"Grey Zone" for European Urology Focus, special edition on nocturia

Implications of underactive bladder syndrome for nocturia. Do we need urodynamic assessment?

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Nocturia is a common urological symptom defined by the International Continence Society (ICS) as "the number of times urine is passed during the main sleep period. Having woken to pass urine for the first time, each urination must be followed by sleep or the intention to sleep. This should be quantified using a bladder diary"(1) . The prevalence of nocturia is high in both genders and increases with age. Nocturia or nocturnal polyuria can be caused by wide-ranging non-urological factors, such as cardiovascular disease, obstructive sleep apnoea, polypharmacy, or learnt behaviour. These mainly contribute to increased rate of urine production. Alongside these, factors impairing the reservoir function of the bladder need to be considered. Underactive bladder (UAB) is characterized by a slow urinary stream, hesitancy and straining to void, with or without a feeling of incomplete bladder emptying, sometimes with storage symptoms (2). UAB has a varied phenotype, and for many patients with UAB the storage symptoms can be prominent and problematic. Urgency and increased daytime frequency are present in a large proportion, meaning that overactive bladder syndrome (OAB) commonly co-exists with UAB.

Nocturia is a commonly-reported UAB symptom, with a severity generally between one and four times a night and frequently described spontaneously as one of the most bothersome symptoms (3). The mechanisms giving rise to nocturia may include reduced functional bladder capacity resulting from a post void residual (4). Alternatively, it may reflect the fact that both UAB and nocturia increase in prevalence with aging, not necessarily with a causative relationship. Finally, the presence of OAB may contribute to nocturia.

The coexistence of UAB and OAB is seemingly counterintuitive. However, ageing contributes to both, and also causes attrition of innervation; this latter process could be a common pathophysiological process resulting in the symptom syndromes. Clearly, accumulating loss of some of the motor innervation is likely to give rise to impaired bladder contraction as it progresses. However, along with the motor nerves that drive detrusor contraction for voiding, there are efferent inhibitory nerves that suppress detrusor activity during storage (5). Loss of these nerves can give rise to urinary urgency (as a result of uninhibited micromotions (6)), and detrusor overactivity. Hence, patchy partial denervation is potentially a common mechanism for both OAB (7, 8) and UAB.

Measurement of bladder contractility is an additional element of assessing storage and voiding function. Voiding function is dependent on the detrusor being able to generate sufficient pressure to overcome any outflow tract resistance. When a bladder is unable to do so, it is referred to as having detrusor underactivity (DU). DU is defined by the International Continence Society as a bladder contraction of reduced strength and/or duration, resulting in prolonged bladder emptying and/or failure to achieve complete bladder emptying within a normal time span (9). Bladder underactivity is characterised by a slow stream, hesitancy and straining to void, with or without a feeling of incomplete bladder emptying, sometimes with storage symptoms (9, 10).

Combined with a bladder scan to measure post void residual volumes, UAB as per the ICS definitions above, can be diagnosed clinically. Symptom score completion and a bladder diary are standard investigative tools in the assessment of patients with lower urinary tract symptoms. Regrettably, bladder diaries are often not completed correctly. This can be due to lack of understanding or, in the case of nocturia, patient tiredness, having just woken up mid sleep. Nonetheless, these assessments give the basis for establishing the presence of UAB, OAB or both. Relevant information is also given by free flow rate testing incorporating a post void residual (PVR) measurement, since a significant PVR directs treatment towards inclusion of intermittent self-catheterisation (ISC).

Clinical assessments thus provide the basis for initial treatment, but response may be insufficient to restore quality of life adequately. This raises a question on whether more detailed assessment may facilitate selection of further treatment options. Several urodynamic parameters have been proposed to estimate bladder contractility. These include bladder contractility index (BCI), projected isovolumetric pressure (PIP), detrusor contractility coefficient (DECO), and maximum Watts Factor (10-13). BCI is the most commonly used parameter to estimate bladder contractility. However, it is only useful for male patients and its calculation, as well as the other parameters mentioned above, depends on urine flow, since it is measured at the point of maximum urine flow, and hence can be affected by outflow resistance.

v_{CE}, or the maximum velocity of muscle element shortening, derived from the isovolumetric phase of bladder contraction (i.e. before flow is initiated), was proposed as an alternate estimate of detrusor contractility (14, 15). v_{CE} was shown to have considerable advantages over the above-mentioned parameters for the evaluation of bladder contractility, since it relates to actual muscle action. However, as the calculation of v_{CE} is complex, a surrogate marker was sought. t_{20-80}, the time for the pressure to rise from 20% to 80% of its maximum value during the isovolumetric phase of detrusor contraction was proposed as an alternative indicator of true detrusor contractility, and named the Detrusor Contractility Parameter, or DCP. DCP was shown to be significantly associated with v_{CE} in both men and women, but only in the absence of a high degree of bladder outlet obstruction (10).

