Differences of standard values of Supersonic shear imaging and ARFI technique – in-vivo study of testicular tissue

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Introduction: Elastography is a technique which improved over the past decade and enables to assess tissue stiffness. Amongst others, Acoustic Radiation Force Impulse Imaging (ARFI) is implemented in the ultrasound scanner. As an advantage, there is no need for external compression, which reduces operator dependency. This is achieved by qualitative and quantitative responses which are generated in a selected region of interest (ROI) by short-duration acoustic radiation forces (< 1 ms). In a similar manner Supersonic shear imaging (SSI) produces an acoustic pressure wave which induces slow-moving lateral waves within the tissue. The speed of propagation of the shear wave is proportional to the square root of the tissue’s elastic modulus. Only since a short while, it is assumed, that there are differences in standard values according to different techniques. Until now, there is no in-vivo study in this context for the examination of the human testis.

Material and Methods: Fifty-eight healthy male the testes were examined using B-mode sonography and different elastography techniques. Firstly, B-mode sonography was performed in order to scan the testis for pathologies followed by performance of real-time elastography in three predefined areas (upper pole, central portion and lower pole) using the SuperSonic Aixplorer ultrasound device (SuperSonic Imagine, Aix-en-Provence, France). Afterwards a second assessment of the same testicular regions by elastography followed using the Acoustic Radiation Force Impulse Imaging (ARFI) technique of the Siemens Acuson 2000 ultrasound device (Siemens Health Care, Germany). Values of shear wave velocity were described in m/s. Parameters of elastography techniques were compared using multivariate analysis.

Results: The values of SSI were all significantly higher in all measured areas compared to ARFI (p<0.001 to p=0.015). Quantitatively there was a higher mean SSI wave velocity value of 1.1 compared to 0.8 m/s measured by ARFI.

Conclusion: Both, ARFI and SSI techniques enabled to assess quantitative and qualitative testicular stiffness and proved to be feasible for clinical application. For the definition of standard values in the testicular tissue, it is mandatory to distinguish between the different elastography techniques. This will be important for the examination of e.g. scrotal masses and other testicular pathologies.