Relationships of ultrasonographic and magnetic resonance image attributes to the histomorphology of ram testes

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Abstract

Declining male fertility has prompted investigations into the diagnostic methods that would permit frequent, non-invasive and accurate detection of changes in testicular histomorphology and the reproductive status of individuals. Ultrasonographic (U/S) and magnetic resonance (MR) imaging both have the potential to be used in this manner as associations have previously been described between the U/S and MR image attributes and histopathological changes in testicular tissue. The present study set out to determine if correlations exist between quantitative U/S and MR image attributes and histomorphological characteristics (total and luminal seminiferous tubule, ST area, and parenchymal cell density) of the excised ram testes, and to compare relative sensitivities of the imaging techniques. The echotextural/MR (input variables) and histological parameters (output variables) were analyzed by the Pearson's product moment correlations. Significant correlations were found for all imaging modalities, with the strongest overall correlation recorded for the T2 FAST SPIN ECHO (T2FSE) MR series (between mean numerical pixel values (NPVs) and total ST area; \( r = -0.93, p < 0.001 \)). The greatest number of significant correlations among quantitative image characteristics and histological attributes of testicular tissue were found for the 3 PLANE LOCALIZER (3 PLANE LOC) MR series, followed by the T2FSE MR, 3D FAST-SPOILED GRADIENT ECHO (3D FSPGRE) MR, U/S (7.5 MHz) imaging, and finally T1 SPIN ECHO (T1SE) MR series. No significant correlations were recorded between the quantitative attributes of T1SE images and ST lumen area or parenchymal cell density, or between the attributes of the 3D FSPGRE images and cell density. We concluded that there existed a potential practical application for both U/S and MR image techniques, combined with computer-assisted image analysis, to monitor the changes in testicular histomorphology and male reproductive health and fertility. Scrotal U/S remains a first-line imaging technique for the assessment of male reproductive health due mainly to its versatility and lower cost.

Keywords

Ram; Testes; Ultrasonography; Magnetic resonance imaging; Histology