CASUISTRY

Transumbilical laparoendoscopic single-site ureteral reimplantation

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KEYWORDS
Ureteral stenosis; Reconstructive surgery; Laparoendoscopic single-site surgery; Ureteral reimplantation

Abstract

Objective: To analyze the outcomes of umbilical laparoendoscopic single-site (LESS) ureteral reimplantation using a reusable single-port platform.

Materials and methods: The casuistic of LESS ureteral reimplantation in 5 patients is presented. The surgical technique using KeyPort system (reusable umbilical single-site platform) is described. Dissection, suctioning and suturing by minilaparoscopy through 3.5 mm accessory port in the iliac fossa are performed. Operative and postoperative outcomes are presented. The median follow-up at time of analysis was 11 ± 14 months.

Results: The median age of patients was 49 ± 34 years; male-female ratio was 1:1.15. Left surgery was carried out in all cases. In 4 patients, the etiology was secondary to stenosis (3 iatrogenic and 1 pelvic endometriosis). In the remaining case, the procedure was performed after excision of a symptomatic adult ureterocele. In all cases, bladder catheter and double-J ureteral catheter were inserted for 7 ± 3 and 30 ± 15 days and then removed. No conversion to conventional laparoscopic or open surgery occurred. The surgery time was 145 ± 60 min, and intraoperative bleeding was 100 ± 75 cc. Neither transfusion nor high analgesia was necessary. No postoperative complications, minor or major, have been reported. Hospital stay was 2 ± 0.5 days. In any patient, restenosis or worsening of renal function occurred.

Conclusions: In experimented centers, transumbilical laparoendoscopic single-site ureteroneocystostomy is a safe alternative with comparable results to conventional laparoscopy and an excellent cosmetic result at low cost thanks to device reuse.

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Reimplantación ureteral laparoendoscópica por puerto único transumbilical

Resumen

Objetivo: Análisis de los resultados obtenidos mediante técnica de reimplantación ureteral laparoendoscópica por puerto único (LESS) transumbilical con plataforma de puerto único reutilizable.

Material y método: Se presenta la casuística de 5 pacientes sometidos a reimplantación ureteral LESS. Se describe la técnica quirúrgica empleada con plataforma de puerto único KeyPort® de colocación umbilical y puerto accesorio de 3,5 mm en la fosa ilíaca, a través del cual se emplea material de minilaparoscopia que facilita la disección, aspiración y sutura. Se presentan los resultados operatorios y postoperatorios obtenidos. La mediana de seguimiento en el momento del análisis fue de 11 ± 14 meses.

Resultados: La mediana de edad de los pacientes fue 49 ± 34 años y la proporción hombre/mujer 1:1,5. En todos los casos la reimplantación fue izquierda. La etiología fue secundaria a estenosis en 4 casos (3 iatrogénica y una debido a endometriosis pélvica) y en el caso restante se realizó tras escisión de ureteroceles tipo adulto sintomático. En todos los casos se dejó sonda vesical por un tiempo de 7 ± 3 d y catéter ureteral doble-J 30 ± 15 d. No hubo reconversión a cirugía laparoscópica convencional ni abierta en ningún caso, y la duración de la intervención fue 145 ± 60 min con un sangrado intraoperatorio de 100 ± 75 cc. No se precisó transfusión ni analgesia al alta. No hubo complicaciones postoperatorias menores ni mayores y el tiempo de hospitalización fue 2 ± 0,5 d. Ningún paciente presentó reestenosis ni empeoramiento de la función renal.

Conclusiones: La técnica de ureteroneocistotomía laparoendoscópica a través de puerto único transumbilical constituye una alternativa segura en centros con experiencia en este abordaje, con resultados equiparables a la laparoscopia convencional y excelente resultado cosmético a muy bajo coste debido al carácter reutilizable del dispositivo.

