Laparoscopic pyeloplasty with cephalad translocation of the crossing vessel – a new approach to the Hellström technique

Tomasz Szydelko[1], Wojciech Apoznanski[2], Piotr Koleda[3], Leslaw Rusiecki[3], Dariusz Janczak[4]

[1]Clinical Department of Urology, 4th Clinical Military Hospital, Department of Palliative Care Nursing, Wroclaw Medical University, Wroclaw, Poland

[2]Department and Clinic of Paediatric Surgery and Urology, Wroclaw Medical University, Wroclaw, Poland

[3]Department of Pathophysiology, Wroclaw Medical University, Wroclaw, Poland

[4]Department of Clinical Procedures, Wroclaw Medical University, Wroclaw, Poland

Videosurgery Miniinv 2015; 10 (1): 25–29
DOI: 10.5114/wiitm.2015.48695

Abstract

Introduction: *It is believed that lower pole crossing vessels may play an important role in the etiology of ureteropelvic junction obstruction (UPJO). A conventional operative technique, which seems to be widely used in patients with UPJO, is Anderson-Hynes (A-H) plasty with dorsal transposition of the vessel. An attractive alternative to dorsal transposition of the vessel might be its cephalad translocation.*

Aim: *To assess the effectiveness of cephalad translocation of the crossing vessel in patients who underwent laparoscopic A-H or Y-V pyeloplasty.*

Material and methods: *Eighty-five patients were included in the study. To assess the effectiveness of cephalad translocation of the crossing vessel in patients who underwent laparoscopic pyeloplasty, the results of the procedure were compared to the results of laparoscopic pyeloplasties performed in patients without crossing vessels (control group). Success was defined as the following factors taken collectively: 80% or greater pain relief according to VAS, no sign of obstruction on intravenous urography (patent UPJ), decreasing excretion curve with T1/2 < 12 min, and improved or stable differential renal function on diuretic renography.*

Results: *The mean follow-up was 53.7 months. There was no statistically significant difference in the success rate between the compared groups (group 1 – cases with cephalad translocation of the crossing artery, and group 2 – cases without crossing vessels) in patients who underwent A-H plasty or Y-V plasty.*

Conclusions: *The analysis of our data seems to indicate that cephalad translocation of the anterior crossing vessel gives good therapeutic results in patients who undergo laparoscopic pyeloplasty.*

Key words: *laparoscopic pyeloplasty, crossing vessel, cephalad translocation.*

Introduction

The pathogenesis of ureteropelvic junction obstruction (UPJO) in adults is a matter of controversy. Some researchers indicate that the changes in the density of Cajal-like interstitial cells may lead to abnormal transmission of peristaltic waves across the ureteropelvic junction, and cause obstruction [1]. Other intrinsic factors which may be included in the etiology of UPJO are stenosis, valves or fibroepithelial polyps [2]. There are also extrinsic factors such as fibrous bands and crossing vessels which may lead to ureteropelvic junction obstruction [3]. It is indicated that especially lower pole crossing vessels may

Address for correspondence
Prof. Tomasz Szydelko MD, PhD, Clinical Department of Urology, 4th Clinical Military Hospital, Department of Palliative Care Nursing, Wroclaw Medical University, 146 Nenckiego St, 52-212 Wroclaw, Poland, phone: +48 602 434 605, e-mail: tomasz.szydelko@am.wroc.pl

play an important role in the etiology of UPJO [4]. However, it still remains unclear what type of surgery – dismembered or nondismembered – should be performed in the presence of crossing vessels, and whether transposition of the vessels is always needed [5, 6]. A conventional technique, which seems to be widely used, is Anderson-Hynes (A-H) plasty with dorsal transposition of the vessel. However, such an operation does not always make it possible to create a tension-free anastomosis. An attractive alternative to dorsal transposition of the vessel might be its cephalad translocation, first described by Hellström [7]. The technique is simple and can also be applied in non-dismembered pyeloplasties.

