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Prostate histoscanning as a tool for decision making

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Introduction & Objectives: Prostate histoscanning (PHS) is ultrasound-based application for differentiation of tissue suspected from being malignant. It uses backscattered ultrasound signature, native radiofrequency data, acquired by transrectal ultrasound. Data are analyzed by a dedicated computer system with interaction of the operator. Resulting 3D model has suspicious areas color highlighted. Our objective was to analyze the accuracy of PHS in patients with biopsy confirmed prostate cancer (PC).

Material & Methods: The study was conducted prospectively between January and September 2012. Cohort consisted of patients with biopsy confirmed PC, who were scheduled for radical prostatectomy. Relevant data were available from 98 patients. PHS was done under general anesthesia before surgery with BK Pro Focus Ultraview ultrasound, 8818 transducer and rotation magnetic holder. Customized form identical for PHS and histology was used for lesions localization. On the form, the prostate was divided into 12 sectors - anterior and posterior left and right, each for apex, mid and base. "Apex" / "base" were considered as 1 cm distance from the outer margin of the gland. Pathologic sectioning of prostate was done by Stanford technique; all detected lesions were marked. Histoscanning software was version 2.3. Lesion volume limit on PHS analysis was set at 0.1 cm³, both suspicious (purple) and positive (red) lesions were included. Urologist and pathologists were blinded to each other's results. Patients with major artifacts on PHS were excluded.

Results: Patients' characteristics were: median age 63 years (IQR 60-66), median PSA 6.4 (IQR 5.2-8.5), median GS 7 (IQR 6-7) and 55% having cT1c. PHS identified 287 lesions; 1 to 5 per patient (average 3), distributed over 523 sectors. Pathology cancer foci were distributed over 473 sectors. Median index cancer volume (ICV) was 1.38 cm³ (IQR 0.66-2.97), median total cancer volume (TCV) was 2.24 cm³ (1.1-4.06); individual lesion volume ranged 0.1 cm³ to 9.3 cm³. In histologically positive sectors the PHS positivity significantly influenced by biopsy and pathological Gleason score (GS) ($p < 0.01$) with detection improved for higher GS. Overall PHS performance was dependent on the distance from probe, bladder fullness, ICV, TCV and sector (all $p < 0.05$). Sector based detection (for lesions from 0.1 cm³) reached sensitivity 60% and specificity 66%, with area under curve (AUC) 0.63. However, if PHS positivity and sector were used in a model, AUC was 0.751, sensitivity 73% and specificity 66%.

Conclusions: PHS seems to have reasonable detection rate given the setting of the study (very small lesion limit) which is likely to be better for bigger lesions. This makes it an interesting tool for 1) PC detection, especially in the setting of targeted biopsies, or 2) for active surveillance of selected patients without the need for rebiopsy. The latter may be even more interesting due to differences in PHS accuracy in different GS.