Laparoendoscopic Single-Site Surgery for Congenital Midureteral Stricture

Koichi Kodama, MD, Yasukazu Takase, MD, Isamu Motoi, MD

Department of Urology, Toyama City Hospital, Toyama, Japan (all authors).

ABSTRACT

Introduction: Retroperitoneoscopic laparoendoscopic single-site surgery for congenital midureteral stricture was performed in a nulliparous girl with contralateral multicystic dysplastic kidney.

Case Description: The patient presented with a 4-year history of intermittent right flank pain and 3 episodes of right acute pyelonephritis. A right-sided retrograde ureteropyelogram showed a short and narrow stricture at the level of L5 with proximal hydroureteronephrosis. Ureterolysis and ureteroplasty were successfully performed via the retroperitoneal route. The total operation time was 200 minutes, and the estimated blood loss was 10 mL. The patient was discharged on postoperative day 5 with no complications. At the 12-month follow-up, the patient reported complete relief from pain and intravenous pyelography showed markedly decreased hydroureteronephrosis.

Discussion: Retroperitoneoscopic laparoendoscopic single-site surgery is an effective treatment option for congenital midureteral stricture with an acceptable esthetic outcome and minimal morbidity.

Key Words: Ureteral obstruction, Midureteral stricture, Laparoendoscopic single-site surgery, Retroperitoneoscopy, Multicystic dysplastic kidney disease.

Citation Kodama K, Takase Y, Motoi I. Laparoendoscopic single-site surgery for congenital midureteral stricture. CRSLS e2014.09164. DOI: 10.4293/CRSLS.2014.09164.

Address correspondence to: Koichi Kodama, MD, Department of Urology, Toyama City Hospital, 2-1 Imaizumi-hokubucho, Toyama, Toyama 939-8511, Japan, Telephone: +81 (76) 422-1112, Fax: +81 (76) 422-1371, E-mail: kokodama@tch.toyama.toyama.jp

INTRODUCTION

Most congenital obstructing lesions are located at either the proximal or distal end (the ureteropelvic junction or ureterovesical junction) of the ureter. Congenital midureteral stricture is a rare clinical entity. In an autopsy series of 12,080 children, only 3 children (4% of those with ureteral obstruction) had midureteral stricture.[1] In this condition the developing ureter is transiently obstructed, and it subsequently undergoes recanalization; congenital ureteral obstruction is presumably caused by errors in this process.[2] We present a case of congenital midureteral stricture associated with a contralateral multicystic dysplastic kidney (MCDK). The midureteral stricture was successfully managed with retroperitoneoscopic laparoendoscopic single-site (LESS) surgery.

CASE REPORT

A 17-year-old nulliparous girl presented with a 4-year history of intermittent right flank pain and 3 episodes of right acute pyelonephritis. She was thin (body mass index, 17.2 kg/m^2) with no abdominal mass. Her medical history was unremarkable with no previous pregnancies. Urine analysis showed normal findings, with an estimated glomerular filtration rate of 80.1 mL · min^{-1} · 1.73 m^{-2}. Abdominal ultrasonography showed right-sided hydronephrosis and proximal hydroureter. Enhanced computed tomography of the abdomen showed hydronephrosis in the hypertrophic right kidney and a 15 × 15-mm mass comprising multiple cysts in the region of the left kidney (**Figure 1**). Three-dimensional computed tomography showed that the right ureter was externally compressed by the right ovarian vein with proximal hydroureteronephrosis (**Figure 2**). However, the right ovarian vein had normal caliber and a normal course with termination at the inferior vena cava. A right-sided retrograde ureteropyelogram showed a short and narrow stricture at the level of L5 with proximal hydroureteronephrosis (**Figure 3**). Voiding cystourethrography showed no ureterovesical reflux. A diuretic nuclear renal scan with ^{99m}Tc-diethylenetriaminepentaacetic acid showed a slow excretory phase from

