

Original Research

The Role of Urodynamic Study in Evaluating Children with Refractory Nocturnal Enuresis

Hamdalla Husayn Abdul-Hafith¹, Khayrullah Salih Abdulhafit^{2*}

¹ *Urology Department, Faculty of Medicine, Tobruk University, Tobruk, Libya*

² *Pediatric Department, Faculty of Medicine, Tobruk University, Tobruk, Libya*

***Corresponding Author:** *Khayrullah Salih Abdulhafit, Department of Pediatric. E.mail:*

khyrallhbnhmd94@gmail.com

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ABSTRACT:

Nocturnal enuresis or bedwetting is the most common type of urinary incontinence in children. It has significant psychological effects on both the child and the family. The Aim of study was to

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evaluate the role of UDS in evaluation of refractory Nocturnal Enuresis in children. This Prospective Study was carried out in Urology Department, Tobruk University that included 30 Patients, 18 boys and 12 girls. The patient ages were ranged from 10–18 years old with mean age (SD) of 11.91 ± 1.95 years. All patients were treated with mono pharmacotherapy (desmopressin). The duration of treatment before urodynamic studies (UDS) at last six months. Bladder sensation was intact in 41.7%, increased in 50.0% and decreased in 8.3% of patients. The value of a single test PVR was ranged from 20-150 ml. 21 of patients were no post voiding volume (87.5%) and 3 cases had post voiding volume (12.5 %). The filling cystometry was normal in 6 patients (25%) and abnormal in 18 patients (75%). Bladder sensation intact in 10 patients (41.7%) and decrease in 2 patients (8.3%) and increase in 12 patients (50%) with p-value (< 0.05). It is recommended to perform urodynamic studies in the form of uroflowmetry and cystometry for those with refractory nocturnal enuresis who failed ADHC (desmopression) for at last 6 months as initial monotherapy. Also a combination therapy of anticholinergics with desmopressin could be applied as treatment for those with refractory monosymptomatic nocturnal enuresis.

KEYWORDS: Nocturnal Enuresis, Urodynamic Studies, Detrusor Overactivity.

INTRODUCTION

The International Children's Continence Society (ICCS) defined nocturnal enuresis as both a symptom and a condition of intermittent incontinence that occurs during periods of sleep. Previously it was wetting in discrete portions while asleep after the age of five. (Hashim H, et al., 2019)

Refractory Nocturnal enuresis is defined as less than 50% improvement in symptoms with an adequate trial of treatment (3 months). Children with refractory enuresis showed abnormal sleep architecture, high incidences of periodic limb movements in sleep, and increased cortical arousability, leading to awakening. (El-Mitwalli A, et al., 2014).

Patients with primary enuresis that is refractory to treatment are usually referred for urodynamic assessment. The referring physician is looking for an urodynamic explanation for the failure of treatment, which has usually been given with the aim of improving the storage function of the bladder. How far these patients would benefit from urodynamic testing as part of their management. (Elmissiry M, et al., 2013)

The monosymptomatic nocturnal enuresis (MNE) is recommended by the International Children's Continence Society (ICCS) to distinguish MNE from non-monosymptomatic nocturnal enuresis (NMNE), which is accompanied by lower urinary tract symptoms (LUTS) such as daytime urinary frequency, urgency, or urinary incontinence. In general, indications for urodynamic studies (UDS) in children include the following: neurogenic bladder, sphincter dysfunction, anorectal malformations, voiding dysfunction including urge syndrome and underactive bladder, vesicoureteral reflux, urinary incontinence, infravesical obstruction, or obstructive uropathy. (Elsiad I, et al., 2019)

It was thought that patients with a diagnosis of MNE had normal bladder function. Thus, invasive urodynamic studies (UDS) was not generally performed in children in order to manage MNE. However, several studies have revealed an important role of the reduced functional bladder capacity and bladder dysfunction in the progression of refractory MNE. (.Yeung CK, et al., 2002)

The Aim of this study was to evaluate the role of UDS in management of refractory Monosymptomatic Nocturnal Enuresis (MNE).

