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INDIRECT RADIONUCLIDE CYSTOGRAPHY VOIDING PATTERNS IN CHILDREN WITH PRIMARY VESICOURETERAL REFLUX: COMPARATIVE STUDY

Aims of Study

There is increasing evidence of association between urinary tract dysfunction and primary vesicoureteral reflux (VUR). Radionuclide evaluation of renal function and ureterovesical valve competence in children with risk factors for VUR is now well accepted and indirect radionuclide cystography (IRNC) following dynamic renal scintigraphy may be easily performed. However, the radionuclide evaluation of lower urinary tract dysfunction (LUTD) has not been well established. The aim of this study was to evaluate bladder function by means of IRNC in children with VUR and to investigate whether radionuclide method can distinguish children with voiding dysfunction.

Methods

The study enrolled 74 neurologically intact children, 14 boys and 60 girls, aged between 2-14 years, in whom VUR were documented using contrast micturating cystouretrography performed as initial method, followed by IRNC using ^{99m}Tc-diethilene triamine penta-acetate (DTPA). According to the urodynamic findings three groups were formed: Group with VUR and normal urodynamic finding (n=27), Group with VUR and detrusor overactivity (n=43), Group with VUR and dysfunctional voiding (n=4). Control group was made of 64 healthy children, 2-13 years old, without any symptoms of LUTD. The dynamics of the bladder emptying were studied after intravenous injection of 37 MBq/10kg/b.w. DTPA in the posterior view collecting ninety 2-seconds frames during voiding (3,4). The parameters evaluated were: voided urine volume (VV), functional bladder capacity (FBC), residual urine (RU), voiding time (VT), average flow rate (AFR), peak flow rate (PFR) and ejection fraction (EF).

Results

Table 1 shows IRNC bladder function parameters obtained by means of IRNC in children with VUR regarding the urodynamic diagnosis.

Table 1. Radionuclide bladder function parameters in children with VUR regarding the urodynamic diagnosis.

Groups	N^{o}	VT (s)	RU (%)	FBC (%)	AFR (ml/s)	PFR (ml/s)	EF (%)
CG	64	22±6	6±3	108±13	12±4	21±5	95±3
VUR-normal finding	27	30±7 ^{b}	12±8	96±16	9±2 ^{b}	14±3 ^{a}	86±8 ^{a}
VUR- detrusor overactivity	43	29±15 ^{b}	16±12 ^{a}	80±37 ^{a}	5±3 ^{a,c}	8±4 ^{a,c}	74±11 ^{a,c}
VUR-dysfunctional voiding	4	34±16	29±18 ^{a,d}	124±25 ^{a}	8±4 ^{b}	14±8 ^{b}	78±24 ^{b}

CG, control group; VUR, vesicoureteral reflux; vs. CG, ^{a}p<0.001, ^{b} p<0.01; vs. VUR-normal finding, ^{c} p<0.001, ^{d}p<0.05; VT, voiding time; RU, residual urine; FBC, functional bladder capacity; AFR, avarage flow rate; PFR, peak flow rate; EF, ejection fraction

Children with VUR and normal urodynamic findings found to have normal FBC, while values for VT, AFR, PFR and EF were slightly, but significantly decreased regarding the controls. The most prominent reduction of FBC was detected in group with VUR and bladder overactivity, with markedly decreased values for AFR, PFR and EF even in respect to children

with VUR and normal urodynamic finding. Children with VUR and dysfunctional voiding were detected to have normal values for VT, but significantly higher FBC regarding the control group. Although slightly lower comparing the controls, mean values for AFR, PFR and EF did not differ significantly in respect to children with VUR and normal urodynamic finding. Mean values for RU were higher in all children with VUR. However, while children with VUR and normal urodynamic finding found to have higher RU but without reaching the statistical significance, children with VUR and detrusor overactivity and dysfunctional voiding detected to have markedly increased RU regarding the controls.

Three types of radionuclide voiding patterns could be separated in children with VUR. Normal radionuclide voiding pattern is characterized by normal FBC and near normal value for EF and PFR. Markedly low FBC with significantly reduced PFR and EF values were found in children with VUR and overactive bladder, while higher bladder volume with almost normal PFR and slightly lower or near normal EF were detected in children with VUR and dysfunctional voiding.

Conclusions

This study has confirmed the association between LUTD and congenital VUR. Indirect radionuclide cystography was found as a simple, noninvasive method, performed in physiological manner which allows a reliable separation of voiding patterns in patients with VUR and can be used as a first-line method in detection voiding dysfunction not only in children with VUR but in all children with urinary tract infection.

References

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