

Detection of Prostate Cancer with HistoScanning™, a novel ultrasound based technique to detect and visualize changes in solid organ tissues: A comparison with pathology findings in 85 patients.

R. Epplen¹, J. van Essen¹, T. van Erps¹, D. Thüer¹, D. Porres¹, R. Knüchel-Clarke², A. Heidenreich¹

¹ Department of Urology, RWTH University Aachen, Germany

² Department of Pathology, RWTH University Aachen, Germany

Introduction

- HistoScanning™ is a tissue differentiation, visualization and quantification tool which identifies changes to solid organ tissues.
- It detects specific changes in the tissue morphology by extracting and quantifying statistical features from back-scattered ultrasound data.
- The characterization algorithms exploit the physical changes to sound waves that result from the interaction of the ultrasound beam and the cancer tissue. These can be summarized as energy loss, erratic spatial distribution of energy and increased entropy.
- HistoScanning™ uses a transrectal ultrasound device which rotates 180° in the rectum of the patient to acquire data which are then transmitted to the HistoScanning™ software program.
- Data are differentiated and suspicious areas in the prostate are localized and spotted in 3D.
- Our objective was to compare HistoScanning™ with histopathology of radical prostate specimens and to determine the HistoScanning™ sensitivity regarding to cancer volume and localization.

Patients and methods

- n=85.
- Median age: 62,8 years (40-75 years).
- Histologically proven prostate cancer.
- All patients received ≥ 2 scans one day pre-operatively in order to exclude artefacts.
- The scan with the largest suspicious volume(s) was used for evaluation.
- Retrospective analyses using HistoScanning™ software version 2.2.
- Suspicious lesions measuring ≥0,2 ml were considered positive.
- Prostatectomy specimens were processed according to the Stanford protocol and evaluated by an experienced uro-pathologist.
- HistoScanning™ findings were correlated with final pathology of the radical prostatectomy specimens regarding the localization and volume. A match was defined as a HistoScanning™ positive lesion in a corresponding histopathologically proven area.
- Results were analyzed regarding the pT-stadium, Gleason Score, PSA, tumor volume and volume of HistoScanning™ lesion.

Results:

- Mean patient age was 62,8 (48-75) years, mean PSA accounted 11,83 (0,1-68) ng/ml.
- Mean prostate volume was 47,5 (19-225) ml.
- Mean tumour volume was 4,8 (0,35-38) ml.
- HistoScanning™ had 74% overall sensitivity in detecting and locating prostate carcinoma.
- Only 55% of these cases showed a good correlation for tumor volume.
- Results were identical for normal and salvage prostatectomy.
- Sensitivity was higher for pT3 tumours (92%) than for pT2 tumours (61%).
- Preoperative PSA had no statistical significance.
- HistoScanning™ detected small (10/85) tumors (<1 ml) in 50%, intermediate (40/85) tumors (1-5ml) and large (35/85) tumors (>5ml) in 58% and 85%, respectively.
- Similar findings are seen regarding to the volume of suspicious HistoScanning lesions. For small (6/85) (≤0,5 ml), intermediate (28/85) (0,5-2ml) and large (51/85) (>2ml) lesions, HistoScanning™ correctly predicted prostate carcinoma localisation in 33%, 78,5% and 65%, respectively.

Gleason Score		Detection rate by HistoScanning™	pT-stadium	
6	n=9		55%	pT2
7	n=50	74%	pT3	n=38
≥8	n= 18	83%	pT4	n=3
8 patients had salvage prostatectomy		n=85		

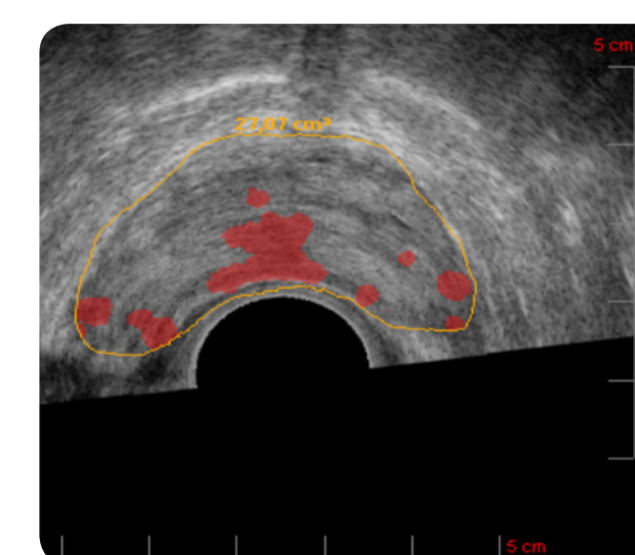


Fig. 1

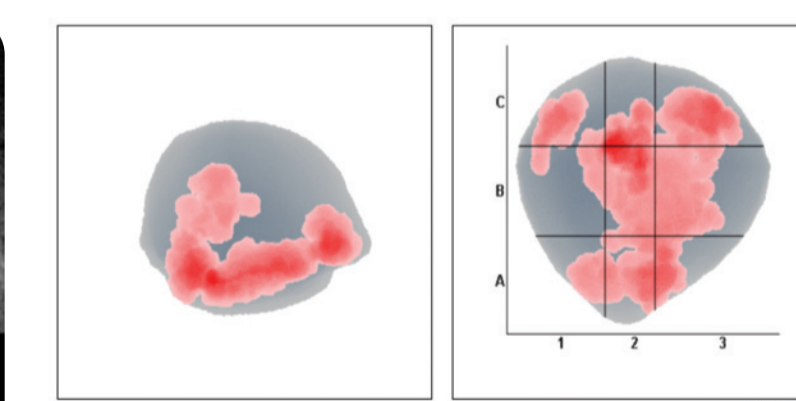


Fig. 2

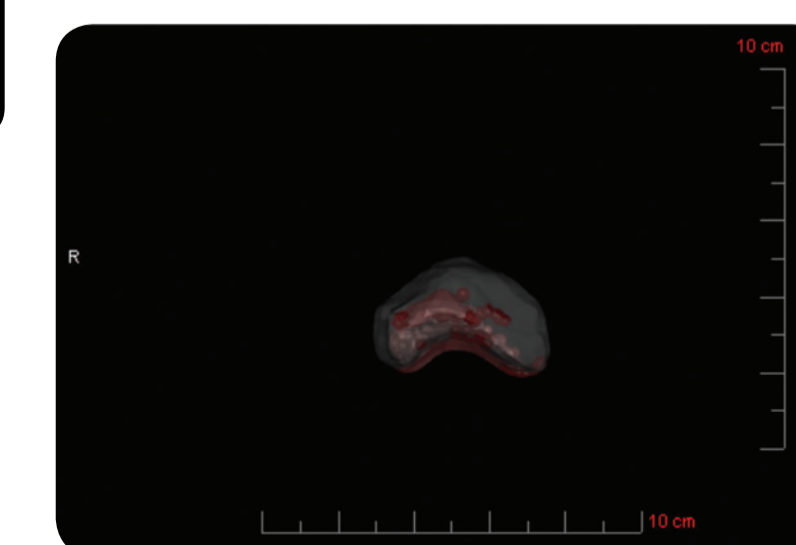


Fig. 3

Fig. 1-3 showing different visualization of scans

Conclusion:

- Learning curve of at least 40 patients.
- Significant prostate (≥pT2-carcinoma, Gleason Score of ≥7) can be detected with HistoScanning™.
- Larger prospective studies will be needed in the near future.