

Is There Need for Both Intravenous Urography and Voiding Cystography in the Evaluation of Children with Recurrent Urinary Tract Infections?

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Summary. In a prospective study 33 children (aged 6–14 years) consecutively referred for recurrent urinary tract infections (RUTI), underwent intravenous urography (IVU) as well as voiding cystography (VC). Seven children had unilateral and two children had bilateral renal scarring, while ten children had unilateral and six children had bilateral vesico-ureteral reflux (VUR). Following normal IVU VUR was demonstrated in 22% of the ureters, but in all cases of low grade. In abnormal IVU, i.e. renal scarring or dilatation of the ureters, VC showed high grade VUR in 54% of the ureters. Based on these results and the current theories on the significance of patient age and the grade of VUR, we conclude that in case of a normal IVU in children with RUTI and age of at least 6 years, there is no reason to supplement the pre-treatment evaluation with VC.

Key words: Children, Recurrent urinary tract infection, Intravenous urography, Voiding cystography.

Introduction

Vesico-ureteral reflux (VUR) can be demonstrated in 30–55% of children with recurrent urinary tract infections (RUTI) [6, 7, 14]. It is generally accepted that these children need to be evaluated urologically and most authors recommend intravenous urography (IVU) and voiding cystography (VC) [8, 12–14]. However, Cavanagh and Sherwood [2] recently found, that VC can be omitted in children older than 6 months, provided the IVU is normal.

Because of 1) the high radiation dose during the X-ray examination of the urinary tract [5] and 2) the risk of

iatrogenic bacteriuria following the catheterisation prior to the VC [9], the purpose of the present study was to examine whether both IVU and VC are mandatory in the assessment of children presenting with RUTI.

Material and Methods

36 neurologically intact children were consecutively referred for RUTI during the period November 1st, 1981 to February 28th, 1983. The median age was 9 years (range 6–14 years). Only one boy entered the study. Three children were excluded owing to previous surgery, leaving 33 children for further analysis.

Following a detailed history, the children underwent physical examination, routine blood chemistry, spontaneous uroflowmetry, ultrasound residual urine determination, urine culture, IVU and VC. During admission urodynamic testing including carbon dioxide cystometry-emg and pressure-flow-emg study as well as cysto-urethroscopy were carried out.

Isopaque^R 100 mg J/ml was employed as contrast medium for VC in children younger than 7 years of age and Conray^R 250 mg J/ml in older children. The radiation dose was reduced as much as possible by means of television-screen amplification and by using small 100 mm films. The bladder was filled, using a transurethral catheter, until desire to void. Then a lateral exposure and two anterior-posterior (A-P) exposures of the bladder and kidney regions, respectively, were obtained. During the latter exposure the patient assumed the Trendelenburg position, while performing a Valsalva manoeuvre. After removal of the catheter the following exposures were taken: one A-P and lateral exposure of the bladder during voiding and two postvoid A-P exposures of the bladder and kidney regions. At least one month had elapsed between the last urinary tract infection and the VC.

Urografin^R 300 mg J/ml was used for the IVU. The procedure comprised a plain film of the urinary tract, exposures taken 3, 7 and 12 min after intravenous injection of contrast medium, oblique films and a postvoiding film. Some of the children also had nephrotomography. Ureteral compression was employed in all children older than 7 years of age, and the 12 min film was taken after removal of the compression.

The following parameters were especially noted: renal scarring and ureteral dilatation [2]. The VUR was graded in mild cases (less than grade 3) and serious cases (at least grade 3) according to the proposals of the International Reflux Study Committee [6].

Table 1. The results of intravenous urography in 33 children with recurrent urinary tract infections

Normal	20
Pyelonephritis chronica	9
Duplicatio renis et ureteris partialis	1
Duplicatio renis et ureteris totalis	1
Hydroureteris	1
Stenosis juxtapelvina dextra et hydronephrosis dextra	1
Total	33

Table 2. The results of voiding cystography (VC) in 33 children with recurrent urinary tract infections

Normal	17
Unilateral VUR	10
Bilateral VUR	6
Total	33

Table 3. Comparison of the findings in intravenous urography (IVU) and voiding cystography (VC). The results represent the findings of ipsilateral kidney and ureter units

IVU	Normal	MCU	
		VUR ≤ grade 2	VUR > grade 2
Normal	39	11	0
Abnormal			
congenital malformations	2	1	0
kidney scars / dilatation of ureter	3	3	7

Results

The IVU showed unilateral scarring of the kidney in 7 children and bilateral scarring in 2 children, while one child had bilateral dilatation of the ureters (Table 1). VUR was demonstrated in 16 children (48%, 95%-confidence limits 31–66%) (Table 2). Ten children had unilateral and six had bilateral VUR, i.e. VUR totally was found in 22 ureters. Comparison of the findings in IVU and VC, respectively, are shown in Table 3. In eleven of the 22 ureters with VUR (50%, 95%-confidence limits 28–72%) the IVU showed normal upper urinary tract. However, in all cases the VUR was mild. One child had a complete duplication of kidney and ureter.

In cases with normal IVU, the VC demonstrated VUR in 22% of the ureters, the reflux never exceeding grade 2. On the contrary, VC proved serious reflux in 54% of the ureters with an abnormal IVU, i.e. renal scarring and/or ureteral dilatation.

Discussion

Owing to the risk of persisting infection, progressive renal insufficiency and arterial hypertension, thorough urological evaluation and treatment is recommended in children with RUTI. The evaluation principally aims to prove possible occurrence of VUR and congenital malformations [6–8, 12–14]. VUR is demonstrated in 30–55% of children with RUTI. The incidence is maximal in the first year of life and declines with increasing age [6–8, 12, 14]. The concept of pathogenesis, pathology and treatment in VUR has changed. Currently the view is that the existence of VUR and intra-renal reflux in combination with RUTI are prerequisites for new or increasing renal scar formation. However, mild VUR in the absence of renal scars in children older than 5 years of age seems less important [6–8, 10, 14] and most often ceases spontaneously [3, 11]. Lund found the frequency of normal IVU's to be 71% in children with VUR [8], and consequently recommended both IVU and VC for these children. No comments on the grade of the VUR in the various age groups were given. In another study [1] 20% of the boys and 47% of the girls with VUR and aged less than 2 years were proved to have normal IVU. With increasing age the combination of normal IVU and concomitant VUR became less frequent. These authors also found 44% of the ureters with normal IVU to have at least grade 3 VUR. Finally Cavanagh and Sherwood [2] demonstrated no children with serious VUR in case of normal IVU. They therefore concluded, that VC might be omitted in children older than 6 months with normal IVU. Concerning VUR the result of the VC generally is subjected to some criticism, as several factors might influence the outcome of the procedure [4]. However, comparison of the first and the last VC in 317 children demonstrated only very few differences, provided normal VC or mild VUR in the first examination [1].

Our results also suggest that a normal IVU excludes serious VUR, i.e. more than grade 2. Based on this experience as well as the literature, we conclude that in case of normal IVU in children older than 6 years of age the VC can safely be omitted in the evaluation of urinary tract infections. This recommendation has to be taken in light of the fact that VC is an unpleasant and potentially harmful procedure. Maskell et al. found the incidence of urinary infection to be 30% after VC in children who prior to the exam had sterile urine [9]. Furthermore the estimated radiation risk following urological x-ray exams means that clearcut indications have to be made [5].

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