Surgical Management of Congenital Ureteropelvic Junction Obstruction: A Pediatric Health Information System Database Study

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Purpose: Although laparoscopic pyeloplasty has gained popularity, to our knowledge no multi-institutional study has evaluated the prevalence of this approach in children. We used a multicenter database to determine trends in the treatment of congenital ureteropelvic junction obstruction.

Materials and Methods: The Pediatric Health Information System database contains data on 37 freestanding hospitals for children across the United States. We extracted data on 0 to 19-year-old patients from 2001 to 2006 with the ICD-9 diagnosis code for congenital ureteropelvic junction obstruction and the procedure code for the correction of ureteropelvic junction obstruction. We identified laparoscopic cases based on hospital charges for 1) laparoscope, 2) trocar, 3) insufflating needle or 4) insufflator and tubing. Data were then analyzed using the chi-square and Student t tests to determine management trends.

Results: We identified 2,353 patients, of whom 2,177 (92.5%) underwent open pyeloplasty and 176 (7.5%) underwent laparoscopic pyeloplasty. The percent of pediatric pyeloplasties performed laparoscopically increased from 2001 to 2003 (2.53% to 9.73%) and has since remained stable. Patients undergoing laparoscopic pyeloplasty were significantly older than those in the open group (age 8.2 vs 3.3 years, $p < 0.0001$). Average hospital charges were significantly higher in the laparoscopic group than in the open group ($23,295.71 vs $16,467.49, $p < 0.05$). There was no significant difference in terms of race, gender or length of stay.

Conclusions: The percent of pediatric pyeloplasties performed laparoscopically has increased with time. However, laparoscopic pyeloplasty is associated with higher hospital charges than open surgery without a significant decrease in length of stay.

Key Words: ureter, ureteral obstruction, laparoscopy, kidney

Options for the surgical management of UPJ obstruction have grown in the last decade with minimally invasive approaches gaining popularity in adults. Laparoscopic approaches have shown advantages over open surgery in the adult population, including decreased operative times, blood loss, analgesic requirements and postoperative stays, without compromising long-term outcomes.[1,2] As a result, laparoscopic techniques have been gaining popularity for UPJ obstruction in adults with a recent survey suggesting that more than a third of adult urologists and more than two-thirds of academic adult urologists use the laparoscopic approach as the preferred treatment for primary UPJ obstruction.[3]

Although literature supports the increasing use of laparoscopic pyeloplasty in the adult population, to our knowledge no multi-institutional study has evaluated trends in laparoscopic urological procedures in children. We used a nationwide pediatric database to better elucidate contemporary trends in procedures performed to correct congenital UPJ obstruction and determine patient factors associated with these trends. We used the PHIS database, analyzing data from a multi-institutional pool of 37 freestanding hospitals for children, to evaluate these trends.

MATERIALS AND METHODS

The PHIS Database

The PHIS database was created by a business alliance of noncompeting, freestanding hospitals for children in the United States. To date 45 medical centers have contributed data, consisting of 125 data elements per patient encounter. At the time of this analysis 37 of these hospitals had contributed data to this study, encompassing approximately 70% of the 55 freestanding hospitals for children in the United States.[4] These data include inpatient admissions, medical short stays, ambulatory surgery visits and emergency department visits. Of the 20 major metropolitan areas in the United States 17 are represented.

As a repository for data comprising more than 250,000 pediatric encounters annually, the PHIS database represents a comprehensive database by which outcomes and resource use can be studied. Data include demographics, payer and cost data, multiple clinical conditions and severity

Study received institutional review board approval.

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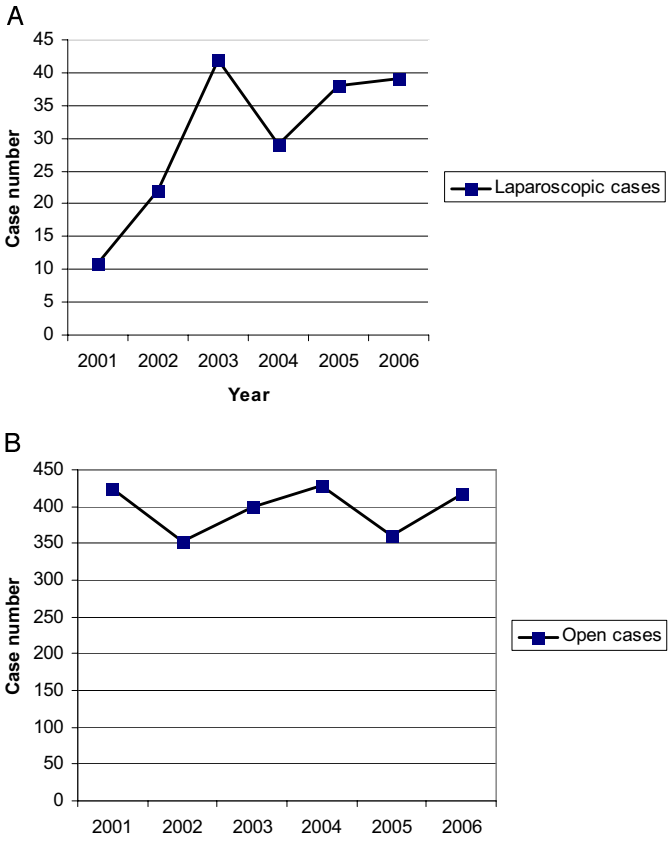