v_{CE} therefore currently constitutes probably the most suitable urodynamic parameter for evaluation of detrusor contractility. Calculation of v_{CE} is, however, complex, requiring processes not immediately feasible for most clinicians. Therefore, the applicability of this parameter is limited in clinical practice. Its usefulness is further undermined by the lack of impact on therapy; identifying DU does not open out a choice of treatments. Instead, it brings a frustrating sense of a lack of widely-applicable, effective and affordable options. Overall, the role of urodynamics to assess nocturia in UAB is doubtful. The premise of the test is to make observations while symptoms are taking place (which is unfeasible when the symptom is nocturia). It can identify DO and DU, but OAB therapy can be given based on urgency, while diagnosing DU does not currently bring additional therapeutic options. This means that the clinical assessment is the key, and urodynamics has to be reserved for highly selected people with a specific relevant issue that the test could realistically be expected to identify. The perceived lack of benefit from urodynamics could change if a phenotype is identified to categorise the UAB nocturia based on urodynamic features, since that could underpin focussed research into therapy. Alternatively, urodynamics gains relevance if a parameter emerges which predicts outcome. At this stage, however, the key features are identified without use of filling cystometry (Figure 1).

Conclusions

Nocturia is commonly reported in UAB. The key factors in deciding which currently available therapy should be used are obtained by interpreting the medical history, symptom score, bladder diary and flow rate/ PVR tests. Urodynamics provides a more detailed insight into the UAB, but this is not a direct assessment of the nocturia, nor does it influence nocturia therapy. Hence routine inclusion of urodynamic assessment is hard to justify on current scientific grounds.

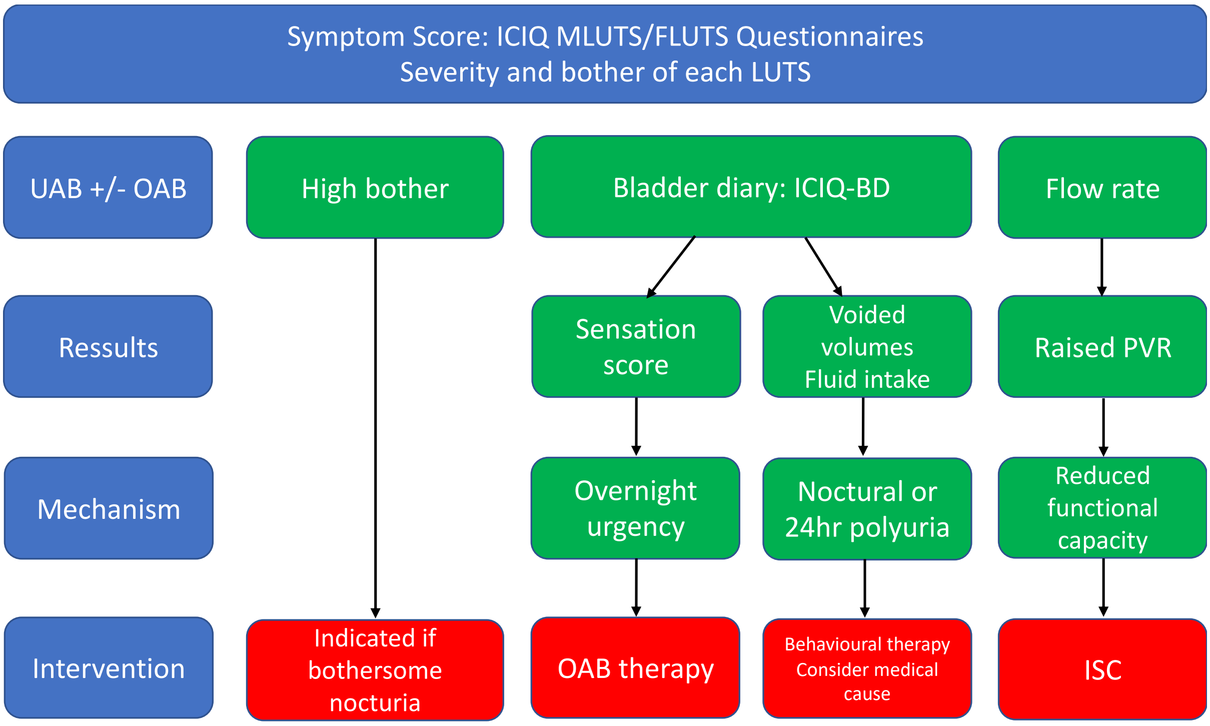

Figure 1: Key assessment findings for nocturia in UAB. *ICIQ: International Consultation on Incontinence; ICIQ-BD: ICIQ bladder diary (16); ICIQ MLUTS/ FLUTS: ICIQ Male / Female LUTS symptom score; ISC: intermittent self-catheterisation; OAB: overactive bladder syndrome; PVR: post void residual; UAB: underactive bladder syndrome.*

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