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Is urodynamic evaluation a must in all operated cases of open neural tube defects

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Summary

Background
Spina bifida is a common cause of pediatric neurogenic bladder. It causes renal failure in almost 100% of patients if the associated detrusor sphincter dyssynergia (DSD) is inadequately managed. Detrusor instability and high detrusor pressures (Figure) have been implicated as the major factors predictive of renal damage in these patients. Urodynamic studies provide early identification of "at risk" kidneys so that appropriate intervention can be made. However, the role in post-operative patients of spina bifida who have no clinical manifestations remains unclear.

Objective
To study the bladder dynamics in asymptomatic post-operative patients of spina bifida and to determine whether routine urodynamic study is justifiable.

Material and methods
Urodynamics was performed on 15 operated patients of spina bifida who did not have any neurological deficit and were asymptomatic.

Results
The mean age of the patients was 4.97 years. None of the patients had any urological complaints with their ultrasonography being normal. None had scars on nuclear scan. Of the 15 patients, 12 (80%) had abnormal findings on urodynamic assessment. Three patients (20%) had detrusor pressures greater than 40 cm of H_2O. One patient had significant residual urine and detrusor instability.

Discussion
The use of urodynamic studies in asymptomatic patients of spina bifida remains controversial, with one school of thought advocating early invasive urodynamic testing. In contrast, some favor noninvasive sonological monitoring, reserving invasive tests only for patients with renal tract dilatation. In our subset of patients none had renal tract dilatation but three patients (20%) had "at risk" bladders. These patients would benefit from early intervention aimed at renal preservation. The study is limited by a small sample size because of the relative rarity of the patient profile included. A further multicenter study with a case–control design could conclusively indicate the role of urodynamic testing in these patients.

Conclusion
Patients of spina bifida, even when asymptomatic, have a high incidence of unsafe bladders. Early identification and appropriate measures can protect kidneys from long-term damage, hence urodynamic profiling is mandatory for identification of potentially high-risk bladders.

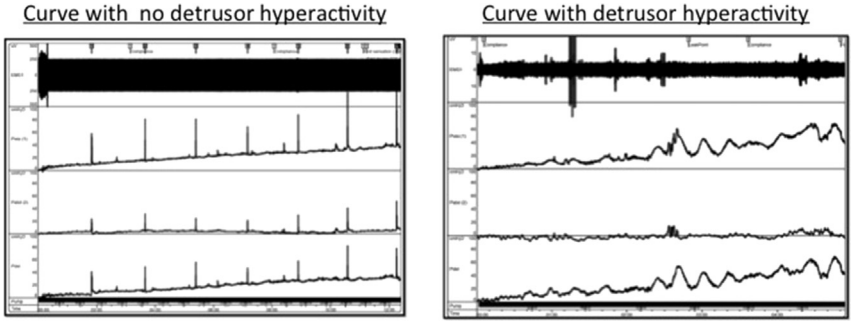

Figure Cystometry curves with and without detrusor hyperactivity.

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Introduction

Spina bifida is the most common cause of neurogenic bladder in pediatric patients. The lifetime risk of renal failure in patients with detrusor sphincter dyssynergia approaches 100% in the absence of adequate treatment [1]. Close to 20% of these patients develop renal failure in the first year of life [1]. Thus the current management of pediatric neurogenic bladder involves conservation of renal functions as the primary objective, along with establishment of social continence [1]. Urodynamic studies (UDS) help to identify the "at risk" kidneys and thus, early institution of "renal protective" interventions. The role of urodynamics in asymptomatic patients still remains unclear. This study was designed to document the urodynamic profile of asymptomatic patients of lumbosacral myelomeningocele (LSMMC) and reflect on justification of early urodynamic study in this subset of patients.

Material and methods

The study was conducted on asymptomatic patients of LSMMC, who underwent repair before reaching 6 months of age and attended our out-patient department from January to December in the year 2015. None of the patients had any clinical motor or sensory deficit and all of them were continent for stool and urine. All the patients voided and emptied well, except one who had a slight elevation in post void residual (PVR) urine, but we were unable to confirm if all of them voided strictly through their own bladder contractions or whether abdominal voiding was employed. For the purpose of the study, children that had not been toilet trained were considered continent if they stayed dry in between micturitions and had no history of dribbling. None of them had any history of urinary tract infections. None of the patients was on clean intermittent catheterization (CIC) at the time of inclusion. Hydrocephalus and other genito-urinary abnormalities were ruled out with a baseline ultrasonography done at the time of initial presentation following repair of myelomeningocele (MMC). Renal ultrasound, renal function tests, and urine cultures were repeated at the time of inclusion into the study. All these tests were found to be within normal ranges. None of the patients showed cortical scarring when subjected to the dimercaptosuccinic acid (DMSA) scan.

