SKILL AND TALENT

Totally laparoscopic repair of primary obstructive megaureter with pyeloplasty, complete excisional tailoring and nonrefluxing ureteral reimplantation

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Abstract

Objective: To describe a new surgical technique of the first case of totally laparoscopic repair of primary obstructive congenital megaureter with pyeloplasty, intracorporeal excisional tailoring of the ureter and nonrefluxing ureteroneocystostomy.

Methods: A 15-year-old male presented with obstructive megaureter. The standard three-port transperitoneal pyeloplasty technique and an additional 5-mm port for dynamic traction were used. Pelvic and ureteral dissection, pyeloplasty, intracorporeal excisional ureteral tailoring and nonrefluxing ureteroneocystostomy were all completed laparoscopically. A double-J stent was used to calibrate the ureter.

Results: Operative time was 240 min. No intra and postoperative complications were observed, and the discharge was made on postoperative day 2. The patient was pain-free and without urinary tract infection during the 4-month period after surgery. Follow-up revealed complete resolution of the ureteral obstruction and adequate pelvic and ureteral caliber.

Conclusion: Laparoscopic pyeloplasty, intracorporeal excisional tailoring, and non-refluxing reimplantation are safe and effective for the treatment of obstructive congenital megaureter. The totally laparoscopic approach is reproducible and provides low morbidity with inherent cosmetic advantages.

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Reparación totalmente laparoscópica de megauréter obstructivo primario con pieloplastia, preparación escisional completa y reimplante ureteral sin reflujo

Resumen
Objetivo: Describir el primer caso de una reparación totalmente laparoscópica de megauréter congénito obstructivo con pieloplastia, preparación de abscisión intracorpórea y ureteroneocistostomía sin reflujo.

Métodos: Un paciente del sexo masculino de 15 años de edad se presentó con un megauréter obstructivo. Fue utilizada la técnica patrón de pieloplastia transperitoneal de 3 puertos de entrada y un puerto adicional de 5 mm para la tracción dinámica. La disección de la pelvis y del uréter, la pieloplastia, la preparación de la abscisión ureteral intracorpórea y la ureteroneocistostomía fueron realizadas a través de laparoscopía. Se utilizó un catéter doble-J para calibrar el uréter.

Resultados: El tiempo de cirugía fue de 240 min. No se observaron complicaciones intra o postoperatorias, y se dio el alta al segundo día después de la cirugía. El paciente no tuvo dolor ni infección en el tracto urinario durante el período de 4 meses posteriores a la cirugía. En el seguimiento del paciente se constató la total resolución de la obstrucción ureteral y un calibre pélvico y ureteral adecuado.

Conclusión: La pieloplastia laparoscópica, la preparación de abscisión intracorpórea y la ureteroneocistostomía sin reflujo son métodos seguros y eficientes en el tratamiento del megauréter congénito obstructivo. El abordaje totalmente laparoscópico puede ser reproducido y proporciona ventajas inherentes a las cirugías mínimamente invasivas, como baja morbidity y ventajas cosmeticas.

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Introduction

Congenital megaureter is an uncommon anomaly of the urinary tract. In primary obstructive megaureter, abnormal development of the musculature of the distal portion of the ureter is believed to be responsible for an adynamic segment closed to the bladder, resulting in altered peristalsis and functional obstruction. It may require more active surgical intervention when recurrent pyelonephritis compromises renal function and pain associated with functional obstruction is present. With increasing experience, technical advances, and documented advantages, laparoscopic surgery is gaining acceptance for various ablative and reconstructive urologic applications. However, laparoscopic ureteral reimplantation requires advanced laparoscopic skills and remains technically challenging, even in experienced hands, limiting its widespread accessibility. Laparoscopic ureteral reconstructive surgery, non-refluxing ureteral reimplantation, and tailoring for megaureter are rarely reported. Recently, Mitre at al. described the first case of laparoscopic ureteral reimplantation with intracorporeal tailoring of the distal ureter for an obstructive megaureter in an adult patient.

We present the first description, to our knowledge, of totally laparoscopic repair of primary obstructive megaureter with pyeloplasty, intracorporeal excisional tailoring, and non-refluxing ureteral reimplantation.

Patients and methods

A 15-year-old male presented with a longstanding history of left lumbar pain and recurrent urinary tract infection. He was diagnosed with severe left ureterohydronephrosis during a screening sonography. Contrast-enhanced computed tomography (CT) demonstrated a marked left hydronephrosis with ureteral dilatation and tortuosity just proximal to the ureterovesical junction, without any evidence of masses or kidney stones, consistent with the report of megaureter (Fig. 1). Renal dynamic scan showed normal function of both kidneys (relative function on the left side 45% and on the right side 55%), with retention of tracer seen in the left ureter, which a T 1/2 was 35 min identifying obstruction. There was no evidence of vesicoureteral reflux on the voiding cystourethrograms.

