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Narrated Powerpoint

Effect of overnight bladder drainage on posterior urethral valve sequelae: A randomized controlled trial

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Summary

Introduction
Posterior urethral valves may lead to persistent hydronephrosis (HN) and bladder dysfunction despite successful endoscopic valve ablation (EVA).

Objectives
To evaluate the effect of overnight bladder drainage (OBD) on upper urinary tracts and bladders of boys post EVA.

Materials and methods
Boys who had persistent HN after EVA were included. Patients were randomly allocated into OBD or no OBD groups. Timed voiding, anticholinergics and antibiotic prophylaxis were offered for both groups. After 12 months, patients were evaluated for compliance to OBD, daytime continence, febrile urinary tract infections (UTIs), renal function by serum creatinine and ^{99m}Tc-dimercaptosuccinic acid scan, HN, vesicoureteral reflux (VUR) and bladder morphology assessed by ultrasound and voiding cystourethrogram.

Results
Ninety-nine patients; 47 underwent OBD while 52 had no OBD, completed 12 months of follow-up. Compliance to OBD was reported in 87.04 %. OBD group showed significant improvement in daytime continence, HN, VUR, bladder capacity and outline. However, febrile UTIs, renal function affection, bladder wall thickness and post-void urine residual were comparable between both groups.

Conclusions
OBD might improve daytime continence, HN, VUR and abnormal bladder morphology that persist after EVA with no subsequent febrile UTIs or renal function affection. Yet, compliance to OBD remains a matter of concern.

Introduction

Posterior urethral valves (PUV) are considered one of the most common urological congenital anomalies in boys that may lead to persistent hydronephrosis (HN) and bladder dysfunction despite successful endoscopic valve ablation (EVA).

Therefore, we evaluated the effect of overnight bladder drainage using catheter (OBD) on the upper urinary tracts and bladders of boys post EVA.

Methods

In a randomized controlled trial, boys who had persistent HN at least one year after EVA were included. Those who underwent urinary diversion, were maintained on clean intermittent catheterization (CIC), had infravesical obstruction (residual PUV or bladder neck hypertrophy after EVA) or refused to participate were excluded.

Patients were randomly allocated into either OBD (catheter placement in the bladder for 8–12 h every night fixed by adhesive tape and connected to a urinary bag, as shown in Fig. 1) or no OBD groups. Randomization was done by computer-generated randomized table in a ratio 1 : 1. Timed voiding every 3 h, anticholinergic drugs and antibiotic prophylaxis were offered for patients in both groups.

Before starting treatment, patients were evaluated for; baseline renal function by serum creatinine (SCr) and 99 mTc-dimercaptosuccinic acid (DMSA) scan, baseline HN (measured by Society for Fetal Urology grading system by independent investigators), vesicoureteral reflux (VUR) and bladder morphology assessed by renal & bladder ultrasound (RBUS) and voiding cystourethrogram (VCUG).

After 12 months of starting treatment, patients were evaluated for; compliance to OBD

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Fig. 1 Overnight bladder drainage technique.

(continuation of regular OBD till the end of the study), daytime urinary continence (>3 h dry), febrile urinary tract infections (UTIs), renal function by SCr and 99 mTc-DMSA scan, improvement in HN, VUR and bladder morphology assessed by RBUS and VCUG.

Results

A total of 99 patients; 47 underwent OBD while the remaining 52 had no OBD, completed 12 months of follow-up between August 2021 and September 2023. Baseline data, such as age (median 5.25 (1.5—15) years old), toilet-training status and grade of HN were comparable between both groups. Compliance to OBD was only reported in 87.04 %, those who were included in analysis. Daytime continence in toilet-trained children was more significantly noted in the OBD patients (62.8 % vs. 44.4 %, p = 0.04).

There was significant improvement in HN and VUR resolution in OBD group (Table 1). Bladder capacity and outline were also significantly better in OBD group (Table 2).

On the other hand, both groups showed comparable results (Table 3), regarding; febrile UTIs, renal function affection, bladder wall thickness and post-void urine residual.

Discussion

Several tools have been recommended to avoid bladder overfilling by daytime, such as timed, frequent and double voiding or even CIC in those who cannot empty their bladder efficiently. Marked improvement in the degree of HN that persisted after successful EVA has been reported by frequent bladder drainage via catheters.

However, overnight bladder overdistention and nocturnal polyuria which were left untreated could not only have an equal unfavorable effect to the upper urinary tracts but also impair what had been resolved by these daytime tools. So, combined timed voiding and OBD was performed in our study to ensure adequate bladder drainage by daytime and nighttime, thus improved daytime

Table 1 Effect of overnight bladder drainage on hydronephrosis and vesicoureteral reflux.

