

Background

Catheter ablation of atrial fibrillation has been associated with damage to collateral structures including the esophagus, phrenic nerve, and recurrent laryngeal nerve.

We recently encountered a patient who developed a left atrial-bronchial fistula following left atrial ablation, which required surgical repair.

Purpose

To define the three-dimensional relationship of the left atrial structures to the bronchial tree.

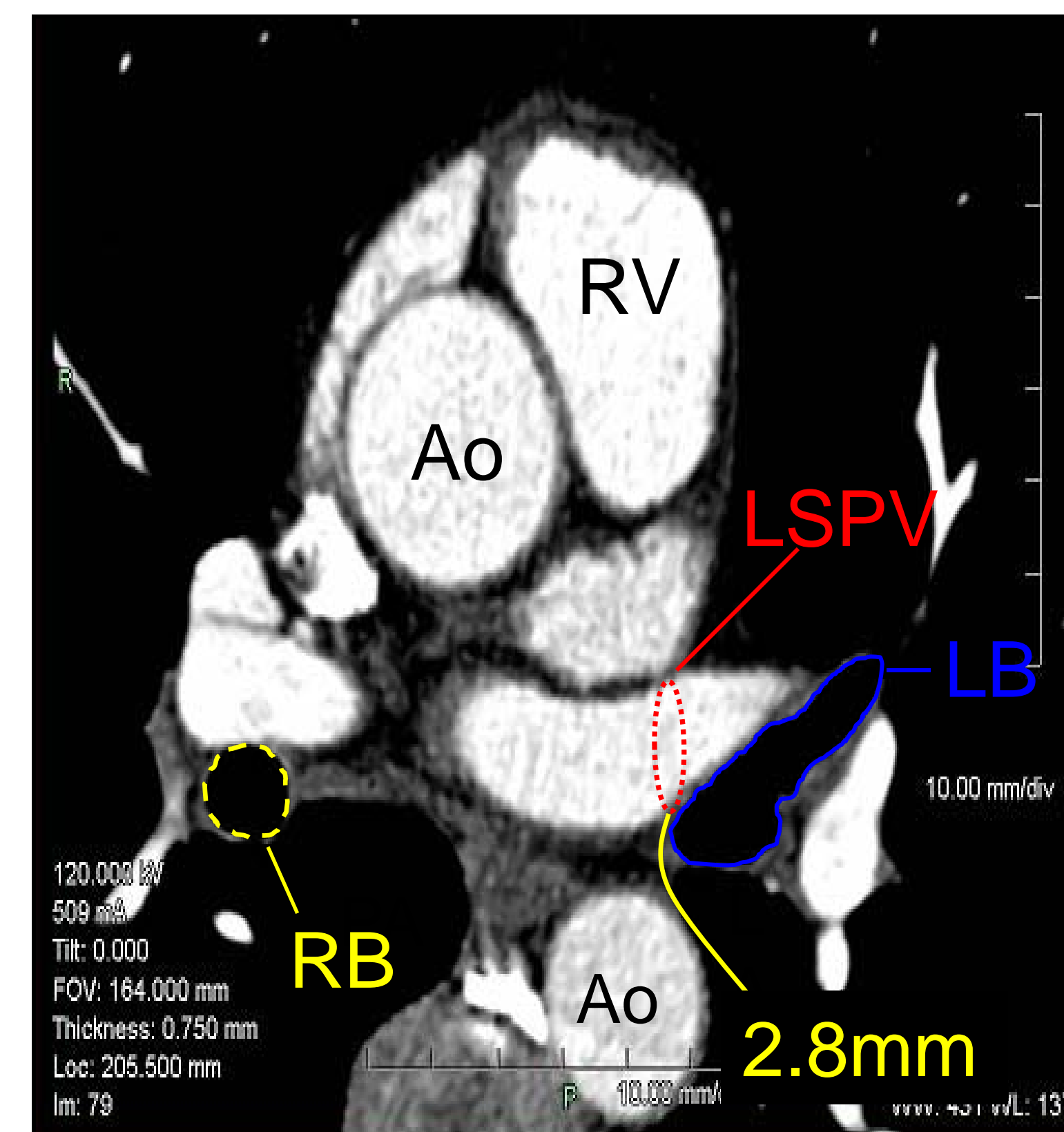
Methods

- Twenty-five patients underwent routine coronary CT angiography with a 64-slice CT scanner (Siemens Sensation 64) for standard indications