Number of laparoscopic pyeloplasties from 2001 to 2006. *A*, laparoscopic. *B*, open.

indexes using All-Patient Refined Diagnosis Related Groups technology. On-line data consist of a rolling 5-year period of data that is updated quarterly with archived data extending to 1992.[5]

Database Interrogation

After institutional review board approval was granted we extracted data on patients 0 to 19 years old from 2001 to 2006 with the ICD-9 diagnosis code for congenital UPJ obstruction (753.21) and the procedure code for the correction of UPJ obstruction (55.87).[6] Patients who underwent additional concomitant urological procedures were excluded. Results were blinded to hospital identity, which is consistent with PHIS policies.

Due to the lack of ICD-9 codes for laparoscopic pyeloplasty we identified laparoscopic cases by evaluating hospital charges for 1) laparoscope, 2) trocar, 3) insufflating needle and 4) insufflator and tubing. Patients with a combination of at least 2 of these 4 charges were included in the laparoscopic pyeloplasty group. The remaining patients were included in the open pyeloplasty group. To ensure that our method of extracting laparoscopic patients was accurate we cross-referenced patients from our institution to verify that those identified as having undergone laparoscopy in the database had undergone laparoscopic pyeloplasty.

The primary outcome variables measured were patient demographics, including age, race and gender, hospital stay in days and hospital charges adjusted for inflation to 2006 dollars using published conversion factors.[7] Data were then analyzed using the Student t test to determine management trends for continuous variables and the chi-square test to evaluate categorical variables after data on each sample were evaluated to confirm a Gaussian distribution. Results were considered significant at $p < 0.05$.

RESULTS

We identified 2,353 patients with a primary diagnosis of congenital UPJ obstruction who underwent surgical correction during 2001 to 2006. Of these patients 2,177 (92.5%) underwent open pyeloplasty and 176 (7.5%) underwent laparoscopic pyeloplasty. The percent of pediatric pyeloplasties performed laparoscopically increased from 2001 to 2003 (2.53% to 9.73%). Since 2003, the rate of laparoscopic pyeloplasty remained stable at approximately 10% (see figure).

Demographics

Patients undergoing laparoscopic pyeloplasty were significantly older than those in the open group (age 8.2 vs 3.3. years, $p < 0.0001$, table 1). No gender differences were seen between the 2 groups with most patients in the open and laparoscopic groups being male (69.3% and 71.1%, respectively). Regarding race, white children represented the majority in the open and laparoscopic groups (75.1% and 87.5%, respectively). Minority children were more likely to undergo open than laparoscopic surgery, although this was not statistically significant ($p = 0.07$).

Length of Stay and Hospital Charges

Average hospital charges were significantly higher in the laparoscopic group than in the open group ($23,295.71 vs $16,467.49, $p < 0.05$, table 2). There was no significant difference in mean length of stay with patients in the open and laparoscopic groups approximating 2 to 3 days in the hospital (2.58 and 2.68, respectively).

DISCUSSION

Laparoscopic techniques have been increasing in popularity in pediatric urology. As technologies have continued to advance, laparoscopy has advanced from primarily a diagnostic tool to a viable alternative to open surgery. Cases such as nephrectomy and orchiopexy have gained wide acceptance and they are arguably replacing the open approach as the gold standard.[8] However, laparoscopy for reconstructive surgery such as pyeloplasty has been less widely embraced. In our study, although the rate of laparoscopic pyeloplasty has been increasing in the last 5 years, open pyeloplasty remains the more frequent approach.

TABLE 1. *Patient demographics and hospital characteristics*

	Total Sample	Laparoscopy	Open
No. pts	2,353	176	2,177
Mean ± SD age	3.72 ± 4.73	8.18 ± 5.70	3.35 ± 4.44
% Girls/boys	29/71	30.7/69.3	28.9/71.1
% Ethnicity:			
White	75.9	87.5	75.1
Black	7.9	5.7	8.1
Asian	1.6	0.6	1.7
Native American	0.3	0	0.3
Missing/other	14.0	6.2	14.6
% Hospital fellowship	52.5	46	53