MATERIALS AND METHODS

This prospective study was carried out in Urology Department, Tobruk University Hospital from March 2024 to December 2024, Twenty four patients with refractory MNE were enrolled in the study. The included patients with MNE were treated with mono pharmacotherapy (desmopressin) for at least six months without response.

Written informed consent was obtained from all children's' parents or their relatives and the study was approved by the research ethical committee of Faculty of Medicine, Tobruk University. The study was done according to The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Inclusion Criteria

Any patient above 10 and less than 18 years who has refractory enuresis according to the ICCS guidelines, meaning failure of medical treatment after at least 6 months of continuous treatment in form desmopression 0.2mg up to 0.6 mg / day and patients with monosymptomatic enuresis .

Exclusion Criteria

Patients with Neuropathic bladder disorder, Diabetes-mellitus, spinal dysraphism, dysfunctional voiding, or anatomical abnormalities of urinary tract were excluded.

Patients

All patients were subjected to complete history including sex, age, fluid intake, urological

symptoms as frequency, urgency, nocturia, urge incontinence, holding maneuvers (e.g., standing on tiptoes, crossing the legs, pressing the heel or hand into the perineum), number of bed wetting per week. Medical history including types of drugs as desmopressin, or other drugs and the duration of treatment. Family history to NE. History of constipation. or other medical diseases. History of previous pelvic or urological procedure.

All patients undergoing physical examination which include general examination as body build, back to exclude spina bifida, abdominal examination to exclude supra pubic fullness, examination of genitalia and perineum to exclude meatal stenosis or any congenital anomalies.

Complete urine analysis, urine culture and sensitivity to exclude active urinary tract infections and hematuria.

Random blood sugar

Pelvic abdominal ultrasonography (U/S) and Plain X-ray (KUB) to evaluate the size of the kidney, parenchymal thickness, degree of echogenicity and to exclude renal, ureteric or bladder stones, spina bifida and other abnormalities.

Urodynamic Method

All patients were subjected to urodynamic study using Laborie Machine model triton, using 6 Fr double lumen urethral catheter to measure intravesical pressure (Pves) and 6 Fr water filled rectal catheter to measure intraabdominal pressure (Pabd).

The Urodynamic tests were done in this study included:

Uroflowmetry: is a measurement of the urine flow rate over time. It is also an assessment of bladder emptying.

Post-void residual urine volume: Post-void residual volume (PVR) is the amount of urine retained in the bladder after a voluntary void and functions as a diagnostic tool.

A post-void residual volume helps in the evaluation of many disease processes, including but not limited to neurogenic bladder, cauda equina syndrome, urinary outlet obstruction, mechanical obstruction, medication-induced urinary retention, postoperative urinary retention, and urinary tract infections

- **Filling cystometrography (CMG):** is the method by which the pressure/volume relationship of the bladder is measured during bladder filling. The filling start by 10 cc/sec and then increase gradually up to 50 cc/sec to avoid overstimulation for dartose muscle, ask patient cough to make sure there isn't blocked to rectal catheter and for exceled stress incontinence also ask patient about first bladder sensation and strong desire to void.

The filling phase starts when filling commences and ends when the patient cannot maintain continence or urinary leakage occurs and urodynamicist given permission to void.

Start by 10 cc/sec and then increase gradually up to 50 cc/sec to avoid overstimulation for dartose muscle, ask patient cough to make sure there isn't blocked to rectal catheter and for exceled

stress incontinence also ask patient about first bladder sensation and strong desire to void. CMG can be performed by double lumen urethral catheter to measure Pves and rectal catheter to measure Pabd. To calculate Pdet the following equation is used: **Pdet = Pves – Pabd.**

Measurements obtained during cystometry include bladder sensations, compliance, bladder capacity and the presence or absence of detrusor overactivity.

