

## PREDICTABILITY OF TRUS-MEASURED PROSTATE VOLUME BY COMPUTED TOMOGRAPHY

### Hypothesis / aims of study

To evaluate the predictability of transrectal ultrasonography (TRUS) measured prostate volume with computed tomography (CT)

### Study design, materials and methods

A patient cohort was made who underwent both CT and TRUS from January 2012 to December 2013 in a single institution. Patients who were diagnosed of prostate cancer or previous history of prostatectomy or having urethral catheter were excluded. A total of 284 patients with 67 noncontrast CT (NECT) images (group A) and 217 contrast enhanced CT (CECT) images (group B) were reviewed. The length and width of the prostate were measured in axial images and height was measured in coronal view of CT. Interobserver variability was measured by 3 independent reviewers and repeated after 2 months to test the intraobserver variability. Prostatic volume from CT was calculated by the equation of  $0.52 \times [\text{width}(\text{cm})] \times [\text{length}(\text{cm})] \times [\text{height}(\text{cm})]$ . We assumed that the TRUS-measured prostate volume was the true prostate volume. Prostatic volume measured by TRUS was using  $\pi/6 \times [\text{width}(\text{cm})] \times [\text{length}(\text{cm})] \times [\text{height}(\text{cm})]$ . The following 3 analyses were carried out: 1) CT-measured total prostate volume/TRUS-measured total prostate volume ratio (CT/TRUS volume ratio) was compared to evaluate the correlation of CT-measured prostate volume with TRUS-measured prostate volume. 2) Interobserver variability and 3) intraobserver variability were calculated to evaluate the reliability of TRUS-measured prostate volume by CT-measured prostate volume. 4) The predictability of TRUS volume using CT was also compared according to the contrast enhancement.

### Results

Mean age of patients was  $64.5 \pm 10.8$  years. Interval between CT and TRUS was  $16.3 \pm 22.6$  days on average. Mean prostatic volume measured by TRUS was  $44.7 \pm 24.9$  ml. 1) Mean CT/TRUS volume ratio was  $0.80 \pm 0.20$  (range 0.38-1.82), suggesting CT underestimates TRUS volume by 20%. 2) Interobserver variability was 0.915 and 0.926 for the test and retest, respectively. 3) Intraobserver variability was very good (Table 1). 4) Mean CT/TRUS volume ratio was not different regardless of the contrast enhancement (NECT/TRUS  $0.83 \pm 0.23$  vs. CECT/TRUS  $0.79 \pm 0.18$ ,  $p=0.166$ ). The correlation of TRUS measured prostatic volume by CT was very good in both groups.

### Interpretation of results

CT is one of common imaging modalities, so that many patients can have a chance to have previous CT for many reasons including routine check-ups. Prostate volume measurement can be made with DRE, TRUS and other imaging modalities. DRE is not accurate especially for large prostate. Although TRUS is popular among urologists, it is not possible in some patients with anal strictures or recent rectal surgeries.

It is known that TRUS is more accurate than CT to measure prostate volume [1]. Previous studies regarding the correlation between CT and TRUS had been conducted in patients with prostate cancer before brachytherapy. In those studies, CT scan overestimated the prostate volume over TRUS by 17-50%. One study of patients with LUTS showed that CT overestimates the prostate volume by 8.4-23.5%. Our result was in opposite with the previous results. Subgroup analysis showed that CT measurements were shorter in length and height, longer in width significantly than those measured by TRUS.

### Concluding message

CT measured volume was approximately 20% lower than TRUS measured volume regardless of contrast enhancement. Prostatic volume measurement using CT is well correlated and reliable method compared with TRUS-measured prostate volume. Therefore, CT can be used to predict the prostate volume whenever TRUS is not applicable.

Table 1. Test-retest reliability of CT measured volume over a period of 2 months

Participants	Cronbach Alpha (95% CI)	P value	Spearman Rho	P value
Reader 1	0.882 (0.833-0.895)	<0.001	0.769	<0.001
Reader 2	0.853 (0.762-0.851)	<0.001	0.676	<0.001
Reader 3	0.895 (0.857-0.911)	<0.001	0.721	<0.001

CI, confidence interval.

### References

1. Fogh S, Doyle L, Yu A, Li J, Weiner P, Suh D, et al. A comparison of preplan transrectal ultrasound with preplan-CT in assessing volume and number of seeds needed for real-time ultrasound-based intra-operative planning in prostate (125) seed implantation. Brachytherapy. 2010;9(4):335-40.

### Disclosures

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