
“Do the Math”

In this issue of *The Journal* 2 articles address the differences between men and women, old and young, in sorting out the pathophysiology and differential diagnosis of nocturia. However, the importance of these articles lies less in these particulars than in the methodological approach used by both sets of investigators, that is the frequency volume chart (FVC), a self-report diary for recording the time and amount of each micturition.

If you make more urine during sleep hours than your bladder can hold, you must get up to urinate, thus you have nocturia. If you make more than a third of your 24-hour urinary volume during sleep hours, you have nocturnal polyuria. If you have nocturnal polyuria, you may have nocturia even if your bladder capacity is normal. If your bladder capacity is low, you may have nocturia even if you do not make too much urine at night.

Thus, the sine qua non for an accurate diagnosis of nocturia is the FVC. Weiss et al derived mathematical parameters based on the FVC that define nocturnal polyuria (nocturnal polyuria index) and low nocturnal bladder capacity (nocturnal bladder capacity index).¹ The nocturia index (Ni) is an estimate of the number of times that nocturia will occur. Based on the bladder diary the maximal voided volume (MVV) is used to estimate bladder capacity. Using the formula $Ni = NUV/MVV$, if NUV is 1,000 ml and MVV is 250 ml, $Ni = 1,000/250 = 4$. Thus, you would expect to void 3 times during sleep hours (250 ml each time) and then void another 250 ml when you arise. Of course, not all patients experience MVV during sleep hours, and patients may awaken at night for other reasons and void out of convenience.

Based on the FVC Weiss et al (page 548) found that approximately half of all patients with nocturia 3 or more times a night have nocturnal polyuria. The ramifications of this finding are obvious. Many patients do not even have a urological abnormality as the cause of their symptoms. In

addition, decreasing the production of urine during sleep hours by any means is likely to decrease nocturia.

In the study by Bing et al (page 552), based on a postal survey of unselected patients found to have nocturia, urge and mixed incontinence were more common in those with nocturia than controls, and 44% of women with nocturia and 72% of men with nocturia had detrusor overactivity. However, only 9% of patients had a low bladder capacity (MVV less than 250 ml). This underscores the usefulness of performing urodynamic studies on patients with overactive bladder symptoms and nocturia. Relying on bladder capacity alone might be misleading.

It is interesting to note that in the Weiss et al study of patients with overactive bladder with nocturia, nocturnal polyuria increased with age whereas younger patients with nocturia had a lower nocturnal bladder capacity. The increased nocturnal polyuria in older patients probably relates to the effect of increased comorbidities such as diabetes mellitus, sleep apnea and venous insufficiency.

The clinical import of this analysis is significant. For nocturnal polyuria the differential diagnosis is extensive and may require sophisticated diagnostic techniques. For decreased nocturnal bladder capacity and overactive bladder the differential diagnosis is straightforward, and an integral part of urological acumen. However, to make these distinctions a bladder diary is essential. Without a bladder diary the rest is guesswork!

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REFERENCE

1. Weiss JP, Blaivas JG, Stember DS and Chaikin DC: Evaluation of the etiology of nocturia in men: the nocturia and nocturnal bladder capacity indices. *Neurourol Urodyn* 1999; **18**: 559.