

III. PEDIATRICS

ABDOMINAL ULTRASOUND IN THE DIAGNOSIS OF URINARY AND KIDNEY MALFORMATIONS IN CHILDREN

Camelia Daescu¹, I Sabau¹, Ioana Maris¹, I Simedrea¹, Tamara Marcovici¹, Elena Pop², Mariana Pacuraru², Adela Emandi Chirita², Corina Duncescu²

¹Pediatric Clinic I University of Medicine and Pharmacy „Victor Babeş” Timișoara

²“Louis Țurcanu” Pediatric Emergency Hospital Timișoara

Abstract

The authors tried to establish the accuracy and the positive and negative predictive value of the ultrasonography in the diagnosis of the renal malformations on a group of 116 admitted children. Positive diagnosis of the reno-urinary malformation was established based on one of the following methods: intravenous urography, voiding cystography, magnetic resonance imaging or computer tomography. Abdominal ultrasound is a noninvasive and accessible method for the diagnosis for renal system malformations with high sensibility and optimal specificity.

Key words: urinary malformations, abdominal ultrasound, accuracy

Introduction

The diagnosis of renal system malformations should be made through antenatal ultrasound screening beginning with weeks 18-20 of gestation. The early diagnosis of these malformations allows: parent's information, parent's conciliation, intrauterine surgical interventions, abortion alternative.

Objective

The authors present the sensibility, specificity, positive and negative predictive value and the accuracy

of ultrasonography in diagnosis of renal system malformations in children.

Material and methods

Group A - 116 patients with malformations of the renal system, admitted in Pediatric Clinic I, „Louis Turcanu” Pediatric Emergency Hospital Timisoara, Nephrology Department between 01 January 2006 - 31 Dec 2007. Median age was 12,91+/-5,78 yrs (neonate - 18 yrs) and sex ratio was M:F 58:58.

Group B - 100 consecutive, randomized patients without malformations of the renal system, admitted in Pediatric Clinic I, „Louis Turcanu” Pediatric Emergency Hospital Timisoara between 01 January 2006 and 31 Dec 2007. Median age was 12,3+/-3,91 yrs (neonate - 18 yrs) and sex ratio was M:F 42:58.

The authors investigated all the patients with abdominal ultrasound and sustained the kidney and urinary malformation diagnosis based on urography, voiding cystography MRI or CT.

The group B was also investigated by ultrasound and MRI or CT for other different causes, without any renal system malformations.

The accuracy and efficiency of the diagnostic criteria were analyzed (for sensitivity, specificity, positive and negative predictive values, positive and negative likelihood ratios, diagnostic and error odds ratios) by completing the observed contingency table.

Observed Contingency Table

*	Outcome Occurred	Outcome did not Occur	Totals
Risk Factor Present or Dx Test Positive	102 = a	9 = b	111 = r1
Risk Factor Absent or Dx Test Negative	5 = c	100 = d	105 = r2
Totals	107 = c1	109 = c2	216 = t