All the patients were also subjected to urodynamic evaluation (cystometry and uroflowmetry) using a solar Medical Measurement Systems (MMS) urodynamic machine (Table 1). Cystometry was done with a 6 Fr double lumen catheter. Lukewarm normal saline was infused at low bladder fill (less than 10% of the expected bladder capacity). The expected bladder capacity in milliliters, for that age group, was calculated using the formula (BC = 24.5 (age) + 62) [2]. The following urodynamic parameters were noted: detrusor pressure (P_{det}), compliance (C), bladder volume, maximum flow rate (Q_{max}), average flow rate (Q_{ave}), flow time (FT), voided volume (VV), and PVR urine. The peak detrusor pressure was calculated as the maximal pressure recorded by the cystometry curve during the filling phase in a calm child. Bladder capacity was taken as the volume of fluid infused, at which urine was seen leaking from the meatus. Compliance was calculated based on the cystometry curve, from the start to the finish of the cystometry graph. If the child was agitated during the study or there was a sharp rise in pressure at the point of leak, the test was disregarded and cystometry was repeated. If detrusor instability was seen in the first cystometry, the test was repeated twice at a slow fill rate of 5 mL/min. The diagnosis of detrusor over-activity was made if persistent fluctuations in detrusor pressures were noted in all the repeat curves. After cystometry, the patients were asked to void into the uroflowmeter. A bell

Table 1 Details of the patients' urodynamic studies.

Sl. no	Age, years	Sex	HC	Age at surgery, days	Bladder capacity (expected capacity), mL	Compliance	P_{det}	Detrusor instability	PVR	Q_{max} (mL/s)	Q_{avg} (mL/s)	FT (s)	FI_{Qmax}	FI_{Qavg}	Voiding pattern
1	10	M	No	60	257 (307)	49	29	No	Nil	22	12	28	0.85	0.72	N
2	4	M	No	63	251 (160)	23	37	No	Nil	–	–	–	–	–	–
3	3	M	No	94	109 (136)	2.3	57	No	Nil	–	–	–	–	–	–
4	7	M	No	97	87 (234)	7.3	47	Yes	15 mL	19	11	30	1.1	1.33	N
5	10	M	No	127	176 (307)	7.2	33	No	Nil	18	7	21	0.88	0.63	N
6	4	F	Mild	5	163 (160)	32	20	No	Nil	8	6	26	0.37	0.58	P
7	3.5	M	Mild	132	178 (148)	59	23	No	Nil	8	5	37	0.35	0.45	P
8	5	M	No	164	222 (185)	17.4	18	No	Nil	11	9	27	0.44	0.73	P
9	7.5	F	No	64	361 (246)	23.7	18	No	Nil	16	11	30	0.5	0.68	P
10	3	M	Mild	129	117 (123)	56.2	16	No	Nil	8	8	27	0.42	0.93	P
11	3	M	No	96	120 (136)	17.14	22	No	Nil	–	–	–	–	–	–
12	2.5	M	No	95	108 (123)	7.5	21	No	Nil	–	–	–	–	–	–
13	1.5	M	Mild	124	55 (99)	15.3	40	No	Nil	31	8	15	2.08	1.32	T
14	5	M	No	37	336 (185)	56.6	23	No	Nil	17	6	18	0.59	0.41	P
15	5	F	No	7	190 (185)	14.8	23	No	Nil	–	–	–	–	–	–

HC, hydrocephalus; P_{det}, peak detrusor pressure; PVR, post void residual urine; Q_{max}, peak flow rate; Q_{avg}, average flow rate; FT, flow time; FI_{Qmax}, flow index of Q_{max}; FI_{Qavg}, flow index of Q_{avg}; N, normal voider; T, tower voider; P, plateau voider.

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