Diagnostic difficulties in the differentiation of urine retention and developmental anomalies in the pelvicalyceal system in the ultrasound examination of children

Anna Wieczorkiewicz-Plaza¹,², Małgorzata Zajączkowska², Elżbieta Radzikowska¹, Ryszard Maciejewski¹

¹Department of Human Anatomy, Medical University, Lublin, Poland
²Department of Paediatrics and Nephrology, Medical University, Lublin, Poland

[Introduced 18 June 2003; Revised 8 December 2003; Accepted 8 December 2003]

Ultrasound examination of the abdominal cavity is part of the baseline diagnostics of urinary tract diseases. Dilatation of the pelvicalyceal system is one of the most frequent findings. In ultrasonography of the urinary tract there are, however, some images of anatomical anomalies of the pelvicalyceal system which should not be consider as abnormal. In the study we analysed 920 ultrasound examinations of the urinary tract. Of all the ultrasound images only those with isolated dilatation of the renal pelvises and calices were selected (130 cases). Ampulla-shaped and/or external pelvises, isolated calices or both abnormalities were disclosed in 104, 46 and 20 cases, respectively. In about one-third of patients additional examinations (voiding cystography, intravenous urography, renal scintigraphy) were performed which revealed normal anatomy of the urinary tract and disorders of urine flow in 80% and 20% of patients, respectively. In conclusion, the study implies that not all dilatation of the pelvicalyceal system structures signifies urine retention, although in the event of further doubt, there is a need for additional diagnostics.

Key words: vesicoureteral reflux, dilatation, collecting system, ultrasonography
which dilatation occurs only in the structures of the
PCS mentioned above. An experienced radiologist
usually distinguishes between such atypical shapes
of structures of the PCS, but some physicians de-
scribe them as urine retention, which, in the absence
of symptoms of urinary tract infection, leads to un-
necessary further diagnostics.

MATERIAL AND METHODS

In the study we analysed 920 ultrasound exami-
nations of the urinary tract in patients (605 female
and 315 male) treated in the Department and Out-
patient Clinic of Paediatrics and Nephrology at the
Medical University of Lublin over a period of 1.5 years.
The patients’ ages ranged from 6 months to 18 years.
The examinations were performed using a GE Logiq
Pro Series 500 machine and a 3.5–5 MHz curved ar-
ray by one of the authors. Renal size was measured
by assessing the length and the parenchymal thick-
ness of the kidney in a standardised position. Grey
scale longitudinal and transverse sonograms of the
kidney were obtained in prone positions. Structures
of the collecting system were also assessed and com-
pared to a standard normogram. The bladder and
distal ureters were imaged in longitudinal and trans-
verse planes whenever possible, with the bladder full
and after micturition. From all the ultrasound imag-
eges only those with isolated dilatation of the renal
pelvses and calices were selected. All patients with
confirmed obstruction in urine flow and with high
(IV–V grade) vesicoureteral reflux were excluded from
the study. In about one-third of the selected patients
additional examinations (voiding cystography, cy-
toscopy, intravenous urography, renal scintigraphy
and uroflowmetry) were performed.

RESULTS

130 patients (92 female and 38 male, aged from
2 to 18 years) with isolated dilatation of the renal
pelvses and calices were selected. They were treat-
ed in the Department and Outpatient Clinic of Pae-
diatrics and Nephrology in accordance with the fol-
lowing diagnoses: urinary tract infection (30%),
erthrocyturia (10%), hypercalciuria (11%), voiding
dysfunction (15%), vesicoureteral reflux (8%), ne-
phritic syndrome (3%) proteinuria (2%), glomerulo-
ephritis (8%), acute and chronic pyelonephritis (3%),
abdominal pain (3%) and other diseases (7%). Am-
pulla-shaped and/or external pelvses, isolated calic-
es or both abnormalities were disclosed in 104, 46
and 20 cases, respectively. Additional examinations
(Fig. 3), performed in 47 cases, revealed normal anat-

![Figure 1. External renal pelvis with a diameter of 13 mm — transverse sonogram.](image1)

![Figure 2. Isolated superior renal calyx with a diameter of 7 mm — longitudinal sonogram.](image2)

![Figure 3. Additional examinations performed in about one-third of the young patients.](image3)
omology of the urinary tract in 80% and uroflow abnormalities (vesicoureteral reflux, subvesical obstruction, urinary bladder dysfunction and urethral stricture) in 20% of patients.

**DISCUSSION**

The size of the renal pelvis or calyx should always be assessed before and after miction and the results compared to standard normograms. This examination should, of course, be performed by an experienced clinician in the field of paediatric radiology. This is especially important at present as general practitioners are now beginning to perform paediatric ultrasonography themselves. Pyelectasia and ureterectasia do not necessarily imply the presence of vesicoureteral reflux and should not be considered as an indication for voiding cystourethrogram [3–5]. Such dilatation may be found in the absence of reflux as a result of atony caused by infection and may disappear after treatment [2, 6]. Isolated dilatations of structures of the renal collecting system are quite often revealed and may be diagnosed as normal with reference to the clinical picture and anatomical anomalies. This principle will help to avoid unnecessary diagnostics.

Classical sonography is sensitive only for high grades of reflux but is restricted in the diagnosis of lower grades [1, 8]. However, the specificity and sensitivity of contrast enhanced cystosonography, a new radiant free method, is significantly high [7]. This new method represents an exceptional way of reducing the number of children being exposed to radiation [3, 8].

The study implies that not all dilatation of the renal collecting system means urine retention. However, in the event of further doubt, there is a need for additional diagnostics to prevent renal damage.

**REFERENCES**