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Accuracy of Computer-Aided Transrectal Ultrasonography Detection (HistoScanning™) of prostate cancer in the prediction of a negative margin in radical prostatectomy patients.

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Introduction

Nerve-sparing radical prostatectomy (RPE) represents a standard surgical treatment for clinically localized prostate cancer (PCA). Intra-operative frozen section (FS) has been described as a feasible and reliable method to ensure the oncologic safety of the procedure. Nevertheless, FS are associated with a longer operation time and additional costs. In 2008 the rate of nerve-sparing procedures was 98% for pT2 and 74% for pT3 tumors in our institution.

Transrectal computer-aided ultrasonography (TCU) was reported to be an accurate method for tumor foci detection that correspond to a volume of ≥ 0.50cc. (1)

We used, in a retrospective analysis, the absence of tumorfoci in the TCU in the region of the neurovascular bundle (NVB) to predict the necessity of a frozen section (FS) and possible NVB resection in prostate cancer patients who underwent a radical prostatectomy (RP).

(1)Braeckman J, Autier P, Soviany C, Nir R, Nir D, Michielsen D, et al. The accuracy of transrectal ultrasonography supplemented with computer-aided ultrasonography for detecting small prostate cancers. BJU Int 2008;102(11):1560-5.

Results

Table 1

Characteristic of 80 patients who underwent RP and TCU since October 2009.	
Preoperative data	
Age, mean (range)	64 (48 - 76)
PSA, mean (range)	5,96 (1,3 - 33,8)
Clinical stage, n (%)	
T1c	35 (83)
T2a	5 (12)
T2b	2 (0,05)
Postoperative data, n (%)	
pT2 (OC)	62 (77,5)
pT3a (ECE)	12 (15)
pT3b (SVI)	6 (7,5)
R1	8 (10)
Gleason score	
3+3	13 (16,3)
3+4	48 (60)
4+3	14 (17,5)
>7	5 (6,3)

The mean age of the 80 patients was 64 years, mean PSA 5,96. Sixty-two RP specimens had an organ confined pathological stage (OC); twelve an extra prostatic extension (EPE); and six a seminal vesicle invasion (SVI)(table.1).

Results for TCU were a 95,4% predictability for an oncologically safe nerve-sparing procedure, when the suspect TCU focus was less than 0,2cc. For TCU focus less than 0,50cc, the predictability decreased to 89%.

When the absence of prostate cancer positive biopsy cores in these sites was included, an 100 % match for preserving the NVB, without compromising cancer control, was observed.

TCU focus size		* 0,2	* 0,5
Nerve-sparing procedure + TCU focus <*		62	89
Resection of the NVB + TCU focus <*		3	11
Resection of the NVB + TCU focus >*		24	16
Nerve-sparing procedure + TCU focus >*		71	44
	n	**160**	**160**
	Sensitivity	**95,4%**	**89,0%**
	Specificity	**25,3%**	**26,7%**

Table 2: Predictability for a nerve-sparing operation, independently of the biopsy cores. Every FS (right or left side) was counted as a independent event (n = 160).

Patients and Methods

Since October 2009, eighty men underwent HistoScanning prior to RPE. The three dimensional construction of the whole prostate were analysed with the HistoScanning™ technology.

A virtual FS of 10mm thickness was drawn into the three-dimensional construction of the prostate in the region of the neurovascular bundles on each side. TCU foci of ≤ 0.2cc, <0.5cc and >0.5cc have been compared to the histo-pathological results of FS.

Every FS (right or left side) was counted as a independent event (n = 160).

Figure 1: Transrectal ultrasonography of the prostate after HistoScanning ™analysis (suspicious calculated areas: red). The virtual FS line is drawn into the image. The whole calculated volume (cc) was used when TCU suspicious areas contact these lines.

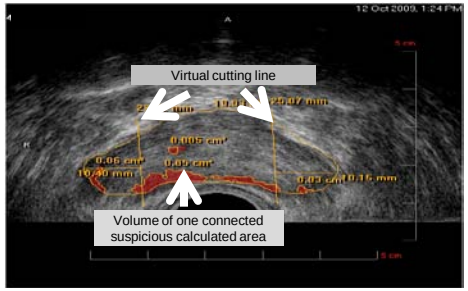
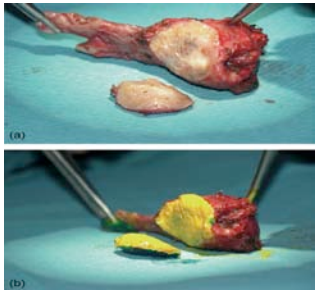


Figure 2: Frozen sections reach from the apex to the base of the complete lateral-dorsal part of the prostate. The sides of the slice are inked in different colours. This technique enables the pathologist to differentiate between true- and false-positive surgical margins.



TCU		*0,2	*0,5
Nerve-sparing procedure + TCU focus <*		19	27
Resection of the NVB + TCU focus <*		0	0
Resection of the NVB + TCU focus >*		1	1
Nerve-sparing procedure + TCU focus >*		21	13
	n	**41**	**41**
	Sensitivity	**100,0%**	**100,0%**
	Specificity	**4,5%**	**7,1%**

Table 3: Predictability for a nerve-sparing procedure only at the prostate lobe with tumor negative biopsy cores. (n =41)

Conclusion

The ideal trifecta of RP is oncological control and preservation of potency and continence. A nerve sparing procedure is mandatory for potency recovery. Knowledge of extra-prostatic extension (EPE) prior to RP would be most useful to preserve the NVB or not. Besides the use of nomograms, which are limited in the prediction of EPE, frozen sections are a helpful tool to detect a positive margin (PSM) in an operative setting. Nevertheless, it is time and cost consuming with a possibility of false negative results. An accurate imaging modality which can detect tumour foci location within the prostate would be most helpful. Decision upon a nerve sparing procedure could be made prior to RP. TCU was reported to identify prostate cancer tumour foci that correspond to a volume of ≥ 0.50mL. Therefore, it could be a powerful tool to estimated the chance of a PSM if foci were close to the capsule of the prostate. However, data on this new technique are sparse.

This retrospective analysis indicated that TCU could avoid approximately 40% unnecessary frozen sections, reducing the operation time and cost and achieving almost the same oncologic safety for a nerve/sparing procedure, with a sensitivity of 95%. A reduction of 12% FS would be possible by analysing the TCU just on the tumour negative biopsy core lobe, with a sensitivity of 100%.

A notable limitation of this study is the small sample size. Therefore, the use of TCU for decision making on nerve sparing procedures cannot be made yet. However, these data are encouraging and further investigations are recommended.