

Case Study #1 CT LVAS Case Studies:

Limitation of PFTs for Therapeutic Management

Age **78**

Sex 

Clinical Presentation

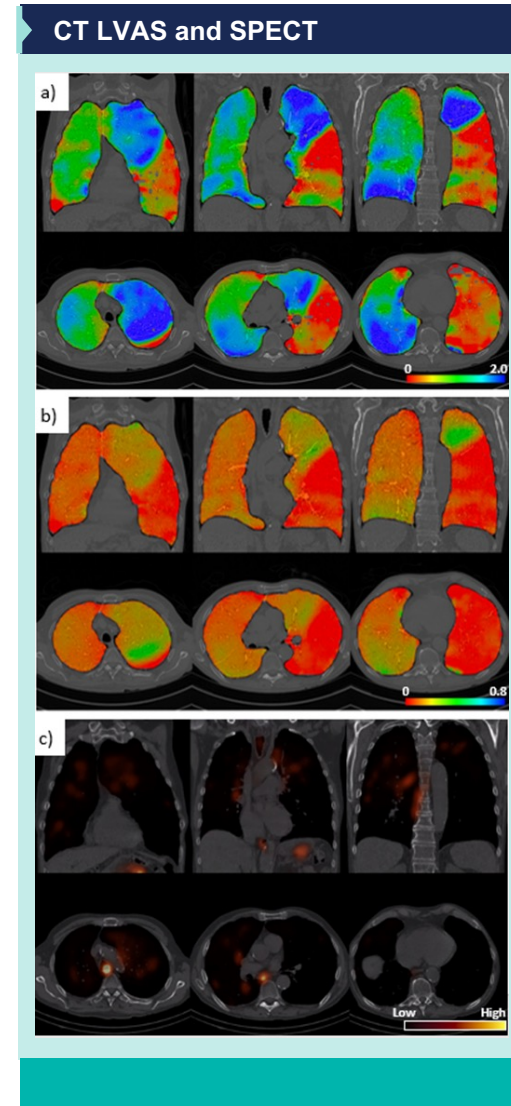
The subject is a 78-year-old male diagnosed with GOLD Stage 3 COPD, a former smoker with severe symptoms such as dyspnea, chronic cough, and limited exercise tolerance. His quality of life, evaluated through CAT and SGRQ scores, is severely impacted.

Findings

- The PFT and CT LVAS metrics reveal impaired lung function.
- Visually, non-normalized CT LVAS (figure b) demonstrated low levels of specific ventilation throughout the lung.
- Ventilation heterogeneity is visually evident in the normalized specific ventilation from CT LVAS (figure a) with a significant defect in the left lower lung with possible compensation occurring in the left upper lobe. This yields further insight into the lung function.
- SPECT (figure c) images show low ventilation across the lungs, however ventilation heterogeneity is not evident with SPECT imagery. Negligible ventilation signal is evident the left lower lung and a few high-intensity artifacts due to the clumping of the radiotracer.

Conclusion

This case study highlights the powerful capability of CT LVAS in visualizing and quantifying ventilation heterogeneity, providing valuable insights into regional ventilation changes within the lungs. While PFT, CT LVAS metrics, and SPECT all indicate poor global lung function, there are additional findings unique to CT LVAS which suggest a significant disparity between the left and right lung in terms of ventilation, emphasizing the need for further investigation and tailored management strategies for this patient.



PFT Metrics		Disease Severity
FEV1 (%)	36.3	Severely abnormal
FEV1/FVC (%)	47.2	Severely abnormal
TLC (L)	9.9	-
FRC (L)	7.4	-
VC (L)	3.0	-

CT LVAS Metrics		
VH	100.2	Significant increase (+71%) above baseline
VHSS	38.6	Significant increase (+57%) above baseline
VHLS	84.6	Significant increase (+81%) above baseline
VDP (%)	29.8	Significant increase (+80%) above baseline
Insp. Vol (L)	8.3	-
Exp. Vol (L)	7.3	-
Volume Change (L)	1.0	-

Case Study #2 CT LVAS Case Studies: Upper Lobe Emphysema

Age **74**

Sex 

Clinical Presentation

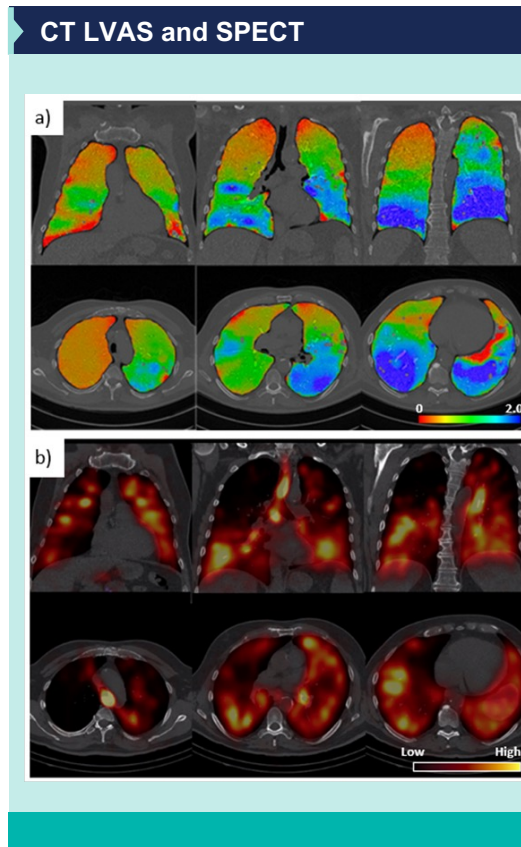
The case study presents a 74-year-old male diagnosed with moderate COPD (GOLD score 2) who has a reduced quality of life, indicated by CAT, SGRQ, and MMRC scores. His PFT metrics display impaired lung function.

