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Ureteropelvic junction obstruction in children by polar vessels. Is laparoscopic vascular hitching procedure a good solution? Single center experience on 35 consecutive patients☆,☆☆

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ABSTRACT

Purpose: We report the results of laparoscopic vascular hitching (LVH) in a series of children with ureteropelvic junction obstruction (UPJO) owing to aberrant lower polar crossing vessels (CV). Our aim is to confirm if LVH associated with intraoperative diuretic test (DT) represents a good procedure to treat extrinsic-UPJO by CV. In order to confirm the relief of the obstruction we suggest performing an intraoperative DT.

Materials and methods: In our department from 2006 to 2014, 120 patients were treated for both extrinsic and intrinsic-UPJO. 85 (30 females, 55 males) presented an intrinsic obstruction and underwent dismembered pyeloplasty (AHDP), 61 open, 16 laparoscopic, 8 retroperitoneoscopic. 35 (23 males, 12 females) were studied for a suspected extrinsic-UPJO: 30 were treated with LVH (modified Hellström vascular hitch). Intraoperative-DT was performed in all patients before and after vessel transpositions confirming the UPJO and eventual relief after the procedure. We included in the study only patients with suspicion of vascular extrinsic-UPJO. Average age at surgery was 7.5 years. Symptoms of presentation were recurrent abdominal/flank pain and hematuria. All patients presented ultrasound (US) detection of hydronephrosis. Preoperative diagnostic studies include: US/doppler scan, MAG3 renogram, urography, functional magnetic resonance urography (fMRU) and CT scan.

Results: 28 out 35 patients had a correct preoperative diagnosis, and the remaining needed an intraoperative diagnosis confirmation. All 35 patients had an intraoperative-DT: 30 patients underwent LVH (positive-DT); 3 patients (negative-DT) underwent laparoscopic-AHDP for intrinsic-UPJO; two with positive-DT and nonobstructive CV, had no surgical treatment. Median operating time was 95 min; mean hospital stay was 4 days. At 12–84 months follow-up 29 patients remained symptoms-free, one needed after two years a laparoscopic-AHDP.

Conclusions: According our experience, LVH associated with intraoperative-DT may be considered a safe procedure to treat extrinsic-UPJO by CV in carefully selected patients. In particular, the very low incidence of relapse suggest that in suspicion of extrinsic-UPJO, performing intraoperative-DT after CV transposition allows to exclude intrinsic-UPJO confirming that the LVH-procedure has relieved the pelvic obstruction, precluding the need for AHDP.

Nowadays the gold standard in the management of intrinsic and extrinsic UPJO is dismembered pyeloplasty (DP) since the procedure was first described by Anderson and Hynes (AHDP) in 1949 [1]. UPJO may be caused by intrinsic disorganization or by extrinsic compression from crossing vessels (CV); extrinsic causes often present symptomatically in older children. The association between UPJO and extrinsic etiology by lower pole CV was first described by Von Rokitansky in 1842 [2,3]. UPJO owing to CV, frequently observed in adults, is a rare condition in neonates and has a slight incidence in older children. There is a lack of consensus regarding the surgical treatment of this vascular anomaly.

An alternative approach to pure extrinsic-UPJO was first described by Hellström [4] in 1949; it involved displacing the lower pole vessels cranially and then anchoring them to the anterior pelvic wall using vascular adventitial sutures. Chapman [5] further modified this technique by securing a more superior position of the lower pole vessels within a wrap of the anterior redundant pelvic wall without the need for vascular adventitial sutures. This technique has since been described in

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children as an alternative to open DP, with the largest series reported in 1999 by Pesce [6].

Aberrant vessels usually cause intermittent UPJO. These cases present a normal perinatal history, followed by the subsequent onset of clinical signs and symptoms, often influenced by the child's hydration status, characterized by intermittent hydronephrosis on imaging and normal kidney function. The CV typically cross over the UPJ to perfuse the lower pole of the affected kidney. Currently, there are no definitive imaging techniques or intraoperative procedures available to confirm the etiology of UPJO. As noted by Schneider [7], frequently one encounters anatomic variability in the relationship between the renal pelvis and the lower pole vessels.

Some authors have proposed DP to exclude intrinsic associated anomalies, others, in order to minimize technical difficulties and improve outcomes, have described simpler procedures that do not involve pyeloureteral anastomosis. Our purpose is to report results in a quite large series of children who underwent LVH and to suggest a simple and uncomplicated intraoperative test, DT, to confirm the relief of the obstruction.

1. Materials and methods

We included in this prospective study all patients treated in our department for UPJO (intrinsic and extrinsic) between 2006 and 2014 focusing our attention on extrinsic-UPJO diagnosis and treatment.

This period was considered because in 2006 we started to treat UPJO also with minimally invasive surgery (MIS) determining the discrepancy among the different group (open vs MIS). In a total of 120 patients, 85 (30 females, 55 males) presented an intrinsic obstruction and underwent AHDP, whereas 35 patients had a suspected extrinsic-UPJO. In the intrinsic group 61 were treated by open approach, 24 by MIS: 16 laparoscopic-DP and 8 retroperitoneoscopic-DP (children <12 months age).

