Reverse Tubularized Pelvis Flap Method for the Treatment of Long Segment Ureteropelvic Junction Obstruction

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Highlights of the Study

- Ureteropelvic junction (UPJ) obstruction is the most common cause of urinary obstruction.
- Long segment UPJ obstruction is rare, and a standard and effective surgical technique is not yet defined.
- We present the reverse flap ureteroplasty method for the treatment of long segment UPJ obstruction.

Keywords

Ureteropelvic junction obstruction · Pyeloplasty

Abstract

Objective: The most common cause of urinary obstruction is ureteropelvic junction (UPJ) obstruction. In short stenosis, a dismembered pyeloplasty is performed, but for long segment stenosis, the procedure is not well defined. We present the reverse flap ureteroplasty method, which we prepared from the pelvis for use in long segment UPJ obstruction.

Methods: Between 2007 and 2016, we operated on 6 cases (4 males, 2 females) with an age range of 2–6 months. After reaching the UPJ region, depending on the length of the long segment obstruction, a flap measuring 25–35 mm in length was prepared from the pelvis so that its width would be 10–12 mm on the pelvis side and 10 mm in the distal por-

tion. It was then reversed and tubularized with an absorbable suture over a 10-French nelaton catheter. The end of this ureter and the end of the distal ureter were spatulated and anastomosed. A double J and minovac drain were used in each case. **Results:** There were no complications in the postoperative period of all our patients. They were all discharged with good health. Follow-up with renal ultrasonography showed that the anteroposterior diameters were decreased and that parenchymal thicknesses had returned to normal. Secondary stenosis, flap necrosis, and retraction did not develop. **Conclusion:** Because the blood supply of the pelvis is increased in patients with UPJ obstruction, a reverse flap of adequate length with preserved blood supply can be achieved and tubularized. We suggest that this method will be appropriate for the treatment of long segment UPJ obstruction.

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Introduction

The ureteropelvic junction (UPJ) is the narrowest part of the urinary tract and hence the most common cause of urinary obstruction [1]. The classical surgical technique for UPJ obstruction in children is dismembered pyeloplasty. Common and reliable methods for short segment stenosis include conventional open or laparoscopic dismembered pyeloplasty, percutaneous retroperic endopyelotomy, and robot-assisted laparoscopic pyeloplasty [2–4]. However, long segment UPJ obstruction is rare, and the issue of common and reliable method remains unclear in the literature. Kidney mobilization with methods such as Culp-Scardino, Davis tube pyeloplasty, or Y-V plasty, and autotransplantation to longer segments with tense anastomosis is generally preferred [5, 6]. The success rates of these methods are still unclear.

In this study, we present the tubularized pelvic flap method developed in our clinic, which we apply in patients with long segment UPJ obstructions.

Methods

Study Population and Design

Between 2007 and 2016, a total of 6 patients (4 males, 2 females) aged between 2 and 6 months who were diagnosed with UPJ obstruction and sent for surgery to the Pediatric Nephrology Department were included in this study. All patients underwent renal ultrasonography (USG), and UPJ obstructions were confirmed with scintigraphy. It was not possible to measure the length of the stenosis in the preoperative UPJ region. Patients who had a long segment during the surgery were included in the study. We used the reverse tubularized pelvis flap method for pyeloplasty. The patients were evaluated in terms of pelvic anteroposterior (AP) diameters, narrow segment length, length of the ureter formed, and postoperative follow-up results. Postoperative follow-up was performed with USG. In these cases, the parenchymal thicknesses of the affected kidneys were either half the parenchymal thicknesses of the healthy kidneys or narrower. USG follow-up was performed after surgery (1 week after surgery, 2 months later when the double J (DJ) catheter was removed, 6 months, and 1 year after surgery).

Surgical Technique

After the UPJ region was reached by laparotomy and the extra-peritoneal method, the narrow segment length was determined. In cases with a long segment obstruction that would not allow primary anastomosis, the ureter was cut after being tied off close to the pelvis with a 5/0 Vicryl suture (Fig. 1). Depending on the length of the narrow segment ureter, a flap with a length of 25–40 mm, a distal width of 10 mm, and a base width of 10–12 mm from the pelvis, and whose feeding was carefully preserved, was cut and reversed (Fig. 2). Then, a 10-French nelaton catheter was inserted into the flap, and the flap was tubularized using a continuous 2-lay-

Fig. 1. The ureter was cut after having been tied off close to the pelvis.

Fig. 2. A flap with a length of 25–40 mm, a distal width of 10 mm, and a base width of 10–12 mm from the pelvis was cut and reversed.

er suture with a 6/0 monofilament absorbable suture (Fig. 3). After the ureter had been prepared from the pelvis and the distal ureter had been tubularized, the posterior wall of the first ureter was sutured one by one, and after the DJ catheter had been inserted, the anterior wall was sutured one by one with a 6/0 monofilament suture. At this point, anastomosis was completed. A minivac drain

Fig. 3. A 10-French nelaton catheter was inserted into the flap, and the flap was tubularized by a continuous 2-layer suture.

