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Association of Prematurity and Urogenital Comorbidities with Postoperative Outcomes of Ureteroneocystostomy for Vesicoureteral Reflux

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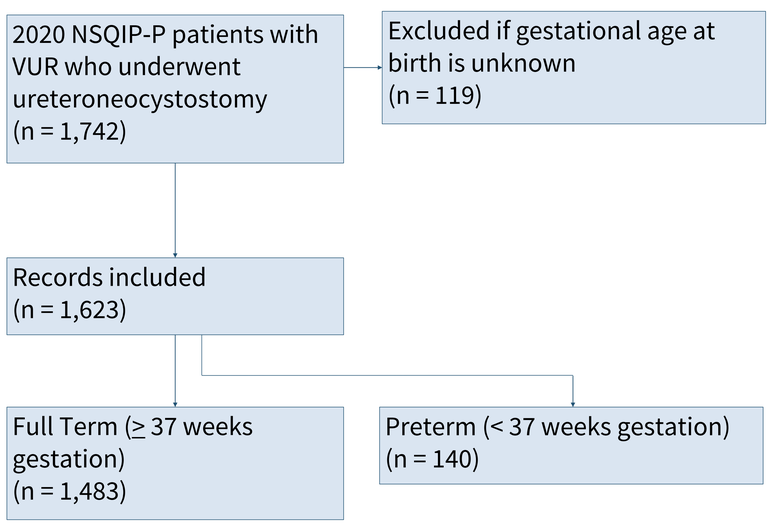
Introduction

An estimated 20-30% of congenital anomalies involve the kidney and ureter, and may lead to the backflow of urine from the bladder to the kidney, a condition called vesicoureteral reflux (VUR).[1] Depending on its severity, VUR may require surgical correction with ureteroneocystostomy (UNC). Prematurity is known to increase morbidity and mortality of patients undergoing repair of congenital anomalies.[2] However, the impact of premature birth and presence of urogenital comorbidities on outcomes of UNC is not known. The objective of this study is to determine the relationship between premature birth and urogenital anomalies with operative outcomes of UNC for VUR.

Methods

- Analysis of 2020 American College of Surgeons National Surgical Quality Improvement Program-Pediatric (NSQIP-P) database
- Demographics, preoperative factors, and comorbid conditions including urogenital comorbidities were analyzed. Postoperative complications were also analyzed.
    - Pearson chi square tests for categorical variables
    - T-test and Welch test for continuous variables
    - Univariate and multivariate analysis

Figure 1: Study design



Results

Prematurity

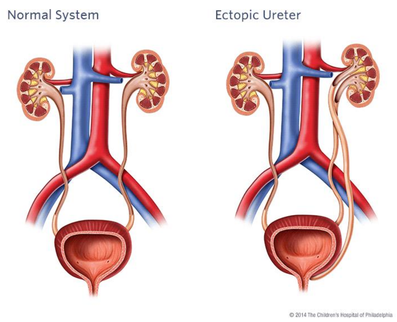
The overall rate of prematurity was 8.6%, compared to 10.5% in the general population.[3] 4.9% were born at 35-36 weeks, 2.6% were born at 31-34 weeks, and 1.0% were born at or before 30 weeks. Premature patients were more likely to have at least one comorbidity (43% compared to 17%). Premature patients were more likely to have ectopic ureter (P = 0.001). Two patients, both full term, died within 30 days of operation. Significant complications are listed in Table 1.

Table 1. Statistical analysis of full term versus preterm UNC patients.

