



Neurogenic non-neurogenic bladder in childhood: complications and prognostic factors

Vessie neurogène non neurogène de l'enfant : complications et facteurs pronostiques

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RÉSUMÉ

La vessie neurogène non neurogène est un motif fréquent de consultation. Non prise en charge, les complications peuvent être graves. Objectifs : Identifier les complications de la vessie neurogène non neurogène et déterminer les facteurs prédictifs de leurs survenues. Méthodes : Etude prospective, transversale et analytique (septembre 2016-septembre 2017) sur une série de cas d'enfants porteurs de vessie neurogène non neurogène, suivis dans le service de pédiatrie de l'hôpital Charles Nicolle de Tunis. Résultats : Vingt-quatre patients ayant une vessie neurogène non neurogène ont été inclus dans l'étude. Les critères prédictifs de complications de la vessie neurogène non neurogène étaient : le sexe féminin, l'hyperactivité vésicale détrusorienne phasique, l'hypocompliance vésicale, l'hypercontractilité détrusorienne permictionnelle. Conclusions : la vessie neurogène non neurogène est une pathologie fréquente en pédiatrie, il est important de la diagnostiquer et de la prendre en charge de façon adaptée et précoce afin d'éviter ses complications.

Mots clés : Enfant, vessie neurogène, pronostic, complications

SUMMARY

Neurogenic non-neurogenic bladder is a common problem in clinical practice. Untreated, complications can be serious. Aim: Identify complications of neurogenic non-neurogenic bladder and determine the predictive factors of their occurrence. Methods: Prospective, cross-sectional and analytical study (September 2016-September 2017) on a series of cases of children carrying VNNN, followed in the nephrology pediatric department of Charles Nicolle Hospital in Tunis. Results: Twenty-four patients were included in the study. The predictive criteria for neurogenic non-neurogenic bladder complications that we were able to highlight were: female sex, phasic detrusor bladder overactivity, bladder hypocompliance, and midstream hypercontractility. Conclusion: Neurogenic non-neurogenic bladder is a common pathology in pediatrics, it is important to diagnose and manage appropriately and early to avoid its complications.

Key words: Child, neurogenic bladder, prognosis, complications

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INTRODUCTION

Bladder disorders are a common complaint in pediatrics, they are in most cases of functional cause. Voiding dysfunction, also called non-neurogenic neurogenic bladder (NNNB), is one of these bladder disorders. The overall prevalence of voiding dysfunction is between 7 and 11% among girls of school age (1). The initial diagnostic approach requires one or more long-term consultations and aims to eliminate organic abnormalities that may be causing the voiding disorder.

Urodynamic study may be necessary in order to specify the detrusor-sphincter disorder and assess its severity. NNNB is a voiding dysfunction in children who is often mild and can present clinical and paraclinical signs of varying severity and generate serious uro-nephrological complications similar to complications of neuro-bladder (2,3).

The aim of this study was to identify the uro-nephrological complications of NNNB and to determine the predictive factors of their occurrence.

METHODS

This is a prospective, transversal and analytical study (September 2016-September 2017) on a series of cases of children with NNNB, followed in the pediatric department of Charles Nicolle Hospital in Tunis. These children were initially recruited from the outpatient follow-up for NNNB and then referred to the urodynamic unit of the urology department of the same hospital for clinical re-evaluation and urodynamic study. We included all children aged from 5 to 18 years followed for NNNB. The diagnosis was based on clinical criteria (day and night urinary incontinence, recurrent urinary tract infections, dysuric syndrome, incomplete bladder emptying feeling, severe chronic constipation and/or encopresis, psychological disorders with a uroflowmetry showing interrupted micturition with a polyphasic curve with or without post-micturition residue (PMR)), a urodynamic criteria (detrusor-sphincter dyssynergy (DSD)) and negative criteria (no neurological lesion on clinical and paraclinical investigation (spinal cord MRI) in a child over 5 years of age after toilet training in early childhood or later.

Children not included in our study were those with:

- A congenital defect of the neural tube: spina bifida
- Obstructive urological congenital malformation: posterior

urethral valves, obstructive megaureter

- Neurological disease: spinal cord injury, multiple sclerosis
- Diabetes mellitus or insipidus
- Severe psychological disorders
- Children in whom neurological abnormalities on clinical or paraclinical examination (spinal MRI) were discovered,
- Parental decline to participate in the study or to perform the urodynamic study

The patients were divided into 3 groups according to the existence or not of complications or chronic kidney disease (CKD): Group A was that of children with CKD, group B included patients with a complicated NNNB with a normal renal function and group C included children with uncomplicated NNNB with normal renal function.

