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Case Series of the Month

Feasibility and Preliminary Clinical Outcomes of Robotic Laparoendoscopic Single-Site (R-LESS) Pyeloplasty Using a New Single-Port Platform

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Abstract

This study tested the technical feasibility and short-term perioperative outcomes of the novel da Vinci Single-Site Instrumentation platform for the treatment of upper ureteropelvic junction obstruction (UPJO) in a selected group of patients. Nine patients underwent robotic laparoendoscopic single-site (R-LESS) pyeloplasty using a new single-site platform for UPJO at our department of urology.

All the procedures were completed without the need for traditional robotic surgery or laparoscopic/open conversion, although in one patient with congenital hepatomegaly it was necessary to use an auxiliary 3-mm trocar to retract the liver properly and expose the surgical field. Mean operative time was 166 min, and no intraoperative complications were recorded. The indwelling catheter was removed on postoperative day 2 in five patients and on postoperative day 3 in four patients. Patients were discharged the day after drain removal. One patient experienced transient hyperpyrexia, treated with antibiotics. No other complications were observed. All patients had the DJ stent removed 4 wk after surgery, following a negative urine culture and abdominal ultrasound evaluation. The five patients who reached a 3-mo follow-up had a clinical resolution of preoperative symptoms and hydronephrosis at the abdominal ultrasound. The same results were maintained in the two patients with 6-mo follow-up evaluations.

In selected patients, R-LESS pyeloplasty using the new single-port platform appears to be a technically feasible and reproducible surgical procedure for the minimally invasive treatment of UPJO. Prolonged follow-up and larger series are required to confirm its potential role as a valid alternative to standard robotic pyeloplasty.

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1. Case report

Laparoendoscopic single-site surgery (LESS) aims to reduce the limited invasiveness of conventional laparoscopy even further and to offer not only a better cosmetic result (incision hidden by the umbilical scar) but also potentially

to reduce postoperative pain and offer a quicker convalescence [1]. Nevertheless, LESS remains a challenging surgical technique mainly due to the lack of triangulation among the surgical instruments. Proper laparoscopic suturing techniques and great surgical skills are required for procedures such as pyeloplasty, and proper suturing is

mandatory to adequately repair the stenotic ureteropelvic junction (UPJ).

Recently, the da Vinci single-site surgery technique was introduced into clinical practice to perform cholecystectomy procedures robotically in a LESS surgery scenario, with encouraging preliminary results [2,3]. However, cholecystectomy in general is a much easier procedure.

The aim of this study was to test the technical feasibility and reproducibility and to evaluate the perioperative short-term outcomes of pyeloplasty performed by using the novel da Vinci Single-Site Instrumentation platform in a selected group of patients.

Nine patients were selected for robotic LESS pyeloplasty for symptomatic UPJ obstruction (UPJO) using the novel da Vinci single-site platform at our university department of urology tertiary care hospital between July 2011 and December 2011.

Patients were selected according to the results of imaging techniques, mercaptoacetyltriglycine-3 diuretic renal scans showing evident obstruction not solved following furosemide injection ($t_{1/2} > 20$ min), and the presence of symptoms (eg, recurrent flank pain, fever, and recurrent upper urinary tract episodes). Exclusion criteria for these preliminary series were a body mass index (BMI) > 30 kg/m², previous abdominal and renal surgery, concomitant renal stones, an extremely large renal pelvis (ie, pelvis diameter > 6 cm), pelvic kidney, and horseshoe kidney. Table 1 lists the demographics and preoperative characteristics of the patients.

Patients signed an informed consent before surgery and were made aware of the possibility that the surgery might be converted into a traditional robotic pyeloplasty or open surgery.