Of the 35 patients (23 males, 12 females), studied for extrinsic obstruction: 30 were treated with LVH procedure, 3 received a laparoscopic-AHDP and 2 had no surgical treatment. We reviewed the charts of patients to determine: age at surgery, preoperative imaging results, operative time, need for conversion, hospital stay length, need for intraoperative drainage, postoperative complications, need for re-do or postoperative stenting. Preoperative diagnosis of extrinsic-UPJO was based on complete medical history, ultrasonography and Doppler-scan (35/35), MAG3 renogram (35/35), diuretic urography (6/35), functional magnetic resonance urography (fMRU)/CT-scan (19/35). Urography and CT-scan were performed on few patients at the beginning of our experience.

Actually in our department all patients with UPJO undergo respectively ultrasonography/Doppler scan, MAG3 renogram; reserving fMRU in case of suspected extrinsic obstruction (Fig. 1).

The obstructive syndrome was defined as hydronephrosis on ultrasonography after hyperhydration and/or poor renal drainage on MAG3 renogram. Suspicion of CV was based on: a normal perinatal history with absence/nonsignificant renal pelvis dilation at prenatal ultrasound (as in our series), a late presentation with intermittent symptoms (vomiting, flank pain, or renal colic), marked hydronephrosis at the time of pain with primarily extrarenal dilatation and an obstructed pattern on a diuretic MAG3 renogram.

All patients were operated on laparoscopically and by the same surgeon, trained in minimally invasive surgery. They were hospitalized 36 hours before surgery, starting with liquid diet and bowel cleansing with laxative and enemas to attain bowel deflation and facilitate laparoscopic approach. Considering the renal anatomy (aberrant polar vessel anteriorly to the renal pelvis) we prefer a transperitoneal approach because this provides better anterior access to the renal pelvis and easier anterior CV hitching.

In operatory theater, patient is placed in a semilateral position with bladder catheter and nasogastric tube positioned before starting the procedure. After an umbilical open approach we insert a 5–10 mm diameter cannula (according weight and age of the patient) then an optical laparoscope is introduced to explore abdominal cavity; we used 30° scope to better visualize the different angulation of the operative field. Two other 3-mm working ports are then placed one in the epigastrium and one in the ipsilateral iliac fossa at the midclavicular line, to allow an ideal triangulation during dissection of the CV and completion of the pelvic wrap; only in 7 patients we used a third 3 mm lateral operative port to move the colon fallen down on the operative field. Pneumoperitoneum is induced by insufflating CO_2 at the minimal pressure to obtain an acceptable operative space (pressure varies from 5–10 mm Hg). The technique consisted exposure of the lower aberrant CV via the transperitoneal approach without ipsilateral colon mobilization. This is almost always obtained on the left side through a window in the mesocolon, while on the right side, working just on the upper side of the colonic flexure. Once the CV are visualized we proceed with their dissection and mobilization off the UPJ. Diuretic test is then performed administering a bolus of normal saline (20 ml/kg IV) before complete vessel mobilization followed by furosemide (1 mg/kg IV) after complete mobilization. Full mobility of the UPJ is confirmed by moving freely the upper and lower portions of the anterior pelvis wall just behind the CV as a shoeshine (shoeshine maneuver). The UPJ is then carefully inspected for any intrinsic visible stenosis (significant narrowing). To be sure of a pure extrinsic obstruction, the CV must be temporarily transposed and the surgeon must observe: the peristalsis associated with the easy urine passage across the junction and, finally, deflation of the pelvis. Once the test is successfully completed the cranially displaced lower pole CV are then positioned away from the UPJ by performing a loose wrap of the anterior pelvic wall around these vessels using 4/0 polydioxanone sutures (pyelo-pyelic sleeve). Two/three

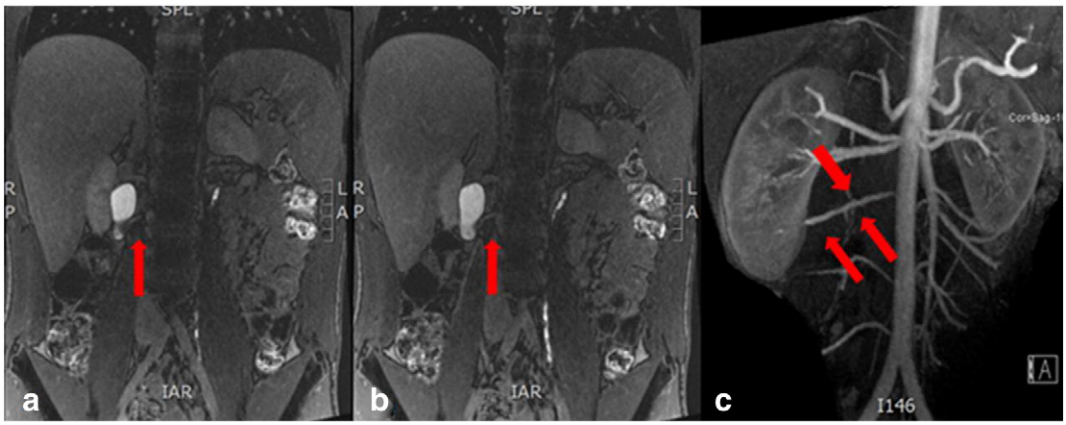

Fig. 1. fMRU: A and B: MRI showing the aberrant vessel crossing the right renal pelvis; C: three-dimensional reconstruction.