

Purpose: The objective of the current work is to assess the relative quality of tissue harmonic (H) transrectal ultrasound images of the prostate and neighbouring critical organs by comparing it with brightness (B) mode, using quantitative and qualitative statistical tools.

Methods: Image sets containing prostate and critical organs were acquired using the B and H mode capable transrectal probe B-K medical 8848, for ten patients undergoing radioactive seed implants at our centre. The prostate, urethra and rectum were contoured by a radiation oncologist (RO) and five similarly trained observers for all image sets. These observers also qualitatively scored randomly presented images using a five-level Likert scale. The prostate, rectum and urethra volumes and qualitative scores of images were used for inter imaging mode comparison and observer group versus RO and among the observers (interobserver) studies.

Results: Pearson correlation coefficients showed that all volumes outlined by observers were in close agreement with that of the RO. Two sample paired student t-tests showed that the prostate ($p=0.008$) and rectum ($p=0.009$) volumes with H mode were significantly smaller than B mode. However there was no significant difference ($p=0.29$) in urethral volumes between the two modes. Interobserver consistency was estimated based on standard deviations as percentages of means. Two-factor analysis of variances (ANOVA) showed significant interobserver variability ($p<0.003$) in defining the prostate and critical organs, in both imaging modes. Interobserver consistency for small prostates and rectum improved in H mode, but there is no significant improvement for the urethra. Qualitative assessment of image clarity agreed well with these quantitative observations.

Conclusions: Except for the urethra, the volumes of prostates and critical organs defined with H mode are significantly smaller compared to B mode. H mode improves interobserver consistency in defining the prostate and rectum as a result of superior image clarity.