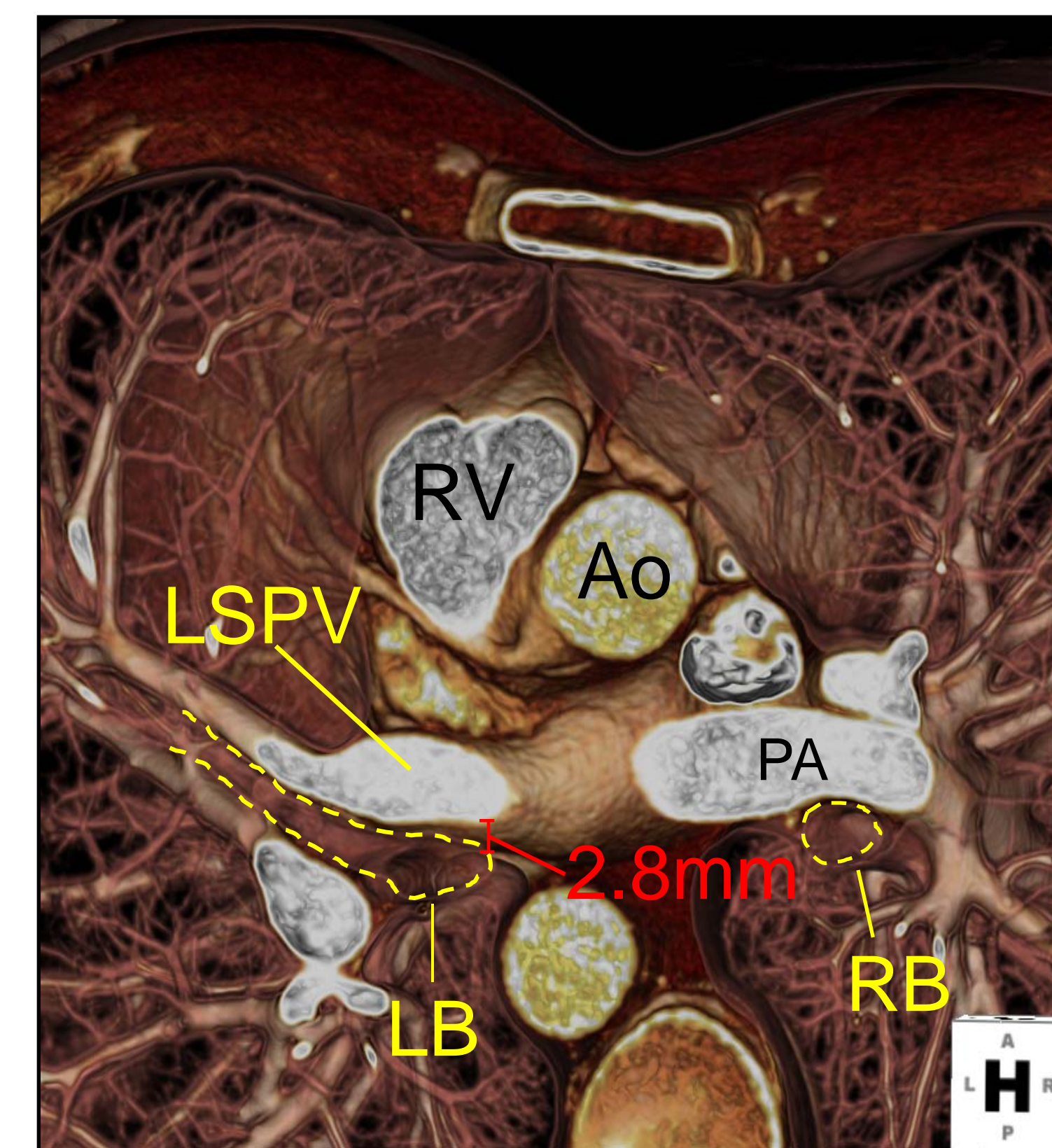
- Each study was reviewed using maximum intensity projection (MIP) images and a 3D reconstruction on the Aquarius 3D workstation (TeraRecon Inc.), allowing optimal bronchial and cardiac chamber visualization

- Distances from the superior-posterior aspect of the right and left superior and inferior pulmonary vein ostia to the most adjacent bronchus were measured in multiple planes. The order of the bronchus at each point was noted.

Methods (continued)



Axial MIP image at the superior pole of the left atrium (LA). LSPV- left superior pulmonary vein, dashed oval- LSPV ostium, LB- left bronchus, RB- right bronchus.



Corresponding 3D axial image at the superior pole of the LA.