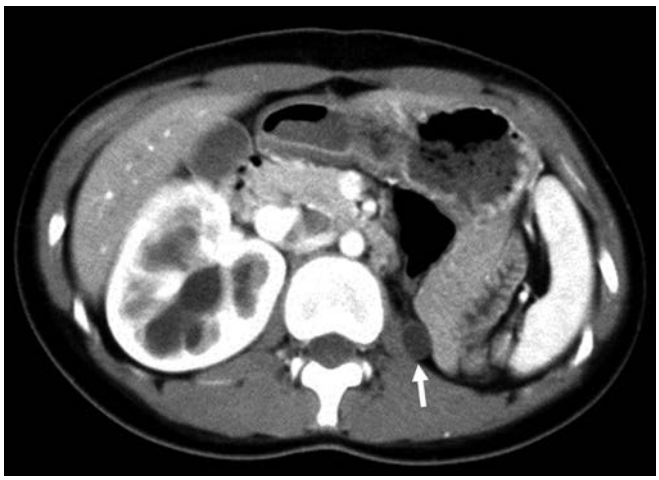

Figure 1. Contrast-enhanced computed tomography scan showing hydronephrosis in the hypertrophic right kidney and a 15 × 15-mm mass comprising multiple cysts (arrow) in the region of the left kidney.

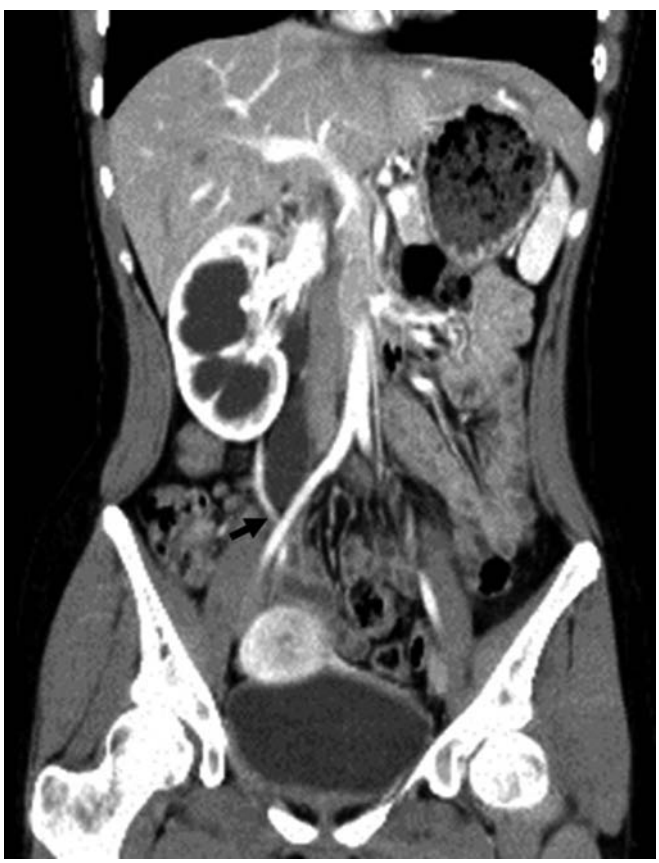

Figure 2. Three-dimensional computed tomography scan showing the right ureter externally compressed by the right ovarian vein (arrow) with proximal hydroureteronephrosis.