The new da Vinci single-site robotic surgery platform is a semirigid robotic operative system designed to work with the Intuitive da Vinci Si Surgical System (Intuitive Surgical, Sunnyvale, CA, USA). The system, which incorporates a multichannel single port that accommodates two curved robotic cannulas, allows for the passage of interchangeable semirigid instruments that cross each other within the trocar so that the right-entering instrument becomes the left-sided operative instrument in the abdominal cavity and vice versa. The master-slave software of the da Vinci platform automatically exchanges the master-slave controls allowing the surgeon at the console to control the tip of the instrument with his right hand at the right side of the

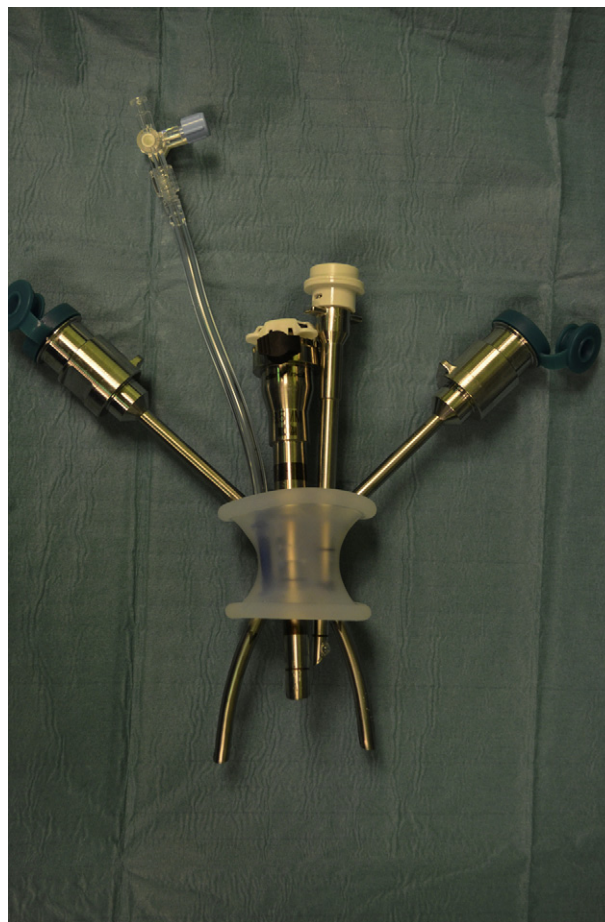


Fig. 1 – Scheme of the da Vinci single-site platform.

surgical field and the opposite for the left. Unfortunately, the surgical instruments do not have the wrist at the tip like conventional robotic da Vinci instruments do. In addition to the robot-controlled instruments and optic (a 30° scope down oriented), the specifically designed port allows for the access of additional one or two conventional laparoscopic entrances for the assistant (Fig. 1). At the present time, this technology is only approved in the United States for cholecystectomy.

Patients were positioned in a 75° flank position with the bed flexed (30°) to elevate the surgical area (Fig. 2a). The surgical field was prepared to have full access to the target abdominal area and the penis in males and vagina in females, adequately providing access to the external urinary meatus to perform the flexible cystoscopy for DJ stent positioning.

A 2- to 2.5-cm intraumbilical skin incision was performed with a dissection of the musculofascial planes to reach the peritoneal cavity. The da Vinci single-site port was then inserted and pneumoperitoneum induced (Fig. 2b).

The transperitoneal pyeloplasty surgical technique was carried out as previously described for standard robotic pyeloplasty at our institution [4]. To ease the plasty reconfiguration, a braided 3-0 monodermal suture was

Table 1 – Demographics and preoperative data of the series of R-LESS pyeloplasty using the new single-port platform

Patients, n	9
Age, yr, median (range)	32 (19–55)
Side (right/left)	8/1
BMI (kg/m ²), median (range)	22.5 (18.7–26.2)
Symptoms	Flank pain: 9 patients Urinary tract infections: 1 patient
Preoperative renal scan $t_{1/2}$ post-Lasix, min, median (range)	28 (21–32)

BMI = body mass index.

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