Confidence Level: 95 %

Compute

Chi-Square Tests

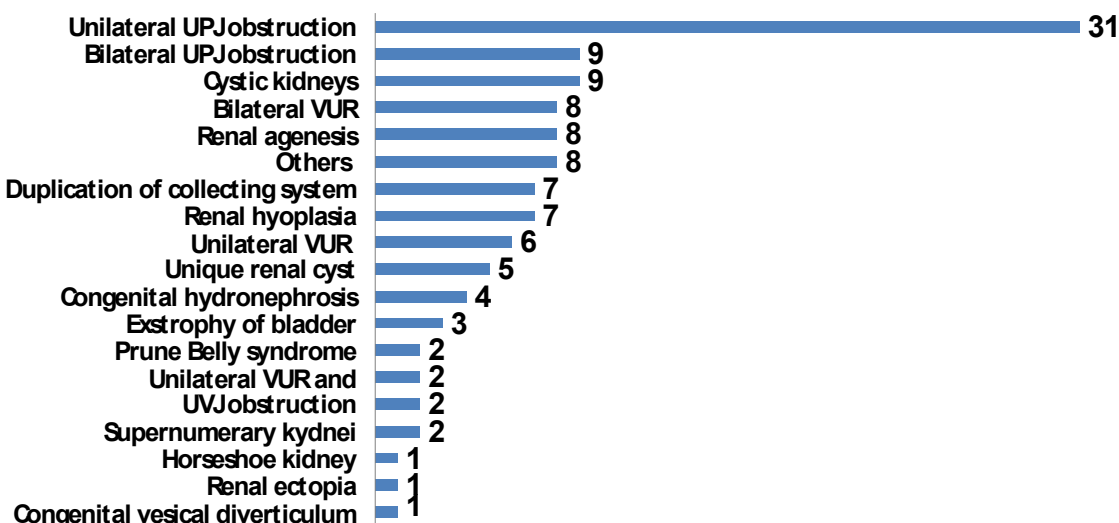
Type of Test	Chi Square	d.f.	p-value
Pearson Uncorrected	163.867	1	0.000
Yates Corrected	160.400	1	0.000
Mantel-Haenszel	163.108	1	0.000

Results

The most frequent kidney malformations were uretero-pelvic junction obstruction, cystic kidney, vesico-ureteral reflux, renal hypoplasia and renal agenesis. Other malformations were observed into a

smaller proportion. Also, we kept under observation the children with complex associated malformation and syndromes that included reno-urinary malformations.

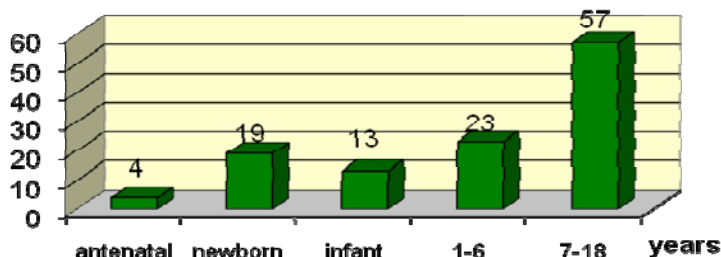
Identified renal system malformations



Median age for diagnosis was 9,64+/-5,09 years. Unfortunately, we had cases whom were diagnosed much later, even at age 7. Antenatal ultrasound

diagnostic was made in 4 cases. The newborn was diagnosed because of the association of malformations with renal failure.

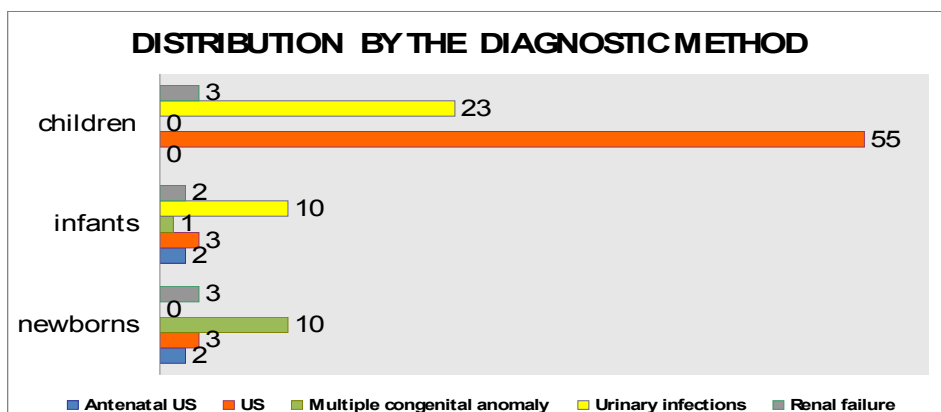
DISTRIBUTION BY AGE OF DIAGNOSIS



The renal system malformations were diagnosed late. Urinary recurrent infections determined the search for malformations, this being the most frequent way in discovering this pathology. Renal failure may be also associated; acute renal failure benefit from urological

treatment, but chronic renal failure is a drama for the patients and their families. Even if the malformations are surgically corrected, the evolution of renal failure is delayed but never stopped.

