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Transrectal Elastosonography for Diagnosis of Prostate Cancer

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Editorial

Histopathology remains the mainstay of confirming the diagnosis of prostate cancer (PCa). Grey scale (B-mode) transrectal ultrasound (TRUS), which is based on increased brightness in relation to the strength of the echo, is widely used for prostate biopsies [1]. The grey scale TRUS is useful in guiding needles into the desired region as per the biopsy protocol however, it does not differentiate between normal and cancerous tissue in up to 50% of the cases [2-4].

The neoplastic tissues are known to have higher density, which causes a change in tissue elasticity [5]. Therefore, cancer tissues project differently when compressed and decompressed and this can allow differentiation from normal healthy tissues [6,7]. Ultrasound elastosonography is a new powerful diagnostic technique that assesses tissue hardness as an indicator of malignancy. The basic principle of elastosonography is that tissue compression produces strain (displacement), that is less in hard tissues than in soft ones and is scored measuring the degree of distortion of ultrasound beam under the application of an external force. The ultrasound elastogram is displayed over the B-mode image in a colour scale that corresponds to tissue elasticity.

Transrectal Elastosonography (TRES) is an emerging technique that could map out the relative tissue stiffness of prostate gland. This can differentiate cancer foci from the benign tissues within prostate gland. A recent study reports that TRES can detect up to 90% of PCa with a specificity of 80% [3]. While, using histopathology of the radical prostatectomy specimens as reference standard, the sensitivity of TRES ranged between 0.71-0.82 and the specificity ranged between 0.60-0.95 [8]. With grey scale TRUS, localization of the cancer foci in prostate gland is a challenge. However, TRES seems to be better in localization of the tumour foci [9]. The role of TRES in PCa detections is relatively new but, the initial reported results of TRES are encouraging suggesting that TRES has a higher PCa detection rate than B-mode sonography [9-14]. TRES is also more sensitive in detecting PCa than digital rectal examination [12,14,15]. Furthermore, TRES has a higher detection rate than both colour Doppler ultrasound and MRI [14]. And importantly, TRES was reported to reduce the number of core biopsies [9].

A wealth of research is ongoing in establishing the role of TRES in routine clinical practice. However, there are few issues which need to be addressed carefully before accepting routine role of TRES for the diagnosis PCa. Future research efforts based on high quality peer reviewed protocol are required for the evaluation of TRES. Additionally, there is need to have predefined standardized sonographic parameters, agreed reference standards and sufficiently powered trials to get meaningful results. Further refinement of the technology will have great impact in future trials. In recent years, elastosonography has improved and the introduction of Shear Wave Elastosonography (SWE) is an important development. SWE involves the generation of shear waves in tissue using acoustic radiation force generated by multiple focused ultrasound beams. As these waves propagate through tissue, the shear wave velocity changes as it is affected by stiffness variations, with the wave propagating faster in stiffer tissues compared to softer tissues [16]. SWE technology and its principles has been described previously [17,18]. SWE is quantitative method and has much less operator dependence, thus providing the potential for effective improvement of cancer detection and characterization. Currently SWE is the only elastosonographic approach that is able to provide local tissue elasticity information in real time [19]. This is quite exciting and the SWE may overcome the flaws of ultrasound and elastosonography.

In summary, the TRES appears better in detection of PCa, however, most reported studies lack standardization of technique. Almost all reported studies used compressional technique with no agreed standardization. This is an important aspect, as the compression is operator dependent and standardization will be challenging. However, uniform standardized technique/parameters are vital for training and reproducibility and this will allow critical appraisal of the trials performed in different centres. At present, it is uncertain whether the enhanced visual imaging with TRES can reduce the number of biopsies. However, if accurate visualization of the cancer foci is achieved, the number of biopsy cores can be reduced and hence morbidity will be less. The available literature on TRUS and TRES suggest different performance for the detection of PCa but, no conclusive evidence as to whether TRES should be part of routine clinical practice exists in the literature. With further advancement of technology, such as SWE, prostate cancer localization will improve. This not only enables targeted biopsies but will also aid in directing focal therapy for PCa.

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