Prenatal hydronephrosis: early evaluation

Carlos R. Estrada Jr

Department of Urology, Children's Hospital Boston and Harvard Medical School, Boston, Massachusetts, USA

Correspondence to Carlos R. Estrada, Jr, MD, Department of Urology, Children's Hospital Boston, 300 Longwood Avenue, HU370, Boston, MA 02115, USA
Tel: +1 617 355 7796; fax: +1 617 730 0474;
e-mail: carlos.estrada@childrens.harvard.edu

Current Opinion in Urology 2008, 18:401–403

Purpose of review

Fetal hydronephrosis is the most common anomaly detected on antenatal ultrasound examination, and its significance and management remain controversial. This review aims to address the early postnatal evaluation of the child with prenatally diagnosed hydronephrosis.

Recent findings

The risk of significant urological pathology increases with the severity of prenatal hydronephrosis. The most common underlying conditions are ureteropelvic junction obstruction and vesicoureteral reflux. The use of postnatal ultrasonograpy in all patients with a history of any degree of prenatal hydronephrosis is routine, but ascertaining which patients require postnatal evaluation with a voiding cystourethrogram to investigate for vesicoureteral reflux remains controversial. Mild cases are the most controversial as the risk of pathology is lessened, however the risk of vesicoureteral reflux and consequent febrile urinary tract infection may be significant. Early postnatal evaluation of all children with a history of prenatal hydronephrosis with a voiding cystourethrogram may reduce this risk. No prospective randomized clinical trials are available, however, to adequately address the question of which patients require postnatal evaluation.

Summary

The postnatal management of prenatal hydronephrosis remains controversial. Sufficient data are lacking to inform patient risk stratification. Therefore, early postnatal evaluation of children with a history of any degree of prenatal hydronephrosis with an ultrasound and voiding cystourethrogram is reasonable and may reduce the risk of febrile urinary tract infection.

Keywords

early diagnosis, hydronephrosis, prenatal diagnosis, vesicoureteral reflux

Curr Opin Urol 18:401–403

0963-0643

Introduction

Fetal hydronephrosis is the most common anomaly detected on antenatal ultrasound examination, affecting 1–5% of pregnancies [1]. Despite its frequency, the appropriate postnatal management of prenatal hydronephrosis (PNH) is not well defined. Conflicting reports on the clinical significance of PNH underpin the lack of consensus on how to manage it. The degree of PNH varies from mild to severe, and intuitively, the degree of PNH should correlate with the severity of the underlying etiology. While this notion has been supported [1,2••,3,4••], the lack of correlation between degree of PNH and severity of etiology has also been well documented [5,6]. Due to these inconsistencies, the appropriate postnatal evaluation of the child with a history of PNH remains incompletely defined and controversial [7].

Classification of prenatal hydronephrosis

The degree of PNH is inconsistently reported in the literature, and this reflects a lack of consensus on PNH grading. Most studies report the anterior posterior diameter (APD) of the fetal renal pelvis at a gestational age or specific trimester. In a recent large meta-analysis by Lee *et al.* [1], PNH was classified into five groups based on APD in the second and third trimester (Table 1). This classification system includes two additional nonconventional classifications, mild/moderate and moderate/severe, to account for reporting variability in the available literature on PNH. The use of three groups – mild, moderate, and severe – based on APD in the second or third trimester (Table 1), however, is sufficient for clinical practice, and is consistent with the majority of available studies.

Clinical significance of prenatal hydronephrosis

The risk of postnatal pathology determines the clinical significance of PNH, and therefore directs postnatal evaluation and management. The most common pathological processes include ureteropelvic junction obstruction (UPJO) and vesicoureteral reflux (VUR), followed by posterior urethral valves, ureteral obstruction, and other

Table 1 Classification of prenatal hydronephrosis (PNH) by anterior posterior diameter (APD)

	APD (mm)	
PNH classification	Second trimester	Third trimester
Mild	≤7	≤9
Mild/moderate	<10	<15
Moderate	7–10	9–15
Moderate/severe	≥7	≥9
Severe	≥10	≥15

Two additional groups, mild/moderate and moderate/severe, were included in the metaanalysis by Lee *et al.* [1] to account for the variability in the literature.

