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INTERNATIONAL CONTINENCE SOCIETY DEFINITION OF DETRUSOR UNDERACTIVITY; ANALYSIS OF CLINICAL PARAMETERS AND COMPARISON WITH CONTRACTILITY GRADING METHODS

Hypothesis / aims of study

Poor stream, hesitancy and sensation of incomplete voiding are common lower urinary tract symptoms (LUTS) experienced by elderly men. These symptoms may be due to bladder outlet obstruction, detrusor underactivity (DU) or a combination of both.(1) The International Continence Society (ICS) defines DU as “a contraction of reduced strength and/or duration, resulting in prolonged bladder emptying and/or a failure to achieve complete bladder emptying within a normal time span”.(2) This definition is quantifiable by the following non-invasive urodynamic parameters: voiding time (Vt), post void residual (PVR) and voiding efficiency (void%). The only genuine method to determine DU is by pressure flow study. Three parameters are applicable to grade detrusor voiding contraction: the Schäfer pressure/flow nomogram (LinPURR), the bladder contractility index (BCI) and the maximum Watt Factor (W_{max}).(3) In this study, the three methods to quantify detrusor contraction and/or to diagnose DU were mutually compared. Furthermore, the non-invasive measurements of DU as stated in the ICS definition, i.e. Vt, PVR and void%, were compared with LinPURR contractility.

Study design, materials and methods

We evaluated 1420 urodynamic pressure flow studies of men >50 years of age with LUTS. Patients with abnormal urinalysis, neurological disorders, surgical correction of congenital anomalies, pelvic surgery, post radical prostatectomy, or with evidence of urethral stricture were excluded. We determined void%, PVR and Vt of all measurements and graded contractility with LinPURR, BCI and $W_{max,}$ making a distinction between strong/normal contractility and weak/very weak contractility. Correlation of different grading methods regarding contractility groups was done using either Spearman or Pearson correlation test. A threshold of < 80 seconds for Vt, <150 ml for PVR, and > 80% for void% was chosen as arbitrary limit. We tested diagnostic values of void%, PVR and Vt and combinations of this parameters related to contractility groups by calculating specificity and sensitivity.

Results

LinPURR and BCI as well as LinPURR and W_{max} contractility groups showed a highly significant correlation (0.975, $p<0.000$), (0.620, $p<0.001$) respectively.
When using non invasive parameters to predict LinPURR contractility grading (as a gold standard), we found a sensitivity for void%, PVR and Vt of 61.9%, 65.6% and 61.3% and a specificity of 61.7%, 55.7% and 56.7% respectively. When combining Void% and Vt and PVR and Vt, we found a sensitivity of 38.9% and 35.7% and a specificity of 38.2%, 42.8% respectively. The positive predictive value for void%, PVR and Vt were found to be 62.6%, 60.6% and 52.2% and the negative predictive value 60.8%, 60.9% and 65.5% respectively. When combining Void% and Vt and PVR and Vt, we found a positive predictive value of 65.0% and 65.1% and a negative predictive value of 71.5% and 68.3% respectively.

Interpretation of results

Correlation between LinPURR and BCI is inevitable since both methods are based on a calculation using the same parameters: $P_{det}Q_{max}$ and Q_{max}. Because of the similarities between LinPURR and BCI in the classification of contraction or contractility, and the association with voiding time and relative volume emptied, both methods can be considered clinically meaningful. However, the LinPURR nomogram also includes grading of bladder outlet obstruction and visualizes both elements of voiding analysis simultaneously. Therefore, it might be more appropriate to use LinPURR in clinical practice standards.
When comparing non invasive measurements with LinPURR contractility a low void% is the most accurate single parameter to diagnose DU, better than high PVR or long Vt. When using low void% as parameter to diagnose DU, 38% (197/517) of the patients with DU will be missed. Also, 38.4% (191/497) patients will be diagnosed as DU while having normal contractility. Combining low void% with long Vt or high PVR was comparable in accuracy to diagnose DU. The combinations still missed a high percentage of 64-77% (337/434 - 279/434) of patients with DU.

Concluding message

Results of LinPURR, BCI and W_{max} contractility grading were highly correlated.
The combination of void% and Vt nor PVR and Vt is specific in predicting detrusor underactivity bij LinPURR contractility grading.

References

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