SURGICAL TECHNIQUE

Ureterectomy in the treatment of urothelial carcinoma of the distal ureter

A. García-Segui a,*, I. Gómez a, A. García-Tello b, F. Cáceres b, J.C. Angulo b, M. Gascón a

a Servicio de Urología, Hospital General Mateu Orfila, Mahón, Spain
b Servicio de Urología, Hospital Universitario de Getafe, Universidad Europea de Madrid, Getafe, Madrid, Spain

Received 9 June 2012; accepted 6 September 2012
Available online 31 July 2013

Abstract
Introduction: Segmental ureterectomy with preservation of the kidney is a treatment option for the low grade urothelial carcinoma (LG-UC) in distal ureter that is not a candidate for endoscopic resection. Laparoscopic distal ureterectomy (LDU) with ureteral reimplantation is common in benign conditions (stenosis, iatrogenic lesion, endometriosis). However, it has been hardly described in malignant ureteral condition. The literature is reviewed in this regard and the surgical technique is described.

Material and methods: The experience regarding two cases of LDU due to low grade urothelial carcinoma in distal ureter is presented. In both, previous bladder transurethral resection (RTU) was performed. The urinary cytology was negative and the imaging studies identified urinary obstruction and distal ureter filling defect. One of the patients had a background of T1G3 bladder cancer and suffered renal failure. In both, the ureter was ligated early. Segmental ureterectomy was performed using a combined endoscopic and laparoscopic procedure with ureteral desinsertion in one case. In the other, it was exclusively laparoscopic. Both were done with 4 trocars. Ureteral reimplantation was conducted with continuous hermetic suture and without tension. In one case with background of high grade bladder tumor, pelvic lymphadenectomy was also performed.

Results: Operating time was 180 and 240 min, respectively, with estimated bleeding of 100 and 250 ml. Hospitalization time was 6 and 4 days. The only post-operative complication was paralytic ileum (Clavien I) in the first case. With a 20 and 12 month follow-up, there is no evidence of recurrence or dilatation. In the patient with renal failure, creatinine clearance improved.

Conclusions: The LDU with ureteral reimplantation is a complex technique. However, it represents a feasible and effective alternative for the treatment of LG-UC in distal ureter, as long as the oncological and reconstructive principles are respected.

© 2012 AEU. Published by Elsevier España, S.L. All rights reserved.

* Corresponding author.
E-mail address: agarciasegui@gmail.com (A. García-Segui).

2173-5786/$ - see front matter © 2012 AEU. Published by Elsevier España, S.L. All rights reserved.
La ureterectomía distal laparoscópica en el tratamiento del carcinoma urotelial del uréter distal

Resumen

Introducción: La ureterectomía segmentaria con preservación del riñón es una opción de tratamiento para el carcinoma urotelial de bajo grado (CU-BG) en uréter distal no susceptible de resección endoscópica. La ureterectomía distal laparoscópica (UDL) con reimplantación ureteral es habitual en patología benigna (estenosis, lesión iatrogénica, endometriosis); pero se ha descrito escasamente en patología ureteral maligna. Se revisa la literatura al respecto y se describe la técnica quirúrgica.

Material y métodos: Se expone la experiencia relativa a dos casos de UDL por carcinoma urotelial de bajo grado en uréter distal. En ambos se llevó a cabo por laparoscopía vesical previa, la citología urinaria fue negativa y los estudios de imagen identificaron obstrucción urinaria y defecto de llenado en uréter distal. Uno de los pacientes tenía antecedentes de neoplasia vesical T1G3 y padecía insuficiencia renal. En ambos el uréter se ligó precozmente. La ureterectomía segmentaria se practicó mediante procedimiento combinado endoscópico y laparoscópico con desinserción ureteral en un caso, y en el otro de forma exclusivamente laparoscópica; ambos con 4 trócares. La reimplantación ureteral se llevó a cabo sin sutura continua hermética y sin tensión. En un caso con antecedente de tumor vesical de alto grado se practicó también linfadenectomía pélvica.