Table 1. The narrow segment length and ultrasonographic findings in six infants

Case No.	Narrow segment length, mm	Anteroposterior diameters, mm			
		preoperatively	1st week postoperative	1 week after removal of double J catheter	6th month postoperatively
1	35	28	14	15	14
2	25	40	12	12	12
3	30	39	14	13	13
4	25	35	9	9	9
5	40	40	10	10	10
6	40	38	9	9	9
Median value	32.5	38.5	11.0	11.0	11.0
Interquartile range	25.0–40.0	33.2–40.0	9.0–14.0	9.0–13.5	9.0–13.2

was inserted into the anastomosis region and was removed on the third day, if there was no drainage. The DJ catheters were removed in the second month, and retrograde pyelography was performed in all cases simultaneously.

Analysis

We used descriptive statistics for the median and interquartile range results for the preoperative and postoperative USG findings (at 1 week, 1 week after DJ catheter removal, and 6 months after the operation) of AP diameters.

Results

The USG findings and narrow segment lengths of the 6 infants are shown in Table 1. Anastomotic obstruction was not detected in the pyelography while the DJ cath-

eter was being removed and distal ureters were dilated (Fig. 4). Our first case is in their eighth postoperative year, and the last case is in their first postoperative year. No secondary obstructions or increases in AP diameters were observed during the follow-up period. In all our cases, on the USG performed in the second month, the parenchymal thicknesses of the operated kidneys reached those of healthy kidneys and also increased in thickness.

In one of the patients in whom classical UPJ obstruction was considered, an approximately 1-cm narrow segment was detected during exploration. We catheterized the ureter and investigated the ureterovesical obstruction after the ureter was separated from the pelvis. A second narrow segment measuring 1 cm in length was observed in an approximately 1-cm distal region. A

Fig. 4. Retrograde pyelography of one patient. There was any obstruction, and the distal ureters were dilated while the double J catheter was being removed.

Fig. 5. After both ureters were very thinly united, the ureter continued in a thick form.

Fig. 6. The pelvis was tubularized. A double J catheter was inserted from the upper ureter and delivered to the lower pelvis and bladder.

35-mm-long ureter with the second narrow segment was accepted as the narrow segment. Primary anastomosis was not possible with the pelvis. The kidney was freed, but it was observed to be insufficient to ensure primary anastomosis. The pelvis was sutured with the excised ureter one by one with 6/0 Monocryl. The blood supply to the pelvis was observed to be very good. A wide-based reverse flap with a length of approximately 3 cm was created from the pelvis. The blood supply was observed for 5 min, and no problem occurred. 10-French nelaton catheters were placed in the flap, and the flap was tubularized with a 6/0 monofilament absorbable suture. The blood supply was observed again, and no problem occurred. Both ureters were spatulated; first, the rear wall was sutured with a 6/0 monofilament absorbable suture one by one, and after a DJ catheter had been inserted, the front wall was anastomosed.

A severe increase was observed in the AP diameter of the patient with double systems in the left kidney and an UPJ obstruction in the lower system. The parenchyma thinned in the follow-up, and during surgery, the upper-lower system ureter was united in the distal side of the kidney. After both ureters were very thinly united, the ureter continued in a thick form (Fig. 5). The proximal system's ureter was cut to an appropriate length. After the reverse flap had been prepared from the distal pelvis,

the proximal ureter was anastomosed to the lower pelvis. The pelvis was tubularized, and without being anastomosed, a DJ catheter was inserted from the upper ureter and delivered to the lower pelvis and bladder (Fig. 6). The DJ catheter was later removed in month 2. On the USG performed in month 6, the patient's AP diameter was 9 mm, and the parenchyma was close to the parenchyma of the other kidney.

The mean follow-up period in all our patients was 57 months (6–108 months). During follow-up, the general clinical status and USG findings of our patients were examined. Renal size, AP diameter, parenchymal thickness, dilatation in ureters, bladder volume, bladder wall thickness, and residual urine after urination were evaluated.

Discussion

Long segment UPJ obstruction is a rare condition, and no publications regarding this subject exist yet in the literature. It has only been discussed in the UPJ series. Narrow segment length is generally under 1 cm in a classic UPJ obstruction. Information regarding the length of long segment stenosis is lacking. In our case series, we regarded the narrow segment, which is too

long to allow primary anastomosis of the ureter to the pelvis, as a long segment stenosis. This length was minimally 25 mm and maximally 40 mm in our series.

There is no conventional method for treating long segment UPJ obstructions. Salehipour et al. [7] have reported a mixed (long or multiple upper ureteral strictures and a large extrarenal pelvis) series with dismembered pyeloplasty technique, which has been shown to be successful. In addition, another study has reported the success of the laparoscopic dismembered pyeloplasty technique in a long recurrent segment stenosis in an adult patient [8]. Although a dilated pelvis seems to allow for easy anastomosis, after the excision of the narrow segment ureter, it is difficult for the two ends to approach each other, resulting in tense anastomosis obstruction. If long segment stenosis is detected and primary anastomosis cannot be performed, the general method preferred is the Culp-Scardino method [9]. The narrow segment is cut lengthwise, and a spiral tube is prepared and tubularized. Results regarding this method, however, are uncertain. In Davis tube ureteroplasty, after the narrow segment is incised longitudinally through the full layer, an appropriate DJ catheter is placed and kept for long periods of time [10]. However, the risk of obstruction using this method appears to be high.