DISTRIBUTION BY THE DIAGNOSTIC METHOD



For the diagnosis of renal system malformations, in the study groups, abdominal ultrasound had the following parameters: sensitivity 95,32%, specificity

91,74%, positive predictive value 91,89%, negative predictive value 95,23%, accuracy of the method 93,51%.

Quantities Derived from the 2-by-2 Contingency Table	Value	95% Confidence Interval	
Sensitivity = $a/c1$; (use exact Binomial confidence intervals instead of these)	0,953	0,913	0,977
Specificity = $d/c2$; (use exact Binomial confidence intervals instead of these)	0,917	0,877	0,941
Positive Predictive Value (PPV) = $a/r1$; (use exact Binomial confidence intervals instead of these)	0,919	0,880	0,942
Negative Predictive Value (NPV) = $d/r2$; (use exact Binomial confidence intervals instead of these)	0,952	0,911	0,977
Diagnostic Odds Ratio = $(\text{Sensitivity}/(1-\text{Sensitivity})) / ((1-\text{Specificity})/\text{Specificity})$;	226,667	74,737	683,510
Error Odds Ratio = $(\text{Sensitivity}/(1-\text{Sensitivity})) / (\text{Specificity}/(1-\text{Specificity}))$;	1,836	1,457	2,693
Youden's J = Sensitivity + Specificity - 1;	0,871	0,790	0,918

Conclusions

Abdominal ultrasound is a noninvasive and accessible method for the diagnosis of renal system malformations with high sensibility and optimal specificity. We must complete this method with the voiding cystography, urography, MRI or CT. The isotopic scintigraphy can demonstrate the presence of renal scar and help us provide the best therapeutically way to resolve renal system malformations. The follow

up of these patients is also performed with abdominal ultrasound.

We hope that antenatal ultrasound diagnostic the renal malformations will improve in time. Although the legal basis for antenatal diagnosis exists, very few patients benefit from it. The poor medical education and the limited access for pregnant women to obstetrician's ultrasound were the premise of late diagnosis of reno-urinary malformations.

References

1. Piepsz A. Antenatally detected hydronephrosis. *Semin Nucl Med.* 2007 Jul;37(4):249-60. Review.
2. Socolov R, Stratone C, [Prenatal diagnostic of congenital unilateral hydronephrosis with megaureter--a case presentation] *Rev Med Chir Soc Med Nat Iasi.* 2006 Oct-Dec;110(4):905-7.
3. Kemper MJ, Mueller-Wiefel DE. Prognosis of antenatally diagnosed oligohydramnios of renal origin. *Eur J Pediatr.* 2007 May;166(5):393-8
4. Izquierdo RM, Luque Mialdea R Evaluation of the lower urinary tract function in pediatric patients with primary vesicoureteral reflux] *Arch Esp Urol.* 2008 Mar;61(2):191-207.
5. Arena F, Arena S, Is a complete urological evaluation necessary in all newborns with asymptomatic renal ectopia? *Int J Urol.* 2007 Jun;14(6):491-5.
6. Mena E, Diaz C [Evaluation of renal lesions using 99mTc-DMSA in children with urinary tract infection and the relation with vesicoureteral reflux] *Rev Esp Med Nucl.* 2006 Nov-Dec;25(6):374-9.
7. Bruyn R, Marks SD. Postnatal investigation of fetal renal disease. *Semin Fetal Neonatal Med.* 2008 Jun;13(3):133-41.

Correspondence to:

Camelia Daescu
Simion Barnutiu Street,
No 57A, Ap 31,
CP 300303
Timisoara,
Romania
E-mail: camidaescu@yahoo.com