Chapter 13
Laparoscopic Extravesical Reimplantation

François Varlet and Manuel Lopez

Abstract The posterior wall of the bladder is easily approached by laparoscopy and allows for a nerve-sparing extravesical unilateral or bilateral reimplantation according to the Lich-Gregoir technique. It is performed with a 5 mm telescope and two 3 mm instruments. The exposure of the posterior wall is helped by transparietal bladder suspension. The postoperative period is comfortable without hematuria and bladder spasms. No bladder catheter is necessary, and it is possible to discharge the child quickly from the hospital. The success rate is about 95 % with no documented voiding dysfunction postoperatively. Furthermore, the ureteral meatus is always in its initial position, allowing easier endourology in the future if necessary.

Keywords Extravesical • Reimplantation • Laparoscopy • Child • Lich • Gregoir

Introduction

Vesicoureteral reflux (VUR) is a frequent pathology, mainly in females of school-going age and secondary to bladder dysfunction. Vesicoureteral reflux resolves in a lot of patients with education regarding good micturition habits and medical treatment, especially against constipation. However, some children have to be operated because of repeated pyelonephritis in spite of well-conducted treatment or decreasing of the renal function on radionuclide scan. Malformations as duplex system are often associated with vesicoureteral reflux and may also require a reimplantation. There are a number of techniques of reimplantation to correct VUR, and one of them is the Lich-Gregoir procedure [1, 2]. This technique is often used for unilateral reflux, but has been used sparingly for bilateral reflux because of a 10 % incidence

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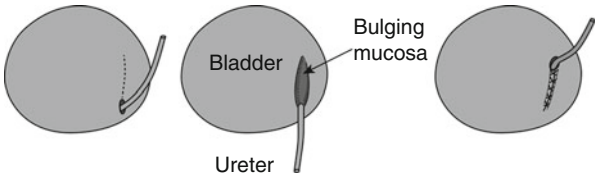

Fig. 13.1 Lich-Gregoir procedure

of postoperative urinary retention [3]. With laparoscopy, the approach to the posterior wall of the bladder is easy, and the dissection of the bladder is dramatically less important, allowing a nerve-sparing procedure and possible bilateral reimplantation [4]. Because of good results with open technique in unilateral reflux with short hospitalization, the laparoscopic extravesical reimplantation (LER) was developed for unilateral and bilateral reflux [5].

Specific Instrumentation

To perform a LER, different instruments are required:

- A 30° 5–10 mm telescope according to the age of child. It is very important to have a 30° telescope for a good exposure of the posterior bladder wall during the muscular section and muscular suture.
- 3 mm instruments: atraumatic graspers, dissector, monopolar scissors, and needle holder.
- Two 3 mm ports for these instruments.
- A "lace or ribbon."
- An 8–12 Fr bladder catheter.
- A 60 ml bladder syringe to empty or to fill the bladder during the procedure.

Operative Technique

The LER is the same procedure described by Lich and Gregoir (Fig. 13.1), but by a transperitoneal approach.

A broad-spectrum antibiotic is routinely administered intravenously on induction of general anesthesia. A cystoscopy may be performed initially if bladder control is required, especially in children with a duplex system to assess the location of the ureteral orifices and to check the anatomy. Sometimes in these duplex systems, when an upper pole nephrectomy is scheduled during the same operation, a ureteral catheter can be placed in one of the two ureters to facilitate its recognition during the nephrectomy; otherwise, the ureterocele can be opened widely during the endoscopy before the upper pole nephrectomy and LER of the two ipsilateral ureters. In other circumstances, for example, bilateral reflux with ipsilateral grade I and