Results

Table 1: CT Results

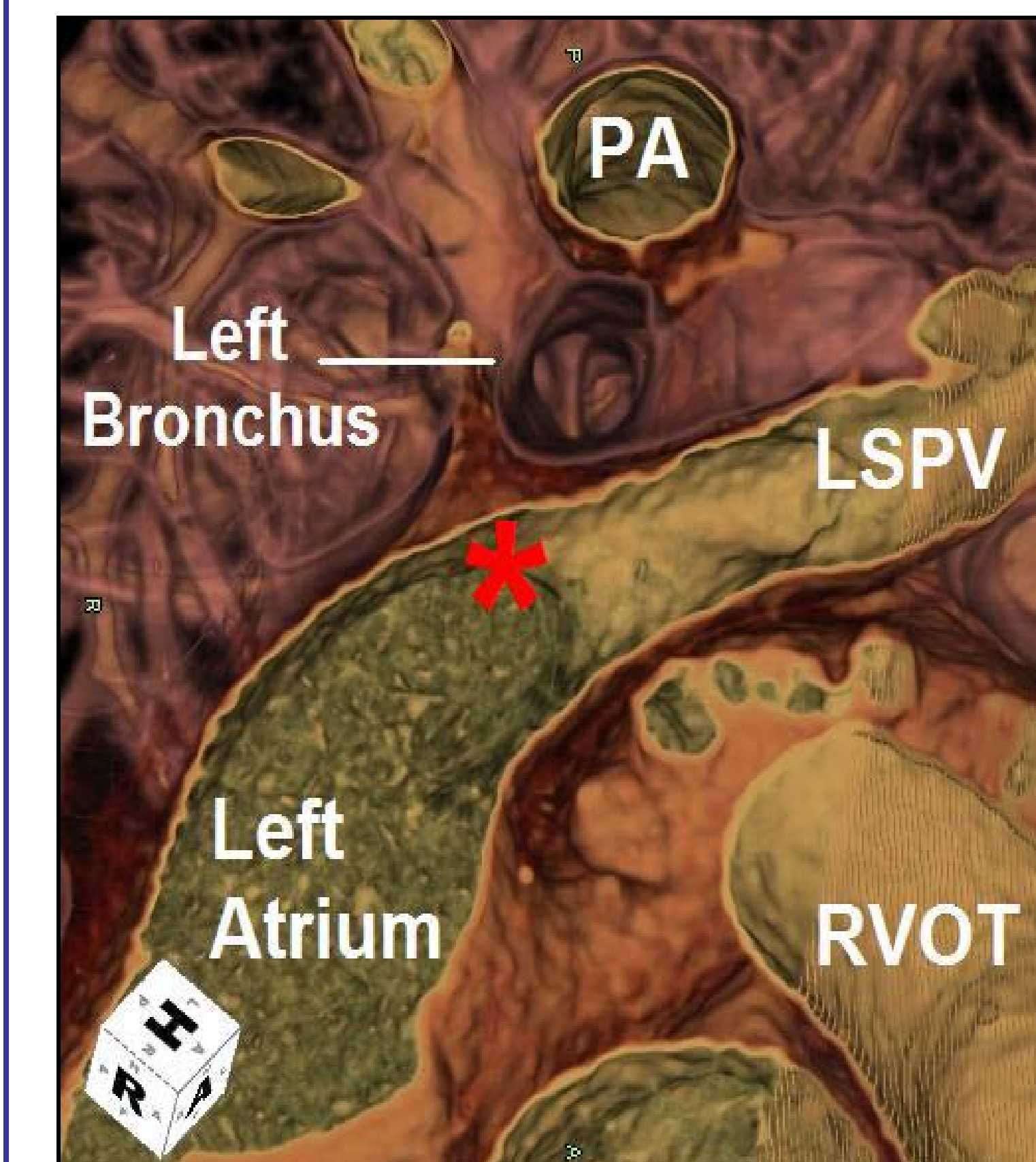
	Mean (n=25)		Mean (n=25)		Mean (n=25)
Age (years)	58±14	LSPV-LB (mm)	6.7±4.3	LB order @ LSPV	1, 2
Male	64%	LIPV-LB (mm)	12.4±5.7	LB order @ LIPV	2
LA width (cm)	4.7±0.5	RSPV-RB (mm)	9.7±5.6	RB order @ RSPV	1, 2, 3
LA length (cm)	3.0±0.4	RIPV-RB (mm)	16.9±6.2	RB order @ RIPV	2, 3

LA- left atrium; LB- left bronchus; RB- right bronchus; LSPV- left superior pulmonary vein; LIPV- left inferior pulmonary vein; RSPV- right superior pulmonary vein; RIPV- right inferior pulmonary vein