less common conditions [1,2••,4••]. The incidence of these in relation to differing degrees of PNH is variably reported, but the intuitive notion that more severe degrees of PNH are associated with an increased risk for postnatal pathology is well supported [1,4••]. Lee *et al.* demonstrated that, overall, the risk of any postnatal pathology per degree of PNH was 11.9% for mild, 45.1% for moderate, and 88.3% for severe. More specifically, the risk of UPJO increased significantly with greater degrees of PNH, but the risk of VUR was not significantly different among all severity groups. Other groups, however, have reported a positive correlation between degree of PNH and incidence of VUR; that is, more severe degrees of PNH are associated with an increased risk of VUR [8]. Available data suggest that VUR is present in 17–38% of children with PNH [5,8,9], but its significance is ill defined. The questions surrounding the association of VUR with PNH are the basis for a large part of the controversy related to the appropriate postnatal evaluation of PNH. Ultimately, and underlying pathology notwithstanding, the most important outcome measure is the incidence of febrile urinary tract infection (UTI), but standardized outcome reporting for PNH does not exist. This makes it difficult for the treating physician to critically evaluate the available literature, and virtually impossible to derive evidence-based practice guidelines.

In an attempt to address the critical questions regarding clinical outcome of PNH, Coelho *et al.* [2••,4••] reported in two separate studies on the same patient cohort with a mean APD of 10 mm (range 7.8–14 mm) and a median follow up of 24 months. In their reports, three important results were provided. First, in a multivariate model two variables were identified as independent risk factors for UTI – female gender and presence of uropathy [2••]. The incidence of UTI was approximately 10 times greater in girls with VUR or UPJO than in boys without these diagnoses. The authors suggested that clinicians pay particular attention to this subset of patients. Second, VUR in patients with PNH is clinically significant. The overall incidence of VUR in their 192 patients was only 8%, but 44% of these had a UTI in the follow-up period. Only two patients underwent ureteral reimplantation, but further follow-up data were not provided. Other authors have reported that VUR associated with PNH may resolve faster than VUR discovered following a febrile UTI [10,11•], highlighting the variable clinical behavior of VUR. Coelho *et al.* also questioned the utility of prophylactic antibiotics, as 74% of their patients had their UTI while on prophylaxis. A lack of data addressing compliance with the prophylaxis regimen, however, precludes any definitive conclusions. Lastly, Coelho *et al.* reported that even patients with a history of mild PNH are at risk for significant uropathy. Of the 89 patients with mild PNH, 18% had a significant uropathy (UPJO 7%, VUR 10%, megaureter 1%). Moreover, 7.8% had a UTI during the follow-up period, but the incidence of UTI was significantly higher among infants with moderate or severe PNH (20%). Based on these data, the authors concluded that mild PNH may not require invasive diagnostic testing (voiding cystourethrogram – VCUG) but rather strict clinical surveillance for UTI and progression of hydronephrosis. Whether these data are optimistic or pessimistic is open to the readers' interpretation, biases, and personal experience. This author generally regards a 7.8% incidence of febrile UTI as unacceptably high when compared with the 1% that is expected in the general population.

Postnatal evaluation

The understanding that any degree of PNH can be associated with significant urological pathology can set the stage for deriving a consistent approach to the evaluation of the child with a history of PNH. The ultimate goal is the prevention of febrile UTI and its attendant risk of renal damage. As discussed above, the inconsistencies in the available literature make it difficult to stratify patients solely on the basis of the degree of PNH. Some groups have utilized the degree of hydronephrosis on the first postnatal ultrasound to direct further evaluation [12]. Other studies, however, have demonstrated a lack of association between postnatal sonographic findings and underlying pathology [2••,13]. Given the uncertainty of its value and validity, it is difficult to rely solely on ultrasonography in the postnatal evaluation of PNH. In all cases except for severe bilateral PNH, we typically obtain the first postnatal ultrasound in 2–4 weeks postnatally, which is consistent with most reports in the literature. As alluded to above, the use of VCUG is controversial. There are several papers that have recommended against VCUG in cases of mild or moderate PNH based on data that may suggest that VUR in these cases may not be clinically significant [2••,4••,5,12]. Based on their large metaanalysis, Lee *et al.* [1] suggested that the appropriate postnatal management of mild PNH remains unclear, and that well defined prospective analysis is required. Given the obvious inconsistencies in the literature, this author agrees with the absolute need for an evidence-based algorithmic approach to postnatal evaluation and management of PNH based on standardized

outcome measures. Considering the negligible risks associated with VCUG in the neonatal period [14] and the significant risk of VUR and UTI associated even with mild PNH, however, it may be prudent in the meantime to approach all patients with any degree of PNH in a similar fashion – early evaluation with an ultrasound and VCUG. Another related issue is whether antibiotic prophylaxis should be immediately administered to all infants with a history of PNH. That discussion is beyond the scope of this article, but protection against febrile UTI while awaiting evaluation may also be considered.