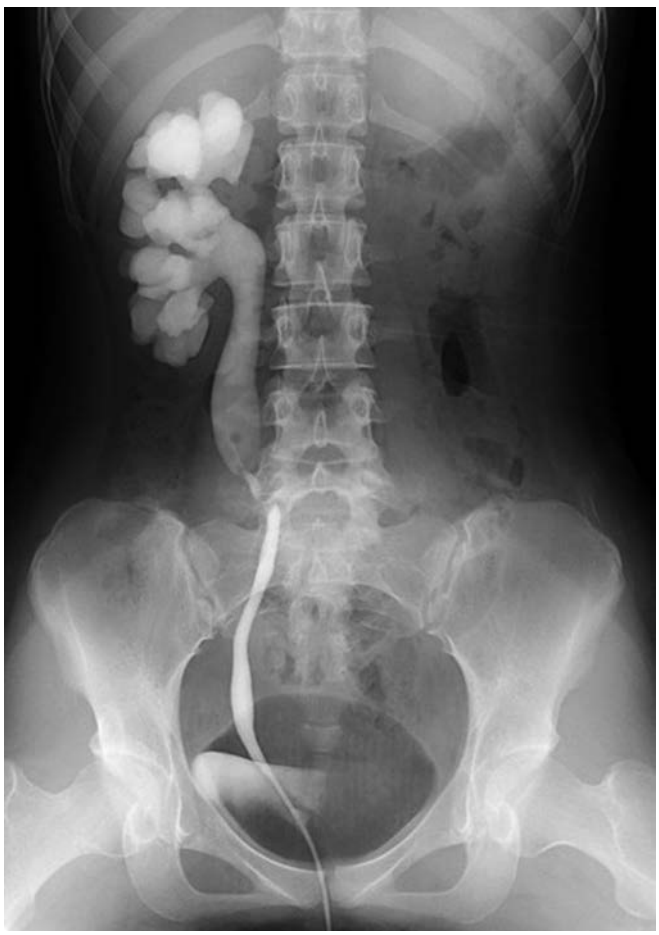

Figure 3. Right-sided retrograde ureteropyelogram showing a short and narrow ureteral stricture at the level of L5 with proximal hydroureteronephrosis.

the right kidney and no uptake by the left kidney. Clinical and radiographic findings strongly suggested right-sided ovarian vein syndrome and left-sided MCDK.

Retroperitoneal LESS surgery for ureteral obstruction was performed with the patient in full-flank position. A 25-mm skin incision was placed between the tip of the 12th rib and the iliac crest. After a retroperitoneal dissection balloon was inflated, a wound retractor/protector (Lap Protector; Hakko, Nagano, Japan) was placed through the incision. Thereafter a silicon rubber cap (EZ Access; Hakko) designed for the Lap Protector was attached to create a tight seal. Carbon dioxide pneumoperitoneum was created at a pressure of 10 mm Hg. A 5-mm trocar for a 5-mm, rigid, 30° video laparoscope was introduced through the EZ Access. Two additional 5-mm trocars were inserted for working instruments such as conventional straight devices and an articulating dissector. Retroperitoneoscopic magnification showed a narrowed midureteral segment adhering to the peri-

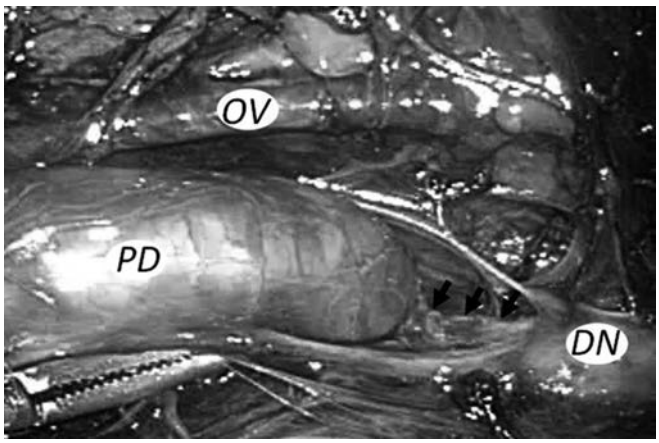

Figure 4. Intraoperative view of a stenotic portion (arrows) of the right ureter with proximal dilation (PD) and distal normal (DN) caliber. The right ovarian vein (OV) does not contribute to the stenosis.

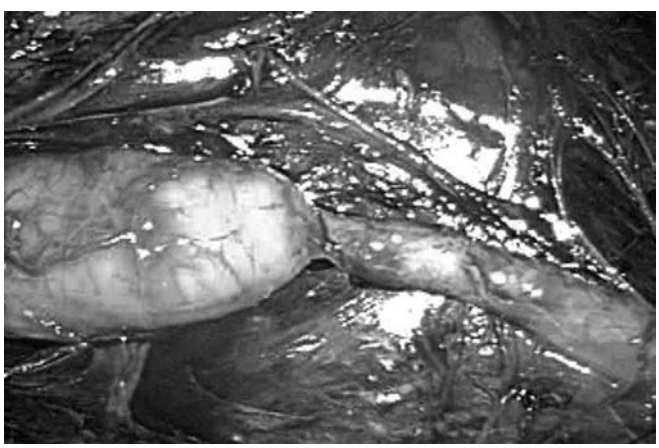

Figure 5. Intraoperative view of the right ureter after ureterolysis and ureteroplasty with sparing of the ovarian vein.