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Introduction

The fundamental goal in ureteral reconstructive surgery is to establish a lasting permeability of the collecting system, for which it is necessary to conduct an adequate ureteral mobilization, which preserves vascularization, and to perform a tight and free-of-tension anastomosis.1 Although the laparoscopic approach is fully established today for ablative urological procedures, in the case of reconstructive surgery, the open path is still a choice in a large number of centers.2 Laparoscopy has proven effective for different reconstructive procedures, offering lower postoperative pain, blood loss, and convalescence than in its open equivalent, as well as a better cosmetic result.3 Therefore, it is the approach of choice in experienced centers.4

Laparoendoscopic single-site surgery (LESS) represents the natural evolution of minimally invasive surgery. In the literature, series of cases and retrospective studies with a large number of LESS procedures have been described. The major challenges of this technique include the limitation on triangulation of instruments, with the resulting crash thereof, resulting in considerable difficulty to perform sutures.5 There is no doubt that, in a reconstructive procedure, this limitation is particularly problematic.6 However, the simultaneous use of accessory minilaparoscopy material through a 3.5-mm port makes it possible to carry out any suture and greatly facilitates the procedure.5,7,8

The results of reconstructive LESS procedures seem comparable to those of conventional laparoscopy, although more data on the safety of this type of procedures are needed.1 In general, it is assumed that LESS surgery involves advantages associated with lower indemnity of the abdominal wall, leading to less postoperative pain, cosmetic improvement, and even more rapid recovery,1,9 especially if the extraction of the specimen is avoided as in reconstructive surgery. We reviewed the experience at our center in ureteral reimplantation surgery using LESS hybrid approach for distal ureteral stenosis secondary to benign processes.

Patients and method

Since February 2012, 5 patients have undergone laparoscopic reimplantation through multichannel single port of transumbilical placement in our center. Three patients were women and 2 were men with a median age of 49 (IQR 34) years. Reimplantation was left in all cases. In the fourth of the 5 patients, it was secondary to ureteral stenosis, with a median length of 1 cm (IQR 1.46; range 0.5–4). The remaining case had a malformation origin, performing reimplantation after left ureterocoele excision of symptomatic adult type. In the cases due to stenosis, the etiology was iatrogenic in 3 patients, secondary to gynecological procedure (hysterectomy with double adnexectomy in which there was ureteral ligation) in one of them, and in the other 2 to urologic procedures (radical prostatectomy
with lymphadenectomy on which ureteral injury occurred and ureteroscopy for ureteral lithiasis with partial tear of distal ureter and subsequent stenosis). The fourth case with stenosis was secondary to ureteral endometriosis.

In all patients, bladder catheter was left for a median of 7 (IQR 3) days and double-J ureteral catheter for 30 (IQR 15) days. One month after the removal of the ureteral catheter, intravenous urography was performed in all cases (Fig. 1). Next, the surgical technique used is described.

**Surgical technique**

Transperitoneal approach is conducted through single-port multichannel system KeyPort® (Richard Wolf, Knittlingen, Germany) of umbilical placement. For this, a 2–2.5 cm intrrumbilical incision is performed (Fig. 2). In all cases a 3.5-mm minilaparoscopy accessory port was also used in the left iliac fossa (Fig. 3). In those cases where the reimplantation was performed by ureterocele and ureteral endometriosis, double-J catheter was also placed in a retrograde way endoscopically before performing the laparoscopic approach.

![Image](https://via.placeholder.com/150)

Figure 1 Imaging study. (A) Descending pyelography combined with preoperative cystography. (B) Postoperative intravenous urography.

The left ureter is identified and dissected below the junction of the iliac vessels to its insertion into the bladder with identification, placement of distal clip, and resection of the portion of stenotic ureter. In patients with ureterocele, dissection of this structure was also performed, for which cystotomy was required and later cystorrhaphy with V-LOC 3-0 suture.

