Retrograde intra-vesical reconstructive surgery (RIVRS): A novel technique

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Abstract

Management of distal ureter by en block resection during radical nephrectomy for upper urinary tract transitional cell carcinoma (TCC) is considered as standard of care. In this report, we describe our technique for management of lower ureter which utilizes both the endoscopic and laparoscopic approach. The nephrectomy including the dissection of the lower ureter was completed laparoscopically. The ureteral orifice was scored using a hook passed through a 24 Fr nephroscope and secured. Transurethral suturing of the defect with SewRight SR5 device passed through the working channel of the 24 Fr nephroscope was done. Our report highlights the fact that management of lower ureter in TCC pelvis can be done endoscopically/laparoscopically without compromising the oncological principles. Our novel technique demonstrates feasibility of intra mural resection of the ureter and primary closure of the bladder endoscopically.

Key words: Bladder cuff, novel method, transitional cell carcinoma

INTRODUCTION

Management of distal ureter by en bloc resection during radical nephrectomy for upper urinary tract transitional cell carcinoma (TCC) is the standard for care. This holds true for large high-grade invasive tumours of the renal pelvis and the proximal ureter[1,2]

Removal of the entire ureter and bladder cuff with ureteric orifice is vital to prevent recurrence. Various other minimally invasive techniques described are the pluck technique,[3] ureteral intussusception,[3] needlescope technique,[4] unroofing and electrocoagulation,[5] laparoscopic nephrectomy with open ureterectomy[6] and the latest being robotic nephroureterectomy.[7,8] Concerns remain as regards the various methods, oncologic effectiveness and the need for long-term catheter drainage. Management of the lower ureter in such cases that include complete excision of the lower ureter with bladder cuff is one of the most challenging parts of surgery due to the anatomy and the need for in-depth operation of the pelvis. In this report, we describe our technique for the management of the lower ureter, which utilizes both endoscopic and laparoscopic approaches. The technique retrograde intra-vesical reconstructive surgery (RIVRS), described in this article, notes the feasibility of intra-mural resection of the ureter and primary closure of the bladder with a combination of endoscopic resection and suturing.

MATERIALS AND METHODS

A total of three patients (two males and one female) underwent this procedure. All the patients had renal pelvic TCC and underwent laparoscopic radical nephrectomy; the bladder cuff and the intra-mural ureter were managed with RIVRS.

The technique
In addition to standard laparoscopic instruments required for laparoscopic nephrectomy, 26-Fr nephroscope/sheath (STORZ) and electrocautery hook (Covidien) were used...
The endosuturing was done with the help of Sew-Right SR5 endosuture needle (LSI Solutions, Victor, NY, USA) and its cartridge [Figures 1 and 2]. The device is a 5-mm suturing instrument used for the placement of interrupted sutures. The device is modified in length and diameter to enable its use through the working channel of a 24-Fr nephroscope on a 26-Fr sheath. It was used for precise intra-renal suturing in percutaneous endopyeloplasty.\(^9\)

For loading the suture, the following steps were followed.

Each end of the suture used with the Sew-Right SR5 has a metal ferrule and comes pre-packed in a cartridge. The tip of the suturing device fits on a groove on the suture cartridge and the loop of the main body is threaded through the length of the shaft and exits through an opening on the handle [Figure 1]. In addition, as shown in the figure, the suture is passed through the handle.

**STEP 1:** The patient is placed in a semi-oblique position, with straps over the thigh and chest as shown in Figure 1. Laparoscopic ports are placed, as in case of trans-peritoneal nephrectomy. Following this, a standard laparoscopic trans-peritoneal nephrectomy was done. The point that specifically merits mention is once the uretero-gonadal packet is lifted, the ureter is immediately clipped to prevent possible inadvertent migration of malignant cells to the lower ureter.

