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MODELING ALLOWS PROPOSING CONCURRENT EVALUATION OF BLADDER OUTLET OBSTRUCTION (BOO) IN MEN FROM ONLY FREE UROFLOWS.

Hypothesis / aims of study

Benign prostatic enlargement (BPE) and its consequences, bladder outlet obstruction (BOO) and acute urinary retention (AUR) are a common condition in the aging man. Abrams-Griffiths number (A-G) is considered as the gold standard to evaluate BOO. Unfortunately it needs invasive investigation.

The D index derived from free uroflow (FF) has been developed to assist in the management of BPE patients [1]. D is an index of voiding dysfunction. Our purpose was to build a tool based on D (non invasive) to evaluate BOO in men, which is usable by a general practitioner.

Study design, materials and methods

Database: Retrospectively, analysis of a database comprising 441 urodynamic studies of men suspected of bladder outlet obstruction (BOO) was performed. Each file included a FF providing maximum flow rate (Q_{max}), and initial bladder volume (V_{ini}) followed by an IF (urethral catheter 8F) providing initial V_{ini}, Q_{max}, detrusor pressure at Q_{max} ($p_{det.Qmax}$) and evaluation of BOO according to AG number ($p_{det.Qmax}$-2*Q_{max}). Classification was non-obstructed (NO) if AG < 20 cmH_2O, equivocal (E) if 20 cmH_2O ≤AG≤40 cmH_2O and obstructed (O) if AG>40 cmH_2O.

Evaluation of D index: Using the VBN knowledge model [2], Q_{max} was computed for a large range of D [0 – 60 cm H_2O] and V_{ini} [90 – 800 mL] values. These tables were used to draw iso-D curves in the [V_{ini}-Q_{max}] plane (they are nomograms). These curves were fitted by simple algebraic equations allowing immediate assessment of D from Q_{max} and V_{ini}.

Influence of urethral catheter during intubated flow (IF): The goal of this study was classification of BOO using only FF. But to study the reliability of D one had to compare, for each patient, classification obtained using D (from FF) and A-G (from IF).

So, influence of urethral catheter on IF must be investigated. The catheter reduces the area of the fluid vein (geometrical effect); this effect is automatically computed by the model. Moreover, the catheter can induce a urethral reflex which consequences are over estimated obstruction and so strongly decreased Q_{max} during IF. Then VBN parameter pucp for obstruction become (pucp+□p) while the detrusor contractility remains unchanged. This remark was used to compute (using previous carried out nomograms [3]) the (no recorded) detrusor pressure during FF (without reflex) and so to obtain an amended value of AG (cor-AG) [3]: cor-AG = $p_{detQmax.FF}$ – 2*$Q_{max.FF}$ which has the same cut-off values as A-G.

Results

Among the 441 files, 79 had $V_{ini.FF}$< 90 mL. These files were not considered for analysis. For each of the 362 other files, D and cor-AG were evaluated and data plotted in the plane [cor-A, D]. Data were scattered around the regression line (Figure): D = 21.942 + .272*cor-AG. Taking the cut-off values 20 and 40 cmH_2O for classification of BOO using cor-AG, cut-off values for D were obtained at the intersection of the regression line with straight lines of abscissa 20 and 40 cm H_2O (Figure). This gave D1 <27 cmH_2O for non-obstructed D2 >33cm H_2O for obstructed and equivocal for 27 cmH_2O ≤ D ≤33cm H_2O.

Comparison of BOO status between 2 evaluations (D and cor-AG) was given in the table:

Classification D vs. cor-AG	Less obstructed	Same classification	More obstructed
No (%)	44 (12.2%)	235 (64.9%)	83 (22.9%)

Interpretation of results

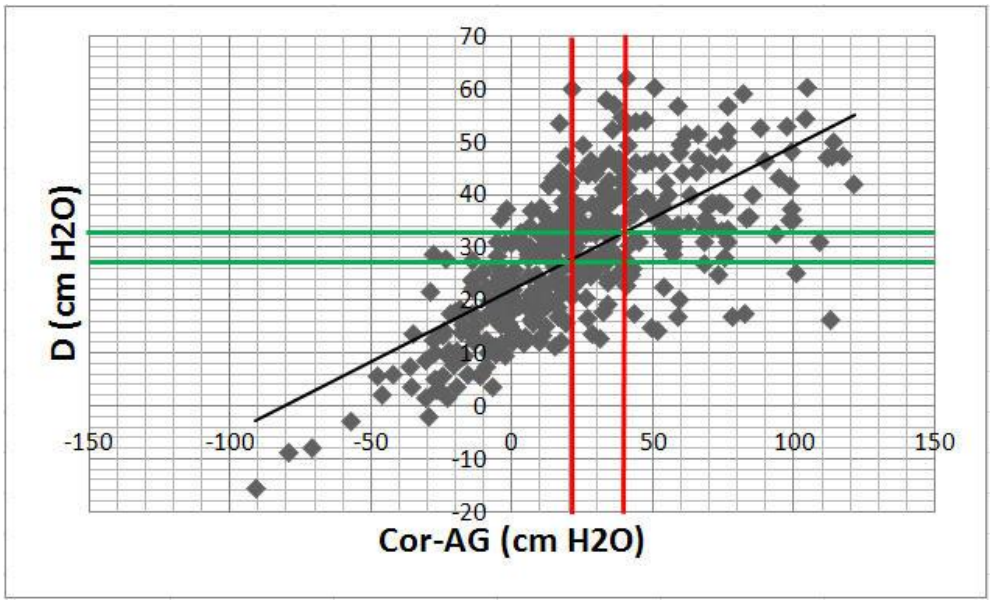
Thus, use of modeling to draw nomograms which are fitted by algebraic equations allows to easily evaluate the index of voiding dysfunction D from the values (Q_{max} and V_{ini}) measured during a FF. Taking into account the potential effect of urethral catheter during IF an amended AG (cor-AG) has been previously defined [3]. This cor-AG is computed from data of a FF (measured Q_{max} and a computed $p_{det.Qmax.FF}$). So D and cor-AG, both deduced from FF, can be compared. Cut-off values for AG and cor-AG being the same, cut-off values for D are easily obtained from the graph D vs. cor-AG.

Evaluation of BOO using D is consistent with evaluation using cor-AG in 64.9% of cases. The limitation of the method is a harmful underestimation in 12.2% of cases (while the 22.9% overestimations are not harmful for the patient, leading to additional examinations).

Despite this limitation, using D has great advantages. Assessment of D is cheap and non-invasive. It needs only a flow meter and a bladder-scan. This first evaluation can be performed by a general practitioner before referring to a specialist.

Concluding message

For the first time, nomograms only based on FF, thus needing few instrumental devices (flow meter ± bladder scan) and thus usable by a general practitioner, are proposed for evaluation of BOO in BPE men. This new, cheap and non-invasive method could make easier watchful waiting and follow-up of chemical or surgical treatment. Further studies will be devoted to large clinical applications.



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3. Valentini FA, Rosier PFWM, Nelson PP. Are nomograms based on free uroflows helpful to evaluate urethral obstruction in men? NAU 2017; 36(S1): S55

Disclosures

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