



Retroperitoneoscopic assisted single-site pyeloplasty using EZ access in children: Comparison with open dismembered pyeloplasty



Yuichiro Yamazaki ^{*}, Woo Jin Kim, Sayaka Akiyama, Takashi Ikeda

Department of Urology, Kanagawa Children's Medical Center, 2-138-4 Mutsukawa, Minami-ku, Yokohama 232-8555, Japan

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ABSTRACT

Purpose: The aim of this study was to compare the results of the retroperitoneoscopic assisted pyeloplasty (RASP) using EZ access (silicone rubber cap) with open dismembered pyeloplasty (ODP) in children.

Methods: A retrospective review was performed of patients treated for ureteropelvic junction (UPJ) obstruction with either RASP or ODP from 2010 to 2015. For patients with RASP, two 5-mm trocars were placed in the EZ access. The UPJ was dissected retroperitoneoscopically and dismembered pyeloplasty was performed extracorporeally. Patient demographics and operative outcomes were compared between the groups.

Results: A total of 50 children were included, with 25 RASP and 25 ODP. Mean patient age was 49 months in the RASP group and 53 months in the ODP group. Perioperative outcomes, including operative time (185 vs 188 min) and postoperative hospital stay (2.0 vs 2.2 days), were similar between the two groups. Mean skin scar length (17 vs 34 mm) was significantly smaller in the RASP group. The postoperative success rate (96% vs 100%) was not significantly different between the groups.

Conclusions: The RASP represents a safe and effective single-site procedure in children. This procedure significantly reduces the skin scar length and has equivalent surgical outcomes to ODP.

The type of study: Retrospective comparative study.

Levels of evidence: III.

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Rapid adoption of surgical robotics in pediatric urology has been most evident in the treatment of ureteropelvic junction (UPJ) obstruction [1]. However, it currently remains unclear whether robotic technology will become a cost-effective replacement for pure laparoscopy or open pyeloplasty in the management of pediatric UPJ obstruction [2,3]. Lima et al. described a simplified video-assisted technique consisting of retroperitoneal laparoscopic mobilization of the UPJ by a single operative trocar, completed by extracorporeal dismembered pyeloplasty in small children from 2 to 18 months of age [4]. Caione et al. also adopted this 1-port retroperitoneoscopic assisted pyeloplasty in 28 children from 6 months to 5 years old [5]. They used a 10-mm zero-degree lens operative telescope with a coaxial 5-mm operative channel (Karl Storz®). Although the technique appears suitable for use in infants and young children, movement of the endoscopic instruments is theoretically limited. To address this drawback, we used a miniature wound retractor (LAP protector for 10–20-mm incision, Hakko Co. Ltd., Tokyo, Japan) with silicone rubber cap (EZ access, Hakko Co. Ltd., Tokyo, Japan). This device is similar to the Alexis® Laparoscopic

System including wound protector and laparoscopic cap, but the combination of LAP protector and EZ access for a 10–20-mm incision is smaller than that of the Alexis Laparoscopic System. These simple devices enabled not only laparoendoscopic single-site surgery with two 5-mm trocars, but smooth conversion to extracorporeal suturing. Our modification of retroperitoneoscopic assisted single-site pyeloplasty (RASP) was applied not only in small children but in children of all ages. The aim of this study was to compare the results of RASP with conventional open dismembered pyeloplasty (ODP) in children.

1. Methods

This study was approved by Kanagawa Children's Medical Center Institutional Review Board for the Protection of Human Subjects (IRB 74-07). Given the retrospective nature of the study design, informed consent was waived.

1.1. Patient population and data collection

The records of consecutive patients undergoing RASP at our institution from December 2012 to February 2015 were retrospectively reviewed. During this period, RASP was nonselectively performed in all children with UPJ obstruction, except patients with multiple kidney stones. A control group of consecutive patients undergoing ODP from

Abbreviations: RASP, retroperitoneoscopic assisted single-site pyeloplasty; ODP, open dismembered pyeloplasty; UPJ, ureteropelvic junction; MAG-3, mercaptoacetyltriglycine; UTI, urinary tract infection; US, ultrasound.

^{*} Corresponding author. Tel.: +81 45 711 2351; fax: +81 45 721 3324.

E-mail address: yuichiroy@gmail.com (Y. Yamazaki).

January 2010 to November 2012 was reviewed for comparison. As described above, patients were excluded if they had concomitant multiple kidney stones in a control group. A total of 50 children were included. Twenty-five consecutive patients with UPJ obstruction underwent RASP from 2012 to 2015, and 25 consecutive controls underwent ODP from 2010 to 2012. Preoperative evaluation included renal ultrasound (US) to assess the grade of hydronephrosis, as well as a diuretic renogram to evaluate drainage patterns and differential function. The indications for surgery included Society for Fetal Urology grade 3–4 hydronephrosis with an abnormal diuretic renogram (prolonged renal drainage time, decreasing renal function below 40%) and/or clinical problems including urinary tract infection (UTI) and pain [6].

