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VARIABILITY OF THE POST VOID RESIDUALS AMONG THE PATIENTS WITH BENIGN PROSTATIC HYPERPLASIA

Hypothesis / aims of study

It is generally considered that the post void residual (PVR) urine is one of the important parameters for the evaluation of patients with benign prostatic hyperplasia (BPH). The measurement of PVR is usually performed in combination with the measurement of voided volume and/or uroflowmetry only once or twice at the patient's visit to clinic. However, it has not been confident that the one time measurement of PVR can reflect the PVRs following all the daily voids in a patient suffering from voiding disorder such as BPH (1). Moreover, it remains to be clearly defined the volume of significant PVR (2). Therefore, in the clinical point of view, it would be of great value to clarify the variability of PVRs among the patients with BPH. Thus, in the present study we investigated the variability of PVRs in individual and the relationship between PVR and the other voiding parameters derived from the 24 hours measurements of uroflow in the patients with BPH.

Study design, materials and methods

Twenty male patients with BPH (age; 70.1 ± 6.2 y.o.) were recruited. The eligibility criteria of BPH in this study included IPSS more than 8 pts, more than 20ml of prostate volume, measured by trans-rectal ultrasound, bladder outlet obstruction proved by pressure/flow study, and PSA concentration less than 4ng/ml. All subjects were asked to complete 24 hours measurements of uroflow and PVR for all the micturitions during normal daily activities. Urospec (Medispec, USA) was used for measuring uroflows and storing the data. Bladder Scan (BVI 6100, Verathon, USA) was used for measuring PVRs. The following parameters were used for analysis; voided volume (VV; ml), PVR (ml), bladder volume (VV + PVR, BV; ml), residual fraction (100 x PVR/BV, RF; %), and maximal flow rate (MFR; ml/sec). Each value was expressed as mean ± standard deviation.

Results

Over all result (181 voids of 20 subjects) showed significant relationship between PVR and BV ($r = 0.754$, $p < 0.0001$), MFR ($r = -0.24$, $p < 0.01$), and RF ($r = 0.801$, $p < 0.0001$), but no significant relationship between PVR and VV ($r = 0.019$). RF was significantly correlated to VV ($r = -0.429$, $p < 0.0001$), BV ($r = 0.312$, $p < 0.001$), and MFR ($r = -0.382$, $p < 0.0001$). In individual, however, each subject's data had no significant relationship between PVR and MFR, nor VV. Eleven patients (55 %) of whom PVR significantly correlated to BV (Figure 1a,b) had large amount of PVR (group A). Other Patients (n = 9; group B) didn't have significant correlation between PVR and BV (Figure 1c). The group B had significantly small amount of PVR and BV compared to those of group A (Table 1). Using linear discriminant analysis, the PVR and BV plotted area of the group A was significantly different from that of the group B ($p < 0.0001$) when all the subjects' micturitions were plotted in the same PVR-BV plane (Figure 2).

Table 1. Comparisons of the values of parameter derived from 24 hours measurements of uroflow and PVR between the group A (n =11) and the group B (n = 9). Non-paired, two-tailed t-test was performed.

GROUP	VV (ml)	PVR (ml)	BV (ml)	RF (%)	MFR (ml/s)	ΔPVR/ΔBC
A	155.3 ± 50.0	141.6 ± 66.5	296.9 ± 57.5	45.1 ± 19.5	9.0 ± 2.9	0.6 ± 0.2
B	140.0 ± 57.0	36.4 ± 28.9	176.5 ± 53.5	22.6 ± 16.7	10.8 ± 4.0	0.2 ± 0.2
T-TEST	p=0.589	p<0.002	p<0.002	p<0.05	p=0.328	p<0.005

