

# One-Port Retroperitoneoscopic Assisted Pyeloplasty Versus Open Dismembered Pyeloplasty in Young Children: Preliminary Experience

Paolo Caione,\* Alberto Lais and Simona Gerocarni Nappo

From the Division of Pediatric Urology, Department of Nephrology-Urology, "Bambino Gesù" Children's Hospital and Research Institute, Rome, Italy

**Purpose:** We propose 1-port retroperitoneoscopic assisted pyeloplasty as a minimally invasive approach and compare the results to open dismembered pyeloplasty.

**Materials and Methods:** All patients 6 months to 5 years old presenting with ureteropelvic junction obstruction between January 2008 and June 2009 were offered 1-port retroperitoneoscopic assisted pyeloplasty. Age matched patients who underwent open dismembered pyeloplasty during 2007 served as controls. The ureteropelvic junction was isolated retroperitoneoscopically and exteriorized through a single operative trocar. Pyeloplasty was performed in an open fashion with Double-J® stenting. Operative time, postoperative pain, surgical complications, hospital stay, ultrasound and mercaptoacetyltriglycine nuclear scan results at 6-month followup were evaluated and compared. Chi-square test and Student's t test were adopted for statistical analysis, with  $p < 0.05$  considered statistically significant.

**Results:** A total of 28 children (17 males) with a mean age of 18 months were treated with 1-port retroperitoneoscopic assisted pyeloplasty (18 left side). The control group consisted of 25 patients (11 males) with a mean age of 19 months who underwent open dismembered pyeloplasty (10 left side). Median operative time was 95 minutes (range 70 to 130) in 1-port retroperitoneoscopic assisted pyeloplasty and 72 minutes (58 to 102) in open dismembered pyeloplasty ( $p < 0.05$ ). Median postoperative hospital stay was 2.4 days with the 1-port approach and 6.1 days with the open procedure ( $p < 0.05$ ). Postoperative pain was significantly less in the 1-port group. Skin scar length was 1.4 to 2.9 cm (median 1.7) with 1-port retroperitoneoscopic assisted pyeloplasty and 3.5 to 6.0 cm (4.3) in the open group ( $p < 0.05$ ).

**Conclusions:** The 1-port retroperitoneoscopic assisted pyeloplasty represents a safe and effective minimally invasive technique to treat hydronephrosis and could be the treatment of choice in young children. The procedure does not require laparoscopic suturing skills, and combines the advantages of open and laparoscopic pyeloplasty.

**Key Words:** hydronephrosis; kidney pelvis; laparoscopy; surgical procedures, minimally invasive

OPEN dismembered pyeloplasty through a retroperitoneal approach has long been considered the referral treatment for ureteropelvic junction obstruction.<sup>1,2</sup> In the

last decade the request for minimally invasive procedures has increased even in children, leading to proposed small incisions for open pyeloplasty,<sup>3</sup> and extend-

## Abbreviations and Acronyms

FLACC = Faces Legs Activity Cry Consolability  
MAG-3 = mercaptoacetyltriglycine  
ODP = open dismembered pyeloplasty  
OPRAP = one-port retroperitoneoscopic assisted pyeloplasty  
 $T_{1/2}$  = half-time  
UPJ = ureteropelvic junction  
US = ultrasonography

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\* Correspondence: Department of Nephrology-Urology, "Bambino Gesù" Children's Hospital and Research Institute, Piazza S. Onofrio, 4-00165 Rome, Italy (telephone: 39-06-6859-2337; FAX: 39-06-6859-2849; e-mail: paolo.caione@opbg.net).

ing the indications for reconstructive laparoscopic approaches in younger children.<sup>4-7</sup> However, laparoscopic pyeloplasty remains a challenging procedure to perform in pediatric urology, requiring high expertise to obtain success rates comparable to those of open dismembered pyeloplasty. The latter still remains the gold standard surgical treatment of ureteropelvic junction obstruction, with a long-term success rate exceeding 90% to 95%. The transperitoneal laparoscopic approach to the ureteropelvic junction violates the peritoneal cavity and requires intracorporeal suturing skills with fine needles. By comparison, the retroperitoneal laparoscopic approach has the disadvantages of a smaller working space, including the crowding of trocars and working instruments.<sup>8,9</sup>

Recently Lima et al described a simplified video assisted technique consisting of retroperitoneal laparoscopic mobilization of the obstructed UPJ by a single operative trocar, completed by extracorporeal dismembered pyeloplasty.<sup>10,11</sup> The technique appears suitable for use in infants and young children, combining the advantages of a minimally invasive laparoscopic approach with the safety and effectiveness of open suturing. We adopted 1-port retroperitoneoscopic assisted pyeloplasty beginning in January 2008. The aim of this study was to assess the results of this procedure in terms of efficacy, ease of performance and complication rates compared to standard open dismembered pyeloplasty in an age matched group of children. We describe the effectiveness and potential advantages of this new surgical approach for UPJ obstruction repair in children.

