Poster presentation

The pulmonary blood density in newly diagnosed systemic sclerosis

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Introduction
Patients suffering from systemic sclerosis (SSc) have a highly increased risk of developing pulmonary arterial hypertension (PAH). An early detection of PAH is crucial in order to halt the progress of disease. The assessment of pulmonary vascular pressures currently lacks reliable quantitative non-invasive measures.

Purpose
The aim of this study was therefore to use magnetic resonance imaging (MRI) to explore the pulmonary blood volume (PBV), the PBV variation (PBVV) over the cardiac cycle, and the pulmonary blood density (PBD) as possible measures of PAH in newly diagnosed SSc.

Methods
Thirty-nine SSc patients (25 women and 14 men, 31-81 years, mean 58 years) and healthy individuals (five women and 13 men, 20-46 years, mean 27) underwent cardiac MRI. PBV was calculated as the product of cardiac output determined by velocity encoded MRI, and the pulmonary transit time (PTT) determined as the time for a 2 ml intravenously administered contrast bolus to pass from the pulmonary trunk to the left atrium. The lung volume was determined by planimetry using transversal MR images covering the lungs. The PBD was defined as the PBV divided by the lung volume. Also, the blood flow in the pulmonary artery and the pulmonary veins was measured using velocity encoded MRI. The PBVV was calculated by integration of the difference in arterial and venous pulmonary flow over the cardiac. PBV and PBD were measured in eight healthy individuals (two women and six men, 20-46 years, mean 31 years). In 10 healthy volunteers (three women and 7 men, 21-30 years, mean 24 years), the PBVV was assessed. The SSc patients were then compared to the healthy subjects considering PBV and PBD, and PBVV, respectively.

Results
Stroke volume and PBV in 36 SSc patients and eight healthy subjects were respectively (mean ± SD) 77 ± 20 ml vs 95 ± 10 ml, 467 ± 111 ml vs 575 ± 149 ml. PBD was 17 ± 5% vs 20 ± 4%. PBVV in 32 SSc patients and 10 healthy individuals were respectively 31 ± 9 ml vs 45 ± 14 ml.

Conclusion
This study is the first to show the feasibility to assess the PBD using MRI. Data shows no difference between newly diagnosed SSc patients and healthy individuals considering PBD, nor PBVV. The PBD may be a useful prognostic non-invasive measure of PAH and cardiac failure. Therefore, further studies are needed to reveal the importance of the PBD in these contexts.