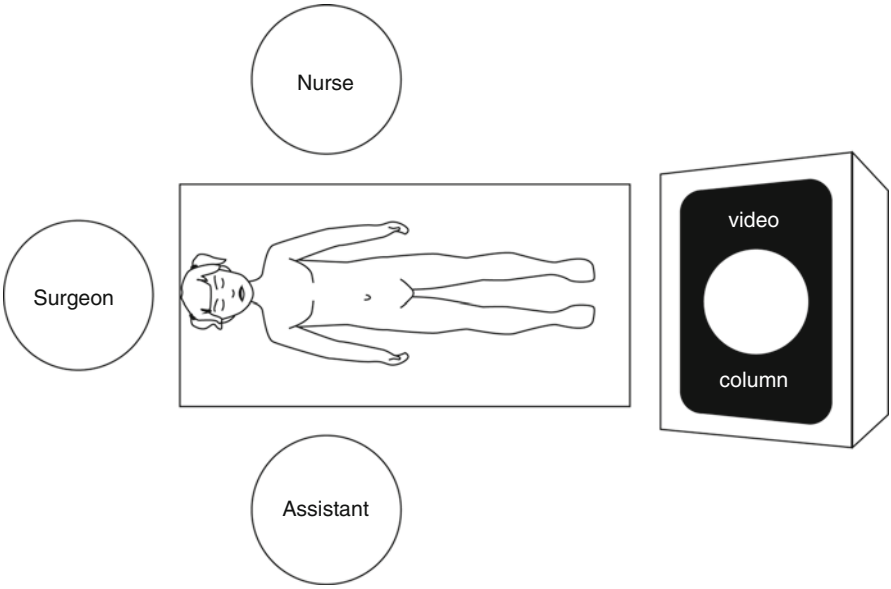

Fig. 13.2 Position of the crew and equipment. The head of patient is close from the edge of the table. The surgeon, the telescope, the bladder, and the monitor form a straight line

contralateral grade III VUR, it is possible to do an endoscopic subureteric injection (STING procedure) to treat the grade I reflux before LER of the grade III reflux.

At the end of the cystoscopy, the child is placed in a supine position on the table with legs apart; the table is adapted to the size of the child to allow a good position of the video column, the closest as possible to the feet, to avoid a monitor too far from the surgeon (Fig. 13.2). After preparation of the abdominal wall, an urethral catheter is placed, and the bladder is emptied to allow a good vision of the pelvic cavity. The surgeon is positioned at the head of the patient; when the child is too old, he or she must to be placed laterally, on the right side for the left ureter and on the left side for the right ureter. The assistant and the nurse are placed according the position of the surgeon (Fig. 13.3).

The laparoscopy is performed through a lateral or trans-umbilical incision under vision, and a 5 mm trocar is introduced for the telescope. The two 3 mm trocars are placed under direct vision at the left and right abdomen and at the same level from the umbilicus. When the child is small, the trocars are higher, and in adolescent they are in the lower part of the abdomen (Fig. 13.4).

The first step is to release the ureter from the level of iliac vessels to the posterior wall of the bladder. The peritoneum is opened just under the iliac vessels, and the ureter is grasped and released for a few centimeters. A ribbon is placed around it to avoid ureteral trauma. The ureteral vessels are coagulated far from the ureter, and progressively it is dissected down to the bladder wall. In girls, the fallopian tube and the ovary have to be pushed laterally to allow this dissection; at the end of this step,

