242

Oh S[1], Kim S W[1], Paick J[1], Ku J H[1]
1. *Seoul National University Hospital*

ACCURACY OF POST-VOID RESIDUAL VOLUME DETERMINATION USING A PORTABLE ULTRASOUND BLADDER SCANNER WITH PRE-SCAN FUNCTION

Hypothesis / aims of study

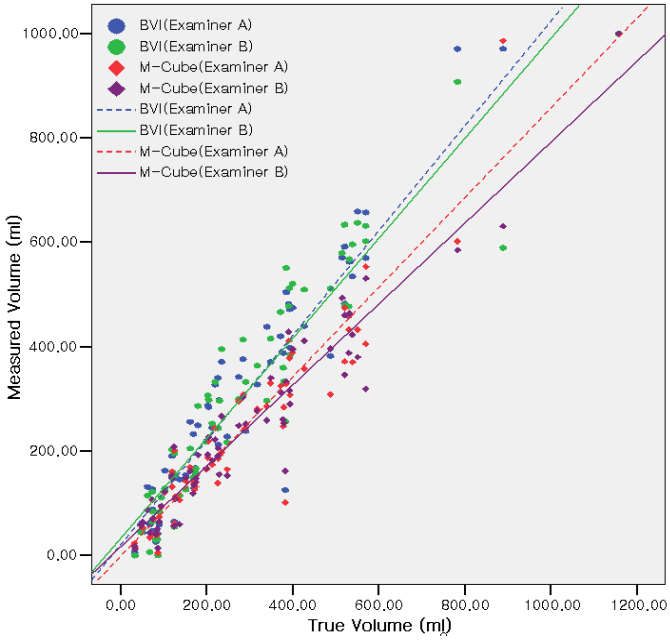
Measurement of post-void residual (PVR) volume is one of the basic components to assess the patients with voiding dysfunction. Recently, non-invasive measurement using portable ultrasound bladder scanners is widely used. It has been demonstrated that the accuracy of these devices is acceptable enough for clinical use [1]. More recently, in an aim to improve accuracy, a portable ultrasonic device equipped with additional pre-scanning function has been introduced. It theoretically seems to be able to enhance accuracy as it can provide examiners with pre-localization of the central target point as well as information on the shape of the urinary bladder prior to actual scanning. We aimed to evaluate whether the device with built-in real-time pre-scan function is superior to the conventional blind bladder scanner in measuring PVR.

Study design, materials and methods

A prospective study was carried out in an outpatient basis in a total of 67 adult patients with voiding dysfunction. After voiding, the patients were asked to be in supine position. PVR volume was measured using both portable 12 frame B-mode sector-probe ultrasound devices: a conventional type (BVI-3000 BladderScan, Diagnostic Ultrasound, WA, U.S.A.) and a pre-scan type (M-Cube, BioCon-500, Mcube Technology, Seoul, Korea). Measurement using each device was done three times by two experienced independent examiners (A and B) at random sequence, which meant a total of 12 times of measurement in a single patient. Time taken to complete measurement was recorded. Immediately after the procedure, urethral catheterization was performed to obtain the true volume of the bladder. The accuracy and variability of measurements were compared between the two devices and correlation coefficients were obtained. Results were expressed as mean ± SD and a p-value <0.05 was considered to be statistically significant.

Results

The patient population consisted of 39 males and 28 females and mean age was 57.9 (±15.4).