	Total Cohort		*Full Term*		*Preterm*		*P Value*
Total No. (%)	**1623**		**1484**	*(91.4%)*	**140**	*(8.6%)*	
Pt Characteristics:							
Mean Age, days (SD)	**1587.5**	*(1223)*	**1587.5**	*(1226)*	**1509.6**	*(1191)*	
Height, in. (SD)	**39.4**	*(1.5)*	**39.5**	*(1.5)*	**37.8**	*(0.4)*	P = 0.047
Weight, lbs. (SD)	**40.6**	*(1.9)*	**41.0**	*(1.8)*	**36.8**	*(0.5)*	P = 0.020
Comorbid Conditions:							
Developmental Delay	**114**	*(7.0%)*	**83**	*(5.6%)*	**31**	*(22.1%)*	P < 0.001
Bronchopulmonary Dysplasia	**17**	*(1.1%)*	**9**	*(0.6%)*	**8**	*(5.7%)*	P < 0.001
Gastrointestinal Disease	**88**	*(5.4%)*	**60**	*(4.1%)*	**28**	*(20.0%)*	P < 0.001
Major Cardiac Risk Factors	**49**	*(3.0%)*	**36**	*(2.4%)*	**13**	*(9.3%)*	P < 0.001
Urogenital Comorbidities:							
Duplex Kidney	**95**	*(9.4%)*	**90**	*(6.1%)*	**5**	*(3.6%)*	
Ureterocele	**57**	*(6.5%)*	**52**	*(3.5%)*	**5**	*(3.6%)*	
Ectopic Ureter	**26**	*(2.6%)*	**19**	*(1.3%)*	**7**	*(5.0%)*	P = 0.001
Operative Considerations:							
Operative Time, min. (SD)	**168.2**	*(78.0)*	**166.8**	*(74.7)*	**183.3**	*(106.4)*	
Laparoscopic/MIS Approach	**202**	*(12.5%)*	**189**	*(12.7%)*	**13**	*(9.3%)*	
Open Approach	**1267**	*(78.1%)*	**1153**	*(77.8%)*	**114**	*(81.4%)*	
Complications:							
Readmission	**85**	*(5.2%)*	**72**	*(4.9%)*	**13**	*(9.3%)*	P = 0.025
Blood Transfusion	**7**	*(0.4%)*	**4**	*(0.3%)*	**3**	*(2.1%)*	P = 0.001
ED Visits	**149**	*(9.2%)*	**124**	*(8.4%)*	**25**	*(17.9%)*	P < 0.001
Unplanned Procedure	**31**	*(1.9%)*	**23**	*(1.6%)*	**8**	*(5.7%)*	P = 0.001
Unplanned Catheter	**43**	*(2.7%)*	**32**	*(2.2%)*	**11**	*(7.9%)*	P < 0.001

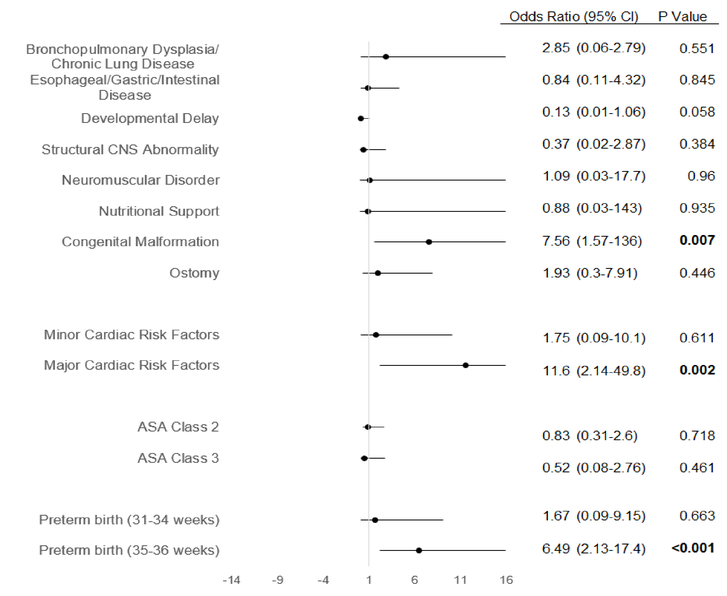
Ectopic Ureter

Ectopic Ureter: a congenital anomaly in which the distal ureter terminates somewhere other than the trigone of the bladder



We completed a subset analysis to determine factors that are associated with ectopic ureter. When controlling for other factors in multivariate analysis, we found that congenital malformation, major cardiac risk factors, and gestational age 35-36 weeks were associated with ectopic ureter. Figure 2 outlines the odds ratio with 95% confidence interval.

Figure 2. Multivariate analysis of factors predicting ectopic ureter.



Conclusions

Prematurity alone is not associated with incidence of VUR; however, preterm patients have significantly higher risk of postoperative complications despite no differences in operative approach, VUR disease severity, prior VUR procedure, preoperative urine culture, and total operative time. These complications include readmission, blood transfusion, ED visits, unplanned procedure related to anti-reflux procedure, and unplanned urinary catheter compared to patients born at term.

This may be related to significantly higher rates of neurologic, cardiac, pulmonary, and gastrointestinal comorbidities in premature patients at the time of surgery.

Ectopic ureter is more likely to be present in premature than full term UNC patients, while duplex kidney and ureterocele are not. In this population, factors that predict ectopic ureter include congenital malformation, major cardiac risk factors, and gestational age at birth of 35-36 weeks.

References

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2 Skertich NJ. et. al. *J Ped Surg.* 2020:55(12)2608-2613.
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Image: https://www.chop.edu/conditions-diseases/ectopic-ureter