Opening of the space of Retzius and bladder release are carried out. We proceed to ureteral section and removal of the clip, followed by spatulation of the ureter. The site of ureteral reimplantation without tension is chosen, conducting bladder opening on 2 levels, muscle first and then mucosa. Subsequently, ureteral retrograde guidewire is placed through a needle introduced percutaneously, to then place over the guidewire a double J catheter, whose distal portion is inserted through the incision of the bladder mucosa (Fig. 4).

Ureteral reimplantation in the bladder is completed by means of 2 continuous monocryl 3-0 hemisutures (Fig. 4). Subsequently, apposition of the muscle fibers and peristomeum is practiced above the anastomosed ureter, by way of submucosal tunnel that provides a certain anti-reflux mechanism. If the ureteral stenotic segment is long, as in the

![Image](https://via.placeholder.com/150)

Figure 2 (A) Umbilical incision for placement of the single-site system. Virtually invisible scar 24 h after surgery.
in all patients. There were no minor or major postoperative complications and the hospitalization time was 2 d (IQR 0.5) (Table 1).

The pathologic examination revealed in the 3 cases of iatrogenic stenosis presence of periluminal fibrosis and chronic inflammation, whereas in the other 2, the diagnosis of ureterocele and ureteral endometriosis was confirmed.

In the control intravenous urography, 4 of the 5 patients completely recovered ureteral morphology in control intravenous urography, while in one case we found a kidney decreased in size, but without delay in removing the contrast, a result of previous ureterohydronephrosis. With a median follow-up of 11 months (IQR 14; range 6–27), we have not identified recurrence of the hydronephrotic process or worsening of the renal function in any of the cases.

Discussion

Reconstructive urologic procedures are indicated in a wide variety of diseases, including UPJ obstruction, iatrogenesis on the ureter, stenosis, endometriosis, or malignancy. The use in these cases of minimally invasive approaches has increased markedly in recent years. There are few series comparing open and laparoscopic surgery, among which are that of Rassweiler et al., which has 10 laparoscopic reimplantations and 10 open by means of psoic bladder with or without Boari flap, and that of Simmons et al., which compares 12 laparoscopic procedures and 34 open. In the series of Nuñez et al., with 6 laparoscopic ureteral reimplantation in psoic bladder, followed for over 2 years, no patient had restenosis or impaired renal function.

![Figure 3](image-url) Operative field image showing KeyPort umbilical system and accessory minilaparoscopy port of 3.5 mm in the left iliac fossa (both reusable).

None of the presented cases required reconversion to open surgery or conventional laparoscopy. The duration of the intervention was 145 min (IQR 60). The median estimated intraoperative bleeding was 100 cc (IQR 75). No patient required transfusion. The drainage was removed after 48 h.

![Figure 4](image-url) Various moments of surgery. (A) Placement of hydrophilic guidewire into the spatulated ureter through a percutaneously inserted needle. (B) Placement of double-J catheter over the wire. (C) Ureteral reimplantation in the bladder by means of continuous suture. (D) End of the suture.
Table 1  Main features and operative data of the patients that make up the series.

<table>
<thead>
<tr>
<th>Patient</th>
<th>Sex</th>
<th>Age (years)</th>
<th>Indication for surgery</th>
<th>Surgical time (min)</th>
<th>Estimated bleeding (ml)</th>
<th>Hospital stay (days)</th>
<th>Time of double-J (days)</th>
<th>Time of bladder catheter (days)</th>
<th>Follow-up (months)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Female</td>
<td>78</td>
<td>Distal ureter stenosis due to gynecological iatrogenesis</td>
<td>140</td>
<td>100</td>
<td>2</td>
<td>30</td>
<td>10</td>
<td>29</td>
</tr>
<tr>
<td>2</td>
<td>Female</td>
<td>49</td>
<td>Distal ureter stenosis after ureteroscopy</td>
<td>210</td>
<td>100</td>
<td>2</td>
<td>30</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>Male</td>
<td>28</td>
<td>Orthotopic-type ureterorecele</td>
<td>170</td>
<td>100</td>
<td>2</td>
<td>45</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>Female</td>
<td>44</td>
<td>Stenosis of the distal ureter due to endometriosis</td>
<td>120</td>
<td>250</td>
<td>2</td>
<td>30</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>Male</td>
<td>62</td>
<td>Post-prostatectomy distal ureter stenosis</td>
<td>145</td>
<td>100</td>
<td>3</td>
<td>45</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