BVI vs true volume

examiner A: r = 0.950, p <0.001
examiner B: r = 0.938, p <0.001

M-Cube vs true volume

examiner A: r = 0.956, p <0.001
examiner B: r = 0.958, p <0.001

Fig. 1. Correlation of the measured volume using the two portable bladder ultrasound machines (BVI and M-Cube)

PVR measurement using both devices showed very high correlation with true volume in overall range. However, correlation coefficient was slightly less examiner-dependent with M-Cube pre-scan mode (Fig. 1). Mean time taken for each measurement was different according to the examiner: a range 7.0 (±0.8) ~ 13.6 (±2.4) sec for BVI and 7.7 (±1.3) ~ 14.2 (±4.6) sec for M-Cube. Statitially singnificant percentage of differences of volume according to the bladder volume status (>200ml) was noticed between the two ultrasound measurement methods. Volumes measured by BVI was overestimated in moderate volume ranges (>100ml). However, volumes measured by M-Cube was slightly underestimated in whole range of the bladder volume (Fig. 2).

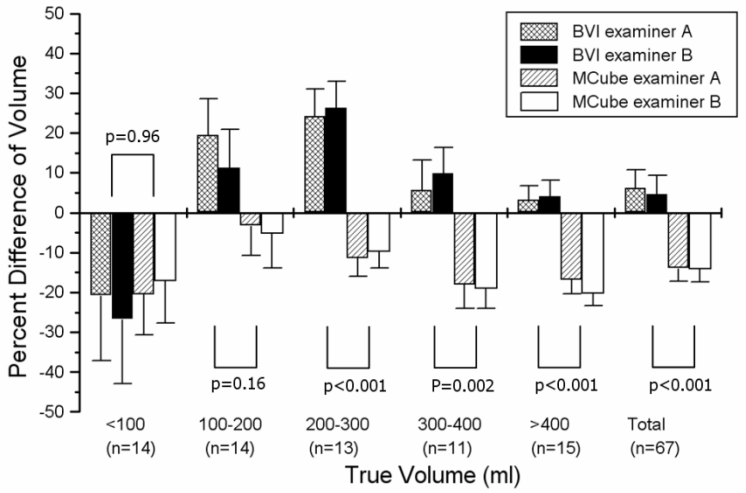


Fig. 2. Percentage of differences of volume according to the bladder volume status

Although being different according to the examiner, the gap between the highest and lowest measured values was significantly wider in BVI than in M-Cube, especially in lower bladder volume (<300ml) (Table).

Table. Maximal range of gap in three times of measurements using each devices

True Vol.	Variability by Investigator A			Variability by Investigator B		
	BVI	M-Cube	p value	BVI	M-Cube	p value
<100(n=14)	28.3±20.3	14.9±10.8	0.01	28.2±23.7	13.4±9.2	0.02
100-200(n=14)	37.9±19.4	15.4±9.7	0.001	60.0±27.0	22.2±10.5	<0.001
200-300(n=13)	83.1±72.3	29.4±48.2	0.05	56.0±38.8	21.0±22.0	0.008
300-400(n=11)	50.1±42.8	18.9±6.9	0.03	89.2±108.5	38.9±29.4	0.1
>400(n=15)	81.2±66.0	44.3±40.2	0.04	74.8±57.8	58.3±60.8	0.3
Total (n=67)	56.4±53.2	25.0±30.8	<0.01	60.7±58.5	30.9±36.4	<0.01

Interpretation of results

Exact pointing to the bladder prior to actual measurement of bladder volume using pre-scan mode seems to contribute to reduce the variability of measured value in M-Cube device. Time for measurement of PVR by either devices seems to be negligible since it can be completed within average 15 seconds. Further study involving more subjects is warranted to identify detailed characteristics of the PVR measurement according to the whole range of the bladder volume.

Concluding message

Our result showed that bladder volume mesured by portable ultrasound devices with either blind mode or pre-scan mode correlates very well with the actual volume. Bladder volume measurement using built-in real-time pre-scan function may reduce the range of error in measuring PVR.

References

1. Urology 2003;62:656-60.

Specify source of funding or grant	**The authors have no vested interest, financial or otherwise, in the devices.**
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	**The Institutional Review Board of the Seoul National University Hospital**
Was the Declaration of Helsinki followed?	**Yes**
Was informed consent obtained from the patients?	**Yes**