Aim

The aim of the study was to assess the effectiveness of cephalad translocation of the crossing vessel in patients who underwent laparoscopic A-H or Y-V pyeloplasty.

Material and methods

We reviewed retrospectively the data of 150 laparoscopic pyeloplasties carried out between October 2001 and November 2010. The data were collected for two projects, both approved by the ethics committee. The first project was created to compare the results of laparoscopic pyeloplasty and antegrade endopyelotomy, the second one to compare the outcomes of dismembered and nondismembered laparoscopic pyeloplasties. The diagnosis of UPJO was made on the basis of medical history, the visual analog pain scale (VAS), and imaging studies – ultrasonography (US), diuretic renography (DR) and/or intravenous urography (IVU).

Eighty-five patients from our database comprising 150 cases were included in the study. We excluded cases with incomplete data, posterior crossing vessels, or anterior crossing vessels transposed dorsally to the anastomosis, as well as cases converted to the open procedure or lost to follow-up. The data of the patients included in the study are reported in Table I. To assess the effectiveness of cephalad translocation of the crossing vessel in patients who underwent laparoscopic pyeloplasty, the results of the procedure were compared to the results of laparoscopic pyeloplasties performed in patients without crossing vessels (control group).

Lower pole crossing vessels were observed intraoperatively in 33/85 (38.8%) cases. In 8 patients, nonobstructive stones were found in the collecting system on US and IVU. In 7 cases they were grasped and removed from the renal pelvis during the procedure. As at the time of the operation a flexible nephroscope was not available, in 1 patient with lower calyx nephrolithiasis the stones were left in place. The patient passed the stones spontaneously within 6 months after the operation.

The mean follow-up was 53.7 months. In the follow-up period patients were asked to come for control visits every 3 months for 25 months. Ultrasonography and assessment of symptoms (visual analog pain scale) were carried out on each visit. The first DR was performed 3 months after the operation, then 13 and 25 months after the procedure. The

Table I. Patients' data

Parameter	Group 1 Patients with crossing vessel (n = 33)	Group 2 Patients without crossing vessel (n = 52)	Value of p
Age, range [years]	18–59	15–65	NS
Patients with concomitant nephrolithiasis, n	1	7	NS
Patients with positive urine culture, n	2	6	NS
Patients according to degree of hydronephrosis, n:			
Grade 1–2	19	23	NS
Grade 3–4	14	29	
Pyeloplasties performed Y-V/A-H, n	20/13	16/36	0.0129

NS for $p > 0.05$.

subsequent visits to a urologist were recommended every 12 months.

Success was defined as the following factors taken collectively: 80% or greater pain relief according to the VAS, no sign of obstruction on IVU (patent UPJ), decreasing excretion curve with T1/2 < 12 min, and improved or stable differential renal function on DR.

The authors previously published the operative technique they applied for A-H and Y-V pyeloplasties [2, 8]. Briefly, all procedures were performed transperitoneally using 4 ports. Before pyeloplasty, crossing vessels were identified and then the artery and vein were isolated. The vein was always clipped and divided. In cases with the posterior crossing artery an A-H procedure was performed with ventral transposition of the crossing artery. In cases with the anterior crossing vessel the preferred technique was cephalad translocation of the artery; however, the final decision was always made after visualization of the relationship of the renal pelvis, ureter and crossing vessel. In order to fix the translocated vessel in the superior position, the perivascular tissue was approximated with 3–4 interrupted 3-0 Vicryl (Johnson & Johnson Intl, St-Stevens-Woluwe, Belgium) sutures to the edge of Gerota's fascia, which had previously been divided over the renal pelvis. This technique is similar to the technique described by Meng and Stoller [9]. Then dismembered or nondismembered Y-V pyeloplasty was performed. At the end of the operation a 5-mm closed suction drain was left in place and a 16 Fr urethral catheter was left in the bladder.

