Real-time ultrasound prostate elastography. An increasing role in prostate cancer detection?

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Prostate cancer (PCa) is the most common cancer in men. The main diagnostic tools used to diagnose PCa include digital rectal examination (DRE), serum concentration of prostate-specific antigen (PSA), and transrectal ultrasound (TRUS)–guided biopsies [1].

Transrectal ultrasound (TRUS) is used to visualize the prostate, to measure its volume and to facilitate needle placement but in the detection of prostate cancer it has a very limited role as a stand-alone technique.

Prostate cancer is most often depicted as a hypoechoic area but it may also appear echogenic or isoechoic. About half of PCa lesions are invisible by grayscale US. The sensitivity of B-mode TRUS for the detection of PCa ranges from 44% to 90% and the specificity from 30% to 74% [1]. The positive and negative predictive values (52.7% and 72% respectively) and accuracy (67%) are low even in recent series [2].

TRUS-guided, 18-gauge systematic core biopsy has become the gold standard method to obtain material for histopathological examination. In order to increase the accuracy of systematic biopsy, the original sextant technique has been modified to include a greater number of cores. Using 8-12 cores biopsy it has become possible to identify up to 96% of cancers [3].

However, even using such high number of cores, systematic biopsy may miss some PCa and many patients require repeat biopsy. Thus it becomes evident that imaging should play an increasing role in identifying suspicious areas of PCa. Targeting those areas would increase the accuracy of biopsy. Such areas harbor an enhanced vascularity which may be depicted with imaging or an increased stiffness visualized by elastography.

Color and Power Doppler US-guided targeted biopsy were first introduced to target areas of increased vascularity. However, the sensitivity of these techniques was not sufficient to eliminate the need for systematic biopsy (SB).

Power Doppler and grayscale contrast-enhanced TRUS using microbubble contrast agents are frequently used to improve detection of tumor vascularity [4]. As higher blood flow is associated with tumor tissue, these techniques can help to target prostate biopsies. In a recent study it was shown that CEUS-guided prostate biopsy identified malignant tumors in 80 % of patients whereas SB detected cancer only in 34% [1]. Although CEUS-targeted cores in this study were positive in a higher number of cases in comparison with SB, the sensitivity (47.7%) and specificity (80%) are still not high enough to be able to avoid systematic random biopsies.

It is well known that prostate cancer has a higher cell density than the surrounding normal tissue. This increased cell density leads to an alteration in tissue elasticity, which can be measured and displayed by sonographic-based elastography in real-time conditions. Real-time sonoelastography (RTE) has been proven capable to visualize PCa areas as ''hard'' lesions and therefore can be used for PCa detection and for targeted ultrasound-guided biopsy [3].

In this issue of Medical Ultrasonography, Dudea *et al* [5] and Giurgiu *et al* [6] publish two interesting papers on real-time prostate sonoelastography. The first paper is a comprehensive review on RTE of the prostate including examination technique, elastographic findings of various prostate pathologies, false results and limitations, results and comparison with other techniques. It demonstrates that elastography can detect up to 90% of PCa with specificity around 80%. The main advantage of elastography seems to be the improved PCa detection rate when used as biopsy guidance (90% versus 76.9% for B mode guidance). Through the improved visualization of tumors,

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RTE may lead to more targeted biopsies and reduce the number of random biopsy cores required to diagnose PCa. This makes it attractive for patients who are interested in a lower number of biopsies with less morbidity, but without the risk that relevant cancers are missed.

The second paper presents the first Romanian experience on prostate elastography. The authors demonstrate that RTE has a good sensitivity and specificity in diagnosing PCa especially when combined with TRUS and/or Doppler findings. They also show that the performance of RTE may be higher in certain subgroups of pacients such as those over 70 or with PSA levels above 10 ng/ml.

Considering the future of real-time elastography in the diagnosis of prostate carcinoma two questions arise. First, could RTE reach such performance as to select patients for prostate biopsy and to avoid unnecessary punctures? Second, will RTE-guided biopsy replace systematic biopsies in the diagnosis of PCa? The answers for both questions are not yet known. Based on available data the answers seem to be positive. Presumably a combined RTE and CEUS approach including guided biopsy will reach a high enough performance to avoid the need of systematic biopsy.

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