

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

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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 considered 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

INTRODUCTION

Ultrasound examination of the abdominal cavity is a basic, recommended and commonly used examination in the diagnostics of urinary tract diseases in children. This test is repeatable and allows monitoring of the diagnostic process as well as the course of the disease. It is also harmless for the young patient [3, 6]. The term “disorder” of the urine flow encompasses obstruction of the urine flow or a vesicoureteral reflux. In both cases dilatation of the renal pelvis

and calices usually develops [5]. In sonography of the urinary tract there are, however, some images of anatomical anomalies of the pelvicalyceal system (PCS), which should not be considered as abnormal. These images include atypical shapes of the renal pelvis such as an external pelvis, where part of this structure is located outside the renal parenchyma and/or ampulla-shaped pelvises, with a diameter usually exceeding 10 mm (Fig. 1), as well as isolated calices with a diameter of over 5 mm (Fig. 2) [4], in

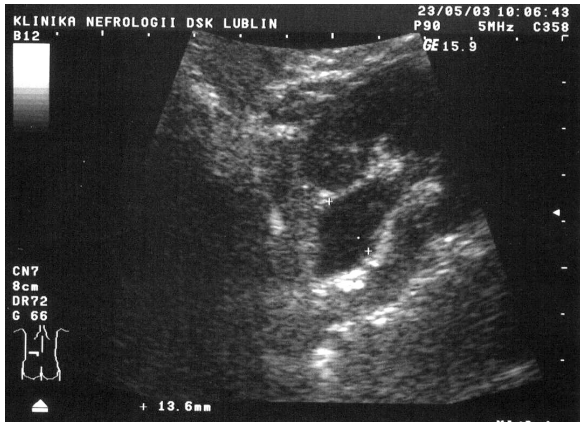


Figure 1. External renal pelvis with a diameter of 13 mm — transverse sonogram.

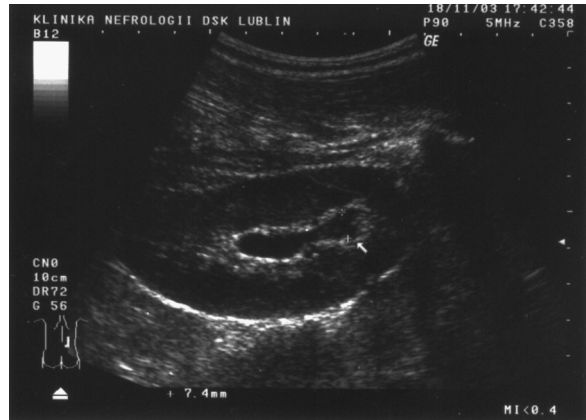


Figure 2. Isolated superior renal calyx with a diameter of 7 mm — longitudinal sonogram.

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 describe them as urine retention, which, in the absence of symptoms of urinary tract infection, leads to unnecessary further diagnostics.

MATERIAL AND METHODS

In the study we analysed 920 ultrasound examinations of the urinary tract in patients (605 female and 315 male) treated in the Department and Outpatient 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 array by one of the authors. Renal size was measured by assessing the length and the parenchymal thickness 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 compared to a standard normogram. The bladder and distal ureters were imaged in longitudinal and transverse planes whenever possible, with the bladder full and after micturition. From all the ultrasound images only those with isolated dilatation of the renal pelvises 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, cystoscopy, 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 pelvises and calices were selected. They were treated in the Department and Outpatient Clinic of Paediatrics and Nephrology in accordance with the following diagnoses: urinary tract infection (30%), erythrocyturia (10%), hypercalciuria (11%), voiding dysfunction (15%), vesicoureteral reflux (8%), nephritic syndrome (3%), proteinuria (2%), glomerulonephritis (8%), acute and chronic pyelonephritis (3%), abdominal pain (3%) and other diseases (7%). Ampulla-shaped and/or external pelvises, isolated calices or both abnormalities were disclosed in 104, 46 and 20 cases, respectively. Additional examinations (Fig. 3), performed in 47 cases, revealed normal anat-

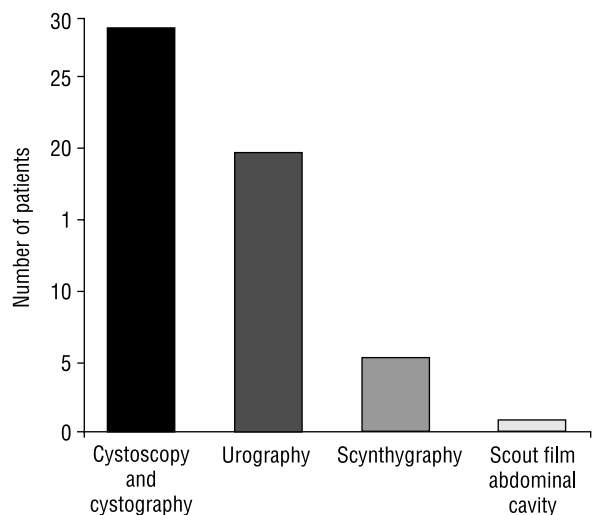


Figure 3. Additional examinations performed in about one-third of the young patients.

omy 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 cystourethrography [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.

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