Statistical analysis

For statistical analysis a χ^2 test and Fisher's exact test were used to compare categorical values. The independent samples *t*-test was used to compare numerical variables. The Shapiro-Wilk test was used to confirm whether the data fit a normal distribution. A *p* value of less than 0.05 was considered statistically significant.

Results

The preoperative data of the compared groups show no statistically significant differences except for the kind of pyeloplasty performed (in group 1, A-H plasty was the most common procedure, while in group 2 it was Y-V pyeloplasty). As the type of pyeloplasty performed may affect the therapeutic results, the outcomes in patients with the crossing vessel and without it were compared separately for patients who had undergone A-H or Y-V plasty. The results of our study are shown in Tables II and III. There were no statistically significant differences in the preoperative data in the compared groups (group 1 – cases with cephalad translocation of the crossing artery, and group 2 – cases without crossing vessels) in patients who underwent Y-V plasty. Success in group 1 was observed in 17 patients, in group 2 in 16 patients, the difference being not statistically significant. Also in patients who underwent A-H plasty the differences in the preoperative data and success rate between the compared groups were statistically insignificant.

Table II. Data of patients who underwent Y-V pyeloplasties

Parameter	Group 1 Patients with crossing vessel (*n* = 20)	Group 2 Patients without crossing vessel (*n* = 16)	Value of *p*
Age, range [years]	18–59	15–58	NS
Patients with concomitant nephrolithiasis, *n*	0	2	NS
Patients with positive urine culture, *n*	1	0	NS
Patients according to degree of hydronephrosis, *n*:			
Grade 1–2	12	10	NS
Grade 3–4	8	6	
Success, *n*	17	16	NS
Failure, *n*	3	0	NS

NS for p > 0.05.

Table III. Data of patients who underwent A-H pyeloplasties

Parameter	Group 1 Patients with crossing (n = 13)	Group 2 Patients without crossing vessel (n = 36)	Value of p
Age, range [years]	18–49	15–65	NS
Patients with concomitant nephrolithiasis, n	1	5	NS
Patients with positive urine culture, n	1	6	NS
Patients according to degree of hydronephrosis, n:			
Grade 1–2	7	13	NS
Grade 3–4	6	23	
Success, n	13	35	NS
Failure, n	0	1	NS

NS for $p > 0.05$.

Discussion

The role of the crossing vessels in the etiology of UPJO remains controversial. The incidence of crossing vessels in UPJO cases ranges from 38% to 71%; however, they are also reported in 20% of normal kidneys [10–13]. Controversy also persists regarding the management of the crossing vessels during laparoscopic pyeloplasty. The conventional technique, chosen by many urologists, seems to be a dismembered procedure with transposition of the anterior crossing vessel dorsally to the newly created anastomosis [14, 15]. There are also authors who report good therapeutic results of nondismembered pyeloplasty with cephalad translocation of the anterior crossing artery [16]. Finally, some urologists question the routine transposition of the crossing vessel and state that such maneuvers should be dictated by the individual anatomic situation [5].

On the basis of our own material involving open pyeloplasties, we observed that dorsal transposition of the anterior crossing vessel might not improve the relations in the region of the UPJ and may make creation of a tension-free anastomosis impossible. Janetschek *et al.* even claim that dorsal displacement of the anterior crossing artery may worsen the anatomic conditions [17].

In contrast to the above-mentioned technique, cephalad translocation of the crossing artery can easily be performed in dismembered and nondismembered plasties. Our study indicates that this particular technique gives good therapeutic results both in A-H and Y-V pyeloplasties. We did not use any diagnostic tests to assess the position of the translocated artery in the postoperative period. We relied only on the result of the operation, which in our material was as good as in the group of patients without crossing vessels.

The limitation of our study is that it is retrospective. The number of patients included is relatively small, which could affect the power of the study. It seems, however, that it could be difficult to collect a large group of patients, operated on in the same center, using solid inclusion criteria and with the accepted follow-up. We also cannot exclude that some patients who underwent cephalad translocation of the crossing vessel would have had a good therapeutic result without translocation. It seems to us that the conclusive answer to the question "to transpose/translocate or not" might be given by randomized studies performed in high-volume centers.