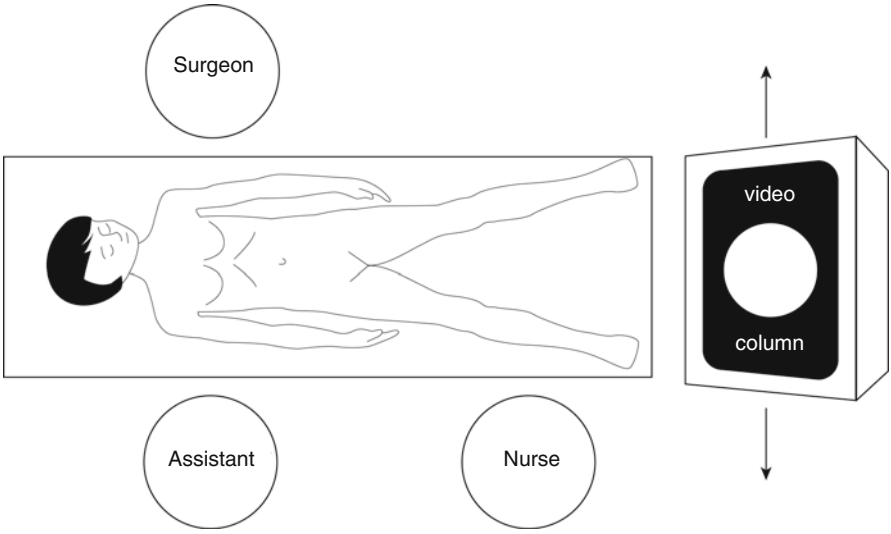

Fig. 13.3 Position with a larger child

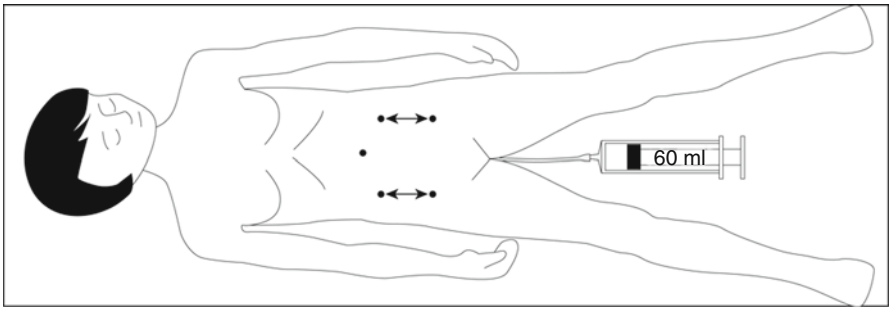

Fig. 13.4 Position of trocars, more or less high according the size of patient. A sterile 60 ml syringe is set up into the bladder catheter to empty or fill the bladder during procedure

the mesosalpinx is opened forward, and the ureter is pull up through this opening (Fig. 13.5); the ureter is mobilized to achieve sufficient freedom for a tension-free reimplantation keeping in mind the uterine vessels which have to be respected. In the boy, the vas deferens is pushed down and up to allows its good mobilization and no subsequent ureteral stricture (Fig. 13.6). During this entire step, the bladder has to be empty.

With the pulling up of the ureter, the axis of the muscular trench is seen on the posterior wall of the bladder and a few coagulations are done on the peritoneum to mark the future muscular section. The bladder is filled with 50–100 ml of normal saline to get a good exposure of the posterior wall and one or two transperitoneal stitches are placed just above the site of muscular section. At this moment the light

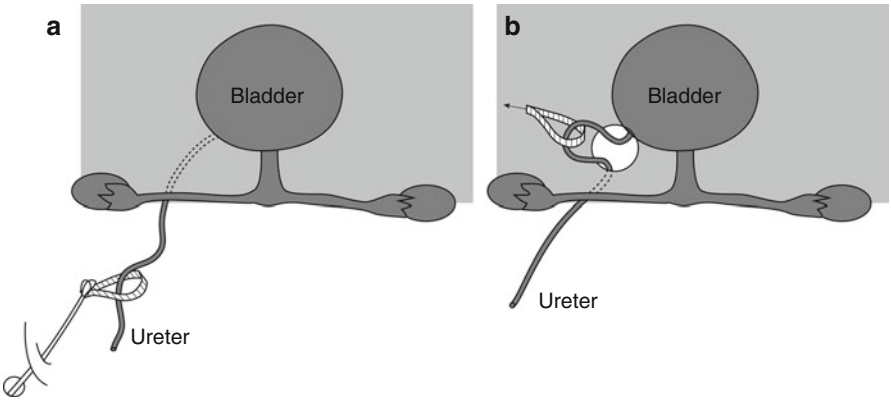

Fig. 13.5 After ureteral dissection behind the fallopian tube (**a**), the mesosalpinx is opened forward to pull up the ureter and to release it close to its entry in the bladder (**b**)

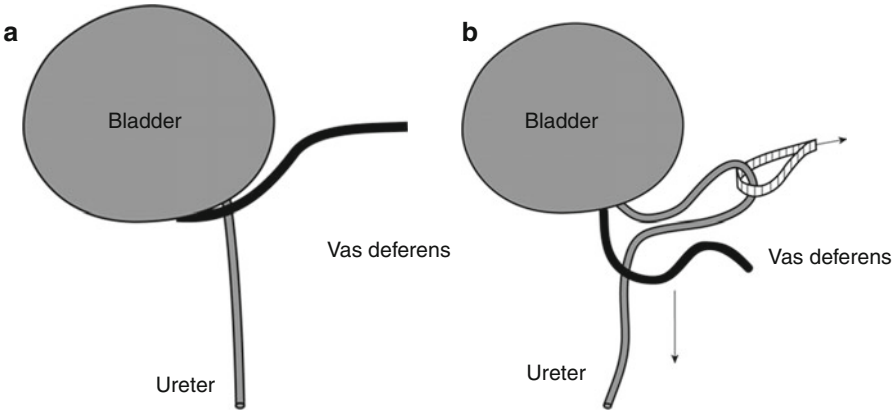

Fig. 13.6 Mobilization of vas deferens: (**a**) before dissection, (**b**) after dissection