Data on outcomes in single-site laparoscopic reconstructive surgery are even more scarce. The broadest multicenter casuistry of patients treated with LESS approach in urological surgery is the one presented by Kaouk et al., in which 1076 consecutive cases performed between 2007 and 2010 in 18 institutions are analyzed. Among them, the vast majority of cases were excisional surgery with only a total of 98 cases (8.4%) of reconstructive surgery for obstruction of the upper urinary tract, including UPJ obstruction, ureteral stenosis, and retrocaval ureter. The authors explain this relative lack of reconstructive procedures due to the obvious ergonomic difficulties of the LESS approach, requiring a very solid prior laparoscopic training. The lack of triangulation, the vision in 2 dimensions, and the crash of the instruments represent additional challenges to conventional laparoscopic surgery. An effective strategy is the introduction of an accessory minilaparoscopy ergonomic, as it has been done in the casuistry that we describe.

Khanna et al. published in 2012 the first study that analyzes medium-term results of patients undergoing reconstructive LESS surgery in the same institution. 32 procedures were performed including pyeloplasties, ileal interposition, ureteral reimplantation, and retrocaval ureter. Ureteroneocystostomy was performed in 3 patients. In 93.8% of the patients who reported surgery, this was successful from the clinical point of view, and the only late complication recorded was incisional hernia in one case. Another important experience regarding reconstructive LESS surgery is the series of Tracy et al., comparing the perioperative outcomes of 14 LESS pyeloplasties and 28 conventional laparoscopic ones, showing shorter surgical time, with less blood loss in the laparoendoscopic approach. We observed no significant differences in the number and severity of complications, or in analgesic requirements. Similarly, Stein et al. compared 16 LESS pyeloplasties and 16 conventional laparoscopic ones, finding no significant differences between both groups.

In summary, although in urological reconstructive surgery it is very convenient and necessary to raise the possibility of approach with no apparent incision (due to the desirable absence of scar in these cases), the overall experience is very limited, and more so if we refer exclusively to the particular experience of LESS ureteral reimplantation. Single-site surgery comes with the intention of further reducing the invasiveness of laparoscopy, with obvious benefits in terms of cosmetic results and trauma to the abdominal wall. In fact, although much lower than in open surgery, multiple incisions of multiport laparoscopy involve risk of complications at the site of trocar placement.

It is interesting to assess the importance that the patient gives for the cosmetic result after a surgical procedure. Olweny et al. assessed the significance of scars in urological patients with respect to other parameters in patients undergoing open renal surgery, laparoscopic, or LESS. Before surgery, younger patients and those undergoing interventions for benign condition gave remarkably more importance to the number and size of the scars of older patients and those with oncological disease. The relative low age of our patients, and the fact that all presented benign processes thus favor the choice of the laparoendoscopic approach.

Now, there is no doubt that LESS surgery has faced significant ergonomic difficulties, some of which are still present. Most of these problems are surmountable with a specific training program and improve with practice and a good knowledge of the instruments.

Conclusions

The technique of hybrid LESS laparoscopic ureteroneocystostomy, which uses single umbilical port and ancillary minilaparoscopy material, is a safe alternative in centers with experience in this approach. The expected results seem comparable to those of conventional multiport laparoscopy,
with marked cosmetic improvement. In cases of benign processes and often postiatrogenia, these excellent results are presented as very desirable, so we believe that the use of LESS surgery will increase in this indication.

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.2015.02.008.

References