227

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INCIDENCE AND CHARACTERISTICS OF LOWER URINARY TRACT DYSFUNCTION OBSERVED IN CHILDREN WITH EPISODES OF URINARY TRACT INFECTION

Hypothesis / aims of study
The aim of this study is to investigate the incidence and characteristics of lower urinary tract dysfunction (LUTD) among neurologically normal children with episodes of urinary tract infection (UTI) by repeated video-urodynamic studies (V-UDSs).

Study design, materials and methods
We retrospectively reviewed the medical records of 98 children under 15 years old (63 male and 35 female, 0-13 years old, median 11 months old) with episodes of UTI, but without any neurological disorders. They had not undergone surgery on the bladder or urethra beforehand. Patients with VUR who were conservatively treated were followed according to a program of repeated V-UDS yearly. Patients without VUR underwent repeated V-UDS according to their condition. Transurethral catheters were used for bladder filling and intravesical pressure recordings. All examinations were carried out without any anaesthesia or sedatives.
High capacity (HC) was defined as more than 150% of expected bladder capacity [1] for children aged 3 and over but more than 200% [2] for those under age 3 because the bladder capacity was smaller and showed greater variations. Expected bladder capacity is estimated by the formula (agex30+30) ml [1]. Existence of detrusor contractions at least 30cm H_2O or phasic detrusor contractions during the filling phase was defined as significant detrusor overactivity (DO). A probability value of $p< 0.05$ is considered as statistically significant.

Results
On their first visit, 88 (90%) children attended for only UTI episodes without any other symptoms. Two had symptom of nocturnal enuresis, 6 had urinary frequency or incontinence and 2 had voiding symptoms. At their first V-UDS, VUR was present in 53 (54%) children, and LUTD was found in 37 (38%) children. The incidence of VUR was significantly ($p=0.037$) higher in children with LUTD (25/37, 68%) than those without LUTD (28/61, 46%). Totally, 166 V-UDSs were performed in these 98 children. Including follow-up, LUTD was observed in totally 49 (50%) children (29% in VUR(-) group, 68% in VUR(+) group, $p=0.0001$). Thirty two (33%) children showed neither VUR nor LUTD. The patterns of LUTD for each age group are shown in Table.
DO was the most common pattern of LUTD and observed at least once in 30 (31%) children. However, it was continuously observed in only 4 children (3 in VUR(+), 1 in VUR(-)). In 2 of them, high pressure voiding associated with detrusor-sphincter discoordination persisted up to 3 years old.
HC was the secondary most common pattern of LUTD and in was observed in 22 children. In 11 children who showed HC at the age of 1 and over, HC did not improve in 10 (91%).
Voiding dysfunctions were observed in 11 (11%) children.
All children with poor detrusor contraction (1 in VUR(-), 3 in VUR(+)) showed HC. Two of them showed progressively decreased detrusor contractility during voiding.
Abnormal urethral function during voiding was observed in 7 children. Two infants under 1 year showed normal voiding detrusor contractions but abnormally poor detrusor sphincter coordination, resulting poor bladder emptying. The detrusor sphincter discoordination improved during follow-up, but the VUR did not resolve. Two children who showed dysfunctional voiding and high voiding pressure after toilet trained, had DO. Sufficient relaxation of bladder neck or urethral sphincter was not observed in other two children.
The resolution of VUR was found in 2(14%) of 14 children with LUTD seen at their first UDS, which was less frequent than that (7/19, 37%) in those without LUTD, though there was no statistically significant difference.

Table

Age		Total	0	1-2	3-5	6-15
No. of patient	VUR (-)	45	25	11	6	5
	VUR(+)	53	28	27	13	11
LUTD	VUR (-)	13 (29%)*	8 (32%)	1 (9%)§		4 (80%)
	VUR (+)	36 (68%)*	14 (50%)	16(59%)§	7 (54%)	5 (45%)
DO	VUR (-)	6 (13%)**	5 (20%)			1 (20%)
	VUR (+)	24 (45%)**	9 (32%)	11 (41%)	5 (38%)	3 (27%)
HC	VUR (-)	7 (16%)	5 (20%)	1 (9%)		1 (20%)
	VUR (+)	15 (28%)	6 (21%)	5 (19%)	3 (23%)	3 (27%)
Detrusor underactivity	VUR (-)	1 (2%)				1 (20%)
	VUR (+)	3 (6%)		1 (4%)	1 (8%)	2 (18%)
Dysfunctional voiding	VUR (-)	1 (2%)				1 (20%)
	VUR (+)	4 (8%)	2 (7%)	3 (11%)	2 (15%)	

Non-relaxing urethra	VUR (-)	1 (2%)				1 (20%)
	VUR (+)	1 (2%)			1 (8%)	
After-void contractions	VUR (-)	1 (2%)				1 (20%)
	VUR (+)					

* p<0.001, ** p=0.001, § p=0.001 between VUR(-) and VUR(+) groups

Interpretation of results

LUTD was commonly observed in children with episodes of UTI. The incidence of LUTD was significantly higher in children with VUR than those without VUR. The patterns of LUTD changed with development. Voiding–phase dysfunction often accompanied with filling phase dysfunction. In children who showed HC at the age of 1 and over, neither HC nor VUR resolved.

Concluding message

LUTD was common in children with episodes of UTI. Especially about 70% of children thought to have simply primary VUR have an associated LUTD. The patterns of LUTD are changeable and LUTD can be detected during follow up periods. The periodic evaluation and management of LUTD is important for children with episodes of UTI.

References

1 Neurourol Urodyn (2007)26; 90-102
2 Scand J Urol Nephrol (2004) Suppl 215; 69-74.

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