RESULTS AND DISCUSSION

Table1: Age and Sex Distribution among Studied Group (N=24)

		Age/ years	
Median (Range)		11.0 (10-18)	
		N	%
Gender	Female	10	41.7
	Male	14	58.3
	Total	24	100.0

Table (1) showed that the mean age was 11.91±1.95 years; males were majority with 58.3%.

Table2: Bladder Sensation Distribution among Studied Group (N=24)

		N	%
Bladder sensation	Intact	10	41.7
	Decrease	2	8.3
	Increase	12	50.0
	Total	24	100.0

Table (2) showed that bladder sensation was intact in 41.7%, increased in 50.0% and decreased in 8.3% of patients.

Table 3: Detrusor stability and Bladder compliance Distribution among Studied Group (N=24)

		N	%
Detrusor Stability	No uninhibited detrusor contractions	7	29.2
	Phasic uninhibited detrusor contractions	17	70.8
Bladder Compliance	Decrease	7	29.2
	Normal	17	70.8
	Total	24	100.0

Table (3) showed that detrusor stability had Phasic uninhibited detrusor contractions and 29.2% had No uninhibited detrusor contractions, regard Bladder compliance 70.85 were normal and 29.2% decreased. Table (3) showed that regarding detrusor stability 17 patients had Phasic uninhibited detrusor contractions and 7 patients had No uninhibited detrusor contractions, while regarding Bladder compliance, 17 patients were normal and 7 patients decreased.

Table 4: Post Voiding Volume Distribution among Studied Group (N=24)

		N	%
Post voiding volume	NIL	21	87.5
	20	1	4.2
	40	1	4.2
	150	1	4.2
	Total	24	100.0

Table (4) showed that NIL Post voiding volume was normal in 21 patients and 3 patients cases had Post voiding volume.

Table 5: Diagnosis Distribution among Studied Group (N=24)

		N	%
Diagnosis	Normal	6	25.0
	Hypo contractile bladder	2	8.3
	Idiopathic detrusor over activity	16	66.7
Low Compliance	No	22	91.7
	Yes	2	8.3
	Total	24	100.0

Table (5) showed that regarding diagnosis, 25% were normal and 66.7% were Idiopathic detrusor over activity and only 2 cases (8.3%) had Hypo contractile bladder and only 2 cases had Low compliance.

DISCUSSION

Patients with enuresis that is refractory to treatment who are referred for urodynamic study usually have tried several kinds of medical and behavioral therapy without any response. The referring physicians are hoping to find a urodynamic explanation for this treatment failure that will affect management. However, if the result of urodynamic study is in the form of a bladder filling abnormality such as reduced bladder capacity, detrusor overactivity or hypocompliance, this will not be of much help, as these patients have already received medical treatment for such problems.(Ismail MB. 2016)

It was thought that patients with a diagnosis of MNE had normal bladder function. Thus, invasive UDS was not generally

performed in children in order to manage MNE. However, several studies have revealed an important role of the reduced functional bladder capacity and bladder dysfunction in the progression of refractory MNE (Yeung CK, et al., 1999). Unlike MNE, it has been suggested that children with NMNE present with symptoms mainly due to underlying lower urinary tract dysfunction (Neveus T et al., 2006). Therefore, this study sought to determine whether or not a UDS is beneficial for NE management in pediatric patients, especially in cases of pharmacoresistant MNE

The urodynamic test should be indicated in patients with symptoms of overactive bladder refractory to treatment, as well as those patients in whom an organic cause is suspected during the diagnostic investigation. The use of such conduct could result in a decrease in the number of invasive procedures, reducing the discomfort of the patient and family, time until the start of the treatment, and hospital costs. (Lebl A, et al., 2016)

SO, this study was aimed to evaluate the role of UDS in diagnosis of the causes of refractory nocturnal enuresis after 6 months of treatment with mono pharmacotherapy.

