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Robot assisted laparoscopic pyeloplasty in obese and non-obese patients

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Abstract *Objective:* We assessed whether increased BMI has a negative impact in children undergoing robot assisted laparoscopic pyeloplasty (RALP).
Patients and methods: Records of patients who underwent RALP were retrospectively reviewed and separated into healthy weight, overweight, and obese cohorts based on age-adjusted BMI percentile, and surgical and postsurgical outcomes were evaluated.
Results: Of the 103 patients, there were 79 healthy weight and 24 overweight, with 10 of the 24 considered obese (BMI $<$85th, $\geq$85th, and $\geq$95th percentile for age, respectively). Cohorts were similar in respect to age, sex, laterality and symptoms. Operative time (234 min, 241 min, $p = 0.642$; 254 min, $p = 0.324$), EBL (7.1 ml, 10.5 ml, $p = 0.293$; 6.8 ml, $p = 0.906$), length of stay (1.2d, 1.2d $p = 0.545$; 1.1d $p = 0.550$), and narcotic administration (0.25 mg/kg, 0.25 mg/kg, $p = 0.545$; 0.13 mg/kg, $p = 0.430$) were similar between healthy weight, overweight, and obese cohorts, respectively. Complication rates were similar in regard to minor and major complications. There was no difference in decreased hydronephrosis (92.2%, 89.6%, $p = 0.440$; 88.9%, $p = 0.730$). Four patients (3.4%) required a reoperative procedure (three healthy weight, one overweight; p = NS).
Conclusions: Despite the potential difficulties with surgery in overweight patients, our data indicate that robot-assisted laparoscopic pyeloplasty can be performed as safely and effectively in overweight or obese children as in healthy weight children.

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Introduction

Performance of robot assisted laparoscopic (RAL) procedures is increasing in pediatric patients. It is the responsibility of those who utilize the technology to determine whether it can be safely applied to all pediatric patients, or if there are situations that put some patients at increased risk for complications. At the same time, childhood obesity rates have significantly increased in recent years, with over 30% of children categorized as overweight (body mass index (BMI) percentile $\geq$85th) and 17% as obese (BMI percentile $\geq$95th) [1]. Furthermore, obesity in adult and pediatric patients has been associated with greater surgical times, length of postoperative stay, and surgical site infections [2–4]. Laparoscopic surgery avoids the morbidity from long surgical incisions; however, obesity has also been linked with worse postoperative outcomes in adult patients undergoing urologic laparoscopic surgery [5,6]. This has not been well studied in pediatric patients who have undergone RAL surgery. Therefore, we evaluated our experience to determine whether increased BMI has a negative impact on success or complications in children undergoing RAL pyeloplasty (RALP).

Patients and methods

This is an IRB-approved retrospective review of RAL urologic surgeries performed by our group between October, 2006 and April, 2013 (patients prospectively enrolled since April, 2010). Robot-assisted laparoscopic urologic procedures (244) were performed in children, from which we identified 117 RAL pyeloplasties; 103 of those had sufficient data for evaluation and minimum follow-up (clinical and/or imaging) of 3 months. Transperitoneal RALPs were performed with a previously published technique [7] by five different fellowship trained and robotic surgery certified pediatric urologists. Fascia was closed at all port sites. Nearly all patients (97%) had indwelling ureteral stents for 4–6 weeks, and all had urethral catheterization overnight. Use of a postoperative drain varied by individual surgeon preference. When used, the drain was placed through an ipsilateral port site, with fascia closed adjacent to the drain. Ultrasounds are typically obtained 3, 6, and 12 months postoperatively. Diuretic renography is performed selectively as dictated by sonographic findings, symptoms, and/or attending surgeon preference.

Body mass index (BMI) was calculated using the standard formula [weight (kg)/height^2 (m)]. Adult definitions of obesity based on BMI alone cannot be utilized because of age-based variation of BMI in children. Therefore, age-based percentile BMI was determined using the Centers for Disease Control (CDC) criteria for children between 2 and 19 years of age [8] and World Health Organization (WHO) criteria for children $<$2 years of age [9]. Patients were categorized as healthy weight (BMI percentile $<$85th), overweight (BMI percentile $\geq$85th), and obese (BMI percentile $\geq$95th) as determined by CDC and Institute of Medicine recommendations [10].

Successful outcome was defined as resolution of symptoms, if present, and/or decreased hydronephrosis on ultrasonography (Society for Fetal Urology (SFU) grading) [11] or improved washout on diuretic renography, if performed.

Complications were assessed using the Clavien-Dindo Classification [12]. Clavien Grade 0 indicates no complication, Clavien Grade I includes any deviation from normal postoperative course without the need for pharmacological treatment or other intervention; Clavien Grade II includes any complication requiring pharmacological treatment with drugs other than such allowed for grade I (antipyretics, analgesics, etc.) such as UTI, Candida diaper dermatitis, etc.; Clavien Grade III includes complications requiring surgical, endoscopic, or radiological intervention; Clavien Grade IV includes life-threatening complications requiring intermediate or intensive care management; and Clavien Grade V is death of a patient. We grouped Clavien Grade I and II as minor complications and Clavien Grade III–V as major complications.

Primary outcomes assessed included success of the procedure, as defined above, and complications. Secondary outcomes assessed included operative time, estimated blood loss (EBL), length of stay (LOS) and narcotic use postoperatively. Operative times were measured from the start of procedure to skin closure. This included port placement and robotic docking as well as cystoscopy, if performed. LOS was measured from the time the patient arrived in the observational unit to discharge, not including postoperative recovery room. Morphine-equivalent narcotic administration was measured from immediately postoperatively to discharge, and converted by a standard web-based calculation.

Groups were compared regarding demographics as well as operative and postoperative data for primary and secondary outcomes. Differences between groups were evaluated with Chi-square tests and Student's *t*-tests. A p value of less than 0.05 was considered statistically significant. All statistical analysis was performed with SPSS version 12.0 (2003; IBM, Armonk, NY, USA).

Results

Of the 103 patients included in this study, 79 patients (77%) were included in the healthy weight group and 24 patients (23%) in the overweight group. Of the 24 overweight patients, 10 (9.7% of the entire RALP cohort) were classified as obese. Demographic comparison between the groups was similar and is represented in Table 1. Age was lower in the obese group, but this was not statistically significant. As expected, BMI and BMI percentile were both significantly higher in the overweight and obese groups. Fifteen patients were undergoing a reoperative pyeloplasty after failed open (13) or RAL (2) pyeloplasty. There was a lower proportion of symptomatic patients (4/10, 40%) in the obese group than healthy weight or overweight groups.

Primary outcome data are shown in Table 2. Mean follow-up was 20.3 months (range 3.0–55), with no difference between groups. Overall, sonographic improvement of hydronephrosis by SFU grade occurred in 91/100 (91%). Three patients had clinical follow-up but failed to return for postop imaging. A total of four patients (3.4%) required reoperative pyeloplasty: three healthy weight patients did