

FACTORS ASSOCIATED WITH CHRONIC KIDNEY DISEASE IN HIGH RISK BOYS PRESENTING FOR URODYNAMICS EVALUATION FOLLOWING TREATMENT FOR POSTERIOR URETHRAL VALVES

Hypothesis / aims of study

This study was carried out in high risk boys treated earlier for posterior urethral valves (PUV) for evaluating the factors associated with chronic kidney disease (CKD) at the time of presentation for urodynamics (UDS) at a tertiary care center.

Study design, materials and methods

This is a retrospective study evaluating the factors associated with CKD in 48 boys treated for PUV presenting for UDS. Each of these boys was at high risk of CKD and had at least one risk factor such as hydronephrosis, incontinence or recurrent urinary infection (table 1). Only boys who were at least 2years post-treatment were included in the evaluation. The mean age at initial treatment was 2.8y (range 0-14y; SD 3.2y). The mean age at UDS evaluation was 9.4y (range 4-28y; SD 5.8y). The average elapsed time since treatment was 6.6y (range 2-20y; SD 4.1y). Initial treatment performed was primary fulguration in 41 children and vesicostomy in 7 children.

Parameters evaluated were age at presentation for UDS, storage symptoms, incontinence, voiding difficulty, initial treatment (fulguration or diversion), documented febrile urinary infection, hydronephrosis, reflux on a recent micturating cystourethrogram (MCU), renal function by estimated glomerular filtration rate, eGFR (calculated by the Schwartz or Cockcroft-Gault method as appropriate) and UDS parameters. Hydronephrosis and reflux were scored for analysis as 0, 1 or 2 depending on whether it was absent, unilateral or bilateral. CKD was defined as an eGFR of less than 60ml/min/1.73m².

UDS was done using a Laborie machine by two-tube method with a single 5F catheter in place at the time of the voiding study. All the other ICS recommendations regarding technique were followed. Reduced compliance was defined as compliance <20ml/cm H₂O and poor compliance as <10ml/cm H₂O (over the entire filling phase upto the point of voiding/peritubal leak). Three different end fill pressures, EFP (20, 30 and 40 cm H₂O) were analyzed. Underactive (in the judgement of the clinician who had interpreted the test) and acontractile detrusor were clubbed into a single group.

Statistical analysis was performed using logistic regression and chi-square test as appropriate (p <0.05 significant). Multiple logistic regression using 10 parameters was performed for the 39 patients for whom a recent MCU was available.

Result

CKD was noted in 22/48 (46%) children. The age at primary treatment (logistic regression coeff 0.1145, p=0.23) and the type of initial treatment (chi square 0.0292, p=0.84) were not associated with CKD. The other parameters studied are shown in table 1. Reduced compliance, poor compliance and various EFP levels were studied. In view of the confounding potential of reflux in assessing UDS parameters, additional analysis was performed for each UDS parameter controlling for reflux in the 39 patients for whom this information was available. Poor compliance and EFP of >20cm H₂O were noted to be associated with CKD in both analyses. In the analysis controlled for reflux, underactivity/acontractility was also noted to be significantly associated with CKD. Detrusor overactivity was negatively associated with CKD. Analyzed separately, unilateral VUR was not associated with preservation of renal function (Chi square 0.0047, p=0.95).

Table 1 Logistic regression analysis for the association of each variable with CKD at presentation for UDS

Variable	Present (%)	Logistic regression for association with CKD		Logistic regression for association with CKD controlled for reflux	
		For all 48 patients		39 patients for whom recent MCU was available	
		p value	Odds ratio	p value	Odds ratio
Incontinence	29 (60)	0.11	2.67 (0.79-8.97)	---	---
Storage symptoms	32 (67)	0.16	2.49 (0.70-8.83)	---	---
Voiding symptoms	19 (40)	0.11	0.38 (0.11-1.26)	---	---
Urinary infection	35 (73)	0.98	0.98 (0.27-3.52)	---	---
Reflux*	14 (29)	0.50	0.76 (0.35-1.68)	---	---
Hydronephrosis**	42 (88)	0.07	2.33 (0.92-5.94)	---	---
Reduced capacity	12 (25)	0.10	3.14 (0.79-12.43)	0.17	2.76 (0.65-11.71)
Reduced compliance	25 (52)	0.14	2.39 (0.74-7.66)	0.17	2.47 (0.67-9.09)
Poor compliance	20 (42)	0.03	3.92 (1.16-13.20)	0.04	4.07 (1.04-15.96)
Detrusor overactivity	11 (23)	0.02	0.08 (0.01-0.66)	0.048	0.11 (0.01-0.98)
EFP >20cm H₂O	18 (38)	0.006	6.07 (1.66-22.12)	0.04	4.21 (1.06-16.63)
EFP >30cm H ₂ O	11 (23)	0.051	4.38 (0.99-19.32)	0.79	3.42 (0.72-16.23)
EFP >40cm H ₂ O	10 (21)	0.10	3.58 (0.80-16.05)	0.80	2.64 (0.55-12.74)

Underactive/acontractile	16 (33)	0.11	2.78 (0.80-9.60)	0.04	6.08 (1.06-34.79)
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* A recent micturating cystourethrogram (MCU) was available for 39 patients. Score 0 (no reflux) in 25, score 1 (unilateral reflux) in 6 and score 2 (bilateral reflux) in 8.

** Hydronephrosis was scored 0 (no hydronephrosis) in 6, 1 (unilateral) in 11 and 2 (bilateral) in 31 patients

On multiple regression analysis (table 2), only hydronephrosis was noted to have a significant association with CKD.

Table 2 Multiple Logistic regression analysis for 39 patients including all variables with a univariate p value of <0.15. Reflux included in view of the potential for impact on UDS.

Variable	p value	
Age at treatment	0.17	
Incontinence		0.50
Voiding difficulty	0.41	
Hydronephrosis	0.02	(Odds ratio 8.18, 1.39-48.11)
Vesicoureteral reflux		0.22
Poor compliance	0.07	
Detrusor overactivity		0.20
Capacity	0.21	
End fill pressure >20cm H ₂ O		0.68
Underactive/acontractile detrusor	0.12	

Interpretation of results

In the long term follow up evaluation of children treated for PUV, poor compliance (<10ml/cm H₂O) and end fill pressures of >20cm H₂O (but not 30 or 40cm H₂O) were significantly associated with CKD. For reasons that are not clear, presence of detrusor overactivity was a marker for children who did better. It is possible that these bladders were biologically less likely to develop compliance changes that are devastating for the kidneys in the long term. Unilateral reflux was not protective in a follow up MCU as contrasted to historical reports suggesting that it might be associated with improved outcomes at initial presentation. On a multiple logistic regression analysis of about 80% of the cohort, only hydronephrosis showed a significant independent association with CKD.

Concluding message

Hydronephrosis is an independent marker for CKD in the follow up of children treated for PUV. Poor compliance and end fill pressures of >20cm H₂O are associated with CKD while children with detrusor overactivity appear to be protected.

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Is this a clinical trial?	No
What were the subjects in the study?	HUMAN
Was this study approved by an ethics committee?	Yes
Specify Name of Ethics Committee	Institutional Ethics Committee, Medwin Hospital, Hyderabad
Was the Declaration of Helsinki followed?	Yes
Was informed consent obtained from the patients?	Yes