Abstract

This paper presents a short review of systems for the urological and nephrological monitoring of a child with neurogenic bladder. Different diagnostic procedures to be performed in these children are compared. On the basis of this review and the authors' own experience, a diagnostic algorithm for a child with neurogenic bladder dysfunction is proposed (Adv Clin Exp Med 2008, 17, 2, 217–220).

Key words: neurogenic bladder, child, urodynamics, diagnostic algorithm.

In 2005, Elliott et al. of the University of Arizona analyzed diagnostic and management procedures for children with neurogenic bladder across 169 clinical centers in the USA. The authors focused on specific diagnostic procedures which were performed at the beginning of treatment and on the strategies of prophylaxis and treatment of urinary tract infections in these children. It turned out that only 15% of the centers followed standardized procedures of management in this category of patients. The most common diagnostic procedures included ultrasonography (USG) (93%), followed by cystography (85%) and urodynamic testing (76%). Isotope studies were performed in only 14% of patients and urography in only 2% [1].

In 1987, Spindel, Bauer et al. of Children’s Hospital in Boston described their system of monitoring and diagnostic procedures in children with myelomeningocele (MMC). Soon after the delivery and stabilization of the neonate’s condition, the children underwent neurological examination, urodynamic testing, and intravenous urography. Cystography was performed in case of urinary tract dilatation confirmed by urography and in children with dyssynergy diagnosed by urodynamic studies. In children with dyssynergy of the sphincter, USG was performed every 6 months and in children with good results of urodynamic testing, further USG examination was performed every 12 months. Control urodynamic testing was performed at similar intervals. Cystography was done in case of urinary tract infections, urinary tract distension, or sphincter dyssnergy. Such a system of monitoring and diagnostic procedures is followed in children until the third year of life [2].

In 1994, Teichmann described the monitoring system in children with meningocele at Children’s Hospital in San Diego, California. The system is based on periodic diagnostic tests. Soon
after birth, USG, physical examination, urine culture, and serum creatinine concentration measurement were performed. The tests were repeated every 3 months and every 6 months in older infants in stable medical condition. Cystography and urodynamic testing were performed in case of urinary tract infection, worsening in urinary continence, or kidney or ureter abnormalities in USG examination [3].

In 1994, Hernandez et al. in Los Angeles presented their system of the monitoring and care of children with neurogenic bladder. During the first visit, USG, serum creatinine concentration measurement, cystometry, cystography, and (since 1988) video-urodynamic testing were performed. The procedures were then repeated every 3 months or every 6 months depending on the patient’s medical condition [4]. Kroovand et al. recommended urodynamic testing and USG during every control visit performed every 3 months during the first year of life [5]. Houser in San Antonio, Texas, performed urodynamic testing in children with suspected tethered cord before surgery. These procedures were then performed every 3 to 6 months during the post-operative period [6]. In a similar population of patients with tethered cord, Palmer et al. of the urology clinic at Children’s Memorial Hospital in Chicago recommended USG every 6 months, whereas urodynamic testing was performed before surgery and within 6 months after surgical intervention [7]. According to Kaufman in Huston, control USG of kidneys should be performed every 6–12 months during the first year of life in children with spina bifida. Urodynamic testing should be performed in children at the ages of 1, 4, and 10 months. They found significant abnormalities in urinary bladder function in children with dysraphism after 4 months of age [13].

New techniques of urinary tract imaging have recently been developed and described. Nuclear magnetic resonance urography allows highly accurate imaging of the urinary tract with concurrent assessment of kidney function [14, 15].

Proposal of a Diagnostic Algorithm

Based on the present authors’ experience and the recommendations listed above, the following algorithm of diagnostic procedures in children with neurogenic dysfunction of the urinary tract is proposed:

1. The initial examination during the neonatal period following myelomeningocele surgery (in a pediatric surgery/urology/nephrology clinic) should include:
   - physical examination, urine culture,
   - serum urea and creatinine concentration,
   - abdominal ultrasonography,
   - renal scintigraphy,
   - urodynamic testing.

2. Control urinalysis has to be performed monthly and urine culture only in case of symptomatic urinary tract infections.

3. Control abdominal USG is to be performed every 6 months during the first three years of life, then every 12 months in low-risk children. It is recommended that USG be performed with a full bladder and 5 minutes following bladder emptying with a catheter and should be standardized with regard to such items as providing the dimensions of the kidney pelvis in three planes.

4. Control urodynamic testing is to be performed every 6 months during the first three years of life, then every 12 months in low-risk children. Testing should be performed immediately in case of confirmed urinary tract dysfunction.
5. Renal scintigraphy is to be performed annually in high-risk groups and every two years in other children.

6. Cystography is to be performed in case of urinary tract dilatation on USG imaging.

The decision when urography should be performed needs to be made on an individual basis each time. This procedure is currently performed less and less often, as renal scintigraphy has become the standard procedure in the evaluation of kidney function and ultrasonography has developed significantly to allow precise assessment of kidney and urinary tract morphology.

Isotope procedures, i.e. renal scintigraphy and, where possible, nuclear magnetic resonance urography (of high value when imaging complicated urological abnormalities), deserve to be promoted.

The recommendations included in this paper should create a basis for further discussion on standards of the diagnosis and treatment of children with urinary tract diseases.

References


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