ureteral sheath; moreover, the ovarian vein was not involved in the ureteral obstruction (**Figure 4**). Subsequently, the stenotic portion was dissected away from the surrounding tissue, and the ovarian vein was spared. However, stenosis remained severe even after dissection, and thus ureteroplasty was performed. Vascular tape was passed under the ureter to provide gentle traction. With the EZ Access removed from the Lap Protector, a Y-shaped incision was placed on the lateral aspect of the stenotic portion, followed by direct antegrade insertion of a double-pigtail stent. After direct extracorporeal interrupted suturing with No. 4–0 Vicryl (Ethicon, Somerville, NJ, USA), the ureter was repositioned (**Figure 5**). All surgical procedures were completed with no complications. The total operation time was 200 minutes, and the estimated blood loss was 10 mL.

A Penrose drain was placed after surgery and removed on postoperative day 2. The patient was discharged on day 5, and the ureteral stent was removed 4 weeks after surgery. At 12 months after surgery, the patient reported complete relief from pain and her estimated glomerular filtration rate was 98.5 mL · min^{-1} · 1.73 m^{-2}. Intravenous pyelography showed markedly decreased hydroureteronephrosis. Only a small port-site scar was visible on the flank; thus the esthetic outcome was acceptable.

DISCUSSION

MCDK is one of the most common congenital urinary tract malformations. The development of the disease is generally attributed to the failure of differentiation of the mesenchymal metanephros and the epithelial cells of the ureteral bud, thereby leading to obstruction and dysregulation of proliferation in the developing kidney. In cases of MCDK, multiple noncommunicating cysts of varying sizes are observed and the kidney is often nonfunctional. In addition, abnormalities involving the contralateral kidney and urinary tract are frequently observed in patients with MCDK. In a systematic review, these associated anomalies were observed in 31.3% of patients; ureterovesical reflux was the most common abnormality (reported in 19.7% of patients), whereas ureteropelvic junction obstruction was reported in 4.8% of patients.[3] However, midureteral stricture was an uncommon associated anomaly in some previously reported cases.[4,5]

In this case report, the late presentation of congenital midureteral stricture is of particular concern. In most cases of congenital midureteral stricture, diagnosis is made in the first few months of life; in very few cases, the diagnosis is made during adolescence.[6] Compensatory hypertrophy is an expected finding in patients with a single functioning kidney. In one long-term, prospective study of 33 children with MCDK, 24% had compensatory hypertrophy at birth and 52% showed compensatory hypertrophy by later childhood.[7] In our patient, midureteral stricture was assumed to develop due to compensatory hypertrophy because hydronephrosis was observed in the hypertrophic right kidney. This suggests that the midureteral stricture was initially nonobstructive, but it progressed as the patient grew older and the urine volume increased subsequently. Congenital midureteral strictures may have a different natural history from ureteropelvic junction obstruction and may require a more aggressive surgical approach.

Treatment options for congenital midureteral stricture include open excision of the area of stricture and ureteroureterostomy[6,8] and, more recently, laparoscopic and robot-assisted laparoscopic resection and ureteroureterostomy.[9,10] To our knowledge, this is the first report of LESS surgery performed in a case of congenital midureteral stricture. The

crucial factor in successful reconstruction for midureteral stricture is the preservation of the ureteral blood supply because the blood supply in the mid ureter is tenuous. The midureteral region is an area of transition because the blood supply to the ureter changes from the abdominal aorta proximally to the iliac and hypogastric arteries distal to the common iliac artery. Goel et al.[11] introduced open nondismembered ureteroplasty for congenital midureteral stricture. In this surgical technique, a longitudinal incision, which is made over the narrowed segment, is closed transversely, thereby preserving the midureteral blood supply. The same principle was used during LESS repair in our patient.

The retroperitoneal approach for LESS repair of upper urinary tract anomalies offers various obvious advantages over the transperitoneal approach. First, the distance from the incision to the ureter is shorter, and mobilization or retraction of the intraperitoneal organs is therefore not required. In our case this shorter distance enabled more direct access for incision and suturing of the ureter along with antegrade stenting through the single port, and this greatly reduced the operation time. Second, because the retroperitoneal approach eliminates the need for violation of the peritoneal cavity, it reduces the risk of injury to the adjacent abdominal organs and spillage of their contents from the hydronephrotic kidney into the peritoneal cavity. Nevertheless, the main disadvantage with the retroperitoneal approach is the limited working space.

