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Is the Enuretic Female Bladder Without Instability Normal?

J. R. Hindmarsh[1] and P. O. Byrne[2]

[1]Newcastle University and [2]Regional Department of Medical Physics Newcastle General Hospital, Newcastle-Upon-Tyne, UK

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Summary. Twenty-one females with a history of nocturnal enuresis were found to have stable bladders on cystometric testing. A stable detrusor is defined as one that is capable of contraction but does not develop abnormal contractions on filling inspite of provocative testing by rapid filling, standing, coughing and erect filling. A detailed assessment of 10 measurements revealed abnormalites in 19 of the 21 cases. This result strengthens the theory that for nocturnal enuresis to occur, two abnormalities are necessary: (a) failure of a full bladder to arouse from sleep, and (b) an abnormality of bladder/urethral function. Identifiable causes of nocturnal enuresis included a small functional bladder capacity, outlet obstruction, increased detrusor contractility and low urethral closure pressure.

Key words: Nocturnal enuretics, Cystometry.

INTRODUCTION

It has been suggested that for nocturnal enuresis to occur two abnormalities are necessary: (a) failure of arousal from sleep when the bladder is full and (b) an abnormality of bladder/urethral function (7). Several studies have been performed to identify a bladder abnormality in nocturnal enuretics and the findings both in children and in adults have shown a high incidence of cystometrically unstable detrusors. However, approximately one-third of the patients in this present series showed no evidence of abnormal detrusor contractions and thus no obvious reason for their nocturnal incontinence.

If nocturnal enuresis occurs only because of an abnormality of bladder/urethral function, then an abnormality must be demonstrated in all cases.

To test this hypothesis, females with nocturnal enuresis and stable bladders on cystometric testing were assessed and 10 urodynamic features measured in an attempt to identify any abnormality.

MATERIAL AND METHODS

Ninety-three patients with a history of nocturnal enuresis were investigated cystometrically. Thirty-one of these patients were stable on cystometric testing. Ten were males and 21 females.

There were three clinically recognisable groups, the primary enuretic with no period of remission longer than 3 months, the recurrent enuretic with a remission period greater than 3 months and the late onset group of patients who stopped bed wetting before 5 years of age but later reverted (Table 1).

The traces of the 21 females form the basis of this study.

Cystometry was performed by recording total bladder pressure, rectal pressure, subtracted detrusor pressure and flow rate on a 4 channel Watanabe Chart Recorder. Filling cystometry was performed in the supine position through an 8 F. G. catheter infusing normal saline at 37°C at 100 ml/min with a Watson-Marlow pump. Voiding pressures were recorded through a 16 gauge epidural cannula with the rectal line in situ.

Urethral closure pressures were measured using an 8 F. G. profile catheter withdrawn mechanically at 1 mm/s with a saline infusion rate of 2.5 ml/min.

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RESULTS

Fifteen age-matched females with minor urological symptoms but cystometrically normal bladders acted as the control group. The average values (± SD) in the group of the 10 features examined were taken as normal (Table 2).

Filling Phase

The first desire to void was recorded. The volume recorded within the bladder at this point showed wide variation and only those patients who appreciated the first sensation with less than 50 ml in their bladders were regarded as being abnormal.

The bladder volume at urgency and the subtracted detrusor pressure were measured. Three patients had a combination of a small functional bladder capacity and high detrusor pressure at capacity.

Three other cases had normal bladder capacities but a high detrusor pressure at capacity.

Six patients had normal detrusor pressures but a reduced functional capacity (Table 3).

Voiding Phase

The urethral opening pressure was abnormal in eight cases with three showing a low and five a high figure. Two of the latter group were obstructed with a high detrusor pressure and low flow rate. One patient with a low opening pressure was shown to have a congenitally short, wide urethra (Table 4).

Of the five patients with high voiding pressures two were associated with outlet obstruction and three with an elevated urethral pressure profile but normal flow rate. It was noted that four of the patients with a high detrusor pressure during voiding also had high opening pressures. No case was recorded where the detrusor pressure alone was high detrusor voiding pressures and two had above tion with a high opening pressure or with a high urethral closure pressure profile.

