow up, was considered as failure of laparoscopic ureteric reimplantation. She was managed by open reconstruction with Boari flap technique.

Discussion

The first laparoscopic ureterovesical reimplant was done in 1994 by Reddy and Evans to correct vesicoureteric reflux [6]. Laparoscopy has the advantage of fast recovery, low post-operative morbidity, less blood loss, less post-operative pain and better cosmesis [5,7,8]. Functional outcomes are comparable between laparoscopic and open ureteric reimplanation [5]. A large number of complications like ureteral damage have been reported in the learning curve of procedures like laparoscopic pelvic surgeries and endoscopic ureteral procedures, the most common procedure being laparoscopic assisted vaginal hysterectomy (LAVH) [9]. Usually patients of ureterovaginal fistula present with clear drainage per vagina with flank pain and unilateral hydronephrosis [10]. Most of the ureteral injuries are missed intra-operatively leading to significant sequelae due to delayed diagnosis and treatment resulting in medicolegal action [11]. Thus managing this complication in a minimally invasive manner is advantageous in reducing the further morbidity. Laparoscopy has the advantage of being minimally invasive with wide access to entire urinary tract. It offers a strong alternative for ureteral reconstruction. Studies show similar results between open and laparoscopic ureteroneocystostomy with decreased morbidity for the latter [4,5]. Laparoscopic ureteroneocystostomy is a practical, feasible and cost-effective for trained laparoscopic urologist [12]. Modi and colleagues presented a series on laparoscopic ureteric reimplantation for ureterovaginal fistula following gynaecological procedures like open abdominal hysterectomy, laparoscopic hysterectomy and vaginal hysterectomy [13]. In this series all patients had underwent ureteroneocystostomy with a psoas hitch. Simmons and colleagues compared their series of laparoscopic and open ureteroureterostomy, ureteroneocystostomy and Boari flap procedures and found out that two most common causes of ureteral stricture formation were iatrogenic (67%) secondary to gynaecological and rectal procedures or impacted ureteral calculi (24%) [4]. The ureteral stricture cause, length and location, were equivalent between both laparoscopic and open groups. They reported no statistical difference in the success (100% versus 96%, $P = 0.544$) and complication rates (8% versus 15%, $P = 0.225$) between the laparoscopic and open groups, respectively. However, hospital stay was longer and operative blood loss was greater in the open group as compared with laparoscopic group.

In our series, we did laparoscopic ureteroneocystostomy for lower ureteric stricture in 22 patients and in 20 patients for uretrovaginal fistula. There were no significant complications both intra-operatively and in post-operative period. The mean operating time was 129 ± 11 (range 110–160) min and mean hospital stay was 2.8 (range 2–6) days which is comparable to previous series on laparoscopic ureteric reimplantation.

However, in reconstructive urological surgery recurrent ureteric strictures may develop upto one year after surgery.

In a study by Selzman et al., 11% stricture rate was observed at 1-year follow up after open ureteric reimplanation [14]. In our study, we found only a single case of recurrence of the stricture or stenosis in the follow up period which ranged upto 70 months. Recurrence of symptoms and hydronephrosis was seen at 3 months of follow up in one of the patients in lower ureteric stricture group due to previous pelvic mass excision and was considered as failure of laparoscopic ureteric reimplantation. She was managed by open reconstruction with Boari flap technique.

Obstructed labour is still a big problem in various parts of the world especially the developing countries [15]. The disastrous sequelae of obstructed labour may vary from foetal and maternal mortality to ureterovaginal fistulas. So laparoscopic ureteric reimplantation offers a minimal invasive approach to further decrease their morbidity and suffering by avoiding an open procedure to treat ureterovaginal fistula.

Conclusion

Laparoscopic ureteric reimplantation for lower ureteric stricture and ureterovaginal fistula is a feasible and effective option in the hands of trained laparoscopic urologists. Its long term good outcomes are in addition to the advantage of lesser hospital stay and lesser comorbidities. Laparoscopic ureteric reimplantation is an excellent modality for both lower ureteric strictures and ureterovaginal fistulas.

Conflict of interests

The authors have no conflict of interest.

Source of funding

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Consent from the patient

Informed consent was obtained from all individual participants included in the study.

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