197

Kamei J[1], Akiyama Y[1], Watanabe D[1], Endo K[2], Homma Y[3], Igawa Y[4]

1. *Department of Urology and Continence Medicine, The University of Tokyo Graduate School of Medicine,* ***2.*** *Department of Urology, The University of Tokyo Graduate School of Medicine,* ***3.*** *Department of Urology, Japan Red Cross Medical Center,* ***4.*** *Department of Continence Medicine, The University of Tokyo Graduate School of Medicine*

FEASIBILITY OF CONTINUOUS MONITORING OF THE BLADDER VOLUME BY A NEW PORTABLE ULTRASOUND BLADDER SCANNER, LILIUM A-200

Hypothesis / aims of study

Previous reports suggested that prompted voiding with monitoring of intravesical urine volume using ultrasound devices was useful not only for improving urinary incontinence of elderly people but also for reducing the absorbent cost and improving care workers' quality of life (1, 2). In those studies, the urine volume in the bladder was measured using a portal ultrasound (US)-scanner by a care worker or a nurse regularly but not continuously. Lilium α-200, a new portable ultrasound (US) bladder scanner, is capable of measuring bladder volume continuously through a small probe attached on the suprapubic region (Figure 1). However, there were no previous studies evaluating the accuracy of the data of its continuous measurements. In this study, we evaluated the correlation of the bladder volume periodically measured by Lilium α-200 with the instilled volume during video-urodynamic studies (V-UDS).

Study design, materials and methods

We prospectively measured fluid volume in the bladder of patients older than 18 years-old by Lilium α-200 periodically during V-UDS. Patients demonstrating pelvic organ prolapse or detected vesicoureteral reflux or severe bladder diverticulum by cystography during V-UDS were excluded. A small US probe was placed on the suprapubic region for periodic measurements of bladder volume every one minute. After the measurement of post-void residual (PVR) volume by US following spontaneous micturition, PVR urine was drained by a transurethral catheter. Then, filling cystometry was performed with 33% contrast medium instillation at 20 ml/min in supine position. The instillation was ended when the patient showed either a strong desire to void or leakage around the catheter. Mean bladder volume measured by US in each minute during filling cystometry was compared with the instilled volume at each time point. All statistical values are represented as mean ± SD. Paired t-test and Spearman's rank correlation were carried out for statistical analysis.

Results

Nine patients (8 men and 1 woman, median age of 71 (18-76) years old) were included. Primary disease was benign prostate hyperplasia in 6 men, neurogenic bladder in the other two men and stress urinary incontinence in the woman. The PVR volume measured by US was strongly correlated to the PVR volume obtained by catheter drainage ($R = 0.90$, $p = 0.0009$; Figure 2). Median instilled volume during filling cystometry was 384 ml (157 - 487 ml). Mean bladder volumes measured by US in every minute and their approximated straight line were shown in Figure 3A. There was strong correlation ($R = 0.92$, $p < 0.0001$) between the instilled volume and the bladder volume measured by US at every 100 ml and at the end of instillation (Figure 3B).

Interpretation of results

The present study demonstrated that the PVR and the bladder volume continuously measured by Lilium α-200 during cystometry were strongly correlated with actual PVR and infused volume, respectively, in adult patients in spine position. Although the measured volumes were considerably varied and the mean value of them tended to be slightly lower compared to actual infused volumes when the volume exceeded 400 ml, the continuous measurement of the bladder volume by Lilium α-200 seems reliable within normal range of bladder capacity.

Concluding message

The present results suggest that continuous measurement of bladder volume by Lilium α-200 is feasible within normal range of bladder capacity and may be applied to monitoring urine volume in the bladder for determining appropriate timing of prompted voiding.

