

COMPARATIVE STUDY OF SSFP LUNG MRI AT 1.5T WITH HIGH RESOLUTION COMPUTED TOMOGRAPHY IN PATIENTS WITH INTERSTITIAL LUNG FIBROSIS

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Introduction:

Despite major advances in the field of MRI, MR imaging of lung parenchyma continues to be a challenge mainly due to low proton density of normal lung tissue. Previous studies have compared parenchymal changes on CT and SSFP MR in cystic fibrosis [2]. Interstitial lung disease is characterised by inflammation and scarring of the pulmonary interstitium leading to increased signal from the diseased lung tissue. The purpose of our study was to compare 1.5 SSFP MRI of the lung parenchyma with high resolution computed tomography (HRCT), which is considered as the 'gold standard' imaging modality in assessment of patients with interstitial lung disease.

Methods:

This was a retrospective study of 61 patients with radiological features of pulmonary fibrosis (n=47) and patients who had normal lung parenchyma on HRCT (n=14). Lung MRI was performed using a 1.5 Tesla whole body scanner (GE Healthcare, Milwaukee, USA). The acquisitions were done as a stack of Coronal 2D steady state free precession (Fiesta), with parameters of 1.3ms TE and TR of 3.1ms, Flip angle 50°, FOV 48x43.2, Matrix 256x256, 125kHz Bandwidth and Slice Thickness 10mm. The breath hold sequence was performed in full inspiration. HRCT and MRI were performed within 48 hours of each other. The MR images were reviewed on a standard GE workstation and qualitatively scored for severity and extent of pulmonary fibrosis (none, mild, moderate and severe-4 point scoring system) by two independent radiologists who were blinded to the HRCT findings. Other features of interstitial lung disease such as ground glass opacification, traction bronchiectasis and cystic reticular changes were also assessed.

Results:

The sensitivity and specificity of MRI in identifying pulmonary fibrosis was 89% (CI of 0.77 to 0.96) and 92% (CI of 0.66 to 0.99) respectively with a positive (PPV) and negative predictive value (NPV) of 72% and 97%. The proton MR imaging was able to identify 78.57% of mild fibrosis and 100% of severe fibrosis. In comparison to CT, MRI demonstrated 75% (9/12) with ground glass opacification, 66.67% (10/15) with traction bronchiectasis and 45.4% (5/11) with cystic reticular changes (table 1 and 2). The images were reviewed by two radiologists with good inter-observer agreement (k 0.79).

Conclusion:

MR lung imaging has good specificity and sensitivity for diagnosing pulmonary fibrosis. However our results show that lung MRI has a poor sensitivity (78.57%) for identifying mild degree of pulmonary fibrosis but high sensitivity for severe disease.

Discussion:

Given the above results, there is a potential role for lung MR imaging in patients with interstitial lung disease, especially in the follow up of patients with known pulmonary fibrosis and also in diagnosing patients with severe disease. Active inflammation, as characterized by the presence of ground glass opacification can be appreciated on the lung MRI and this can be used as a tool for assessing response to treatment.

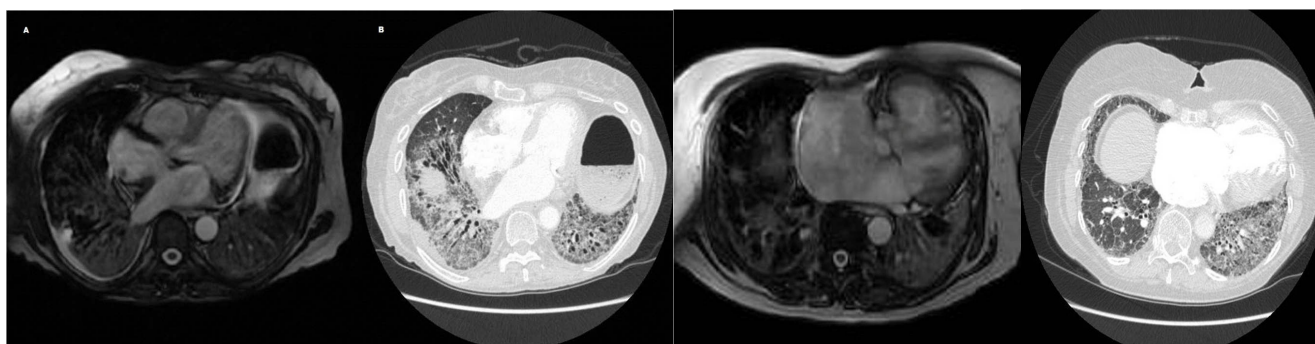


Image 1: shows typical NSIP pattern of fibrosis with presence traction bronchiectasis that is seen both on MRI and HRCT

Image 2: shows the presence ground glass opacification which can be appreciated on both MRI and HRCT

Table 1

Degree of Fibrosis	MR/CT	Sensitivity	Confidence interval
Mild	11/14	78.57%	0.49 to 0.95
Moderate	23/25	92%	0.73 to 0.99
Severe	7/7	100%	0.59 to 1.00

Table 2

	MR/CT	Sensitivity	Confidence interval
Ground glass opacification	9/12	75%	0.43 to 0.95
Traction bronchiectasis	10/15	66.67%	0.38 to 0.88
Cystic reticular changes	5/11	45.4%	0.16 to 0.76

Reference:

1. Initial experience with lung-MRI at 3.0T: Comparison with CT and clinical data in the evaluation of interstitial lung disease activity. Lutterbey G, et al. Eur J Radiol. 2007;6: 256-61.
2. Lung morphology assessment using MRI: A robust ultra-short TR/TE 2D steady state free precession sequence used in cystic fibrosis patients R.Failo, Magn Reson Med, 2009,61(2);299-306