In Y-V plasty, the narrow segment is incised lengthwise through the full layer, and this forms the leg of the "Y." The incision is performed from the pelvis, which forms the branches of the "Y." The end part then is sutured to the distal narrow segment, and anastomosis is performed [7, 11]. If there is a narrow segment that cannot be treated with these methods, autotransplantation of the kidney is another alternative method [12].

Using our proposed method, we treated 6 cases with the ureter created from the dilated pelvis, reversed and tubularized, with long segment UPJ obstruction. In UPJ obstruction, the pelvis is very dilated, and its vascularization is significantly increased as well (Fig. 1). Ureters that were 20–35 mm long were created from the pelvis with increased vascularization without impairment of the blood supply. Our last case is in their first postoperative year, and the first case is in their eighth postoperative year. Flap necrosis did not develop in any of our cases in the short term, and we did not observe tissue contraction or anastomotic obstruction in the long term either. We considered the possibility that the ureter formed from the reversed pelvis had adapted itself to the peristalsis of the pelvis. None of our cases showed an increase in pelvic AP diameters during follow-up. Addi-

tionally, in our cases, the pelvis resorbed more rapidly than after conventional UPJ surgery. A ureter with a wider diameter formed from a wide-based flap prepared from the pelvis ensures that the bladder empties more rapidly, and pyeloplasty was performed as well. Accordingly, when we performed retrograde pyelography after the DJ catheter was removed in the second month, we detected abundant urine reaching the distal ureter, adapting rapidly to this narrow and thin ureter region and becoming dilated.

In our method, anastomosis was performed with the original ureter by widely spatulating the flap, which was prepared from the pelvis so that anastomotic obstruction did not occur. Also, given that the anastomosis line was distal to the renal parenchyma, pressure complications as a result of kidney compression did not occur. The limitation of our study is the small number of cases we studied.

In conclusion, our study findings suggest that the reverse pelvis flap method for the treatment of long segment UPJ obstruction is a surgical method that can be considered due to the ease in preparing a ureter of an appropriate length, allowing anastomosis to an appropriate width, and ensuring a more rapid pelvic resorption.

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Statement of Ethics

Ethical approval was not required or obtained. Informed consent forms were obtained and signed by the parents of the patients before the operation.

Disclosure Statement

The authors have no conflicts of interest to declare.

References

- 1 Nadu A, Mottrie A, Geavlete P. Ureteropelvic junction obstruction: which surgical approach? *Eur Urol Suppl*. 2009;8(9):778–81.
- 2 Chacko JK, Koyle MA, Mingin GC, Furness PD 3rd. The minimally invasive open pyeloplasty. *J Pediatr Urol*. 2006 Aug;2(4):368–72.
- 3 Neulander EZ, Romanowsky I, Assali M, Klain J, Lissmer L, Kaneti J. Renal pelvis flap—guide for ureteral spatulation and handling during dismembered pyeloplasty. *Urology*. 2006 Dec;68(6):1336–8.
- 4 Kajbafzadeh AM, Turchi A, Nezami BG, Khakpour M, Mousavian AA, Talab SS. Miniature pyeloplasty as a minimally invasive surgery with less than 1 day admission in infants. *J Pediatr Urol*. 2011 Jun;7(3):283–8.
- 5 Grosfeld JL, O'Neill JA, Fonkalsrud EW, Coran A. *Pediatric surgery*. 6th ed. Philadelphia: Mosby; 2006. pp. 1723–41.
- 6 Hashim H, Woodhouse CR. Ureteropelvic junction obstruction. *Eur Urol Suppl*. 2012; 11(2):25–32.
- 7 Salehipour M, Khezri A, Azizi V, Kroup M. Open dismembered tubularized flap pyeloplasty: an effective and simple operation for treatment of ureteropelvic junction obstruction. *Urol Int*. 2006;76(4):345–7.
- 8 Kaouk JH, Kuang W, Gill IS. Laparoscopic dismembered tubularized flap pyeloplasty: a novel technique. *J Urol*. 2002 Jan;167(1):229–31.
- 9 Tynes WV 2nd, Warden SS, Devine CJ Jr. Advancing V-flap dismembered pyeloplasty. *Urology*. 1981 Sep;18(3):235–7.
- 10 Sturm RM, Chandrasekar T, Durbin-Johnson B, Kurzrock EA. Urinary diversion during and after pediatric pyeloplasty: a population based analysis of more than 2,000 patients. *J Urol*. 2014 Jul;192(1):214–9.
- 11 Diamond DA, Nguyen HT. Dismembered V-flap pyeloplasty. *J Urol*. 2001 Jul;166(1):233–5.
- 12 Ge C, Li Q, Wang L, Jin F, Li Y, Wan J, et al. Management of complete ureteral avulsion and literature review: a report on four cases. *J Endourol*. 2011 Feb;25(2):323–6.