



Does functional bladder capacity predict outcomes in nocturnal enuresis?

WHY IS FUNCTIONAL BLADDER CAPACITY IN NOCTURNAL ENURESIS ESSENTIAL?

Nocturnal enuresis (NE) is defined as intermittent involuntary urinary incontinence displayed during sleep in children 5 years of age or older. NE is classified into monosymptomatic NE (MNE) and nonmonosymptomatic NE (NMNE). MNE refers to NE in children with no other lower urinary tract symptoms (LUTS), whereas NMNE refers to NE in children with any other LUTS and a history of bladder dysfunction. NE can cause lower self esteem and a disturbance of social development. NE is a multifactorial disease. Main etiologies of NE include nocturnal polyuria, small functional bladder capacity (FBC), an arousal disorder, or a mixture of these factors. Of the three etiologic factors, a small FBC—not only at nighttime but also in daytime—is presumed to be more common in NMNE than MNE. In children with NE, evaluation of FBC can provide important information about nocturnal polyuria and bladder capacity. Therefore, in children with NE, evaluation of FBC is an essential component of the therapeutic approach and the monitoring of treatment response.

HOW IS FUNCTIONAL BLADDER CAPACITY MEASURED IN CHILDREN WITH NOCTURNAL ENURESIS?

Despite many studies in NE, there is still considerable heterogeneity in evaluation methods and therapeutic approaches. The International Children's Continence Society recommends the use of 48-hour frequency/volume (48-h F/V) charts for evaluating FBC. Maximal voided volume, which can be obtained using these charts, is known to represent FBC. The 48-h F/V chart is noninvasive and represents FBC of the everyday environment, but it must be performed for at least 48 hours to obtain objective and accurate results for

maximal voided volume. This is rather time-consuming for both parents and children, and obtaining reliable results may be difficult, especially in less motivated families. In addition, the chart evaluation does not recognize postvoid residual volume (PVR); thus, this method may underestimate FBC. Uroflowmetry with ultrasound measurements of PVR and radionuclide cystography are alternative methods of assessing FBC. The disadvantage of these FBC measurement methods is their higher cost and unnatural situation. Maternik et al. [1] reported no significant difference between the FBC obtained from the 48-h F/V chart and that obtained from uroflowmetry with PVR in patients with several LUTS. Kang et al. [2] also reported a lack of significant variance in FBC values obtained from the two measurement methods.

FUNCTIONAL BLADDER CAPACITY AS A PREDICTOR OF TREATMENT OUTCOME IN CHILDREN WITH NOCTURNAL ENURESIS

Previous studies investigating the predictive factors of treatment response mainly focused on lower FBC, nocturnal polyuria, and arousal problems. Many children with NE have lower FBC than in children without NE. In general, reduced FBC is the main factor not only in the prediction of response to desmopressin but also in predicting refractory NE. However, according to the reports so far, there is controversy as to whether FBC is useful as a predictor of NE treatment response.

1. Do children with nocturnal enuresis have lower functional bladder capacity than children without nocturnal enuresis?

Several studies have shown that FBC is reduced by up to 50% in children with NE. According to Kim's study [3], 46.5% of all patients had reduced FBC for age, and the incidence of

small FBC was increased in children with everyday wetting and everyday multiple wetting. In the study by Liu et al. [4], 33.9% of children with MNE had a low bladder capacity. Kang et al. [2] reported that 68% to 70% of patients (according to measurement method) had a small FBC for age, regardless of NE subgroup. Baek et al. [5] found that the prevalence of reduced bladder capacity without daytime voiding symptoms was relatively high (27.8%) in children newly diagnosed with primary NE. Borg et al. [6] suggested that a significant proportion of children with MNE and normal maximal voided volume during the daytime frequently experience wet nights, and that bladder reservoir dysfunction during sleep is relatively common in MNE.

Generally, the first voided volume after waking up in the morning is the nocturnal bladder capacity. However, in patients with NE, it is difficult to accurately measure the first voided volume after waking up because the bladder has already been emptied during sleep because of nighttime wetting. Cho et al. [7] recommend that when an accurate first morning voided volume cannot be obtained, as in patients with NE, calculating maximal voided volume during the daytime and multiplying by 1.25 allows for estimation of bladder capacity in place of nocturnal bladder capacity.

2. Is functional bladder capacity useful as a predictor of nocturnal enuresis treatment response?

Several studies have highlighted the influence of FBC (i.e., maximal voided volume) on response to desmopressin. Kim [3] reported a significant correlation between the severity of NE and the degree of reduction in FBC. Yeung et al. [8] reported that the patient group with significantly small FBC relapsed with decreased desmopressin response. In the study by Shim et al. [9], when patients were stratified by treatment response, the mean FBC of patients with no response, partial response, or complete response did not differ significantly at baseline. However, in the univariable analysis, increased FBC (30% or more increase, 6 months after cessation of treatment compared with baseline) was associated with decreased relapse of NMNE [9]. Thus, practical consensus guidelines for the management of NE suggest that a reduced FBC for age is associated with a lower response rate to desmopressin.

On the other hand, several studies suggest that FBC does not predict the outcome of treatment of NE. Chang and Yang [10] found no significant association between reduced FBC and response to medical treatment. Instead, they confirmed that elevated PVR and nocturnal polyuria were significant predictors for medical treatment [10]. In the study

by Liu et al. [4], FBC was not a predictive factor of the response to desmopressin. Only the initial response to low-dose desmopressin was a positive predictor of greater therapeutic success [4]. Kang et al. [2] evaluated whether FBC differs among subgroups of patients with NE and can be used to predict treatment response. They concluded that children with NE had diminished FBC as determined by both 48-h F/V charts and uroflowmetry with PVR. However, they found no significant difference in FBC by NE type or treatment outcome [2]. Therefore, FBC may not be helpful in distinguishing NE types or predicting treatment responses.

CONCLUSIONS

In conclusion, NE is a complex disease that stems from many etiologic factors. FBC is calculated to confirm the characteristics of NE and determine the treatment method. The 48-h F/V chart and uroflowmetry with PVR are reliable methods for measuring FBC. Children with NE, particularly those with severe NE, have small FBC as reported by 48-h F/V charts and uroflowmetry with PVR, regardless of the measurement method or NE subgroup. Thus, a small FBC is a common sign of NE, but so far, it is difficult to draw the conclusion that FBC can predict NE treatment outcomes.

CONFLICTS OF INTEREST

The authors have nothing to disclose.

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