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WITHDRAWN - (U*) Comparing Two De-Noising Methods for 129Xe and 19F Hyperpolarized Gas MRI

Biomarkers are an important tool used to quantify lung disease, and are extracted from accurate, de-noised images (1). Hyperpolarized gas imaging, specifically Diffusion-Weighted (DW) and Dynamic-Ventilation (DV) are techniques used to quantify these biomarkers. However, noise is a concern, leading to over or underestimation of biomarkers (2). In this study, we aimed to compare two de-noising methods in order to improve measurements of diffusion length scale estimates (*LmD*) and Mean-Linear-Intercept-Estimates (*Lm*) as well as Regional-Fractional-Ventilation (*r*) in patients with lung disease as these metrics are potential biomarkers candidates (3). We first acquired 129Xe morphometry and fractional ventilation maps, as well as 19F fractional ventilation maps. We then applied MP-PCA (Marchenko Pastur- Principle Component Analysis) and modified MP-PCA de-noising methods to each image and obtained the pre and post de-noising *r*, *LmD*, and *Lm* metrics. MP-PCA de-noising works by first deconstructing the image signals using by projecting them onto an orthogonal base, reducing the size of noisy components, and then reconstructing the signal. Modified MP-PCA included the addition of hard-thresholding over a nuclear norm in k-space. Finally, applying a Student's T-Test, we found that the unmodified MP-PCA method was better suited to de-noise 19F and 129Xe images with no significant change between global metrics pre and post de-noising ($p<0.03$). Conversely, the modified MP-PCA method showed grossly overestimated and therefore significantly different fractional-ventilation image metrics, and should not be used to de-noise hyperpolarized 19F and 129Xe images. In conclusion, de-noising HP 129Xe and 19F image using the unmodified MP-PCA method results in better overall images, and can be used to further research biomarkers of lung disease such as *r*, *Lm*, *LmD* in longitudinal studies.

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