Evaluation of Urinary Tract Dilation Classification System for Grading Postnatal Hydronephrosis

Amr Hodhod,* John-Paul Capolicchio, Roman Jednak, Eid El-Sherif, Abd El-Alim El-Doray and Mohamed El-Sherbiny

From the Departments of Surgery and Pediatric Surgery, Montreal Children's Hospital, McGill University, Montreal, Quebec, Canada (AH, JPC, RJ, MEl-S), and Department of Urology, Faculty of Medicine, Menoufia University, Al Minufya, Egypt (AH, EEl-S, AEl-AEl-D)

Purpose: We assessed the reliability and validity of the Urinary Tract Dilation classification system as a new grading system for postnatal hydronephrosis.

Materials and Methods: We retrospectively reviewed charts of patients who presented with hydronephrosis from 2008 to 2013. We included patients diagnosed prenatally and those with hydronephrosis discovered incidentally during the first year of life. We excluded cases involving urinary tract infection, neurogenic bladder and chromosomal anomalies, those associated with extraurinary congenital malformations and those with followup of less than 24 months without resolution. Hydronephrosis was graded postnatally using the Society for Fetal Urology system, and then the management protocol was chosen. All units were regraded using the Urinary Tract Dilation classification system and compared to the Society for Fetal Urology system to assess reliability. Univariate and multivariate analyses were performed to assess the validity of the Urinary Tract Dilation classification system in predicting hydronephrosis resolution and surgical intervention.

Results: A total of 490 patients (730 renal units) were eligible to participate. The Urinary Tract Dilation classification system was reliable in the assessment of hydronephrosis (parallel forms 0.92). Hydronephrosis resolved in 357 units (49%), and 86 units (12%) were managed by surgical intervention. The remainder of renal units demonstrated stable or improved hydronephrosis. Multivariate analysis revealed that the likelihood of surgical intervention was predicted independently by Urinary Tract Dilation classification system risk group, while Society for Fetal Urology grades were predictive of likelihood of resolution.

Conclusions: The Urinary Tract Dilation classification system is reliable for evaluation of postnatal hydronephrosis and is valid in predicting surgical intervention.

Key Words: diagnosis, hydronephrosis, multivariate analysis, patient outcome assessment

Abbreviations and Acronyms

APD = anteroposterior diameter
P = postnatal category
PUV = posterior urethral valves
SFU = Society for Fetal Urology
UTD = Urinary Tract Dilation
UTI = urinary tract infection
VUR = vesicoureteral reflux

Accepted for publication October 18, 2015.

No direct or indirect commercial incentive associated with publishing this article.

The corresponding author certifies that, when applicable, a statement(s) has been included in the manuscript documenting institutional review board, ethics committee or ethical review board study approval; principles of Helsinki Declaration were followed in lieu of formal ethics committee approval; institutional animal care and use committee approval; all human subjects provided written informed consent with guarantees of confidentiality; IRB approved protocol number; animal approved project number.

* Correspondence: Room B04.2916.3, Glen Campus, 1001 Blvd. Décarie, McGill University Health Center, Montreal, Quebec H4A 3J1, Canada (e-mail: amrwuk@yahoo.co.uk).

HYDRONEPHROSIS is the most common abnormality that can be detected prenatally and is present in about 1% to 4.5% of pregnancies.[1–4] Multiple classification systems have been used for grading prenatal hydronephrosis. However, the Society for Fetal Urology grading system is the most popular for postnatal assessment of hydronephrosis.[5–8] The Society for

0022-5347/16/1953-0725/0
THE JOURNAL OF UROLOGY®

http://dx.doi.org/10.1016/j.juro.2015.10.089
Vol. 195, 725-730, March 2016
Printed in U.S.A.

Fetal Urology grading system has limitations, such as inability to distinguish between segmental and diffuse parenchymal thinning, and the difference between grade 3 and 4 disease is unclear.[9–11]

In 2014 a new classification system was introduced to satisfy the need for a unified system for prenatal and postnatal evaluation of hydronephrosis. The new UTD classification system stratifies hydronephrosis according to risk, aiming to define a certain management pathway for each risk group.[12] The authors used many parameters that had not been used before, such as ureteral dilation, bladder status and renal parenchymal appearance. Moreover they redefined normal hydronephrosis variants and suggested that these cases be discharged from the clinic.

