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Morphometric analysis of prostate zonal anatomy by magnetic resonance imaging (MRI): Impact on age-related changes

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Introduction: Magnetic resonance imaging (MRI) could reliably evaluate the McNeal’s prostate zonal anatomy. The aim of this study was to evaluate impact of the morphometric MRI-analysis of the prostate zonal anatomy on aging, prostatic hypertrophy.

Methods: A retrospective analysis of 151 men, who consecutively underwent 3-Tesla MRI prior to prostate biopsy due to elevated PSA. Using Synapse-Vincent (Fujifilm), the prostatic zones was segmented in each axial step section of T2-weighted MRI, to reconstruct 3D-model of the prostate to calculate the zonal volumes (whole gland prostate [Pr-vol], transition zone [TZ-vol], and peripheral zone [PZ-vol]), presumed circle area ratio [PCAR], and PZ-thickness. PCAR was defined as the ratio of the area in the maximum axial section of the prostate to the area of a presumed circle with the equal circumference of the section. PZ-thickness (mm) was defined as PZ-volume divided by the maximum coronal section-area of prostate, to be calculated from the reconstructed 3D-prostate volume.

Results: PCAR had significant correlation with Pr-vol (r=0.337, p<0.001), and TZ (r=0.348, p<0.001). According to the increased age, PZ-vol (r=0.293, p=0.001), TZ (r=0.286, p<0.001), and PCAR (r=0.195, p=0.017) significantly increased. PZ-vol had no age-related (p=0.2). PZ-thickness had statistical negative correlation with PCAR (r=0.440, p<0.001) and TZ-vol (r=-0.533, p<0.001). These suggested that the greater the intra-prostatic-pressure increases (represented by the greater PCAR) due to the greater growth of TZ-vol, the thinner the PZ-thickness become. Limitation of this study included lack of longitudinal age-change analysis.

Conclusions: PZ-volume had no age-related increase in men with age of 40s-80s. The greater the TZ-volume grows, the higher the intra-prostatic pressure and the thinner the PZ-thickness become. MR-analysis of prostate zonal anatomy enhanced understanding of age-related changes of morphology.