In this study 24 patients including, 14 boys and 10 girls (male 58.3%-female 41.7%) the patient ages were ranged from 10–18 years old with mean age (SD) of 11.91 ± 1.95 years. No patients were found to have any relevant psychological history, medical diseases or other urological symptoms. All patients were treated with mono pharmacotherapy (desmopressin). The duration of treatment before UDS ranged from six to ten months.

(Naseri M, Hiradfar M. Abnormal,2012) reported that of 60 there were 33 boys and 27 girls with mean age 8.8 ± 2.3 years (range 5-14 yr) met the inclusion criteria. Also, (Conkar S,

Mir S. , 2018) reported that their study included two hundred and seventy-seven (30.8%) boys and 620 (69.1%) girls with a mean age of 7.52 (± 2.6) years (range: 5-18) underwent UDS in their study

Bladder sensation intact in 10 patients (41.7%) and decrease in 2 patients (8.3%) and increase sensation in 12 patients (50%).

(Saber-Khalaf, et al., 2017), Reported that abnormal cystometric findings was detected in the form of detrusor overactivity in 52.5% and abnormal bladder sensations in 24% of patients

Regarding detrusor stability, there was overactive bladder in 17 patients (70.8%) and normal detrusor function in 7 patients (29.2%). Which in agreement with the study of (Conkar S, Mir S. , 2018) who reported that the overactive bladder detected in 630 patients (70.2%) and 29.8% of patients were normal.

While in contrast, (Elmissiry M, et al., 2013) found that detrusor overactivity was reported in 45% of patients and 55% were normal.

The value of PVR was ranged from 20-150 ml, 21 of patients were no post voiding volume (87.5%) and 3 cases had post voiding volume (12.5%) 2 case of them hypocontractile bladder.

While (Conkar S, Mir S., 2018) reported that the post voiding volume was represented in 450 patient (50.1%).

The filling cystometry was normal in 6 patients (25%) and abnormal in 18 patients (75%). 8 patients out of 18 have idiopathic detrusor overactivity (IDO) in patients (66.7%) and hypocontractile bladder in 2 case (8.3%) low bladder compliance in 7 patients (38.9%).

(Naseri M, Hiradfar M. Abnormal,2012), reported in his study on 48 patients that The detrusor overactivity (DO) was the most common findings in (56.2 %).

Also (Elsiad I, et al., 2019) reported in his study on 30 patients with MNE, normal filling cystometry in (43.3%) and abnormal filling cystometry 17 patients (56.6%) in the form of detrusor overactivity (DO) in 12 patients (40%) and low bladder compliance in 5 patients (16.6%).

Higher percentage of abnormal UDS findings were reported by (Ryu D, et al, 2014) in combined study including 19 patients with MNE and 61 patients with NMNE. In the MNE arm of the study, (36.8%) had normal filling cystometry and (63.2%) had abnormal filling cystometry in the form of (31.6%) Detrusor overactivity (DO), (21.1%) had DO with decreased cystometric bladder capacity, and (10.5%) had DO with detrusor sphincter dyssynergia (DSD).

Another study by (Sehgal R, et al., 2007), on large No of patients (116) who are not classified .when compared to our study, it reported that the filling cystometry of 116 patients, (68.9%) had abnormal filling cystometry and (31.03%) had normal filling cystometry. The most common abnormality was overactive bladder (OAB) in (43.1%), small bladder capacity in (17.2%), reduced bladder compliance in (2.5%) and detrusor sphincter dyssynergia in (2.5%).

(Ryu D, et al 2014), reported in this study 80 children (50 boys and 30 girls,), 19 of which were diagnosed with MNE and 61 of which were diagnosed with NMNE, were included in the final analysis. Of the 19 MNE children, 12 (63.2%) demonstrated abnormal UDS findings which is comparable to our study (75%). Ten

demonstrated detrusor overactivity (DO) with or without decreased cystometric bladder capacity (CBC)

We should note the differences between our study and these previous studies. Our study included small number of patients with only MNE , while in the studies by (Sehgal R, et al., 2007)a large number of patients with unclassified NE were evaluated.

