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Valentini F[1], Zimmern P[2], Nelson P[3]
1. U731 INSERM/UPMC - Hôpital Jean Rostand, 2. The University of Texas, Southwestern Medical Center, 3. Hôpital Jean Rostand

CAN A DANGER INDEX OF OBSTRUCTION HELP CATEGORIZING PATIENTS WITH BENIGN PROSTATIC ENLARGEMENT AT RISK FOR ACUTE URINARY RETENTION?

Hypothesis / aims of study
Goal: To predict patients with benign prostatic enlargement (BPE) at risk of acute urinary retention (AUR).
Introduction: One of the goal of a danger index (D), as reported in a prior publication[1], would be to accurately predict who might ultimately develop acute urinary retention (AUR). Three factors, the obstructive status of the patient, the neurological network controlling detrusor contraction and concomitant sphincteric relaxation during voiding, and the degree of chronic retention related to an initial high bladder volume may be independently or jointly involved to provoke AUR. Since these factors can all be analyzed by the VBN model, a simple algorithm for BPE patient monitoring can now be considered and prospectively tested. We report on the theoretical steps of development of this algorithm.

Study design, materials and methods
The VBN mathematical model [2] was used to compute 3 factors swiftly. First the D calculation from a simple free flow with a volume voided above 100mL. Next, the active time of voiding (T) extending from the start of the detrusor contraction to the end of the flow. And finally the volume residual (V_r) as a function of volume initial (V_{ini}) for different values of (D) and for a common value of T. T was extracted from a review of 80 urodynamic tracings of BPE patients in our database.

Results
A T histogram is shown (figure 1) revealing the dispersion of T values in patients with a wide range of D values. The mean value was T= 62.4 ± 18.9 seconds. V_r was computed with T at 75 seconds because it seemed to be the threshold for either fading of the detrusor contraction or increase in sphincter excitation. Next we derived V_r versus V_{ini} curves (figure 2), with AUR occurring when $V_r=V_{ini}$ (bissecting line of the figure). Lastly we computed Q_{max} versus V_{ini} for different values of D (figure 3); thus by using figures 2 and 3, we could evaluate the risk of retention from Q_{max} measurements.

Figure 1   Figure 2   Figure 3
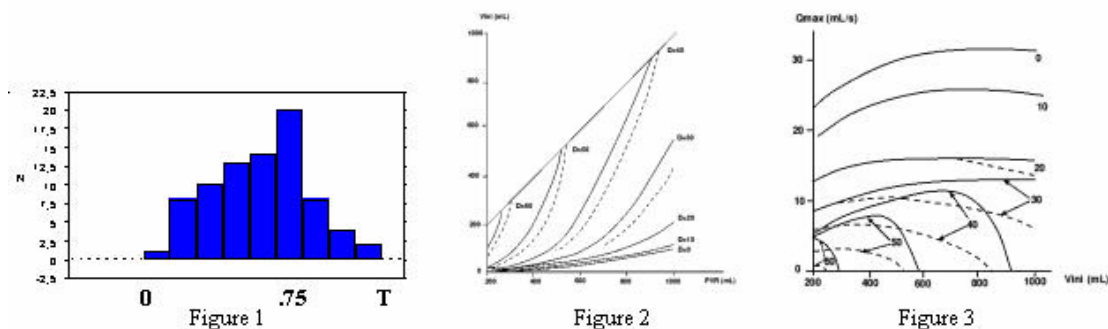
Interpretation of results
This theoretical study determined that $Q_{max} > 10$ mL/s can be sufficient for watchful waiting in a BPE patient. For more obstructed patients, determination of D from a free uroflow may help categorize patients into D < 30 cm H_2O with a low risk of AUR versus those above 30 who are at a higher risk of AUR, especially when D values reach 40 cm H_2O or above. The compressive nature of BPE leads to either an increase in detrusor efficiency (resulting in a decrease of the danger index (D)) or frequent voidings which impairs the quality of life but decreases the risk of a great V_{ini} which in turn could be the trigger for an episode of AUR. The multifaceted VBN mathematical model allows the interplay of all 3 potential contributing factors to AUR and resulted in a simple management algorithm which can now be tested prospectively in BPE patients according to their D values.

Concluding message
After developing a danger (D) index of obstruction severity in BPE patients with the VBN mathematical model, further theoretical work aimed at determining factors contributing to the ultimate catastrophic event of AUR. Interaction between D, the active time of voiding which is a neurologically mediated event, and bladder volumes (V_{ini} and V_r) can be studied with the VBN model and resulted in a simple management algorithm for the BPE patient.

[1] Neurourol Urodyn 2004, 23(5/6) : 592-3
[2] Neurourol Urodyn 2000, 19(2) : 153-176.

DISCLOSURES: NONE
HUMAN SUBJECTS: This study did not need ethical approval because not necessary, retrospective study but followed the Declaration of Helsinki Informed consent was not obtained from the patients.