Resultados: El tiempo operatorio fue 180 y 240 min, respectivamente; el sangrado estimado 100 y 250 ml; y el tiempo de ingreso 6 y 4 días. La única complicación post-operatoria fue ileo paralítico (Clavien I) en el primer caso. Con un seguimiento de 20 y 12 meses no hay evidencia de recidiva ni de dilatación. En el paciente con insuficiencia renal el aclaramiento de creatinina mejoró.

Conclusiones: La UDL con reimplantación ureteral es una técnica compleja, pero representa una alternativa factible y efectiva para el tratamiento del CUBG en uréter distal, siempre que se respeten los principios oncológicos y reconstructivos.

© 2012 AEU. Publicado por Elsevier España, S.L. Todos los derechos reservados.

Introduction

The urothelial carcinoma of the upper urinary tract accounts for 5% of all urothelial malignancies. The standard treatment is nephroureterectomy with excision of the ipsilateral ureteral orifice, including a bladder impeller. For the urothelial tumors of the middle and distal ureter, unsuitable for endoscopic resection, distal ureterectomy with ureteral reimplantation is an accepted treatment option, particularly in solitary lesions.2

With the advent of minimally invasive surgeries, there are multiple oncological techniques that reproduce the oncological procedures and the results of conventional open surgery. Still, the articles about laparoscopic distal ureterectomy (LDU)1,4 and robotic2-13 to treat distal ureteral tumor are scarce. We describe the laparoscopic technique performed in 2 patients with low-grade urothelial carcinoma (LGUC) not infiltrating the distal ureter and we review the literature published in MEDLINE on the conservative laparoscopic treatment of the carcinoma of the distal ureter.

Patients and methods

Both patients had in common the existence of a 1.5–2 cm exophytic bladder lesion located on the ureteral orifice and within the light of the ureter. One case also had a history of prior T1G3 bladder tumor resected a year earlier. The other case was detected by gross hematuria. We performed bladder transurethral resection (TUR) in both, histologically confirming non-muscle-invasive LGUC. Imaging studies show a space-occupying lesion at the level of the distal ureter with delayed elimination of the contrast and hydronephrosis. In the case with a history of bladder cancer, the creatinine clearance was 49 ml/min.

In both cases, an unsuccessful tumor resection attempt was made by means of ureteroscopy with holmium laser. In the case with renal failure we could not even make the total obstruction ureteral catheterization, and in the other one, the tumor resection was incomplete but confirmed LGUC. The urinary cytology was negative in both. We decided to perform segmental ureterectomy with right ureteral reimplantation. Considering the experience acquired in oncologic and reconstructive laparoscopic surgery, we decided to use this approach after obtaining informed consent from patients. Below are described the techniques used that partially differ in each case. In Appendix B, both surgeries can be viewed, both the pure laparoscopic technique and the laparoscopic and endoscopic one, in the additional material to the article in its online version.

Pure laparoscopic technique

In the case where ureteral catheterization was not possible, the LDU was performed in an exclusively laparoscopic...
Ureterectomy in the treatment of urothelial carcinoma of the distal ureter

and the peripheral zone of the bladder impeller. We performed cystorrhaphy with continuous barbed suture and we checked for bladder tightness. Because of the history of high-grade bladder tumor, we proceed to right ilio-obturator lymphadenectomy extended up to the right common iliac. The distal ureter is spatulated and we conduct double-J 7Fx 30 cm catheterization percutaneous retrograde prior to direct ureteral reimplantation with several 3/0 monocryl continuous sutures. After a new tightness test and hemostasis, a drainage and a urethral catheter are placed over the surgical bed.

Mixed laparoscopic technique

For incomplete ureteroscopic resection, the procedure was performed by means of a combined endoscopic and laparoscopic approach. The patient was placed in lithotomy position with Trendelenburg. We used 2 working towers, one laparoscopic and the other one for cystoscopy (Fig. 1B). In the endoscopic time, catheterization of both ureters was made to facilitate resection and avoid contralateral ureter injury during the laparoscopic time. The endoscopic resection of the ureteral orifice was performed using the Collings handle, incising through the detrusor fibers around the orifice, being careful not to affect the thickness of the muscular wall to prevent tumor seeding. Then, sterile water was instilled into the bladder to promote lysis of malignant cells.