The UTD classification system was introduced to replace the SFU system and other grading systems. It consists of 6 parameters, namely APD of the renal pelvis, urinary tract dilation, parenchymal thickness, parenchymal appearance, ureteral status and bladder status.[12] By comparison, the SFU system evaluates hydronephrosis through 2 parameters only, ie urinary tract dilation and parenchymal thickness.[7] Therefore, we hypothesized that the UTD classification system is superior to the SFU system. However, reliability and validity have not previously been assessed. We evaluated the reliability of the postnatal UTD classification system by comparing it with the widely used SFU system. Moreover, we studied the validity of the UTD classification system through prediction of outcome (resolution and surgical intervention).

PATIENTS AND METHODS

We retrospectively reviewed the charts of all patients presenting with hydronephrosis from January 2008 to April 2013. We included all patients diagnosed prenatally and those with hydronephrosis discovered incidentally during the first year of life.

Patients with urinary tract infection, associated neurogenic bladder, multicystic dysplastic kidney, chromosomal anomalies or associated extraurinary congenital malformations were excluded. We also excluded patients with followup less than 24 months, unless the hydronephrosis had already resolved before then.

Patient demographic data were recorded. Hydronephrosis was graded on postnatal ultrasound using the SFU system. According to hydronephrosis grade, subsequent investigations such as voiding cystourethrography and renography were carried out when clinically warranted. Voiding cystourethrography was indicated in all patients with high grade hydronephrosis (SFU grade 3 or 4), hydroureter or prior UTI. Renography was requested for all patients with high grade hydronephrosis or worsening hydronephrosis at followup. Management protocol, whether conservative or surgical, was chosen and discussed with the parents.

Conservative treatment entailed periodic abdominal ultrasound and antibiotic prophylaxis in patients with high grade hydronephrosis and/or high grade VUR or recurrent UTIs. Further investigations were carried out when clinically warranted. Surgical management was performed in cases of persistent or worsening high grade hydronephrosis, renal function less than 40% or deterioration of renal function more than 10%, recurrent UTIs (especially with development of renal scarring on dimercaptosuccinic acid scan), persistent high grade VUR, presence of large or obstructive ureterocele or PUV.

We reviewed the initial abdominal ultrasound images for all included cases, and 1 author (AH) regraded cases blindly according to the UTD and SFU classification systems.[7,12] Definition of both grading systems is provided in table 1. We stratified renal units in patients with prenatal hydronephrosis and normal postnatal ultrasound as grade 0. UTD P2 was considered in the presence of peripheral calyceal dilation, dilated ureter and/or APD greater than 15 mm.[12] Moreover, presence of abnormal bladder, parenchymal thinning and/or abnormal parenchymal appearance was stratified as UTD P3.

Outcome of hydronephrosis was reviewed concerning resolution and surgical intervention. Resolved hydronephrosis was defined as spontaneous disappearance of hydronephrosis during conservative management. Renal units with nonresolved hydronephrosis and subjected to surgery were censored during statistical analysis.

SPSS®, version 20 was used to record patient data and for statistical analysis. The UTD classification system was compared to the widely used reliable SFU system to assess reliability using parallel forms analysis. The test is

Table 1. *Grading parameters for UTD and SFU classification systems*

	APD (mm)	Dilation	Parenchymal Thickness	Parenchymal Appearance	Ureter	Bladder
UTD classification:						
Normal	Less than 10	Pelvic	Normal	Normal	Normal	Normal
P1	10–15	Central calyceal	Normal	Normal	Normal	Normal
P2	15 or Greater	Peripheral calyceal	Normal	Normal	Abnormal	Normal
P3	15 or Greater	Peripheral calyceal	Abnormal	Abnormal	Abnormal	Abnormal*
SFU grade:						
0	–	None	Normal	–	–	–
1	–	Pelvic splitting	Normal	–	–	–
2	–	Pelvic + few calyces	Normal	–	–	–
3	–	Pelvic + all calyces	Normal	–	–	–
4	–	Pelvic + all calyces	Thin	–	–	–

* Ureterocele is graded P3 since it is considered a bladder abnormality in the UTD classification system.