Figure 1. Lilium α-200, a new portable ultrasound bladder scanner (left), and its small US probe placed on the suprapubic region (right)

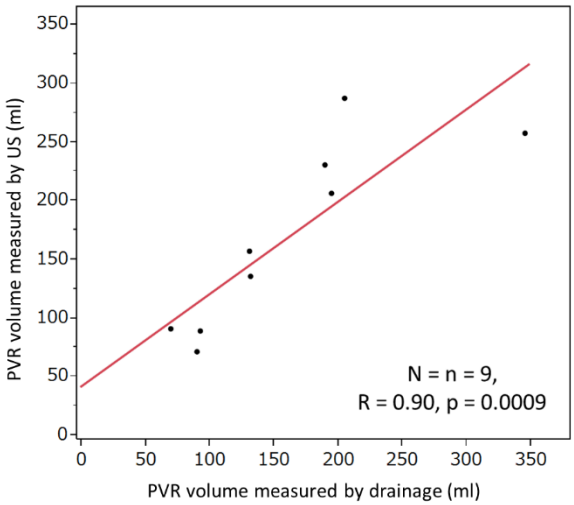

Figure 2. Correlation between PVR volumes measured by drainage and those measured by Lilium α-200 (N = 9)

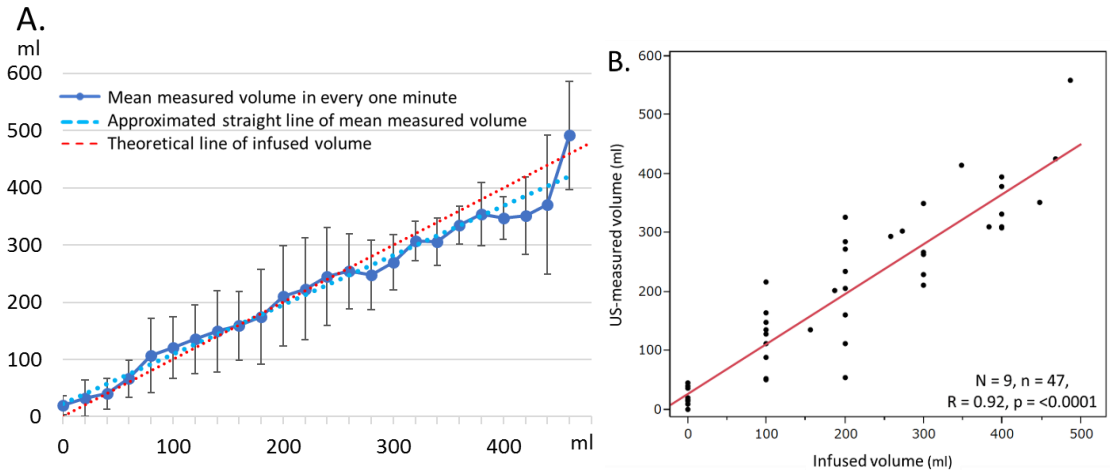

Figure 3. A. Mean bladder volumes measured by Lilium α-200 in each minute (blue points and solid line) and their approximated straight line (light blue broken line) during filling cystometry Theoretical value of infused volume is described by red broken line. B. Correlation between the infused volumes and bladder volumes measured by Lilium α-200 at every 100 ml and at the stop of infusion during filling cystometry (N =9, n = 47).

References

1. Iwatsubo E, Suzuki M, Igawa Y, Homma Y. Individually tailored ultrasound-assisted prompted voiding for institutionalized older adults with urinary incontinence. Int J Urol. 2014, 21: 1253-7
2. Suzuki M, Iguchi Y, Igawa Y, et al. Ultrasound-assisted prompted voiding for management of urinary incontinence of nursing home residents: Efficacy and feasibility. Int J Urol. 2016;23: 786-790.

Disclosures

Funding: funding by Lilium Otsuka Co., Ltd. **Clinical Trial:** Yes **Public Registry:** No **RCT:** No **Subjects:** HUMAN **Ethics Committee:** Ethics Committee, The University of Tokyo Graduate School of Medicine **Helsinki:** Yes **Informed Consent:** Yes