The laparoscopic procedure was performed by means of transperitoneal approach with 4 trocars. In order to obtain adequate exposure of the pelvis, we performed retraction of the sigmoid colon, holding it by one of its epiploic appendices through an externalized suture in the contralateral abdominal wall. The peritoneum was incised and the distal ureter was carefully released, preserving the adventitia to ensure adequate blood supply. After identifying the relief of the tumor, we placed Hem-o-lok proximal to the lesion (Fig. 2A). Distally, it was not possible to apply clip due to the flow presence of the neoplasia. The bladder remained partially relaxed with sterile water to facilitate the dissection of the ureter, although prior to the cystotomy, the bladder content was evacuated. Circumferential cystotomy was performed around the ureterovesical junction, reaching the previously made endoscopic incision. The ureter was sectioned proximally and the specimen was extracted bagged (Fig. 2B). Later, cystorrhaphy was conducted, followed by release and mobilization of the bladder. Transverse incision was also performed on the anterior side of the bladder and longitudinal closure to gain 2–3 cm, because there was some tension for the apposition between the ureter and bladder. The cephalic end of the bladder incision remained open to facilitate insertion of the double J stent and the construction of the anastomosis. The ureter was spatulated and a retrograde double-J ureteral catheter was inserted using the previously insinuated ureteral guide wire in the bladder neck (Fig. 3). Tension-free anastomosis was performed using a continuous suture line (Fig. 4) and we checked for tightness instilling 160 ml of saline solution. Then, simple sutures were placed which made it possible to cover the suture line with fatty tissue. The contralateral ureteral catheter was removed and drainage and catheter were inserted.

Figure 1  (A) Trocar placement points. (B) Arrangement of the patient and surgical elements.
Figure 2  (A) Identification of the relief that produces the tumor mass over the ureter to perform early proximal ligation with Hem-o-lok. (B) Excision of the distal ureter and placement in laparoscopic bag.

Results

The operative time of the interventions was 180 and 240 min, intraoperative bleeding 100 and 250 ml, and hospitalization 6 and 4 days, respectively. There were intraoperative complications and the only postoperative complication was paralytic ileus (Clavien I) on the second day in the first case, which was treated effectively with nasogastric tube and hunger cure until day 5. With a follow-up of 20 and 12 months, there is no evidence of recurrence or dilation. In the patient with kidney failure, the creatinine clearance improved. In the other case, the renal function remained stable at all times.

The histopathological study confirmed low-grade papillary urothelial carcinoma without infiltration of the corium in both cases. The surgical margins were free of tumor in both cases. In the patient with ipsilateral lymphadenectomy, 12 lymph nodes were obtained, all negative. The drainage was maintained during the hospitalization time and the bladder catheter was removed at 10 and 8 days, respectively, and the double J catheter after a month. With a follow-up of 20 and 12 months, both patients are free of recurrence and dilation.

Discussion

Conservative treatment for malignant tumors of the middle and distal ureter demonstrated equivalent oncologic...
results to more aggressive procedures, mainly because it has been determined that the tumor histological grade and the stage of the lesion are more significant prognostic factors than performing an extensive resection.\(^\text{4,5,11,12}\) Proper selection of the patients by means of imaging tests, urine cytology, and histological studies of confirmation of malignancy is paramount.\(^\text{5,13}\) In the joint presence of bladder and ureteral injury, first bladder TUR is recommended to exclude the presence of carcinoma in situ, or muscle invasive disease that could lead to pose a different radical surgical treatment that includes cystectomy.\(^\text{5}\)