All statistical values were represented as the mean SD. The χ^2 -test was used to compare parameters between groups. A p-value<0.05 was considered statistically significant. All statistical analyses were carried out using SPSS software.

RESULTS

Twenty-four children were included in our study: 16 girls and 8 boys (sex ratio = 0.5), the average age was 8.2 ± 3.3 years (range: 4-18 years old). A history of recurrent urinary tract infections was noted in 21 patients (87.5%). Associated disorders were found in 18 children: mental disorder in 3 cases, emotional shock in 2 cases, abuse and birth of a brother in one case each. The associated transit disorders were encopresis (n=3) and constipation (n=8).

Six children were in group A, 8 in group B, and 10 in group C.

Storage symptoms were pollakiuria, nocturia, urgency, Urinary Urge urinary incontinence, Stress urinary incontinence, enuresis, permanent urinary incontinence, Insensible urinary incontinence, and Reduced sensitivity (Table 1).

Voiding symptoms were: slow stream, straining, intermittent stream, hesitancy and terminal dribble (Table 2). Symptoms of the post-voiding phase were the presence of post micturition dribble, and the feeling of incomplete emptying (Table 3). A total of 14 patients (58.3%) had overactive bladder syndrome (2 of group A, 5 of a group B, and 7 of group C) and ten patients (37.5%) had dysuric syndrome (5 of group A, 4 of group B, and 1 patient of group C).

Table 1: Distribution of patients in the three groups according to the symptoms of the filling phase

	Groupe A	Groupe B	Groupe C	Total
Pollakiuria	3(12,5)	3(12,5)	5 (20,8)	11(45,8)
Nocturia	2(8,3)	1(4,1)	2(8,3)	5(20,8)
Urgency	2(8,3)	4 (16,7)	7 (29,1)	13 (54,1)
Urge urinary incontinence	1(4,1)	3(12,5)	7(29,1)	11 (45,8)
Stress urinary incontinence	0	2(8,3)	1(4,1)	3(12,5)
Mixed urinary incontinence	0	0	0	0
Enuresis	3(12,5)	2(8,3)	6 (25)	9(37,5)
Continuous urinary incontinence	1(4,1)	0	0	1(4,1)
Insensitive urinary leakage	0	1(4,1)	0	1(4,1)
Reduced sensitivity	1(4,1)	6(25)	8 (33,3)	15 (58,3)

Table 2: Distribution of patients in the three groups according to the symptoms of the voiding phase

	Groupe A	Groupe B	Groupe C	Total
Slow stream	2(8,3)	2(8,3)	3(12,5)	7(29,1)
Intermittent stream	2(8,3)	3(12,5)	3(12,5)	8(25)
Hesitancy	3(12,5)	2(8,3)	2(8,3)	7(29,1)
Straining	2(8,3)	1(4,1)	4(16,7)	7(29,1)
Terminal dribble	0	2(8,3)	3(12,5)	5(20,8)

Table 3: Distribution of patients in the three groups according to symptoms of the post-voiding phase

	Groupe A	Groupe B	Groupe C	Total
Post micturition dribble	1(4,1)	0(0)	3(12,5)	4(16,7)
Feeling of incomplete emptying	0	2(8,3)	4(16,7)	6(25)

Daytime voiding frequency ranged from 5 to 12 with an average of 7.7 ± 2.58 voids during the day. Two patients had nocturia. The daily voiding frequency averaged 8.55 ± 3.06 micturitions per day (5-15). Two patients had polyuria. Urine output ranged from 240 to 2200 ml with an average of 1400 ± 466 ml. The maximum voiding volume per voiding ranged from 120 to 350 ml with an average of 212 ± 77 mL.

Regarding the impact on the upper urinary tract, 11 patients (45.8%) had a diverticular bladder: five from group A and six from group B. A bladder wall thickness was noted in two patients. Uretero-hydronephrosis was noted in 7 cases: unilateral ureter dilatation in four patients of group A and

one patient of group B. The ureter dilatation was bilateral in two patients of group B. Seven patients presented with vesicoureteral reflux (VUR): it was unilateral in one patient of group A and two patients of group B and was bilateral in three patients of group A and one patient of group B. Six patients of group A had impaired renal function, it was moderate in four patients and severe in two children. With regard to flow measurement, Staccato-shaped curve was noted in seventeen patients. Maximum flow ranged from 2.7 ml to 43.3 ml, with an average of 19.47 ± 7.29 ml. The average urine volume was 164.7 ± 75.1 ml (30-379). Eight patients had post-void residue (PVR). The average PVR was 150.71 ± 96.89 ml (30-300). On cystometry, the bladder was normal in 19 patients (79.1%). Sensitivity was increased in two patients and reduced in three patients.

