Comparative Study of Air-charged Urodynamic and Water-filled Urodynamic in the Examination

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Introduction

Understand whether airborne urodynamic (ACC) can replace liquid urodynamic (WFC) and the significance of ACC assessment for assessing prostatic hyperplasia (BPH) in the elderly.

Methods

Object of study :27 male BPH patients (60-90 years old) were randomly selected for a prospective study, and the same patients underwent an airborne urodynamic examination and a liquid urodynamic examination in the same period to compare the urodynamic pressure parameters recorded in the two groups.

The inclusion criteria :1. Meet the quality control standard of urodynamic examination; 2. Patients with prostatic hyperplasia; 3. Age over 60 ~90 years old, 69.1 ± 6.0 years old; 4. Detrusor muscle contraction.

Exclusion criteria: 1. Interference factors such as large fluctuation of rectal pressure, bladder pressure and abdominal pressure; 2. urinary tract infection; 3. Detrusor contraction; 4. Elderly and weak unable cannot cooperate with the examination.

General information: including abdominal pressure (Pabd), internal bladder cavity pressure (Pves), detrusor pressure (Pdet), etc.

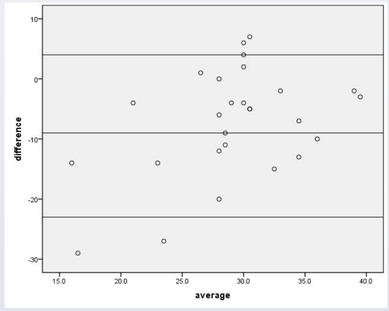
Statistical method: SPSS19.0 software. Paired sample t-test compared analyzed pressure values, P <0.05, Bland-Altman plots to show agreement between pressure values in WFC and ACC, P <0.05.

Table1

Pressure parameters	WFC	ACC	Mean difference	Correlation coefficent	Paired samples
$P_{abd.fill}$	25.3（8.5）	32.5（5.3）	-7.2（8.9）	0.235	P＜0.05
$P_{ves.fill}$	26.0（8.4）	32.6（5.0）	-6.630（7.972）	0.396	P＜0.05
$P_{det.void}$	98.8（32.8）	95.3（36.9）	3.5（20.5）	0.833	P＜0.05

Note: Pabd.fill: abdominal pressure at the end of detrusor filling; Pves.fill detrusor end of filling pressure; maximum pressure during Pdet.void detrusor urination

Table 2



Pabd.fill average pressure value (abscissa) and pressure difference value (ordinate) as measured by WFC UDS and ACC USD

Table 3

Group	Example number	descend (%)	Not descending (%)
WFC	27	**20（74.07）**	**7（25.93）**
ACC	27	**1（3.70）**	**26（96.30）**
χ^2 value			**25.247**
P value			**＜0.001**

Comparison of abdominal pressure drop in WFC and ACC [Example (%)]

Results

Table1

Detrusor filling end abdominal pressure and detrusor end filling pressure recorded by water catheter and inflatable catheter; maximum pressure [mean (standard deviation)] (n=27)

Table 2

The Bland-Altman plot shows the abscissa indicating the Pabd.fill mean pressure (A), Pves.fill mean pressure (B) and Pdet.void mean pressure (C) measured by WFC UDS and ACC USD at the start of bladder filling, respectively. The ordinate represents the pressure difference measured by the two methods, the direction of the difference is WFC minus ACC, and the three horizontal lines represent the upper limit of the 95% confidence interval, mean and lower limit of the 95% confidence interval.

Table 3

Comparison of abdominal pressure measured by WFCUDS and ACCUDS WFCUDS showed progressive decrease in 20 (74.1%); ACCUDS decreased in 1 (3.7%) (χ 2=25.25, P <0.01).

Interpretation

1. Cooper et al tested the ACC and WFC placed simultaneously in a pressure chamber using standard engineering tests such as transient and sweep testing, which showed that T-DocACC acts as a low-pass filter with a cut-off of **3 Hz**. In contrast, the WFC is a **two-stage damping system**, and thus, with a wide resonance frequency of approximately **10Hz**, alterations of these pressure signals in the pressure conduction system have an impact on clinical urodynamic testing only when the frequency of their occurrence is significantly manifested in the clinical urodynamic pressure signal.

2 In UDS testing, cough detection is generally considered to produce the **most variable** (i. e., the most frequent) bladder pressure signal. Thind et al. evaluated the spectrum of cough testing in six healthy volunteers: four men and two women, who found that 99% of the power of the bladder pressure signal at a cough occurred at a frequency of 9 Hz or lower. Through the analysis of 131 sets of data, Kranse et al. believe that most of the signal power frequency occurred at **less than 1 Hz**. This suggests that Pves can accurately record bladder pressure as pressure changes, but ACC may attenuate bladder pressure (e. g., recording bladder pressure is lower than actual pressure), as coughing increases bladder pressure faster than urination.

3 WFC can also accurately record bladder pressure during voiding, but **may amplify bladder pressure during cough testing compared to ACC**.

Conclusion

The abdominal and intravesical pressures in ACC were higher than the UDS pressure values in WFC, while the detrusor pressure was lower than the values recorded in WFCUDS, suggesting that the findings obtained by the two UDS examination methods are **not interchangeable**.

The high consistency of results measured by ACC and WFC suggests that the former can also be used to assess changes in bladder function in elderly BPH.

The gradual reduction of the filling period of abdominal pressure recorded by WFC may be one **reason** for the high detrusor pressure recorded.