ORIGINAL ARTICLE

Laparoscopic surgery of vesicoureteral reflux: An experience in 42 patients with the Lich-Gregoir extravesical technique

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Abstract

Introduction: Vesico-ureteral reflux (VUR) is a common congenital anomaly of the urinary tract in the pediatric population, existing controversy regarding its management. Patients selected for treatment options are offered from endoscopic injection of substances sub-ureteral to ureteral reimplantation surgery.

Objective: To evaluate the use of the laparoscopic surgical technique for the treatment of vesico-ureteral reflux, with an analysis of the procedure, results and complications.

Materials and methods: We evaluated a series of 50 ureteral units in 42 patients, who undergoing laparoscopic transperitoneal ureteral reimplant, using the classic technique of Lich-Gregoir detrusorrafia.

Results: The mean operative time was 74 min. There were neither intraoperative nor immediate postoperative morbidities. At longer follow-up VUR was cured in all cases.

Conclusions: Laparoscopic surgery is an effective alternative in the surgical treatment of vesico-ureteral reflux, with results comparable to open surgery techniques and over sub-ureteral injection techniques.

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PALABRAS CLAVE

Reflujo vesicoureteral; Neoimplante ureteral; Laparoscopia; Endoscopía

Cirugía laparoscópica del refl ujo vesicoureteral: experiencia en 42 pacientes con la técnica extravesical de Lich-Gregoir

Resumen

Introducción: El refl ujo vesicoureteral (RVU) es una anomalía congénita de la vía urinaria frecuente en la población pediátrica, existiendo controversia con respecto a su manejo. A los pacientes que son seleccionados para tratamiento quirúrgico se les ofrecen diversas opciones, desde la inyección endoscópica de sustancias subureteral hasta la cirugía de neoimplante ureteral.


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Laparoscopic surgery of vesicoureteral reflux

Introduction

Vesicoureteric reflux (VUR) is the most frequent urological disorder in children affecting 1% of them. VUR has been reported in 25–40% of children with urinary infection. It is well known the relationship between vesicoureteric reflux, urinary tract infection and renal damage. In 3–25% of children and in 10–15% of adults, reflux nephropathy is the cause of terminal renal failure.1,2,3

Since Hutch proved in his classical study the relationship between VUR with urinary tract infection and renal damage, the management of VUR has been classified into conservative and surgical treatment.4 Conservative therapy is mainly based on that VUR often resolves over the time, as long as adequate antibiotic prophylaxis to prevent urinary tract infection is maintained, and that morbidity or complications associated with the VUR can be controlled medically.5

Surgical treatment of VUR has been well established for several decades. Ureteral reimplants procedures, open, intra- and extravesical (Lich-Gregoir, Politano-Leadbetter, Cohen), are highly successful (92–98%) and with minimal complications.6,7 Several improvement efforts have been undertaken to reduce perioperative morbidity and hospital stay maintaining success rate. Minimally invasive techniques, such as sub- and intra-ureteral endoscopic injection of bulking agents (Deflux, Vantris, Macroplastique)8 and laparoscopic extravesical ureteral reimplantation (highly laborious), have demonstrated to be effective in meeting the goals.9,10

The feasibility of laparoscopic extravesical ureteral reimplantation has been proven for the first time in animal model.11–13 In 1994, this demonstration was followed by 2 publications about clinical experience in small series of patients.9,14 Since then, few centers have carried out this procedure.15,16 The arguments against it are that it is a procedure highly demanding and with large technical difficulty.

In order to reconsider and promote this surgical approach, we have analyzed our surgical technique, results and complications.

Materials and methods


Operative technique

Preoperative phase: under general anesthesia, urine catheter is inserted routinely (caliber of the catheter varies with the age of children). The patient is placed in supine position with arms on the flanks.

Pneumoperitoneum and trocars ports: 8–12 mm Hg pneumoperitoneum is created with umbilical Veress needle insertion. Four ports are used in all cases for 5 mm trocars: 0° telescope in umbilical port, and instrumental trocars in suprapubic port and flank ports (Figure 1).

Ureteral dissection: after initial inspection of abdominal cavity, patient is placed in light Trendelenburg position to displace the bowel loops cephalad. Thus, guide structures that will limit our initial section (iliac vessels, vas deferens or rounded ligament and medial umbilical ligament) can be seen through peritoneum. Slight rotation of patient to opposite side of refluxing ureter can be performed if necessary. To look for distal ureter, transverse incision of parietal peritoneum is performed within the following boundaries: proximally, crossing the ureter with iliac vessels and distally with iliac vessels, and distally crossing the ureter with round ligament or vas deferens. Incision is prolonged to the bladder entry. Bladder is filled with 50–150 cc of saline solution. Detrusor muscle is cautiously sectioned with monopolar
coagulation scissors, in the area immediately above bladder-
ureteral junction, until the mucosa is exposed.
In order to improve the distal ureter exposure, ureter is
retracted laterally toward trocar flank with a vascular tape.
After completing the dissection, detrusor muscle is sutured
over the ureter with 3 or 4 separate intracorporeal stitches
with polyglycolic acid sutures 3-0. It is important to avoid
leaving a narrow meatus or portion of the tunnel opened
in order to prevent pseudodiverticulum formation.
Postoperative care and control: routinely, urethro-vesical
catheter is removed 2 days after surgery. Intravenous anti-
biotic treatment is administrated within the first 24h after
surgery; it is followed by oral antibiotic treatment until
Foley catheter is removed. Ultrasound monitoring is done
after one month after, and urethrocystography at 6 months.