(Elmissiry M, et al., 2013) when compared to our study we included only MNE with no day time symptoms or dysfunctional voiding so, we use only uroflowmetry and cystometry without EMG. also (Vignoli G., 2017) reported that according to AUA/SUFU guidelines on urodynamic, EMG of pelvic floor muscles is recommended in patients with relevant neurological disease at risk for neurogenic bladder .

CONCLUSION

It is recommended to perform urodynamic studies in the form of uroflowmetry and cystometry for those with refractory nocturnal enuresis who failed ADHC (desmopressin) for at last 6 months as initial monotherapy. Also a combination therapy of anticholinergics with desmopressin could be applied as treatment for those with refractory monosymptomatic nocturnal enuresis.

RECOMMENDATION

This study recommends performing urodynamic studies in the form of uroflowmetry and cystometry for those with refractory nocturnal enuresis who failed ADHC (desmopressin) for at last 6 months as initial monotherapy. Also a combination therapy of anticholinergics with

desmopressin could be applied as treatment for those with refractory monosymptomatic nocturnal enuresis.

Abbreviations:

SD: Mean Age
USD : Urodynamic studies
ICCS : International Children's Continence Society
MNE : Monosymptomatic Nocturnal Enuresis

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اللاإرادي المقاوم للعلاج والذين لم يستجيبوا للعلاج الأحادي الأولي بمضادات الكولين (ديسموبريسين) لمدة 6 أشهر على الأقل. كما يُمكن تطبيق العلاج المركب بمضادات الكولين مع ديسموبريسين كعلاج للمرضى الذين يعانون من التبول الليلي اللاإرادي أحادي العرض المقاوم للعلاج.

الكلمات المفتاحية: التبول الليلي اللاإرادي، دراسات ديناميكية بولية، فرط نشاط العضلة الدافعة للمثانة.

المخلص

يُعدّ التبول الليلي اللاإرادي، أو التبول في الفراش، أكثر أنواع سلس البول شيوعاً لدى الأطفال، وله آثار نفسية كبيرة على الطفل وأسرته. هدفت هذه الدراسة إلى تقييم دور دراسات ديناميكية التبول (UDS) في تشخيص التبول الليلي اللاإرادي المقاوم للعلاج لدى الأطفال. أجريت هذه الدراسة الاستباقية في قسم جراحة المسالك البولية بجامعة طبرق، وشملت 30 مريضاً (18 صبياً و12 فتاة). تراوحت أعمار المرضى بين 10 و18 عامًا، بمتوسط عمر (انحراف معياري) $11.91 \pm$ 1.95 عامًا. خضع جميع المرضى للعلاج بدواء واحد (ديسموبريسين). استمرت فترة العلاج قبل إجراء دراسات ديناميكية التبول (UDS) ستة أشهر على الأقل. كانت حساسية المثانة سليمة لدى 41.7% من المرضى، ومُحسنة لدى 50.0%، ومُنخفضة لدى 8.3%. تراوحت قيمة حجم البول المتبقي بعد التبول (PVR) في الاختبار الواحد بين 20 و150 مل. لم يُلاحظ وجود حجم بول بعد التبول لدى 21 مريضاً (87.5%)، بينما لوحظ وجود حجم بول بعد التبول لدى 3 مرضى (12.5%). وكانت نتائج قياس امتلاء المثانة طبيعية لدى 6 مرضى (25%) وغير طبيعية لدى 18 مريضاً (75%). وكانت حساسية المثانة سليمة لدى 10 مرضى (41.7%)، بينما انخفضت لدى مريضين (8.3%)، وزادت لدى 12 مريضاً (50%)، مع قيمة p أقل من 0.05. يُوصى بإجراء دراسات ديناميكية بولية، تشمل قياس تدفق البول وقياس ضغط المثانة، للمرضى الذين يعانون من التبول الليلي