Conclusion

The postnatal management of infants with a history of PNH remains controversial. Sufficient data to inform patient risk stratification are lacking, but recent reports suggest that even patients with mild PNH may be at risk for febrile UTI related to VUR. Therefore, early postnatal evaluation of children with a history of any degree of PNH with an ultrasound and VCUG is reasonable. Long-term prospective studies based on standardized outcome reporting are necessary to formulate evidence-based clinical algorithms.

Acknowledgement

There are no potential conflicts of interest.

References and recommended reading

Papers of particular interest, published within the annual period of review, have been highlighted as:

- • of special interest
- •• of outstanding interest

Additional references related to this topic can also be found in the Current World Literature section in this issue (p. 442).

1 Lee RS, Cendron M, Kinnamon DD, Nguyen HT. Antenatal hydronephrosis as a predictor of postnatal outcome: a meta-analysis. Pediatrics 2006; 118:586–593.

2 •• Coelho GM, Bouzada MC, Lemos GS, *et al.* Risk factors for urinary tract infection in children with prenatal renal pelvic dilatation. J Urol 2008; 179: 284–289.

This study is a multivariate analysis of a cohort of patients with prenatal hydronephrosis that implicates female gender and urological abnormalities in the risk of UTI. Furthermore, the data suggest that even patients with a history of mild PNH are at significant risk for UTI.

3 Anderson NG, Allan RB, Abbott GD. Fluctuating fetal or neonatal renal pelvis: marker of high-grade vesicoureteral reflux. Pediatr Nephrol 2004; 19:749–753.

4 •• Coelho GM, Bouzada MC, Pereira AK, *et al.* Outcome of isolated antenatal hydronephrosis: a prospective cohort study. Pediatr Nephrol 2007; 22: 1727–1734.

This study is a prospective study defining the medium term clinical outcome of a cohort of patients with PNH. As in the related publication [2••], the data suggest that even mild PNH may be associated with significant risk of UTI.

5 Yerkes EB, Adams MC, Pope JCt, Brock JW 3rd. Does every patient with prenatal hydronephrosis need voiding cystourethrography? J Urol 1999; 162:1218–1220.

6 McIlroy PJ, Abbott GD, Anderson NG, *et al.* Outcome of primary vesicoureteric reflux detected following fetal renal pelvic dilatation. J Paediatr Child Health 2000; 36:569–573.

7 Toiviainen-Salo S, Garel L, Grignon A, *et al.* Fetal hydronephrosis: is there hope for consensus? Pediatr Radiol 2004; 34:519–529.

8 Brophy MM, Austin PF, Yan Y, Coplen DE. Vesicoureteral reflux and clinical outcomes in infants with prenatally detected hydronephrosis. J Urol 2002; 168:1716–1719; discussion 1719.

9 Phan V, Traubici J, Hershenfield B, *et al.* Vesicoureteral reflux in infants with isolated antenatal hydronephrosis. Pediatr Nephrol 2003; 18:1224–1228.

10 Knudson MJ, Austin JC, McMillan ZM, *et al.* Predictive factors of early spontaneous resolution in children with primary vesicoureteral reflux. J Urol 2007; 178:1684–1688.

11 • Merlini L, Parvex P, Anooshiravani-Dumont M, *et al.* Postnatal management of isolated mild pelvic dilatation detected in antenatal period. Acta Paediatr 2007; 96:1131–1134.

This study addresses patients with a history of moderate PNH. The authors show that, overall, the incidence of VUR in this population was 10% at 1 month, but only 3% at 1 year.

12 Moorthy I, Joshi N, Cook JV, Warren M. Antenatal hydronephrosis: negative predictive value of normal postnatal ultrasound: a 5-year study. Clin Radiol 2003; 58:964–970.

13 Jaswon MS, Dibble L, Puri S, *et al.* Prospective study of outcome in antenatally diagnosed renal pelvis dilatation. Arch Dis Child Fetal Neonatal Ed 1999; 80:F135–138.

14 Vates TS, Shull MJ, Underberg-Davis SJ, Fleisher MH. Complications of voiding cystourethrography in the evaluation of infants with prenatally detected hydronephrosis. J Urol 1999; 162:1221–1223.