cable is turned to have a 30° vision. The section of the detrusor is begun with monopolar scissors. After coagulation, the muscle is cautiously cut in the upper part of the bladder until to see the mucosa, with its characteristic blue coloration and protrusion. Then, the muscle and the mucosa are released down on 3 or 4 cm (×5 ureteral diameter). The trench ends at the level of the terminal part of the ureter; in this lower part, there are frequently small vessels that you have to coagulate to avoid bleeding. A monopolar hook can be used too, but the scissors are more precise in our opinion. If a mucosal perforation occurs, this is closed with an absorbable loop: when it is in the abdominal cavity, the hole is grasped with the dissector, and the loop is tied around it; this allows the procedure to proceed. Another solution is to empty the bladder and to suture the mucosa with interrupted or running 5-0 absorbable suture. To lay the ureter on the mucosa, another transperitoneal suspension is

done through the abdominal wall and the ureteral ribbon, respecting the long axis of the trench. Then, the detrusor is reapproximated with 4-0 or 3-0, according the bladder size, absorbable sutures. To get a correct lower suture, it is advised to do the lower stitch first to get a good view of the terminal part of the ureter. This is an important point when a paraureteral diverticulum is present. In the girl, the uterine vessels are left between mucosa and ureter; in the boy, the vas deferens is placed above and behind the ureter. In case of duplex system, the two ureters are placed in the same trench. The new ureteral entry in the bladder has to be large enough to avoid a stricture and postoperative ureteral dilatation. At the end of the procedure, the transperitoneal suspensions of the bladder and ureter are removed, and the ureter should lie without tension. If there is too much tension, the ureter is released proximally. A peritoneal suture is usually not necessary, but if the ureter protrudes forward or laterally, the peritoneal suture allows pushing it along the pelvic wall and will avoid a possible incarceration of a small bowel loop. No drain is necessary.

In case of bilateral reflux, the same procedure is performed on the other side. The trocar position is the same, and the transperitoneal suspension is modified to get the best exposure of the posterior bladder wall for this side. In adolescents, the surgeon may have to change sides to be more comfortable.

The umbilical incision is closed with 3-0 absorbable suture through the muscle, and the skin is approximated with adhesive bands. The bladder catheter is removed.

Postoperative Management

Intravenous analgesia is required for 12–24 h, and then only simple oral analgesic is required. The child is discharged from the hospital day after surgery without antibiotics.

Author's Experience

Between 2007 and 2012, LER was done in 63 patients and 84 ureters, with a mean age of 51 months (15–183). The reimplantation was unilateral in 42 and bilateral in 21 children, and 20 had a duplex system. Five children had Hutch diverticulum. The average renal function with DMSA scintigraphy was 32 % (18–39 %).

No open conversion was necessary. Endoscopic opening of ureterocele was performed in two cases and upper pole nephrectomy in two cases. The mean operative time was 70 min in unilateral cases (38–120) and 124 min in bilateral cases (100–210). The immediate follow-up was impressive with moderate pain at day 1 treated only by simple oral analgesia and no difficulties with micturition. None of the children with bilateral reimplantation developed urinary retention, and discharge on postoperative day 1 was possible in 95 % of cases. Two children developed urinary peritonitis at postoperative day 7 and day 15 due to ureteral

perforation just above a too tight point of entry in the bladder; but at this period, we did not use the ribbon to pull the ureter during the procedure, and an excessive handling of the ureter may have resulted in local ischemia as it was reported in the early series by laparotomy [6]. They were treated by open reimplantation with Leadbetter-Politano procedure and psoas hitch in the first case and by laparoscopic ureteral suture on double J stent after enlargement of the hole of entry in the second case; this last patient had a remaining grade I reflux treated by endoscopic injection with success. A voiding cystogram was done routinely for the 30 first patients and after only in cases of recurrent pyelonephritis. The mean follow-up was 36 months and two recurrences of reflux occurred, one cured by Cohen reimplantation and one is under follow-up. Hence our success rate was 60/63 patients (95.2 %) and 81/84 ureters (96.4 %). No recurrence occurred in duplex systems LER.

Conclusion

Laparoscopic extravesical reimplantation is a good procedure to treat vesicoureteral reflux with a good success rate. This technique has the advantages of the endoscopic injection with less pain and short hospitalization, and the advantages of the Cohen technique with good results. For a unilateral reflux, LER has to be in balanced with the Lich-Gregoir technique by the open technique because this treatment is possible as a 1-day surgery. The LER is effective in duplex system, and the size of the two ureters is not a contraindication. It is also feasible for bilateral reflux because of reduced dissection and nerve sparing of the posterior wall of the bladder, and we had no episodes of postoperative urinary retention.

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