

# A MRI Arterial Spin Labeling Software for Quantification of Regional and Complete Pulmonary Blood Flow

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## BACKGROUND

Quantification of pulmonary blood flow (PBF) is essential for the assessment of efficient gas exchange. The ability to quantitatively evaluate changes in regional PBF (rPBF) can enhance our understanding of the relationship between lung structure and function in both health and disease.

Aerial spin labeling (ASL) is a powerful MRI technique for noninvasive perfusion imaging of organs. It uses arterial blood water as the endogenous contrast agent without the exposure of ionizing radiation, the limitation of spatial or temporal resolution, or the need for an exogenous contrast agent, making possible for this non-invasive procedure to be widely available at relatively low cost. Pulsed ASL techniques have been validated for cerebral blood flow; however, because of the high pulsatility of PBF, ASL acquisition and data analysis differ significantly between the lung and the brain.

## TECHNOLOGY DESCRIPTION

UC San Diego researchers have developed a reliable MRI ASL pulse-sequence software to measure the PBF, with the entire imaging sequence being completed in one single breath-hold. It is based on the algorithm described in the published paper by Bolar et. al. (referenced below). Regional PBF can be quantified using an ASL-FAIRER (flow-sensitive alternating inversion recovery with an extra RF pulse) technique coupled with the single-subtraction approach of using one tag-control pair acquisition at an inversion time (TI) matched to the RR-interval.

In addition, a multi-slice option for complete lung coverage, not described in the referenced publication, is also included.

## APPLICATIONS

The software is developed using General Electric's source code and can be adapted to other source codes. Applications include:

- Investigational and clinical diagnosis, prognosis, and treatment monitoring for COPD, asthma, pulmonary hypertension, high-altitude pulmonary edema.
- Exploration of normal lung physiology, pulmonary embolism, and pulmonary fibrosis.

## STATE OF DEVELOPMENT

Thirty healthy human subjects have been scanned with this software using General Electric Scanners (version 11X and above). A single ASL image can be obtained in approximately 8 seconds. Optionally, a subject can be imaged continuously for several minutes by having the person gate his/her breathing appropriately.

## RELATED MATERIALS

Bolar DS, Levin DL, Hopkins SR, Frank LF, Liu TT, Wong EC, Buxton RB. Quantification of regional pulmonary blood flow using ASL-FAIRER.

Magn Reson Med. 2006 Jun;55(6):1308-17.

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## OTHER INFORMATION

### KEYWORDS

MRI, pulmonary blood flow, PBF,  
  
aerial spin labeling, ASL, FAIRER,  
  
MRI, diagnostic, imaging, COPD,  
  
asthma, pulmonary hypertension, high  
altitude pulmonary edema, lung  
physiology, pulmonary embolism,  
pulmonary fibrosis

### CATEGORIZED AS

- **Medical**
  - Diagnostics
  - Disease: Respiratory and Pulmonary System

### RELATED CASES

2009-824-0

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