Variable, n (%)		OBD Group (n = 47)	No OBD Group (n = 52)	P
Right HN	Improved	25 (53.2)	11 (21.2)	*<0.001*[a]
	Static	22 (46.8)	26 (50)	
	Progressed	—	15 (28.8)	
Left HN	Improved	18 (38.3)	6 (11.5)	*0.001*[a]
	Static	29 (61.7)	38 (73.1)	
	Progressed	—	8 (15.4)	
Right VUR	Improved	12 (25.5)	—	*<0.001*[a]
	Static	35 (74.5)	44 (84.6)	
	Progressed	—	8 (15.4)	
Left VUR	Improved	20 (42.6)	1 (1.9)	*<0.001*[a]
	Static	27 (57.4)	38 (73.1)	
	Progressed	—	13 (25)	

The italic values refer to the statistically significant results (P < 0.05). HN, hydronephrosis; OBD, overnight bladder drainage; VUR, vesicoureteral reflux. Improved = downgrading or resolution of HN or VUR, static = same grade of HN or VUR, progressed = upgrading of HN or VUR, respectively. Grades of HN were measured by Society for Fetal Urology grading system by independent investigators. Grades of VUR were assessed by International Reflux Grading System by voiding cystourethrogram.

[a] Chi-square test.

Table 2 Effect of overnight bladder drainage on bladder capacity and outline evaluated by voiding cystourethrogram.

Variable, n (%)		OBD Group (n = 47)	No OBD Group (n = 52)	P
Bladder capacity	Improved	21 (44.7)	10 (19.2)	*0.004*[a]
	Static	26 (55.3)	36 (69.3)	
	Progressed	–	6 (11.5)	
Bladder outline	Improved	11 (23.4)	3 (5.8)	*<0.001*[a]
	Static	36 (76.6)	38 (73)	
	Progressed	–	11 (21.2)	

The italic values refer to the statistically significant results ($P < 0.05$). OBD, overnight bladder drainage. Improved = increase in bladder capacity or smooth bladder outline, static = no change in bladder capacity or outline, progressed = decrease in bladder capacity or bladder wall irregularity, respectively. Bladder capacity was evaluated by voiding cystourethrogram and defined as increased, when bladder extended over the line connecting both iliac crests, decreased, when bladder did not reach the line connecting the caudal extension of the sacroiliac junctions or adequate bladder capacity, between these two levels.

[a] Chi-square test.

Table 3 Effect of overnight bladder drainage on febrile urinary tract infections, renal function affection, bladder wall thickness and post-void urine residual.

Variable		OBD Group (n = 47)	No OBD Group (n = 52)	P
Febrile UTIs, n (%)	No Episodes	33 (70.2)	38 (73.1)	0.88[a]
	Single Episode	9 (19.2)	8 (15.4)	
	≥2 Episodes	5 (10.6)	6 (11.5)	
SCr, mg/dL, mean ± SD	Baseline	0.88 ± 0.11	0.69 ± 0.09	0.17[b]
	Follow-up	0.96 ± 0.13	0.73 ± 0.08	0.11[b]
	P	0.92[c]	0.72[c]	–
Right renal Scarring by DMSA scan, n (%)	Static	38 (80.8)	42 (80.7)	0.14[a]
	Progressed	9 (19.2)	10 (19.3)	
Left renal Scarring by DMSA scan, n (%)	Static	40 (85.1)	44 (84.7)	0.41[a]
	Progressed	7 (14.9)	8 (15.3)	
Bladder wall Thickness, mm, mean ± SD	Baseline	5.1 ± 0.43	5.2 ± 0.59	0.61[b]
	Follow-up	4.54 ± 0.75	5.07 ± 0.64	0.07[b]
	P	0.06[c]	0.66[c]	–
PVR, n (%)	Improved	8 (17)	10 (19.3)	0.56[a]
	Static	34 (72.4)	33 (63.5)	
	Progressed	5 (10.6)	9 (17.3)	

DMSA, dimercaptosuccinic acid; OBD, overnight bladder drainage; PVR, post-void urine residual; SCr, serum creatinine; UTIs, urinary tract infections. Improved = PVR changed from significant to insignificant amount, static = no new renal scars by DMSA scan or no change in PVR, progressed = new renal scars by DMSA scan or PVR changed from insignificant to significant amount, respectively.

[a] Chi-square test.

[b] Student's t-test.

[c] Paired t-test.

continence, HN, VUR and abnormal bladder morphology that persist after EVA.

Conclusions

OBD might improve daytime continence, HN, VUR and abnormal bladder morphology that persist after EVA with no subsequent increase in febrile UTIs or renal function affection. Yet, compliance to OBD remains a matter of concern.

Implications for practice

To the best of our knowledge, this the first randomized controlled trial to declare the promising role of OBD in the management of the sequelae that could develop post EVA. One of the strengths of our study, that it is a well-controlled randomized prospective study with sufficient number of patients. The patients were also closely monitored from the start of the study to the end. Follow-up visits included thorough history taking, clinical examination, laboratory and radiological investigations.

Disclosure

I would like to disclose that the authors of this work have no conflict of interest to declare.

Further reading

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpurol.2024.11.006.