## PATIENTS AND METHODS

The study group consisted of children 6 months to 5 years old with UPJ obstruction who underwent OPRAP between January 2008 and June 2009. UPJ obstruction was diagnosed by renal ultrasound and nuclear scan. Obstruction was defined as an anteroposterior pelvic diameter 20 mm or greater and progressively increasing on repeat ultrasound, and impaired split renal function 40% or less on MAG-3 nuclear scan with obstructed furosemide test washout parameters ( $T_{1/2}$  greater than 20 minutes).<sup>12</sup> The control group included age matched children who underwent ODP by the same surgeon (PC) for obstructed UPJ, defined by the same ultrasound and nuclear scan criteria, during 2007.

In the OPRAP technique the patient is placed under general anesthesia by orotracheal intubation, and the bladder is filled with 50 cc saline solution and 2 cc methylene blue through a Foley catheter. With the patient in the full flank position the usual skin landmarks for retroperitoneoscopy are marked (fig. 1, A). Through a 15 mm skin incision under the 12th rib apex Gerota's fascia is bluntly reached and opened. A 10 mm trocar balloon is inserted, and 9 mm Hg CO<sub>2</sub> pressure with 1 liter per minute flow rate insufflation is started. Through a 10 mm zero-degree lens operative telescope with a coaxial 5 mm operative channel (Karl Storz®) the working space is bluntly developed by a peanut, and the psoas muscle edge and lower pole of the kidney are

identified as landmarks (fig. 1, B). The proximal ureter, UPJ and renal pelvis are inspected, looking for any crossing vessels. Needle aspiration of giant hydronephrosis is performed if needed to increase operative room and make mobilization of the pelvis easier. The UPJ is lifted on a vessel loop and then exteriorized to the skin level as the telescope and trocar are carefully removed (fig. 1, C and D).

Anderson-Hynes dismembered pyeloplasty is next performed using 6-zero or 7-zero polydioxanone suture and 2.5 to 3.5 surgical loops. Stay sutures on the distal pelvis and proximal ureter may be useful to avoid torsion of the anastomosis. A 4.8Fr Double-J stent is positioned before completing the pyeloureteral suture in all patients, with the methylene blue drops coming up to the pelvic extremity of the stent marking the distal curl positioning in the bladder (fig. 2, A to C). A final retroperitoneoscopic look is useful to check for the absence of bleeding or twisting of the pyeloureteral anastomosis. The port wound is closed without drain positioning (fig. 2, D).

Full dose broad-spectrum antimicrobial prophylaxis is administered intravenously at anesthesia induction and on postoperative day 1, and the transurethral catheter is removed on postoperative day 2. Oral prophylaxis at 50% dose is continued until the Double-J stent is removed at 4 to 6 weeks. Postoperative pain is checked daily by nurses at 2-hour intervals or at the request of the patient using the FLACC pain scale.<sup>13</sup> At the end of surgery all patients receive morphine at a dose of 0.01 mg/kg body weight per hour in continuous infusion for 24 hours, continued thereafter as needed (FLACC scale 4 or greater) and recorded.

ODP was performed by the same surgeon using a flank subcostal lumbotomy with muscle splitting. The UPJ and dilated pelvis were exposed, and standard Anderson-Hynes dismembered pyeloplasty was performed with proper spatulation of the proximal ureter using 6-zero or 7-zero polydioxanone running suture. Transanastomotic nephrostomic stent and perirenal Penrose drain, when adopted, were removed on postoperative days 5 and 6, respectively. The Double-J stent was removed cystoscopically in both groups at 4 to 6 weeks.

At followup the study and control groups were compared regarding operative time, surgical complications, length of postoperative hospital stay and postoperative pain as assessed using the FLACC pain scale.<sup>13</sup> Scar size was measured at 6 months. US results were evaluated at 3, 6 and 12 months, and MAG-3 nuclear scan was performed at 1 year postoperatively. Successful pyeloplasty was defined as absence of symptoms, decreased pelvic-iceal dilatation on US and improved renal drainage on renography.

Student's t test for quantitative data comparison and chi-square test were adopted for statistical analysis. A p value of less than 0.05 was considered significant.

## RESULTS

A total of 28 patients in the OPRAP group and 25 in the control group fulfilled inclusion criteria. Patient demographics are summarized in table 1 and surgical outcomes are presented in table 2. Preoperative renal pelvic diameter and MAG-3 renogram param-

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