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# ULTRASOUND OF THE PROSTATE AND ITS USE FOR GUIDED BIOPSY

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**Abstract**

The development of ultrasound diagnostics of the prostate is described. With modern ultrasound technique in combination with guided biopsy transrectal ultrasound (TRUS) is a powerful diagnostic means and very likely today's best screening tool (if screening would be regarded as feasible). The author advocates transrectal core biopsy instead of fine-needle aspiration biopsy as histology does not have false positives and forms a firmer basis for grading.

*Key words:* Prostate, cancer, ultrasound, biopsy.

## Diagnostic development

Transrectal ultrasound (TRUS) underwent rapid development in the 1980s. The equipment was refined: 3 MHz became 5 and later 7 with resulting increase in image detail. Transverse or longitudinal scanning was replaced by biplanar imaging. Transperineal TRUS-guided biopsy was replaced by transrectal TRUS-guided Biopty biopsy. The most important change was, however, not technical but interpretative. The concept of prostatic anatomy was revised and so were the ultrasound criteria for cancer.

In 1985 the hyperechoic nature of prostatic cancer was challenged. With 5 and later 7 MHz equipment prostatic cancer was shown to be hypoechoic. The improved resolution, moreover, displayed an inner architecture that matched only with McNeal's zonal concept from 1969. Prostatic ultrasound anatomy and ultrasound criteria for cancer are described in a 'State of the Art' paper from 1989 (1).

The increasing use of TRUS has generated criticism—relevant as well as irrelevant. The irrelevant criticism mainly tries to discredit TRUS as a screening tool whereas the relevant question is the soundness of screening for prostatic cancer. It is very likely that TRUS is today's best screening tool. The sensitivity is probably double that of digital rectal examination with a slightly lower specificity (probably close to 95% (2)). The question is whether screening for prostatic cancer is worthwhile and then whether TRUS can do the job. Controlled studies with answers to these questions are being planned.

## Ultrasound-guided transrectal biopsy

In 1981 transperineal biopsy of the prostate guided by transverse imaging was described (3). In 1983 transperineal biopsy guided by longitudinal imaging was developed (4). The two methods were combined by Lee and coworkers in 1987 (5).

The drawbacks of transperineal biopsies are, however, that it is difficult to place needles accurately in lesions 1.0 cm or less in size, patient tolerance is low, and it is a time-consuming procedure.

In 1986 probes designed for transrectal biopsy were combined with the Biopty system (modified Tru-Cut). With fingershaped probes that visualize the tissue in front of the tip it is possible to perform transrectal US-guided prostatic biopsies. The advantages of such a biopsy are that patient tolerance is high, the procedure is very accurate because of a short needle path, and that it is a very quick procedure. The insufficiency rate is close to zero (6). The biopsy procedure has been described in detail (7, 8). Cancers may be imaged and accurately biopsied in the same setting. Palpable as well as non-palpable cancers are found. However, not every hypoechoic lesion turns out to be a cancer. Several authors have found 40–50% positive

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biopsies in referred populations. In a screening study (lower prevalence) Lee had 33% positive biopsies.

The drawback of transrectal biopsy is the risk of infection. In the US it is recommended to administer prophylactic antibiotics prior to biopsy. A benefit of this has not been proven. At Herlev Hospital we do not give antibiotics but take the following precautions:

1. Patients must not have an active infection—evaluated clinically.
2. Patients must not have a bleeding disorder—evaluated clinically and from available blood tests.
3. High risk patients (coagulation- or infection-wise) are referred for further work-up prior to biopsy and individual precautions are taken.

After biopsy the patients are informed of blood in stool, urine, and sperm as normal in the following 24 h. In the event of fever (38°C) they must contact the hospital immediately. When transrectal US-guided biopsy is performed routinely it becomes a very quick procedure. Thereby, any abnormality demonstrated ultrasonically can be biopsied immediately as the procedure only prolongs the examination by approximately 5 min.

### Cytology versus histology

Numerous papers have compared fine-needle aspiration biopsy with core biopsy of the prostate. They all show a sensitivity of cytology about 90% and a sensitivity of histology about 70%. Common to all these studies are that the transrectal route is used for cytology and the transperineal for histology, that multiple needle passes are used with cytology and the single for histology, and that palpation is used to guide the needle. The higher sensitivity of cytology is attributed to a larger sampling volume making up for the inaccuracy of a 'blind' biopsy. When ultrasound is used for guidance ensuring correct needle placement and when both histologic and cytologic biopsies are performed transrectally, the pros and cons for the two procedures must be reevaluated.

In 310 cases of US-guided prostatic biopsy both types of biopsy were performed. Three passes were made with the 18 gauge Biopty needle followed by one pass with a 22 gauge Lee-Ray aspiration needle. Sensitivity of histology was 98% compared to 63% for cytology. If suspicious results were read as positive, the sensitivity of cytology was elevated to 77%. The predictive value of a positive histology was 100% compared to 94% for cytology. If suspicious results were read as positive the predictive value for cytology was 87%.

On the basis of these results we do not recommend to perform cytology. Histology does not have false positives and forms a firmer basis for grading. We acknowledge that the design favors histology. We attribute our high sensitivity of histology to multiple needle passes.

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