Results
We have carried out 50 laparoscopic transperitoneal ureteral
reimplants in 42 children, 32 girls and 10 boys, aged from
9 months to 13 years old (average age 5.8 years). Surgical
indications were VUR grade III or higher and medical treat-
ment failure (Figs. 2 and 3). All patients had a history of
repeated urinary infection. Of 42 patients 3 showed VUR
grade V, 3 others VUR grade IV and the remaining patients
VUR grade III. Eight patients had bilateral VUR. Two patients
with unilateral VUR showed double ureters.
Operative time varied from 60 to 120 min (mean: 74 min).
Hospital stay was 2–7days (mean: 96 h). There were
no immediate postoperative complications. A girl devel-
oped cardiorespiratory arrest of unknown cause that was
completely recovered without late sequelae at sixth postop-
erative day. In long-term follow-up, VUR disappearance was
demonstrated in all cases (mean follow-up time: 31 months).
In one case, postoperative contralateral VUR grade I was

![Figure 3](image3.png) Preoperative cystography showing bilateral severe reflux.

shown and the child is maintained with conservative man-
agement (under observation). Renal damage progression was
observed in a boy with reflux grade VI. Neither impairment of
bladder emptying nor secondary hydronephrosis occurred
in any case of bilateral correction.

Discussion
Any classic vesicoureteral reflux surgery technique shows
high efficiency with low morbidity. Classic or open Lich-
Gregoir procedure frequently used in Europe is not widely
accepted among American urologist. In our environment,
Lich-Gregoir technique reports a resolution rate of VUR close
to 95%, similar to those reported in the large series in
which success rates vary from 95% to 98% in VUR grade I–IV,
and is around 80% in VUR grade V. The success achieved
with open technique has been replicated by laparoscopic
approach (with complete resolution of VUR in all cases).
In our series a patient showed contralateral VUR grade I
resolved with conservative management. In open surgery
series, VUR grade I has been reported in 5% of the patients.1

In accordance with other authors,11 this technique is not
contraindicated in patients with double ureters. Thus, in
our series, 2 patients with double-ureters were successfully
treated with laparoscopic approach. Moreover, we consider
that this is the technique of choice for the conjoint reim-
plantation of the double ureters in their common sheath.

In open surgery, the Lich-Gregoir technique reports inci-
dence of urinary retention for bilateral reimplantation in
8.4–15.2% of the cases.19 In this sense, several authors
claim against bilateral reimplantation because postopera-
tive voiding efficiency may be impaired. However, in our
series this complication has not been observed because
bladder requires less dissection and mobilization. With this
technique it is not necessary to move the ureter and its

![Figure 2](image2.png) Voiding cystography showing left unilateral severe reflux.
Table 1 Advantages and disadvantages of the Lich-Gregorire laparoscopic technique.

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<th>Comparative advantages of laparoscopic Lich-Gregorire</th>
<th>Comparative disadvantages of laparoscopic Lich-Gregorire</th>
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<tr>
<td>Technical proven efficiency</td>
<td>Transperitoneal approach</td>
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<tr>
<td>Minimal ureteral manipulation</td>
<td>Likely paraureteral diverticulum if poor tunnel closure</td>
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<tr>
<td>Lower risk of meatal stenosis</td>
<td>Likely ureteral stenosis if narrow tunnel</td>
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<td>Easy dissection of the tunnel</td>
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<tr>
<td>Eventual management of meatus size (string) in same position</td>
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<td>Eventual ease of endoscopic tutors techniques</td>
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<tr>
<td>Reproducible</td>
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<td>Mucosa breakage does not matter</td>
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meatus when endoscopic subureteral injection of bulking agent fails, representing a technical advantage over transvesical approaches (Table 1).

The success rates of endoscopic techniques for perimeatal injection is correlated with reflux grade: 78.5% in VUR grade I-II; 72% in grade III; 63% in grade IV and only 51% in grade V. 77.1% of cases are resolved in the first injection; however, the success rate decreases in following sessions (from 68% in the second to 34% in the third injection). The success rate achieved with single systems is 73% meanwhile in duplicated systems it is only 50%.²⁰ No severe complications have been described, and 0.5% of obstruction risk has been reported.²¹ Although this technique represents a low-invasive alternative (mean success rate: 80–85%), the results of our laparoscopic technique are fully comparable.

Conclusion

Laparoscopic surgery is an effective alternative in the surgical treatment of vesico-ureteral reflux in children. In our opinion, this series is one of the most extensive published.

Conflict of interests

The authors declare that they have no conflict of interest.

References