

Blinded assessment of Prostate HistoScanning™ accuracy compared to elective radical prostatectomy step-sectioned histopathology

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Introduction

Prostate HistoScanning™ (PHS) is an ultrasound based imaging technique in uro-oncology. Utilising computer-aided spectral analysis of the raw data acquired at 3D-TRUS, it produces a binary visual mapping of cancer vs non-cancer within the prostate. A 90% accuracy for detection of tumours in patients destined for radical prostatectomy has been previously reported¹.

We investigated prospectively the accuracy of this innovative imaging technique to volume assess index and satellite lesions in prostates prior to scheduled radical prostatectomy.

If this imaging technology can be shown to reliably locate and volume estimate primary and secondary lesions it could be used to assist treatment planning or to aid in active surveillance.

Patients and Method

Suitable consecutive patients scheduled for radical prostatectomy underwent pre-operative 3D trans-rectal ultrasound scans and Prostate HistoScanning™ analysis. The operator who obtained the 3D-TRUS scans is experienced in the use of trans-rectal ultrasound and has performed in excess of 40 HistoScanning™ acquisitions. HistoScanning™ analysis was performed on the 3D-TRUS data and analysed by an external specialist experienced in Prostate HistoScanning™ reporting. The reporter was blinded to pathology and clinical details.

Each prostate was assessed for total tumour volume and the volume of each tumour focus. All patients underwent radical prostatectomy performed by the same experienced surgeon. Specimens were processed centrally by an experienced histopathologist, using 5mm step-sectioned whole mount histopathology. Results of the HistoScanning™ analysis were compared with whole mount step sectioned radical prostatectomy specimens.

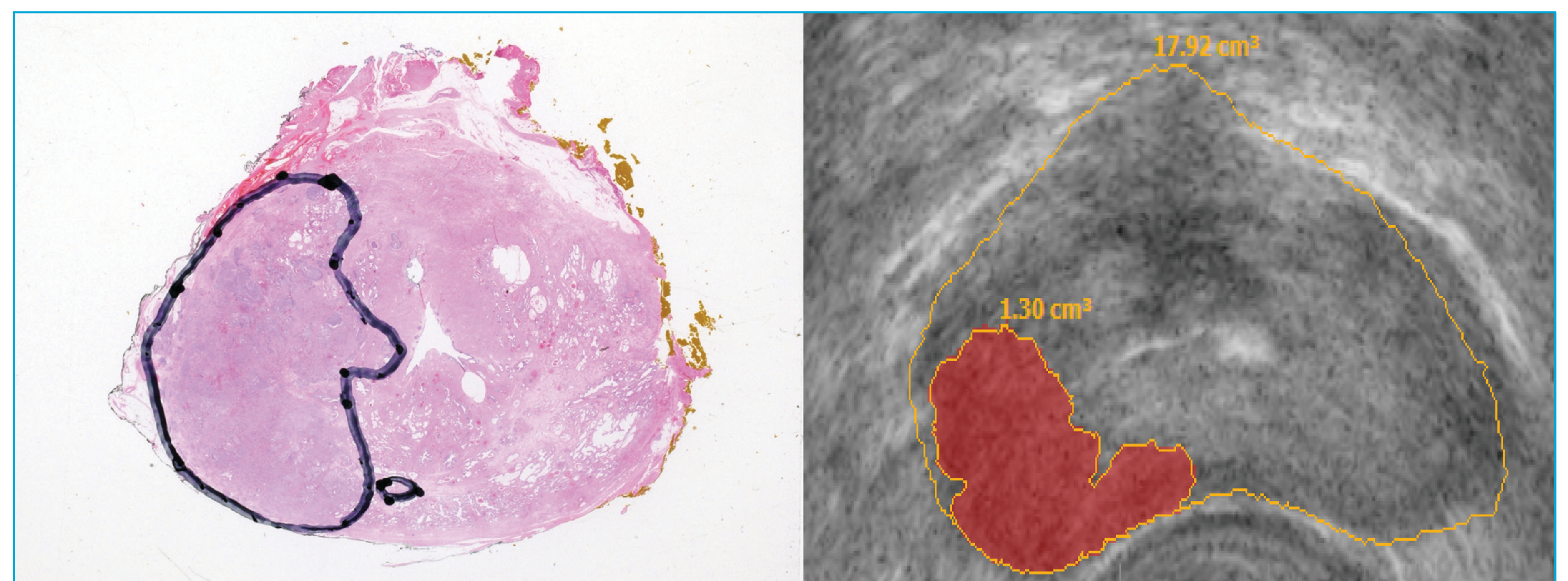


Figure 1: Matching between whole mount histopathology slice and corresponding HistoScanning™ image.

Results

A total of 24 patients (representing 48 separate tumour foci) underwent preoperative Prostate HistoScanning™. The median total tumour volume for PHS and RP specimen did not differ significantly, being 1.42 and 2.29cc respectively (Spearman's rank correlation $P = 0.1748$). Comparison of index lesions revealed similar median volumes of 1.2cc vs 1.8cc, respectively ($p=0.45$).

Prostate HistoScanning™ identified 23 of 24 index lesions, one satellite lesion over 0.5cc was missed by PHS. Prostate HistoScanning™ generally underestimated tumour volume and two exceptionally large tumours (18cc and 40cc) were grossly underestimated at 1.3cc and 6.1cc, respectively.

Conclusion

Tumour recognition with Prostate HistoScanning™ is reasonably accurate when compared to radical prostatectomy step-sectioned histopathology; very few significant lesions are missed. This may allow HistoScanning™ to assist in treatment planning and as a tool for active surveillance. Not only could it help identify prostate cancer lesions but this simple non-invasive imaging technique may also allow for lesions to be closely monitored over time.

Average volume agreement for total cancer volume and index lesion volume in our series did not differ significantly between histopathology and HistoScanning™ analysis. Two very large cancers were grossly underestimated by PHS, reasons for this are unclear, however both patients in whom this occurred were reported as having had suboptimal scans. A limitation of HistoScanning™ technology accuracy is that it relies heavily on the quality of ultrasound data acquired. Further work on the effect of scan quality on HistoScanning™ accuracy is required. We believe this technology demonstrates the potential to assist in preoperative tumour assessment or for tumour surveillance as a part of active surveillance protocol. This requires further validation in larger prospective trials.

Reference

(1) Braeckman J, Autier P, Soviany C, Nir R, Nir D, Michielsen D, Treurnicht K, Jarmulowicz M, Bleiberg H, Govindaraju S, Emberton M. The accuracy of transrectal ultrasonography supplemented with computer-aided ultrasonography for detecting small prostate cancers. *BJU Int.* 2008 Dec;102(11):1560-5.