Given the great tortuosity of the megaureter and renal pelvis, a complex reconstruction was necessary. The patient was submitted to totally laparoscopic pyeloplasty, intracorporeal excisional tailoring (ureteroplasty), and non-refluxing ureteral reimplantation (Lich-Gregoir). Regardless of pyelo-ureteral junction, obstruction was not identified, pyeloplasty and totally ureteral tailoring were performed to provide an adequate outlet ureteral flow and to avoid a urinary stasis, which is a well-known cause of urinary tract infection post-operatively. A totally laparoscopic approach was chosen, to reduce morbidity.

Surgical technique description and equipment

Positioning and port placement

After general anesthesia in the supine position, a Foley catheter was inserted in the bladder under sterile conditions. The patient was then positioned in 30-degree right lateral decubitus; he was taped in position so that his arms,
legs, and abdomen remained securely in place. Pneumoperitoneum was created to a pressure of 12–15 mm Hg using the closed technique, and a 3-port standard transperitoneal pyeloplasty was inserted, with an additional 5-mm port for dynamic traction. The first trocar (10-mm umbilical camera port for visualization) was inserted, and the others (5-mm and 10-mm ports in the left and right lateral rectus abdominalis muscles for dissection and suturing, respectively, and one 5-mm port on the left mid axillary line for dynamic traction) were inserted under direct vision.

Pelvis and ureteral preparation

The procedure was initiated incising along the ipsilateral line of Toldt and reflecting the descending colon medially. The massively dilated ureter could be visualized from the renal pelvis to the bladder right after the colon reflection. The renal pelvis and ureter were dissected proximally and distally using sharp and blunt dissection, taking care to avoid stripping the ureter of its vascular supply. A narrow 5-mm distal segment of the ureter was identified, ligated at its bladder insertion and resected. Two anchoring sutures were placed in the renal pelvis and distal ureter; and a 7Fr double-J ureteral stent was inserted through the abdominal wall to facilitate the intra-corporeal excisional tailoring and calibrate the diameter of the ureter.

Pyeloplasty, ureteral tailoring and reconstruction

After defining the vascular support, a non-traumatic clamp was placed over the catheter, and excess ureter was sharply longitudinally excised (excisional tailoring) from the renal pelvis to the distal end of the ureter. A standard laparoscopic pyeloplasty (dismembered Anderson-Hynes technique) was performed. The intra-corporeal tailoring was carried out using a running locking 4-0 Polyglactin (Vicryl; Ethicon, Johnson and Johnson) suture. The suture was initiated in the renal pelvis at the proximal end, and advanced as far as the distal end of the ureter (Fig. 2). At the distal end, the ureter was left spatulated for reimplantation.

Bladder preparation and nonrefluxing reimplantation

The bladder was then filled with saline and longitudinally opened in the left posterolateral direction. Electrocautery and blunt dissection were used to divide the perivesical fat and detrusor muscle fibers (seromuscular cystotomy) to create a detrusor tunnel with an estimated 5:1 ratio of length to ureteral diameter. Sharp dissection was used to expose and incise the bladder mucosa at the distal extent of the tunnel, creating a cystotomy. The distal coil of the ureteral stent was placed in the bladder, the ureter was positioned through the submucosal tunnel, and a mucosa–mucosa ureterovesical anastomosis was completed with 4-zero polyglactin interrupted sutures. A distal anchoring stitch suture was used to hold the ureter near the seromuscular tissue of the bladder in order to avoid ureteral retraction. The detrusor tunnel was then closed over the ureter for a length of 4–5 cm, using 3-zero Polyglactin (Vicryl; Ethicon, Johnson and Johnson), completing the non-refluxing anastomosis. An extravesical attachment stitch between the detrusor and ureteral adventitia was applied with 4-zero polyglactin (Fig. 3). A Jackson-Pratt drain was placed through the left lateral port site and positioned in the pelvis. The fascia at the camera port was closed, and the skin incisions were reapproximated in a subcuticular manner.

Results

The total operative time was 240 min; 40 min to pelvis and ureteral preparation, 100 min to pyeloplasty and ureteral tailoring and reconstruction; 50 min to bladder preparation and non-refluxing reimplantation. Positioning, port placement, bleeding control, and ports sutures demanded 55 min.
Estimated blood loss was 200 mL. Postoperatively, orals were allowed on day 1, and pain was otherwise controlled with oral medication. No intravenous narcotic medication was necessary after the day of the procedure. The tubular vacuum drain was left in the patient for 48 h. The Foley catheter was removed on the second postoperative day, and the patient was discharged from hospital.