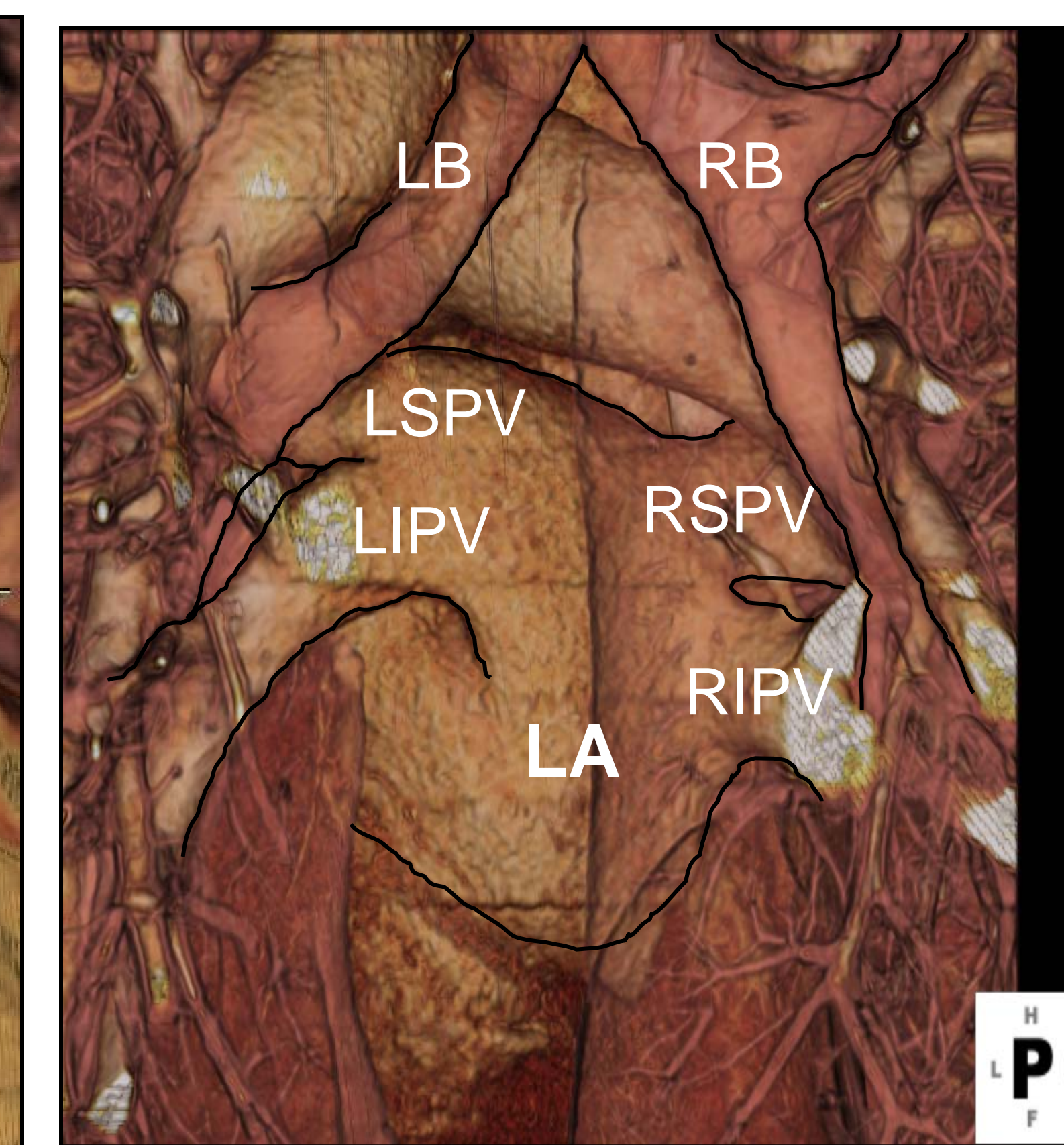
- In all 25 patients, the shortest distance between the two structures was from the superior-posterior aspect of the LA wall (at the LSPV ostium) to the anterior portion of the left bronchus (LB)

Results (continued)

- 10 of 25 (40%) patients had a distance < 4mm from LA to LB
- In all patients, the left and right bronchi lie posterior to the superior PV and anterior to the inferior PV



A typical ablation site (*) along the superior-posterior atrial wall in close relation to a 2nd order bronchus.



Coronal 3D image from the level of the tracheal bifurcation (top) to the inferior pole of the left atrium (bottom).

Conclusions

- The left and right bronchi, especially the former, are in close relation to the posterior structures of the left atrium
- Catheter deformation of the atrial wall may result in direct contact of the left atrium with the bronchial tree, resulting in the potential for fistula formation
- Cardiac CT may be considered for the delineation of left atrial and collateral structure anatomy prior to ablation

References:

- Doshi R, Kaushal R, Cesario D, Shivkumar K. Atriobronchial fistula formation as a devastating complication of left atrial catheter ablation for atrial fibrillation. Heart Rhythm 2006;3(5):AB29-1.
- Pappone C, Oral H, Santinelli V, et al. Atrio-esophageal fistula as a complication of percutaneous transcatheter ablation of atrial fibrillation. Circulation. 2004;109:2724-6.