In LESS surgery the most difficult and time-consuming aspect of intracorporeal reconstruction of the ureter is suture placement. Several solutions have been proposed, including articulating needle drivers, accessory 2-mm needlescopic trocars, and the Endostitch device (Covidien, Norwalk, CT, USA). Additional developments in instrumentation and technology may help circumvent some of the limitations of current LESS surgery, which result from instrument crowding and relative lack of triangulation. On the other hand, extracorporeal suturing through the port incision, as reported in one case of retrocaval ureter,[12] is another possible solution. In our patient the extracorporeal suturing technique was used for ureteroplasty without a second incision or enlargement of the original incision. This technique decreased the operation time and improved the esthetic outcome as well.

LESS surgery seems ideally suitable for upper urinary tract reconstructive procedures, such as the one performed in our patient. The cosmetic advantage is the most appealing aspect of LESS surgery, particularly for younger patients. However, for LESS surgery to be more widely adopted, other patient benefits beyond the cosmetic advantage must be shown. Further studies are necessary to evaluate potential recovery benefits in LESS surgery when compared with those in standard laparoscopic procedures.

CONCLUSION

Although it is a technically challenging surgical methodology, retroperitoneoscopic LESS surgery may represent a novel and feasible treatment option for congenital midureteral stricture.

References:

1. Campbell MF. Clinical considerations of the anatomy, physiology, embryology, and anomalies of the urogenital tract. In: *Pediatric Urology*. Volume 1. New York: MacMillan; 1937:188, 273, 287–289.

2. Ruano-Gil D, Coca-Payeras A, Tejedo-Mateu A. Obstruction and normal recanalization of the ureter in the human embryo. Its relation to congenital ureteric obstruction. *Eur Urol.* 1975;1:287–293.

3. Schreuder MF, Westland R, van Wijk JA. Unilateral multicystic dysplastic kidney: a meta-analysis of observational studies on the incidence, associated urinary tract malformations and the contralateral kidney. *Nephrol Dial Transplant*. 2009;24:1810–1818.

4. Kalisvaart J, Bootwala Y, Poonawala H, et al. Comparison of ultrasound and magnetic resonance urography for evaluation of contralateral kidney in patients with multicystic dysplastic kidney disease. *J Urol.* 2011;186:1059–1064.

5. Grattan-Smith JD, Jones RA, Little S, Kirsch AJ. Bilateral congenital midureteric strictures associated with multicystic dysplastic kidney and hydronephrosis: evaluation with MR urography. *Pediatr Radiol*. 2011;41:117–120.

6. Hwang AH, McAleer IM, Shapiro E, Miller OF, Krous HF, Kaplan GW. Congenital mid ureteral strictures. *J Urol.* 2005;174:1999–2002.

7. John U, Rudnik-Schöneborn S, Zerres K, Misselwitz J. Kidney growth and renal function in unilateral multicystic dysplastic kidney disease. *Pediatr Nephrol*. 1998;12:567–571.

8. Smith BG, Metwalli AR, Leach J, Cheng EY, Kropp BP. Congenital midureteral stricture in children diagnosed with antenatal hydronephrosis. *Urology*. 2004;64:1014–1019.

9. Bhandarkar DS, Lalmalani JG, Shah VJ. Laparoscopic resection and ureteroureterostomy for congenital midureteral stricture. *J Endourol*. 2005;19:140–142.

10. Thiel DD, Badger WJ, Winfield HN. Robot-assisted laparoscopic excision and ureteroureterostomy for congenital midureteral stricture. *J Endourol*. 2008;22:2667–2669.

11. Goel A, Singh D, Sengottayan VK, Sankhwar S. Nondismembered ureteroplasty for congenital midureteral stenosis: a new application of an old technique. *Urology*. 2010;76:1004–1006.

12. Tobias-Machado M, Lasmar MT, Wroclawski ER. Retroperitoneoscopic surgery with extracorporeal uretero-ureteral anastomosis for treating retrocaval ureter. *Int Braz J Urol*. 2005;31:147–150.