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(G*) (POS-54) The Feasibility of the Xenon Ventilatory ADC Approach Using 129Xe MRI

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Hyperpolarized 129Xe lung MRI(1,2) is an efficient technique used to investigate and assess pulmonary diseases. The technique provides physiologically-relevant-biomarkers of obstructive lung-disease including emphysema, bronchopulmonary-dysplasia, congenital lobar emphysema and alpha-1-antitrypsin-deficiency.(3) However, the longitudinal observation of the emphysema progression using hyperpolarized-gas MRI-based Apparent-Diffusion-Coefficient (ADC) can be problematic, as the disease-progression can lead to increasing unventilated-lung-areas, which likely excludes the largest ADC estimates.(4)
Five patients, underwent spirometry and 1H/129Xe (Static-Ventilation and ADC) MRI scans. 129Xe imaging was performed at 3.0T (MR750, GEHC, WI) using whole-body-gradients (5G/cm) and a commercial 129Xe quadrature-flex RF coil.(5) Hyperpolarized 129Xe gas (polarization=35%) was obtained from a turn-key, spin-exchange-polarizer-system (Polarean-9820 129Xe polarizer).(6) Calculated ADC values were normalized on the corresponding ventilation-defect-percent ((VDP), calculated as previously described(7) estimates to obtain vADC.
The generated global-mean VDP estimates for the study-subjects were between 5% and 18%. The generated global-mean ADC/(vADC) estimates for the study-subjects were between 0.034s/cm2/(0.034s/cm2) and 0.048s/cm2/(0.048s/cm2).
The 129Xe DW data reconstructed with the key-hole-technique had sufficient SNR to generate reliable ADC maps and reasonable matching with the Static-Ventilation data. For the first time the feasible of the vADC 129Xe MRI-based approach was demonstrated and shown that this method can be used to accurately evaluate the emphysema-progression in a small-group. The study results suggest that the diffusion data reconstructed with the key-hole-technique(8) had sufficient SNR to generate reliable ADC maps and showing reasonable matching with the static-ventilation-data. For future work, we plan rescan the study-participants in twelve-months and normalize the ADC by VDP for an accurate-assessment of the emphysema-progression over the year-interval.
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