

Is There a Role for Prophylactic Antibiotics Post Pediatric Pyeloplasty?

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Abstract

Background: The use of postoperative prophylactic antibiotics in pediatric upper urinary tract reconstruction remains controversial. In this study, we elected to examine if prophylactic antibiotics post pediatric dismember pyeloplasty reduce the incidence of clinically symptomatic urinary tract infections (UTIs) in our institution. As a secondary outcome, we also examine which patient population benefits the most from low dose prophylactic antibiotics.

Methods: Institutional review board approval (IRB) was obtained. A retrospective study was performed in patients who underwent dismember pyeloplasty (2011-2017) at our institution. Patients with prior history of urologic interventions or other abnormalities of the genitourinary tract were excluded. Demographics (age, gender, ethnicity, insurance status), prior history of culture proven UTIs, surgical details (administration of perioperative antibiotics), and postoperative outcomes, including any readmission 30 days post repair, any urine samples, and culture results were collected.

Results: 209 patients (149 boys, 60 girls) met our inclusion criteria. The average age was 6 years (range: 2 months-18 years). 160 patients (77%) underwent robotic-assisted pyeloplasty. Thirty-one patients underwent open repair (15%). 176 (84%) had an indwelling ureteral stent. Eleven patients (5%) had a culture-proven febrile UTI within 30-days postoperatively. No significant differences were seen in postoperative complications or incidence of UTIs when comparing surgical approaches, ureteral stent, or the use of prophylactic post-operative antibiotics. Secondary review of patients with post-operative febrile UTIs noted younger age (2.8 v. 6.2 years, $p = 0.02$) and positive intraoperative urine culture ($p = 0.01$) as significant risk factors.

Conclusion: The incidence of postoperative UTIs in our cohort is relatively low. There is a higher incidence of febrile UTIs in patients less than 3 years old and those with positive intraoperative urine culture. The use of prophylactic antibiotics in patients post dismember pyeloplasty did not appear to affect the incidence of febrile culture proven UTIs, however, might be important in younger patients pre potty training.

Background

The use of postoperative prophylactic antibiotics in pediatric upper urinary tract reconstruction remains controversial (1). With growing concern for the risk of early antibiotic exposure in the developing immune system (2), we elected to examine if prophylactic antibiotics post pediatric dismembered pyeloplasty (UPJ) reduce the incidence of clinically symptomatic urinary tract infections (UTIs) in our institution. As a secondary outcome, we also examine which patient populations benefit the most from low dose prophylactic antibiotics.

Methods

Ethical approval from the Institutional Review Board (IRB) was obtained. Patients 18 years or younger, who underwent UPJ repair between years 2011 to 2017, were identified using the CPT codes 50400, 50405 (pyeloplasty), and 50544 (laparoscopic). Exclusion criteria included redo pyeloplasty, history of prior genitourinary interventions, and presence of a solitary kidney or any other developmental abnormalities of the genitourinary tract. Demographics (age, gender, ethnicity, and insurance status, surrogate for access to care), as well as prior antibiotic exposure unrelated to the urinary tract were collected. Any history of UTIs, type of perioperative antibiotics, intraoperative urine cultures, operative details, including surgical approach (open, laparoscopic or robot-assisted) and any intraoperative urinary drainage placement and readmissions were noted. Postoperative febrile UTI is defined as a fever ($>38^{\circ}\text{C}$) within 30 days with positive urine culture ($>50,000 \text{ CFUs/ml}$) as defined by the 2011 AAP guideline (3). Fisher exact test and Mann Whitney test were used to compare patients with and without postoperative febrile UTIs, with significance defined as $p<0.05$.

Result

Of 255 patients who underwent pyeloplasty, 46 patients were excluded due to previously defined criteria. Average age was 6.0 years old (2 months to 18 years) and 71% of our study population was male and 40% had public insurance (table I). 77% of our patients underwent robotic assisted pyeloplasty, 15% had open repair, while 9% underwent laparoscopic approach. Intraoperative ureteral stents were placed in 84% of patients and 26.3% were discharged on prophylactic antibiotics. Eleven patients (5%) experienced postoperative febrile UTIs per criteria. There was no statistical significance in terms of surgical approach, presence of stent, or the use of postoperative antibiotics (Table 1). Statistical significance was noted in the age of the patients with postoperative UTIs. Younger patients, those between the age of 2.8 ($+/-3.22$) years old were more likely to present with fever and positive urine culture ($p = 0.02$). Further analysis did not demonstrate a statistically significant decrease in the incidence of febrile UTIs with or without the use of prophylactic postoperative antibiotics ($p = 0.73$). Insurance status was used as a surrogate to access to care in our study. Our initial analysis did not demonstrate a significant difference in the incidence of febrile UTIs based on fever of $>38^{\circ}\text{C}$ and positive urine culture; however, when we combined patients presenting with culture-proven febrile UTI and positive urinalysis with fever, those with Medicaid had a higher incidence (65% versus 38%, $p = 0.038$).