**STEP 2:** Once the laparoscopic nephrectomy part is done, cystoscopy is undertaken. The position helps to simultaneously dissect the lower ureter and perform transurethral intra-mural dissection of the intra-mural ureter. The urethra is dilated and a 24-Fr nephroscope on a 26-Fr sheath is introduced per urethral. A 5-Fr hook is introduced through the channel of nephroscope and ureteral orifice is circumferentially scored by electrocautery. Although not done in the present patient cohort, this step can be alternatively done with a resectoscope sheath and a Collings knife. The depth of incision is extended up to perivesical fat, which is laparoscopically monitored. Pneumoperitoneum helps in reducing the theoretical chance of a bowel injury during intra-mural dissection and suturing. The laparoscopic surgeon simultaneously dissects the ureter up to the vesicoureteric junction (VUJ), guided by the cystoscopic movement and light. The dissection of the intra-mural ureter transurethrally helps in securing adequate margin of the bladder cuff. In addition, it also guides the surgeon in performing the dissection of the lower ureter. Previously scored VUJ helps in securing the cuff. Once the specimen is disconnected, it is bagged. The rubber nipple on the nephroscope helps in preventing loss of pneumoperitoneum.

**STEP 3:** The next step includes suturing the bladder cuff with the Sew-Right device. The loaded Sew-Right SR5 is passed through the working channel of the 24-Fr nephroscope. The initial suture approximates bladder incision in mid part, thereby dividing the suture line into two equal halves. Additional sutures are placed on either side of the initial stitch to complete the procedure. The number of sutures depends on the size of the cystostomy. Typically three to five sutures are required, one to two on either side of initial stitch; however, the number of stitches may vary. With the help of a needle selector, the first needle passes through the tissue and it automatically pulls the suture through the tissue, after which the second needle is passed and the procedure is repeated. The end result is suture-passed though both ends of the tissue, which is followed by an extra-corporeal Rodders knot passed through the channel of nephroscope using a pusher [Figure 3].
The unique feature of our technique is the use of endoscopic method of suturing for closure of bladder by a special instrument designed for endosuturing, a suturing technique that has already been described for percutaneous endopyeloplasty\[11\]\[Figure 4].

RESULTS

Mean age of the patients in our series was 58 years (range: 44-68 years), mean operative time for bladder cuff was 56 min (45 to 65 min) and mean time for catheter removal was 4 days (range: 3-5 days). Average follow-up period was 9 months, with no recurrence in any case.

DISCUSSION

Conventional management of the distal ureter is done by the open method using extra-vesical method, intra-vesical method or a combination of both these methods. The most commonly used method is the intra-vesical method. Disadvantage of the intra-vesical method is the need for anterior cystotomy and prolonged catheterization period ranging 5-7 days. With extra-vesical dissection, cystotomy is avoided but there is a risk of incomplete dissection of the intra-mural portion of the ureter and accidental risk of contralateral ureter injury due to excessive traction.\[3]\[Figure 4]

Total laparoscopic techniques are associated with high risk of local recurrence, the most plausible reason being retained distal ureter in the bladder.\[10]\[Figure 3: A 68-year-old male underwent left lap nephrectomy and endoscopic management of bladder cuff by RIVRS

Few authors have reported high recurrence rate with endoscopic methods but these reports have not mentioned the location of the tumour, which might have resulted in potential bias in interpreting the results.\[12-14]\[Figure 4: Technique of bladder suturing\]

With the wide application of robotics in urology, the techniques of laparoscopic nephrectomy with robotic ureterectomy as well as total robotic nephroureterectomy have been described recently.\[7,8]\[Figure 3: A 68-year-old male underwent left lap nephrectomy and endoscopic management of bladder cuff by RIVRS\]

The robotic-assisted surgery has the advantage of being able to emulate the open technique with good results, the disadvantages being the cost and the non-universal access to robot at all institutes.

This report highlights the fact that management of the lower ureter in TCC pelvis can be done endoscopically without compromising the oncological principles. Advantages of this minimally invasive technique include simultaneous laparoscopic endoscopic intervention, decreased chance of injury to the opposite ureter, controlled adequate tissue dissection, primary bladder closure, short catheterization period, early ambulation and decreased hospital stay. Precise suturing without need to change position with precise. The disadvantages are the requirement of specially designed instrument(s) for intra-vesical suturing and the need for two trained surgeons and additional expertise required for endoscopic suturing. The described technique is not suitable for the management of lower ureteric tumours encroaching in the bladder, as the defect would be challenging to suture. The limitation of our study was the limited number of cases.

CONCLUSION

We conclude that RIVRS is a safe, efficient, minimally invasive and reproducible technique for lower ureter resection in TCC pelvis with primary bladder closure.
REFERENCES


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