Findings

- Both CT LVAS (figure a) and SPECT (figure b) images display ventilation heterogeneity with reduced ventilation in the right upper lobe, patchy ventilation in the left lower lobe, and increased ventilation in the lung bases. Thus, explain pulmonary function impairment.
- The high-resolution CT LVAS images stand out as particularly noticeable with improved visualization of the destitution of ventilation compared to SPECT and highlights ventilation heterogeneity between the left and right lungs.
- The metrics provided by CT LVAS (VDP%, VH, VHSS and VHLS) provide further evidence seen from the images and offer a more detailed assessment of lung function and disease severity compared to PFT metrics and SPECT.

Conclusion

In the case of a 74-year-old man with moderate COPD, CT LVAS not only demonstrated reduced ventilation in various regions but also revealed significant heterogeneity in ventilation between the left and right lungs. These findings, not easily distinguished from PFT nor SPECT, underscore the unique value of CT LVAS in providing a more detailed assessment of lung function.

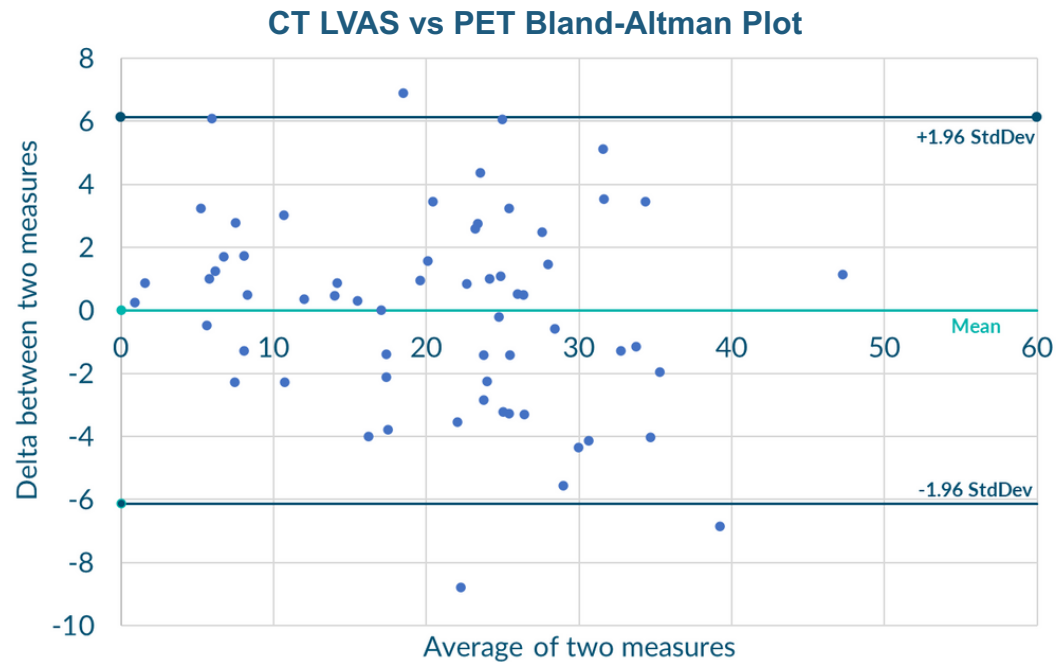


PFT Metrics		Disease Severity
FEV1 (%)	53.7	Severely decreased
FEV1/FVC (%)	64.0	Severely decreased
TLC (L)	8.6	-
FRC (L)	6.2	-
VC (L)	3.7	-

CT LVAS Metrics		
VH	84.9	Significant increase (+65.8%) above baseline
VHSS	25.2	Moderate increase (+34.1%) above baseline
VHLS	67.8	Significant increase (+76.4%) above baseline
VDP (%)	30.4	Significant increase (+80.6%) above baseline
Insp. Vol (L)	7.4	-
Exp. Vol (L)	5.9	-
Volume Change (L)	1.5	-

CT LVAS Clinical Validation

- Lung cancer patients underwent ventilation imaging using PET-ventilation and CT LVAS* scans.
- CT LVAS demonstrated good agreement with PET-ventilation in the assessment of ventilation at a lobar level.
- CT LVAS offers benefits of improved spatial resolution, avoidance of exogenous contrasts and wide availability making it a powerful imaging tool for a range of applications, including surgical or targeted treatment planning, disease characterization, and general lung health assessment.



*CT LVAS ARTG listing number: 344948

*Results accepted for presentation at ATS meeting (May 19-24, 2023, Washington, DC)