Conclusions

The analysis of our data seems to indicate that cephalad translocation of the anterior crossing vessel gives good therapeutic results in patients who undergo laparoscopic pyeloplasty because of UPJO. The technique is simple and can be applied in both dismembered and nondismembered procedures.

Conflict of interest

The authors declare no conflict of interest.

References

1. Koleda P, Apoznanski W, Wozniak Z, et al. Changes in interstitial cell of Cajal-like cells density in congenital ureteropelvic junction obstruction. Int Urol Nephrol 2012; 44: 7-12.
2. Szydelko T, Tuchendler T, Litarski A, et al. Laparoscopic Anderson-Hynes procedure as a treatment of ureteropelvic junction obstruction caused by fibroepithelial polyp. Videosurgery Miniinv 2013; 8: 361-3.
3. Wolak P, Golabek T, Obarzanowski M, et al. A complex case of abdominal pain in a patient with pelviureteric junction obstruction. Videosurgery Miniinv 2014; 9: 273-5.
4. Park JM, Bloom DA. The pathophysiology of UPJ obstruction. Current concepts. Urol Clin N Am 1998; 25: 161-9.
5. Boylu U, Oommen M, Lee BR, et al. Ureteropelvic junction obstruction secondary to crossing vessels-to transpose or not? The robotic experience. J Urol 2009; 181: 1751-5.
6. Canes D, Desai MM, Haber GP, et al. Is routine transposition of anterior crossing vessels during laparoscopic dismembered pyeloplasty necessary? J Endourol 2009; 23: 469-73.
7. Hellstrom J, Giertz G, Lindblom K. Pathogenesis and treatment of hydronephrosis. J Belge Urol 1951; 20: 1-6.
8. Szydełko T, Kasprzak J, Apoznański W. Modified laparoscopic Y-V pyeloplasty: experience of a single center. J Laparoendosc Adv Surg Tech A 2009; 19: 633-6.
9. Meng MV, Stoller ML. Hellstroem technique revisited: laparoscopic management of ureteropelvic junction obstruction. Urology 2003; 62: 404-8.
10. Van Cangh PJ, Wilmart JF, Opsomer RJ, et al. Long-term results and late recurrence after endoureteropyelotomy: a critical analysis of prognostic factors. J Urol 1994; 151: 934-7.
11. Nakada SY, Wolf JS, Brink JA, et al. Retrospective analysis of the effect of crossing vessels on successful retrograde endopyelotomy outcomes using spiral computerized tomography angiography. J Urol 1998; 159: 62-5.
12. Sampaio FJ. Vascular anatomy at the ureteropelvic junction. Urol Clin North Am 1998; 25: 251-8.
13. Zeltser IS, Liu JB, Bagley DH. The incidence of crossing vessels in patients with normal ureteropelvic junction examined with endoluminal ultrasound. J Urol 2004; 172: 2304-7.
14. Tuerk IA, Davis JW, Winkelmann B, et al. Laparoscopic dismembered pyeloplasty – the method of choice in the presence of an enlarged renal pelvis and crossing vesels. Eur Urol 2002; 42: 268-75.
15. Inagaki T, Rha KH, Ong AM, et al. Laparoscopic pyeloplasty: current status. BJU Int 2005; 95: 102-5.
16. Rassweiler JJ, Subotic S, Feist-Schwenk M, et al. Minimally invasive treatment of ureteropelvic junction obstruction: long-term experience with algorithm for laser endopyelotomy and laparoscopic retroperitoneal pyeloplasty. J Urol 2007; 177: 1000-5.
17. Janetschek G, Peschel R, Frauscher F. Laparoscopic pyeloplasty. Urol Clin N Am 2000; 27: 695-704.

Received: 14.11.2014, **accepted:** 11.12.2014.