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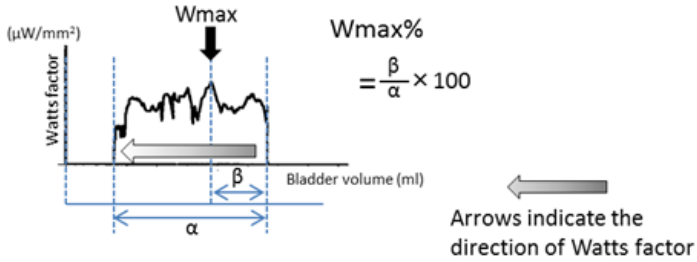
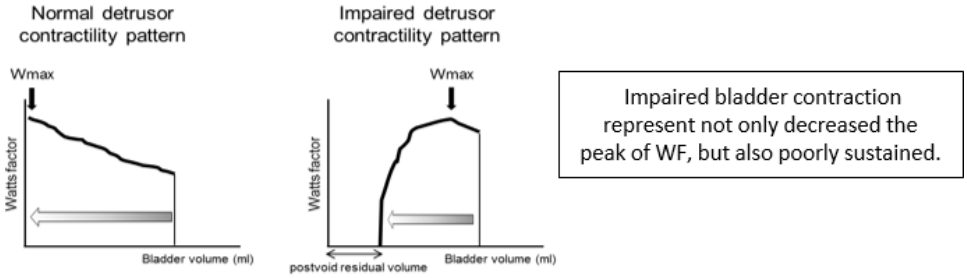
HOW TO EVALUATE THE "TRUE" DETRUSOR CONTRACTION PATTERN USING PRESSURE FLOW STUDY PARAMETERS?

Hypothesis / aims of study

Pressure flow studies (PFS) have been regarded as the gold standard for evaluating bladder function. Bladder contractility consists of contractile strength and duration. However, the variable method for evaluating the contraction duration is not well validated. We previously reported that radical prostatectomy (RP) restore the detrusor contractility of prostate cancer patients (ref. 1). However, precise changes of detrusor contraction pattern remain to be completely elucidated. We reported that the parameter which represent when reach the maximum Watts factor (WF) (Wmax%) could provide the bladder contraction sustainability.

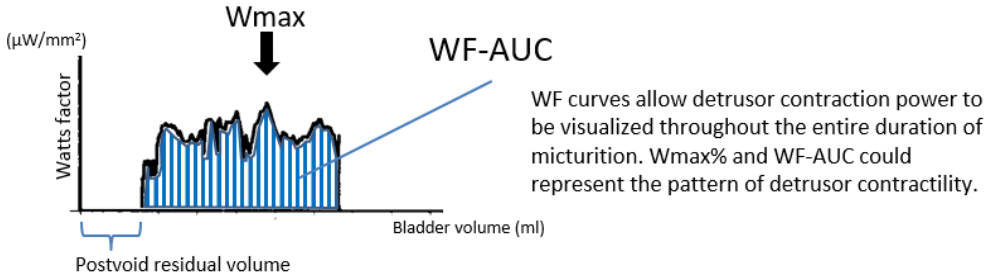


However, Wmax% could not represent the pattern of detrusor contraction completely throughout micturition. Because the WF curve was spiny appearance which could not be a smooth line (because of biological data) and Wmax% itself could not represent the duration of bladder contractility. Wmax% alone could not represent the patterns of bladder energy using throughout the voiding cycle. In the present study, we focused on the detrusor contraction pattern using pressure flow study parameters. A normal detrusor contractility pattern involves a marked increase in WF at the initiation of micturition followed by further gradual increases until the end of micturition (ref. 2). Intuitively, increasing WF values might indicate that the bladder muscles have sufficient physiological reserves. Conversely, decreasing WF values reflect poor contraction function, i.e., the inability to continue detrusor contraction.



Study design, materials and methods

We calculated the percentage of when reach the peak of WF (Wmax%) and Area Under the Curve of throughout the voiding cycle (WF-AUC).

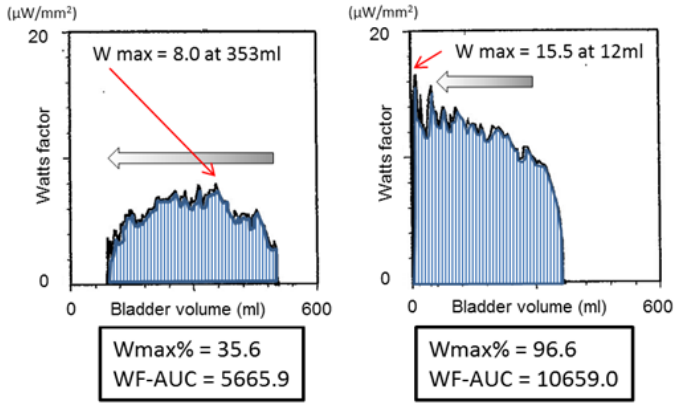


Thirty seven patients with clinically localized prostate cancer who were urodynamically evaluated pre and post RP. The urodynamic parameters included the maximum flow rate (Qmax), postvoid residual volume (PVR), Wmax, Wmax% and WF-AUC were examined.

All data were represented as mean values ± standard deviation of the mean and all data were analysed using paired Student *t*-test. $P<0.05$ was regarded as statistically significant.

Results

Representative examples of pre- and post-RP related parameters for the same patient.



	Pre	Post	*P*
Qmax	13.0 ± 6.5	17.3 ± 7.7	<0.01
PVR	48.6 ± 66.1	10.1 ± 28.5	<0.05
Wmax	10.5 ± 3.1	11.0 ± 3.2	n.s.
Wmax%	51.6 ± 28.0	80.1 ± 20.0	<0.01
WF-AUC	7714.0 ± 2634.0	12115.8 ± 4095.2	<0.05

Qmax increased significantly, and PVR decreased significantly after RP (Table). Although Wmax did not changed significantly, Wmax% and WF-AUC was increased significantly.

Interpretation of results

The contractility of the bladder was quantified using a parameter that approximates power per bladder wall area according to the Hill equation, which calculates detrusor pressure in relation to volume and flow rate. The WF was calculated throughout bladder emptying and plotted as a function of the volume of liquid in the bladder at each moment in time. Conceptually, WF represents the mechanical power generated per unit area of the bladder wall surface. Intuitively, increasing WF values might indicate that the bladder muscles have sufficient physiological reserves. Therefore, Wmax is a measure of detrusor contraction strength at a single point in time, but it is necessary to produce a WF curve throughout micturition to assess overall detrusor contractility. Neither Wmax nor WF provides any information about detrusor contraction sustainability, whereas combination of Wmax% and WF-AUC can be used to detect changes in detrusor contraction patterns. In the current patients setting, both Wmax% and WF-AUC are significantly increased after RP. This could represent the bladder muscles have recovered after RP as sufficient physiological reserves. To confirm our findings, a multicentre study will be critical, and further collection of data (various diseases or conditions) leads to enhancement of scientific reliability.

Concluding message

Our study confirmed that RP change the detrusor contractility pattern of prostate cancer patients. The measurement of Wmax% and WF-AUC provides new approach to the bladder contraction sustainability.

References

1. 2012; 4: 82-6
2. 2004; 215: 93-100

Disclosures

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