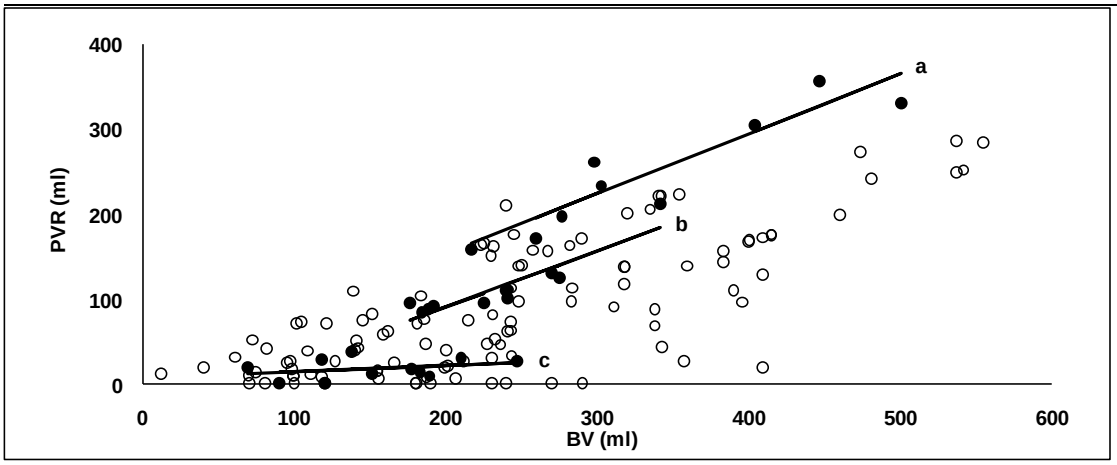

Figure 1. Typical records of the correlation between PVR and BV in individual. a: Y=0.7X+13.2, r=0.941, p<0.01, b: Y=0.66X-42.1, r=0.912, p<0.01, c: Y=0.072X+6.4, r=0.392, not significant.

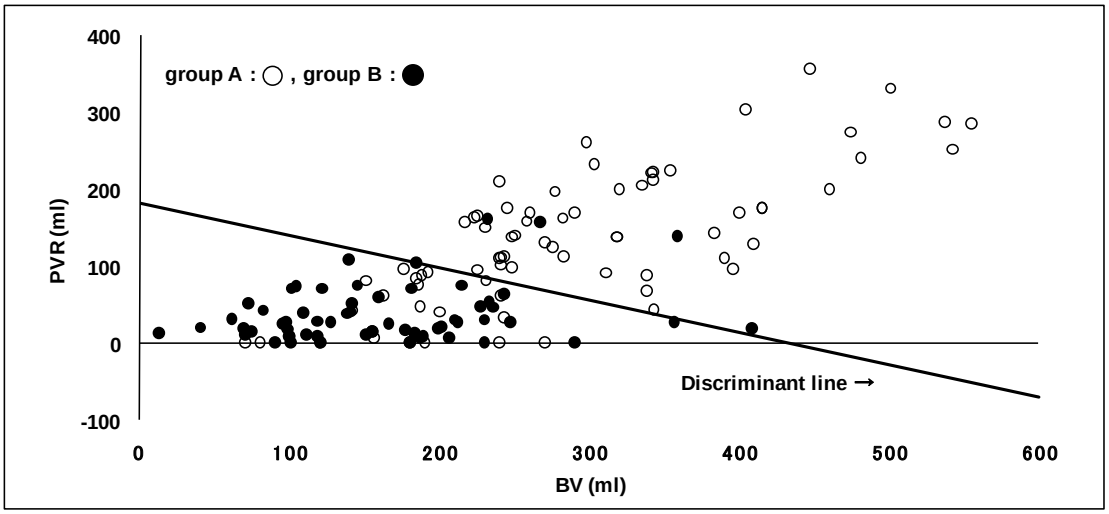

Figure 2. Linear discriminant analysis of data from the group A vs B.

In addition, the incremental rate of PVR against the increase of BV (ΔPVR/ΔBV), estimated by the inclination of linear approximation of individual micturition plots in PVR-BV plane, was also significantly different between the two groups (Table 1, Figure 1).

Interpretation of results

The present study clearly demonstrates that there are two types of patient with BPH; one type has PVRs increasing significantly in response to the increase in BV, resulting in the wide range of amount (group A), the other has relatively stable and small amount of PVRs (group B). Although the mechanism by which the PVR occurs remains to be elicited, in the former type it is likely to have a risk of adverse event such as urinary retention. Thus, our results suggest that clinically significant PVR would be defined as ΔPVR/ΔBV rather than the volume.

Concluding message

In conclusion, the relationship between PVR and BV can reflect the characteristics of PVR of the patient with BPH. Thus, PVR and BV should be measured at least two or more times to estimate ΔPVR/ΔBV. The clinical implication of this study is that ΔPVR/ΔBV would have a possibility to be a new parameter for the evaluation of PVR in the BPH patient.

References

1. Scand J Urol Nephrol Suppl 1988;114:72-7
2. Neurourol Urodyn 2002;21:167-78

Specify source of funding or grant	**No**
Is this a clinical trial?	**Yes**
Is this study registered in a public clinical trials registry?	**No**
What were the subjects in the study?	**HUMAN**
Was this study approved by an ethics committee?	**Yes**
Specify Name of Ethics Committee	**IRB of Fukushima Medical University**
Was the Declaration of Helsinki followed?	**Yes**
Was informed consent obtained from the patients?	**Yes**