EARLY DETECTION OF OBLITERATIVE BRONCHIOLITIS WITH AN AIR TRAPPING INDEX BASED ON SPECIFIC GAS VOLUME ANALYSIS OF CHEST COMPUTED TOMOGRAPHY

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INTRODUCTION

- Bronchiolitis obliterans (BO) is a major long-term complication and a leading cause of death after lung transplantation. Transbronchial biopsy has limited value in detecting and quantify BO due to the irregular distribution of the disease.

- Air trapping is the most frequent thin-section CT abnormality observed in patients with BOS and has been proposed in several series as the most reliable indicator of BO (Sens. 50%-91%; spec. 67%-94%).

- To overcome interobserver disagreements and the gravity factor, the variation of specific gas volume (SVg) on CT was proposed as a valuable tool for identifying and quantifying the extent and severity of trapped gas.

- We analyse SVg variation obtainig an Air Trapping (AT) index as indicator for obliterative bronchiolitis in recently transplanted patients.

MATERIALS AND METHODS

- Eight patients recently transplanted were included in the study: 3 women and 5 men; mean age 42.8 yrs (range 26-67). Six patients underwent a double lung transplant for FC and two patients underwent a single lung transplant for IPF.

- The patients were clinically stable and were scheduled for sourveillace bronchoscopy with transbronchial biopsy (TBB).

- Before the biopsy a chest CT scan at residual volume (RV) in addition to standard scan at total lung capacity (TLC) was performed: mean time after transplant 8.7 months .

- Total lung capacity and residual volume correspondent images were selected. The residual volume images were deformed onto the total lung capacity images by an automatic algorithm based on an optical flow method. Two-dimensional maps of pixel-by-pixel differences in density and SVg were obtained at level of the aortic arch, the carina and top diagphram.

- Air Trapping index was defined as **ΔSVg/SVg,RV.**

- Bronchoscopies were performed with patients under conscious sedation and local anestesia. Transbronchial biopsies and broncho-alveolar lavage were obtained from lung target areas indentified by the two-dimensional maps.

- All the procedures were free of complications.

RESULTS

- All transbronchial biopsies were classified as A1, B0, C0 (ISHLT 2007).

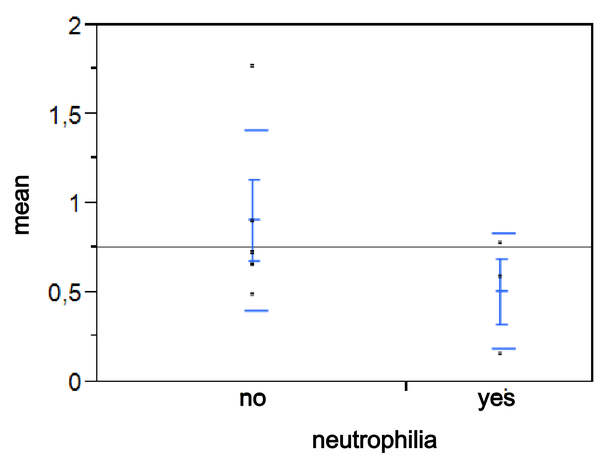
- Three patients had increased neutrophilia at bronchoalveolar lavage and a mean 1.3% FEV1/month improvement versus 3.5% in the other five patients without neutrophilia.

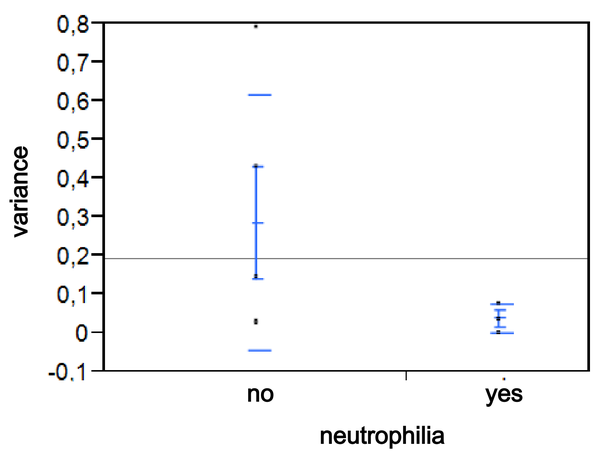
- Some grade of Air Trapping is present in the whole study population with a mean AT index 0.71 ± 0.57.

- Patients with neutrophilia had mean AT index 0.50 versus 0.90 in patients with normal bronchoalveolar lavage.

- Patient with neutrophilia had lower AT index variance: 0.03 versus 0.15.