1.2. Surgical procedure

RASP was initially performed by a senior pediatric urologist (YY), but it was eventually performed by three surgeons of the same surgical team. For patients with RASP, a 15–17-mm skin incision was made under the 12th rib apex, and fascia transversalis was bluntly opened. A LAP protector was used to retract the small wound circumferentially, and EZ access was attached to the LAP protector for sealing. Two 5-mm trocars were placed in the EZ access, and retroperitoneoscopy was performed using a 5-mm 30-degree lens with CO₂ insufflation. Without a special apparatus, the retroperitoneal insufflation space was bluntly expanded by a peanut dissector, and the UPJ was dissected with a Maryland grasper or small scissors (Fig. 1A and B). In cases of complicated dissection, such as crossing vessels, an additional peanut dissector was directly inserted on the EZ access without a trocar to achieve countertraction. In cases with a large renal pelvis crossing the midline in small children, decompression was performed by an 18G trocar needle through the EZ access retroscopically.

The UPJ was lifted to the skin level by a vessel loop or a 5-mm Babcock grasper. An Anderson–Hynes dismembered pyeloplasty was then performed extracorporeally with double-J stenting (Fig. 1C). After completion of the anastomosis, the UPJ was checked by retroperitoneoscopy so as to not miss a twisted anastomosis. Change from open to retroperitoneoscopy was easily done by attachment of the EZ access. ODP was performed by the same surgical team. Subcostal lumbarotomy with muscle-sparing approach was performed, and the wound was retracted by an Alexis® Wound Retractor size S or XS (Applied Medical, Rancho Santa Margarita, CA). Standard Anderson–Hynes dismembered pyeloplasty was performed extraperitoneally, and all patients, except one, had a stent placed during surgery. No drain was left in place. In both groups, the double-J stent was removed cystoscopically 4 to 6 weeks after the operation.

1.3. Data analysis

Patient demographics, operative outcomes, and complications were compared between the groups. Data were collected on age, weight, operative time, length of skin incision, length of postoperative hospital stay, postoperative analgesic requirements, length of follow-up period, and the success rate. Operative time was defined as from skin incision to closure. The length of the skin incision was measured at the end of surgery (Fig. 1D). Postoperative complications were assessed according to the Clavien–Dindo classification, and a significant complication was defined as greater than or equal to grade 2 [7]. Follow-up US was performed at 3, 6, and 12 months. A postoperative MAG-3 nuclear scan was not routinely performed in every patient with improved renal US. When postoperative US showed no improvement of hydronephrosis, a MAG-3 nuclear scan was performed at 6 months to 1 year after surgery. Postoperative success was defined as improved symptoms, improved hydronephrosis (US), and/or improved parameters of MAG-3 nuclear

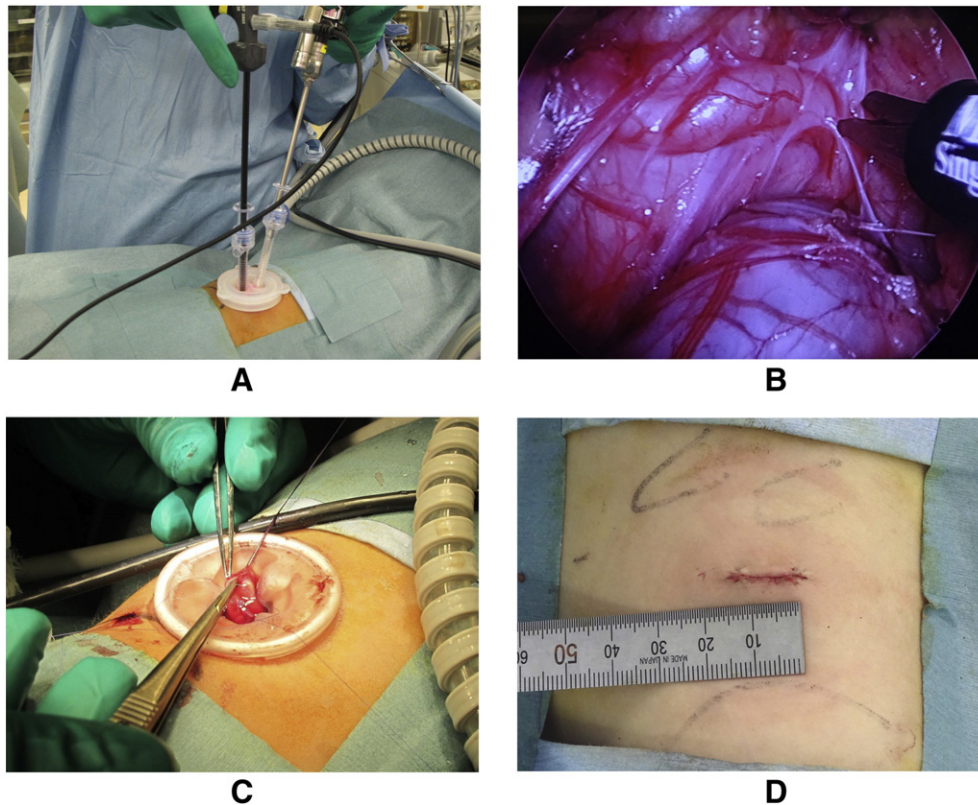


Fig. 1. A, Two 5-mm trocars are placed in the EZ access. The telescope is held and controlled with the surgeon's left hand while the right hand instrument performs the ureteral dissection. B, The UPJ is dissected with a Maryland grasper and small scissors. C, An Anderson–Hynes dismembered pyeloplasty is performed extracorporeally with double-J stenting. D, The length of the skin incision is measured at the end of surgery.

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