Discussion

Amongst children undergoing routine UPJ repair, the incidence of postoperative febrile UTI in our cohort is relatively low (5%), consistent with current reported rates of 1–3% (4). When evaluating potential risk factors for development of febrile UTI in the initial 30-day postoperative period, we did not identify an association between the use of perioperative antibiotics, surgical approach, or urinary drainage method. However, younger age and the presence of a positive culture within the month to surgery did correlate with a higher rate of postoperative febrile UTI. Furthermore, additional analysis indicate that insurance status might also impact the presentation of UTIs. Similar results were seen in Ferroni et al., where

postoperative antibiotics did not alter the rate of UTIs in patients undergoing minimally-invasive UPJ repair (5). Our study population included various surgical techniques, generalizable to the overall pediatric surgery population. While our study indicates that antibiotic prophylaxis is not effective in reducing post-pyeloplasty UTIs in majority of our patients, there is a selective group of young children who might benefit from prophylactic antibiotics. Our analysis indicates that children younger than 3 years old have a higher risk of postoperative febrile UTIs. This might be related to toilet-training, similar to the population included in the recent AAP UTI guideline (3).

While there has been concern for potential infection risk associated with ureteral stent usage due to high colonization rates (6), the risk of infection is low when they are maintained for less than 90 days (7). Since our post-pyeloplasty stents remain in place for at most 4–6 weeks, it makes sense that we did not find any association between use of a ureteral stent and postoperative febrile UTI. We also used patient insurance type, Medicaid versus non-Medicaid, as a surrogate for potential socioeconomic status. In our cohort, patients with Medicaid did not show a higher risk of febrile UTI postoperatively. However, they were more likely to have a febrile event postoperatively when we include febrile UTIs and fever with positive urinalysis. Our study was not powered to study this difference; moving forward, future study would be needed to if there is a social factor as potential barrier to care access. In our study population, The results of a positive urine cultures within 30 days of surgery did significantly correlate with incidence of clinically symptomatic UTIs postoperative UTI. Perhaps this is a cohort of patients who should be maintained on postoperative antibiotics, and these patients should be selectively treated with antibiotics to prevent a febrile UTI. There is another patient population that are at risk for postoperative UTIs. Studies have shown that febrile UTI's represent the most common type of complication in young patients diagnosed with bronchiolitis patients and are particularly common in infants with bronchiolitis (positive RSV culture with symptoms) (7–10). The current AAP guidelines on bronchiolitis recommend treating only patients with symptoms for concurrent UTI and bronchiolitis (11). Based on these studies, we suggest a preoperative culture within 30 days of surgery for patients under 2 years of age with a history of bronchiolitis. A urine culture is particularly high yield for this cohort and could help determine whether to treat with prophylactic antibiotics. A complicating factor in our analysis of the effect of antibiotic prophylaxis is the high rate of antibiotic treatment for "UTI's" without use of urinalysis or urine culture. A 2013 analysis by Copp et al. estimated that, of all patients treated with antibiotics for UTI, 76% receive a urinalysis and only 57% receive urine culture (12). This rapid treatment paradigm likely comes from the desire to limit renal scarring. As the study by Shaikh, et al. shows, a delay in antibiotic treatment greater than 48 hours is associated with significant risk for renal scarring in children younger than 6 years of age (13). This risk encourages physicians to quickly respond to suspected febrile UTI's, but we believe there is an opportunity for more judicious prophylactic antibiotic use. To more closely consider the effect of this treatment paradigm, we included patients who presented with a fever and positive urinalysis within 30 days of surgery in our analysis. These patients often received antibiotics. However, the addition of prophylactic antibiotics did not affect the rate of febrile urinary events of either type. While our study did show a limited potential for antibiotic use in patients undergoing pyeloplasty, our study was limited by its retrospective nature in a single institution. Furthermore, most patients had ureteral stents and

robotic surgery, which makes comparison of the different urinary drainage options and surgical approaches limited by numbers. Since we were only able to gather data available during our patient encounters, it is possible that patients were seen at outside facilities for febrile UTIs with no records of urinalysis or culture results, and these events were missed in our analysis. Lastly, most of the urine cultures obtained for patients undergoing pyeloplasty were done intraoperatively at the time of surgery, and therefore these patients could not be treated prior to surgery based on results. This is mainly limited by patient convenience to present for a separate appointment prior to surgery to obtain a urine culture. Based on our current model, the intraoperative urine culture results can be used to guide use of antibiotics postoperatively on day of discharge, usually the day after surgery. Finally, due to the overall low number of events of febrile UTIs after pyeloplasty, larger groups are needed to better define an algorithm guiding prophylactic antibiotic use in higher risk patients.

Conclusion

Overall, our data show no increased risk of postoperative febrile UTIs with use of ureteral stents, deterring the reflexive use of prophylactic antibiotics in patients undergoing pyeloplasty. However, in judicious use in select higher risk patients, such as those with positive cultures within 30 days of surgery and patients that are 2 years or younger, could potentially prevent postoperative febrile UTIs. Further studies in a prospective fashion in needed to better delineate a prophylactic treatment algorithm.

Abbreviations

UPJ = pediatric dismembered pyeloplasty

UTI = urinary tract infection

IRB = Institutional Review Board

Declarations

Declarations:

Ethics approval and consent to participate: Ethical approval for this study from the Institutional Review Board at Baylor College of Medicine, under protocol number H-33575. We obtained a waiver of the requirement for informed consent for this retrospective chart review study from the same IRB.

Consent for publication: Not applicable

Availability of data and materials: The datasets used during the current study are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests

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Authors' contributions: MW initiated the study, and MW, KS, HZ, and SR were responsible for study design. HZ was responsible for statistical design and analysis. SR and JK wrote the protocol and managed ethical approval. KS, KP, and PN reviewed medical charts and obtained data. KS, KP, PN, and JK contributed to analysis of the data. KS, MW, and JK prepared and revised the manuscript.

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Table

Due to technical limitations, table 1 is only available as a download in the supplemental files section.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Table1.UPJ.docx](#)