Distal ureterectomy is considered an accepted treatment for the management of the distal ureteral carcinoma.\(^\text{2,3}\) Its indications include ureteral tumors not amenable to endoscopic resection or single kidney patients, with chronic renal failure, diabetes mellitus, renal lithiasis, and bilateral upper urinary tract tumors. In patients with a healthy contralateral kidney, the LDU can be considered in cases of injury to the distal ureter, unilocular, <2 cm and without invasion of the muscle layer. Some authors justify this conservative treatment due to the risk of contralateral disease, synchronous or metachronous, which can occur in 1–4% of the patients.\(^\text{4,6}\) On the other hand, elective endoscopic resection of ureteral tumors has risk of perforation, tumor seeding, and conditioning ureteral stenosis.\(^\text{8}\) Additionally, ureteroscopic laser ablation prevents obtaining sample for pathological anatomy study, which affects the correct determination of the histologic tumor grade, the level of infiltration and the surgical margin status of resection.\(^\text{5}\) However, ureteroscopic resection remains the first choice in the conservative treatment of ureteral tumors.

The LDU provides good results for the treatment of benign diseases of the distal ureter such as stenosis, endometriosis, or iatrogenic injury.\(^\text{15,16}\) However, the bibliographical references of this technique in malignant disease are limited, with a total of at least 40 reported cases (12 by laparoscopy and 28 by robot-assisted laparoscopy) (Table 1). Gerber et al. described the first case of LDU with good oncological results.\(^\text{5}\) Simforoosh et al. performed laparoscopic segmental ureterectomy to treat a tumor of proximal ureter.\(^\text{4}\) Rouprêt et al. described the first series of 6 patients undergoing LDU and concluded that it is a feasible technique, with oncologic outcomes equivalent to open surgery.\(^\text{17}\) Basiri et al. highlighted the low morbidity of this technique, although in order to carry it out advanced laparoscopic skills are required.

The advent of applied robotic technology in urological reconstructive procedures has also shown utility in performing distal ureterectomy. Uberoi et al. described, the same way as the mixed laparoscopic approach presented here, the robot-assisted distal ureterectomy in combination with endoscopic resection of the ureteral orifice.\(^\text{7}\) Other series of robot-assisted ureterectomy in benign and malignant disease processes reproduce the surgical steps of open surgery, ensuring oncological and reconstructive effectiveness.\(^\text{7,13}\)

It is essential to maintain the oncological and reconstructive principles, regardless of the technique applied. From the oncological point of view, we must avoid the flow of urine from the affected ureter into the peritoneum to prevent seeding of tumor cells, making as far as possible the ligation proximal and distal to the tumor.\(^\text{5,10,13}\) From the reconstructive point of view, we must handle the tissues delicately, get adequate exposure of the operative field, and run a watertight ureterovesical anastomosis free of tension, conducted on well-vascularized tissues to obtain optimal results.\(^\text{14,16}\)

There is no doubt that there is reticence with regard to the oncological safety of laparoscopic or robotic conservative treatment, since the high abdominal pressure of the pneumoperitoneum could favor tumor seeding.\(^\text{5}\) However, this risk has not been confirmed in the laparoscopic...
nephroureterectomy series in which there is no increased local recurrence. On the other hand, the risk of seeding in low-grade ureteral tumors may be rather theoretical and not significant, and it must be weighed against the benefits regarding the morbidity of the laparoscopic and robotic technique.  

Another element of concern is the fact that the opening of the bladder may be another facilitator of tumor recurrence. Once the literature is reviewed, it seems that the risk of tumor seeding due to ruptured bladder integrity may be considered minimal. Additionally, it is considered that intravesical instillation of sterile water, prior to the opening of the bladder, may be useful to reduce the risk of seeding in an attempt to lyse malignant cells.

Consequently, our experience confirms that the LDU may be a feasible and effective alternative for the treatment of malignant tumors of the distal ureter, provided that there is adherence to the oncological and reconstructive principles. It is a complex technique that requires training in laparoscopic surgery, although robotic assistance could diminish the complexity of the procedure and expand its applicability.

Conflict of interest

The authors declare that they have no conflict of interest.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.acuroe.2012.09.001.

References

Ureterectomy in the treatment of urothelial carcinoma of the distal ureter