During filling, the bladder was stable in 62.5% of patients, uninhibited bladder contractions were noted in 9 patients. The bladder was of normal capacity in 15 patients (62.5%). It was of small capacity in 3 patients and of large capacity in 6 patients. The bladder was normocompliant in 15 patients (62.5%), it was hypocompliant in eight patients and hypercompliant in one patient. Permittional detrusor contractility was normal in almost half of the cases. Female sex was a risk factor for complications (chi-square = 9.436, P = 0.003). There was no statistically significant correlation between the symptoms of the filling phase, those of the micturition phase or post-micturition phase and the occurrence of complications. Detrusor hyperactivity and abnormal bladder compliance were predictive factors for the occurrence of complications (Table 4).

Table 4: Urodynamic factors predicting the occurrence of complications in the NNNB

Urodynamic factors	Complications	No complications	Chi-square	P	
Sensitivity	Normal	10	9	3,42	0,07
	Increased	1	1		
	Decreased	3	0		
Activity	Normal	6	9	4,2	0,04
	Detrusor Overactivity	8	1		
Capacity	Normal	5	10	12,24	0,001
	Small	0	3		
	Big	6	0		
Compliance	Normal	5	10	11,37	0,001
	Hypocompliance	8	0		
	Hypercompliance	1	0		
Contractility	Normal	4	10	12,69	0,001
	Hypercontractility	9	0		
	Hypocontractility	1	0		

p<0.05 : significant

DISCUSSION

Bladder dysfunction is very common in clinical practice in pediatric nephrology (4). These children are particularly prone to develop complications including recurrent urinary tract infections, vesico-renal reflux. Our study shows that the predictors of the severity of bladder dysfunction are: the female sex and the existence of urodynamic abnormalities such as detrusor overactivity during filling, high bladder capacity, bladder hypocompliance and bladder hypercontractility during voiding (5). The diagnostic criteria differ from one study to another although the definition criteria have been determined by the ICSS since 2006 (6). It has been reported in the literature that NNNB occurs more frequently in boys (7), this was not the case in our series since 66.66% of our patients were girls. Claudon et al (8), in their multicenter study, reported that the male sex was a predictor of the severity of DSD. However, our results were inconsistent with the literature since we found that the female sex was a predictor of occurrence of complications.

NNNB can occur during childhood or more rarely at puberty (9). It can persist into adulthood (10). The late age of diagnosis would be a predictor of severity, the age in our study was 8.2 ± 3.3 years. This late age could explain the frequency of complicated forms. The frequent association with behavioral disturbances has led to the suggestion of a psychosomatic pathology, recent work in neurophysiology has made it possible to better understand the supramedullary processes leading to mental disorder and to a somatic sphincter expression (11). Constipation is frequently found during bladder dysfunction as suggested by several studies (12,13), in our series, 33.3% of children had constipation. In the study by Lahrabli et al, NNNB was mainly revealed by symptoms of the lower urinary tract: enuresis or intermittent urinary incontinence (48.5%), urinary retention (42.4%) and urinary stream abnormalities (33, 3%) (14).

Claudon et al. [8] in their retrospective, multicenter study of 31 patients found that 84% of patients had initial urological symptoms, 35% of which were enuretics. In our series, intermittent incontinence (as defined by ICCS) was the most common initial symptom with a preponderance for the daytime form as described in the literature (15). In our study, no symptom of the filling phase seemed to influence the occurrence of complications in NNNB.

The urinary stream abnormalities (dysuria) were significantly correlated with the occurrence of dilation

of the upper urinary tract ($p < 0.05$) in the Lahrabli study (14). In our study, no symptoms of the voiding or post voiding phase appeared to influence the occurrence of complications in NNNB.

Likewise, dysuric syndrome did not seem to be a predictor of the occurrence of complications in NNNB. Detrusor hyperactivity and hypertonia cause muscle hypertrophy, fibrosis with a decrease in bladder capacity and an increase in PVR. This set is maintained by chronic infection.

This theory would explain the urodynamic results found in our study. In the Lahrabli study (14), bladder capacity was reduced in 27.3% of children. Detrusor hyperactivity was associated with complications of the upper urinary system in 36.4% of cases.

Compliance disorders and decreased bladder capacity have been reported in Hinman syndrome. In our study, it seems that overactive bladder as well as compliance disorders, increased bladder capacity and overactive bladder are predictive factors for the occurrence of complications.

CONCLUSIONS

NNNB is a frequent pathology in pediatric nephrology consultations. It is a significant cause of recurrent urinary tract infections, vesico-renal reflux and chronic renal failure. The psycho-social impact is very important to consider in VNNN which implies early and appropriate care.

Conflicts of interest: There are no conflicts of interest.

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