740

Chung B[1], Lee T[2], Yang J H[2]
1. Dept of Urology, Hallym University Sacred-Heart Hospital, 2. Dept of Urology, Inha University Hospital

THE DIAGNOSTIC VALUE OF PORTABLE BLADDER VOLUME MEASUREMENT SYSTEM (BVMS) WITH REAL BLADDER IMAGE IN THE MEASUREMENT OF BLADDER VOLUME ACCORDING TO THE DIFFERENT ANGLING OF TRANSDUCER

Hypothesis / aims of study

Several portable bladder volume measurement systems (BVMS) are commercially available. However, there are several shortcomings of such systems, which make the measurement of the bladder volume inaccurate. The most important shortcoming when using a mechanical system on the abdomen is the undetermined angulation of the transducer, because we cannot see the real-time images and revise the angulation immediately.
So we assessed the volume estimation of bladder with two angles (10 and 30 craniocaudal direction) of the transducer by one examiner and investigated the accuracy determined by estimated and catheterized bladder volume. And we investigated the effect of angulation on the accuracy by analyzing the real bladder images which contain the total bladder images completely or incompletely on the Field-of-View (FOV).

Study design, materials and methods

Sonographic studies of bladder volume by a newly developed portable (2.4 kg) BVMS (BioCon-500, Mcube, Korea) with real bladder image were conducted in 150 patients (3-92 years old; M:F=115:35) at the angle of 10 and 30 degree cranio-caudal on the abdomen 2 cm above from the symphysis pubis. This ultrasound-estimated volume was compared with the immediately catheterized volume. Comparison of BVMS estimation volumes with the catheterized volumes according to the angles was performed by using the Intraclass Correlation Coefficient (concordance), and difference plots (bias, linearity of the difference) and Bland & Altman plot. One session of the BVMS on one patient contains 12 real bladder images. We stored the bladder images of 10 and 30 degree angles on 46 cases, and investigated the percentages of cases with the real bladder images swerved from the FOV to the cases with total bladder-contained in FOV according to the real bladder volume.

Results

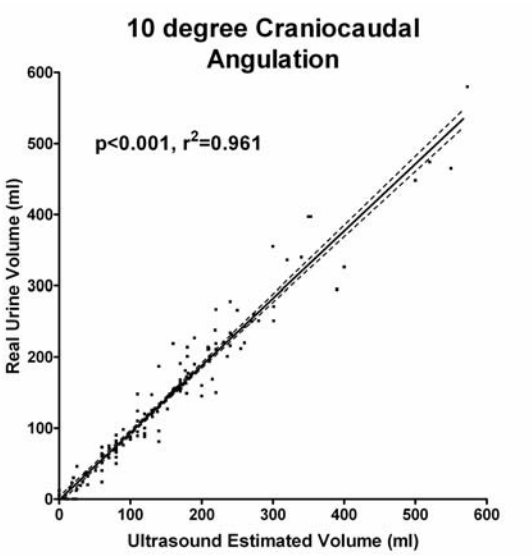
Prefereable agreement between BVMS estimations and catheterized volumes was found for both cranio-caudal angles with a slight underestimation, but better for 30 degree estimations (no significance). The 10 degree angled ultrasound estimation showed correlation with bladder volumes of 0.980 (R^2=0.961) and a mean difference from the true bladder volumes of 8.35 ml (95% confidence interval 4.93 to 11.78 ml). The 30 degree angled ultrasound estimation showed correlation with bladder volumes of 0.982 (R^2=0.965) and a mean difference from the true bladder volumes of 3.21 ml (95% confidence interval 0 to 6.45 ml). In cases with less than 200 ml of true volume, there was no case with bladder images swerved from FOV for both cranio-caudal angles. In cases with more than 200 ml of true volume, 28.6 % and 50.0 % of patients, examined on 10 and 30 degree angles respectively, showed bladder images swerved from FOV.

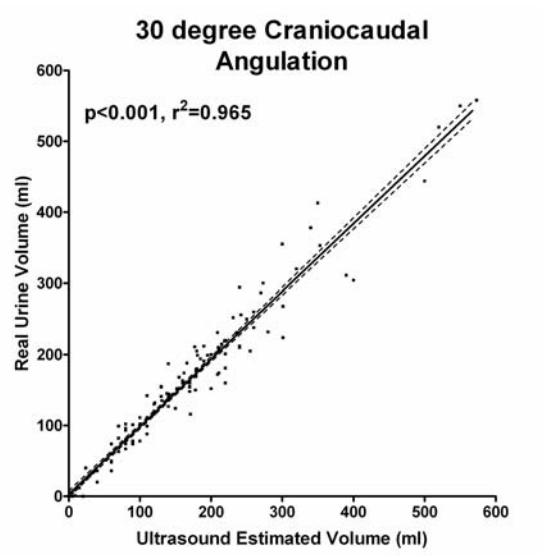
Interpretation of results

Volume estimation using this BVMS showed very good agreement with true volumes at both 10 and 30 degree craniocaudal angles of the transducer. At more than 250 ml of bladder volume, volume estimation at 30 degree craniocaudal angles of the transducer rather than 10 degree is recommended because of FOV limitation on ultrasound.

Concluding message

Volume estimation using this BVMS is recommendable to use as an alternative to catheterization for the determination of bladder volume before and after voiding. The results from the different angles of the transducer demonstrated the necessity to standardize these procedures for volume estimation by BVMS.





Pearson's correlation analysis: the solid line indicates the r^2 and dotted lines indicate the 95 % confidence interval.

FUNDING: M-Cube Technology