Neutrophilia and Air Trapping index





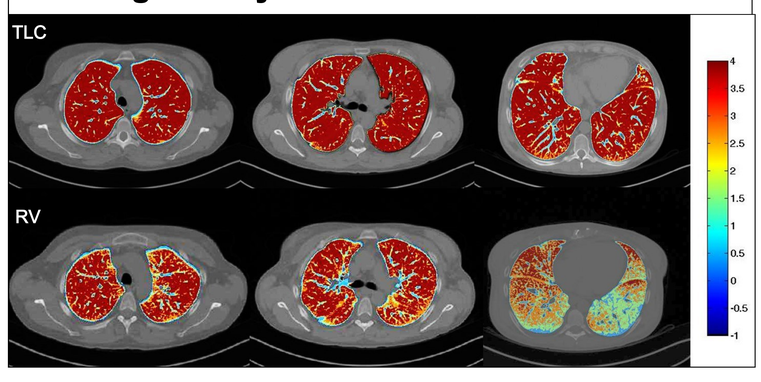
CONCLUSIONS

- This preliminar study suggests that the Air Trapping index is congruent with increased neutrophilia in bronchoalveolar lavage and poor FEV1 improvement in recently lung transplanted patients.

- Air Trapping index could be useful in early detection of bronchiolits obliterans.

- Further studies are needed to confirm a strong relationship between Air Trapping index and bronchiolitis obliterans.

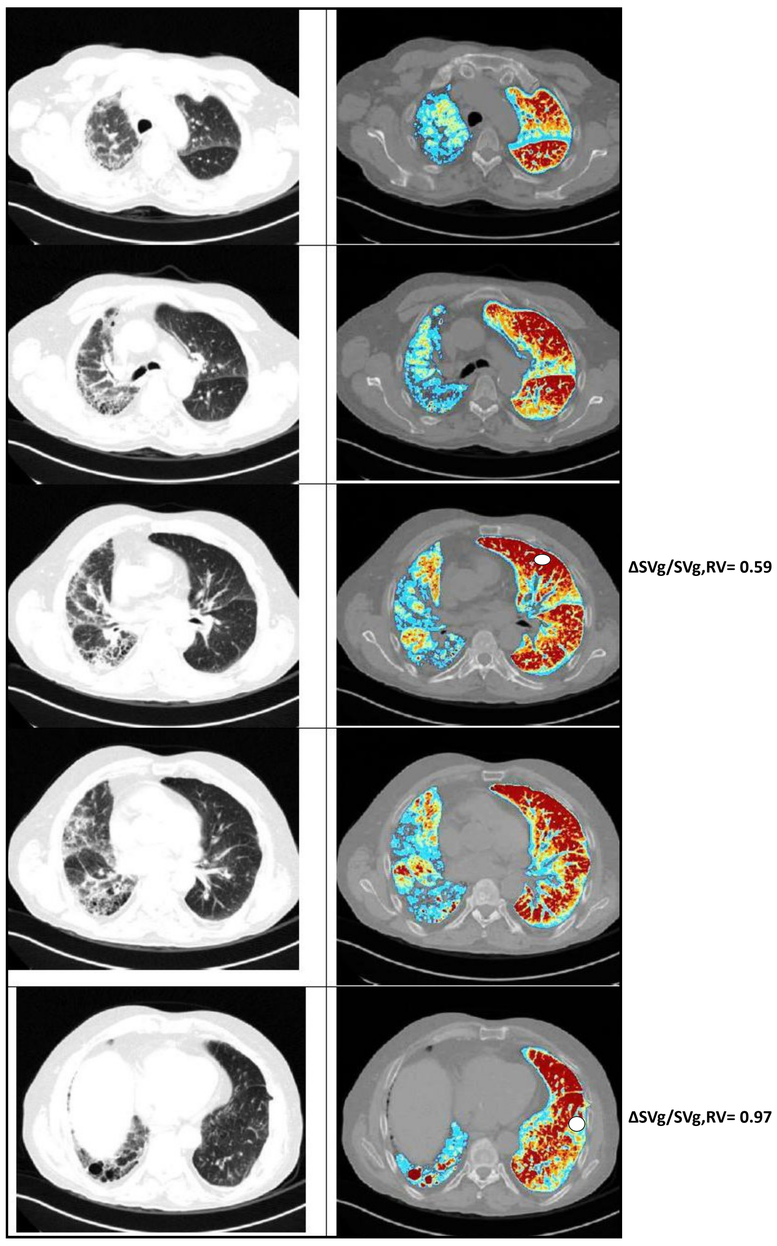
SVg = Volume of gas per gram of tissue (mL/g)
Derived pixel-by-pixel from CT images of lung density



AT index = ΔSVg/SVg,RV

AT index normal value 2.87 ± 0.94

- Two-dimensional map with target ares in a patient tranplanted for IPF.



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No conflict of interest to declare