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Perfusion parametric map for the characterization of interstitial lung disease

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PURPOSE: To evaluate the value of perfusion parametric map in the assessment of disease activity in patients with interstitial lung diseases (ILDs).

MATERIALS AND METHODS: We included 21 patients with biopsy-proven ILD and who underwent thoracic dynamic contrast enhanced-MRI (DCE-MRI) and non-contrast CT. The following diseases were diagnosed: usual interstitial pneumonia (UIP)/ idiopathic pulmonary fibrosis (IPF) (n = 10), non-specific interstitial pneumonia (n = 5), cryptogenic organizing pneumonia (n = 4), desquamative interstitial pneumonia (n = 1), and respiratory bronchiolitis-interstitial lung disease (n = 1). Extended Kety model was applied for quantitative measurement of volume transfer constant (K^{trans}) and volume of extravascular extracellular space per unit volume of tissue (ve). In order to minimize the effect of individual variation of arterial input function, percentage change of K^{trans} (K^{trans}%) and ve(ve%) were calculated by comparing to those of normal lungs and displayed as perfusion parametric map. The changes of lesion extent were followed with chest CT (n = 14) or radiography (n = 7) (mean interval between initial and follow-up, 9.9 months). The parameters were compared between UIP/IPF and non-UIP/IPF patients and between lesions with progressive fibrosis or stable and improvement by using t-test.

RESULTS: The K^{trans}% was more decreased in UIP/IPF compared to that of non-UIP/IPF (0.873 and 0.937, respectively; p = 0.017). The K^{trans}% and ve% were more decreased in progressive fibrosis or stable lesions compared to lesions with improvement (K^{trans}%, 0.878 and 0.954; ve%, 0.002 and 0.486; p = 0.001 and 0.006, respectively). In patients with non-UIP/IPF (n = 12), lesions with risk of fibrotic progression (n = 2) showed significantly lower K^{trans}% than lesions with improvement (n = 6) (0.864 and 0.954, respectively; p = 0.011).

CONCLUSION: We quantified perfusion parameters from DCE-MRI in patients with ILDs. Perfusion parametric map delineates significant kinetic differences between UIP/IPF and the other ILDs and can be a non-invasive imaging biomarker for predicting prognosis in patients with ILDs.