

Re: Clinical Application of Computed Tomography on Prostate Volume Estimation in Patients with Lower Urinary Tract Symptoms

Sir,

We have read this article with interest due to a sparse literature data regarding a comparison of prostatic volume (PV) measurement by computed tomography (CT) scan and transrectal ultrasonography (TRUS).⁽¹⁾ The authors have to be congratulated for implementation of Bonaventura Cavalieri's principle for measurement of irregular bodies volume using the 3D reconstruction of CT scan images. However, several concerns regarding this study should be raised. Prostatic glands don't have unique shape. Therefore, there is no a single formula for accurate volume calculation for different prostates. An ellipsoid formula, which has been used in this paper, is associated with overestimation of volumes in larger glands as well as underestimation of volume in smaller glands.⁽²⁾ Rodriguez and colleagues have shown that ellipsoid formula consistently underestimates the actual gland size in radical prostatectomy specimen.⁽³⁾ Previously, McMahon and colleagues have found that a formula for bullet shape ($V = \text{Height (H)} \times \text{Length (L)} \times \text{Width (W)} \times 5\pi/24$) is more convenient for prostates with volume $< 55 \text{ cm}^3$.⁽⁴⁾ Therefore, the authors have not used more accurate formula for prostate volume calculation in more than 75% of samples in the study. Usage of CT scan for prostate volume measurement can't be justified in clinical settings due to significant dose of irradiation (approximately 20-30 mSv). However, CT scan performed for unrelated reasons could serve for measurement of prostatic volume. As the authors rightfully stated, this technique also has some drawbacks due to difficulties in determinations of appropriate borders, particularly at the base and the apex of prostate. 3D CT scan prostate volume measurement using Cavalieri's principle is time consuming procedure, and surprisingly is more inaccurate than measurement using ellipsoid formula. Probably, small movements of prostate during data acquisition could be one of reasons for overestimation of prostatic volume by CT scan. On the other side, further refinements of computer program enabling tracing of borders in two planes might be required for more accurate tracing in the apical and basal area of the gland. Unfortunately, this study has not been designed to enable judgement of intrapersonal nor interpersonal variation of measurement. Various authors have shown significant intrapersonal and interpersonal variability of prostate contour tracing on CT scan as well as measurement of dimensions and volume of prostate.^(5,6) Certainly, accurate measurement of prostatic volume will remain significant challenge waiting for definite solution.

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Reply by Author

Dr. Bogdanovic and colleagues raised two issues for our article entitled “Clinical Application of Computed Tomography on Prostate Volume Estimation in Patients with Lower Urinary Tract Symptoms”. First of all, they mentioned that there is no a single formula for accurate volume calculation for different prostates. Furthermore, they recommended that modified prostate volume (PV) algorithm developed by McMahon and colleagues is more convenient for prostates with volume < 55 cm³.⁽¹⁾ I agree with their opinion. In 2010, Yang and colleagues reported modified ellipsoid formula at different stage of benign prostatic hyperplasia.⁽²⁾ They also pointed out inaccuracy of volume estimation by ultrasound like Dr. Bogdanovic and colleagues. However, the authors desinged eccentricity parameter to improve accuracy of PV measurement by ultrasound. Interestingly, bullet formular was also as inaccutate as ellipsoid formular in smaller gland. Furthermore, we suggested PV determination by CT scan using formula as preferable alternative in the clinics for quick volume measurement. Actually, we think that many physicians and urologists are familiar with ellipsoid formula. Secondly, we could not show intrapersonal and interpersonal variation of measurement because of retrospective study design. In addition, we just focused on the reliability and possibility of clinical use of PV measured by CT scan using the ellipsoid formula. Therefore, further studies are needed to validate intrapersonal and interpersonal variation of measurement. Thanks for all the suggestions and tips.

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