Four weeks after the procedure, cystoscopy was performed with removal of the ureteral stent. The postoperative evolution was uneventful. At 12 months follow-up, the patient was pain-free and there was no urinary tract infection. The CT scan (Fig. 4) and diuretic renal scan were obtained at 4 months demonstrating a significant reduction in diameter of the pelvis and ureter, no ureteral obstruction, preservation of renal function, and rapid washout of tracer on the affected side (T ½ 9 min on the left side and 7 min on the right side), respectively.

**Discussion**

Open surgery is still the gold standard for urological reconstruction surgeries, but an increasing number of procedures have been described by laparoscopy, with the same good results, safety, and lower morbidity. Ansari et al. recently made the first description of the use of laparoscopy for correction of a megaureter with reimplantation, but the technique of extracorporeal tailoring was used. The greatest difficulty is the extensive area of resection of the ureter and the posterior suture along the entire ureter in cases where this type of resection is indicated. Some authors report different ureteral reimplantation techniques using laparoscopy with success rates of over 90%. Recently, Mittre et al. described a reimplant in a megaureter with tailoring only of the distal portion of the ureter.

**Figure 2** Pyeloplasty, urethroplasty, and preparation.

**Figure 3** Ureteral reimplantation without reflux and final outcome.
Figure 4  CT scan in the fourth month after the operation, demonstrating a significant reduction in the diameter of the pelvis and ureter without intestinal obstruction.

For the ureteral reimplantation, it is necessary to reduce the caliber of the distal end of the ureter with a submucosal tunnel that is adequate for the antireflux mechanism. Thus, some authors perform this stage with extracorporeal approach through one of the ports. Success rates of 92–99% have been described when ureters of less than 7 mm in diameter are reimplanted, and of 54% for larger ureters. When the pyeloureteral dilation is severe, and only part of the dilated portion is removed, urinary stasis occurs, increasing the risk of infections and urolithiasis. These complications tend to be higher in groups at greater risk for Urinary tract infection (UTI), such as young women and the elderly. Besides facilitating reimplantation, reducing the caliber can improve ureteral function. The capacity of the ureter to propel the bolus of urine depends on the coarctation capacity of the ureteral wall. According to Laplace's law, the increase in intraluminal pressure is achieved by decreasing the internal radius. This increased pressure efficiently propels the urine distally within the ureter. We therefore carried out the pyeloplasty starting at the renal pelvis, along the entire extension of the ureter, as far as its distal segment, with only the intrarenal excretory duct remaining dilated.

Our case involved an adolescent of short stature, which was one of the contributing factors in the use of only four ports. One of the ports was used to insert an Allis clamp and double tie the catheter in the renal pelvis, in order to keep the ureter taut. This portal (number 4) was initially used in the pyeloplasty. Some points of this technique deserve particular mention. A very useful manoeuvre that facilitates resection and suture of the ureteral tailoring is to keep the ureter taut, so that it does not give way to pressure from the scissors, and to facilitate the continuous suture. For this purpose, the percutaneous passing of a wire that transfixes the cephalic portion of the renal pelvis, and another in the distal portion of the sectioned ureter of the bladder, is essential. Although we have not used this technique, it is also possible to place a wire in the middle ureter, keeping either the cephalic portion or the caudal portion of the ureter taut, depending on whether the surgeon is working above or below this point.

Another point to mention is the technique of dismembered pyeloplasty with bevelled ureteral implant, as in the conventional technique, avoiding having a single suture from the pelvis descending to the ureter. This may increase the risk of JUV stenosis, as the lateral wall would be maintained. To avoid forcing ureteropelvic anastomosis, the point of repair in the cranial segment may be transferred to the proximal segment of the ureter immediately after the pyeloplasty stage, to perform the ureteral tailoring. The repair in the caudal portion of the ureter is performed at 5 cm intervals above the point where the ureter was sectioned from the bladder, as these much dilated ureters also have increased length, and they should be left until the end of the definitive resection of the ureteral excess, to prevent over-resection. This repair exits in the iliac fossa and beside it, a double J stent is inserted percutaneously. The passage of the stent is facilitated, since all that is needed is to pull the repair distally to align the opening of the ureter with the percutaneous needle used to pass the double J guide wire.

We believe that this is the first description in the literature of a pyeloplasty with ureteral tailoring and ureteral reimplantation done totally by laparoscopy. The laparoscopic technique has proven to be safe and effective and may be a less invasive alternative to conventional surgery. It is indicated in cases of major pyeloureteral dilation caused to an obstructive megaureter. A higher number of cases is needed to determine its similarity with open surgery. Also, it has not yet been demonstrated in children, although the adolescent in the case described here was short in stature.

Conflict of interest

The authors declare that they have no conflict of interest.

References