Abnormally high isometric detrusor contractions did not occur in isolation. Three cases had high detrusor voiding pressures and 2 had above normal flow rates. This measurement simply confirms detrusor overactivity by recording its potential power.

Two patients were obstructed on flow rate alone. Eight patients showed above normal flow, four were related to high detrusor pressures, one related to low urethral closure pressures and two related to high pressure low volume bladders during the filling phase. One patient with a high flow rate had otherwise normal parameters.

The urethral closure pressure profiles were measured with the pelvic floor both relaxed and contracted. Four patients showed evidence of outlet weakness with low profiles, three of these having no other abnormality. One of these, as previously stated, had a congenitally short urethra.

Four of the six patients with a high urethral closure profile were found to have high detrusor voiding pressures, the other two were associated with small high pressure bladders.

Only 2 of the 21 cystometrically stable cases showed no demonstrable abnormality, but their bladder capacities were in the low normal range.

DISCUSSION

For nocturnal enuresis to occur there must be either a deficiency in the production or in the

Table 1.

		Primary enuretics	Recurrent enuretics	Late onset enuretics
Male	10	5	3	2
Female	21	16	2	3
Total	31			

Table 2. Normal ranges in females n = 15

1.	Volume at desire to void (D. V.)	197 ± 41 ml
2.	Pressure at D. V.	4.3 ± 1.4 cm/H_2O
3.	Volume at capacity	420 ± 123 ml
4.	Pressure at capacity	7.2 ± 1.8 cm/H_2O
5.	Urethral opening pressure	17 ± 6.1 cm/H_2O
6.	Detrusor pressure at maximum flow rate	27 ± 6.7 cm/H_2O
7.	Isometric detrusor pressure	40 ± 13 cm/H_2O
8.	Maximum flow rate	29 ± 5 ml/s
9.	Urethral pressure maximum	
	Relaxed distal sphincter complex	71 ± 24 cm/H_2O
	Contracted distal sphincter complex	94 ± 26 cm/H_2O
10.	Compliance	58.2 ± 16.5 ml/cm/H_2O

conduction of sensory stimuli from the bladder or a failure to receive, appreciate or react to them (7). Also necessary is a failure of the bladder to accommodate a normal night production of urine. This may be caused by polyuria or a reduced functional capacity. It is also possible that local triggering reflexes from the urethra are capable of initiating a voiding contraction before the bladder is full while the patient is asleep. Most reports have indicated a high incidence of bladder instability on cystometric testing in both adults and children (1-6). It is unclear whether the instability is a primary failure of suppression of the infantile bladder or whether the overactivity is secondary to a form of outlet obstruction.

The enuretic male is more likely to have an unstable bladder than the female due to this ability to contract powerfully the distal sphincter complex and so effectively produce a functional obstruction (1).

In this series, 9 patients had small functional bladder capacities, one third with high pressures. These patients were less likely to be able to hold a night production of urine than the normal, so producing either nocturia or incontinence depending on the depth of sleep.

Evidence of outlet obstruction was seen in two patients on pressure/flow studies. Two further patients showed poor urethral relaxation to detrusor contraction, although the detrusor was noted to compensate adequately to this with a high pressure and high flow rate.

Three patients were found to have low urethral closure pressure profiles and normal pressure flow studies. One of these had a repair for a congenitally short urethra, with symptomatic improvement.

There were only two patients who did not have any abnormality on pressure flow studies but their functional bladder capacities were at the lower limit of normal.

Table 3. Filling phase

	Reduced capacity	Normal capacity
High pressure	3	3
Normal pressure	6	9

Table 4. Voiding phase

	Reduced	Normal	High
Opening pressure	3	13	5
Detrusor pressure	0	15	6
Isometric pressure	0	16	5
Flow rate (max.)	2	11	8

CONCLUSIONS

A careful urodynamic assessment of any stable adult enuretic should be made as an abnormality of bladder function will be found in the majority. In this series the findings of a small functional bladder capacity and a high bladder pressure at capacity were common. Voiding studies showed bladder outflow obstruction with compensating detrusor activity in response to a non-compliant urethra, and excessive detrusor activity in the presence of a low urethral pressure.

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Dr. J. R. Hindmarsh
Senior Research Associate in Urodynamics
Newcastle University
Newcastle-Upon-Tyne
United Kingdom