

MEDI2101 Lecture COPD

PROFESSOR ALVIN ING

2nd November 2023





- 67-year-old gentleman
- Carpenter. Self employed. Ceased work at the age of 60 years because of breathlessness.
- Smoker 90 pack years
- Ceased aged 60 yrs
- Intercurrent IHD. 2 coronary artery stents inserted 5 years ago
- Plavix

Respiratory Background

- Exercise tolerance 300m on the flat when he ceased work. Now 25-40m.
Difficulty with one flight of stairs
- Some exertional wheeze and cough. No sputum
- 3 years ago, applied for disabled parking permit
- Therapy:

Tiotropium (LAMA)

Salmeterol, Fluticasone (LABA / ICS)

Salbutamol prn (SABA)

Examination

- Peripheral Signs
- Central signs
- Chest signs
- Co-morbidities / Pulmonary Hypertension / CVS signs



COPD

- Emphysema, Chronic Bronchitis, Bronchiolitis (Bronchiectasis)
- Inflammation induced by cigarette smoke is the major factor in pathogenesis. Open wood fires / air pollution. Genetic factors
- 6th leading cause of death World Wide
- Affects 5% of the population
- 8% of population over 60yrs
- 60,000 hospitalisations per year
- Of all major diseases, COPD presents the fastest increasing healthcare burden.

COPD – Airflow Limitation

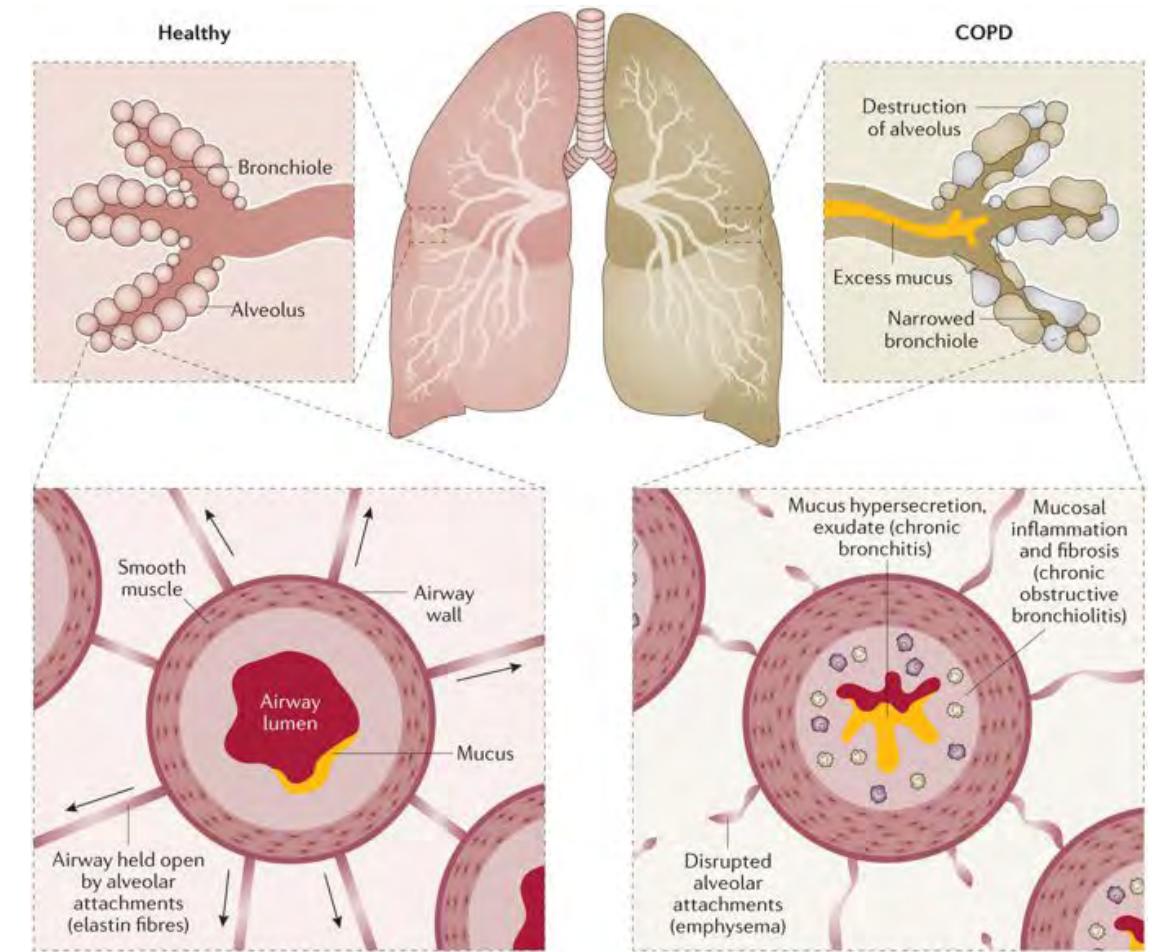
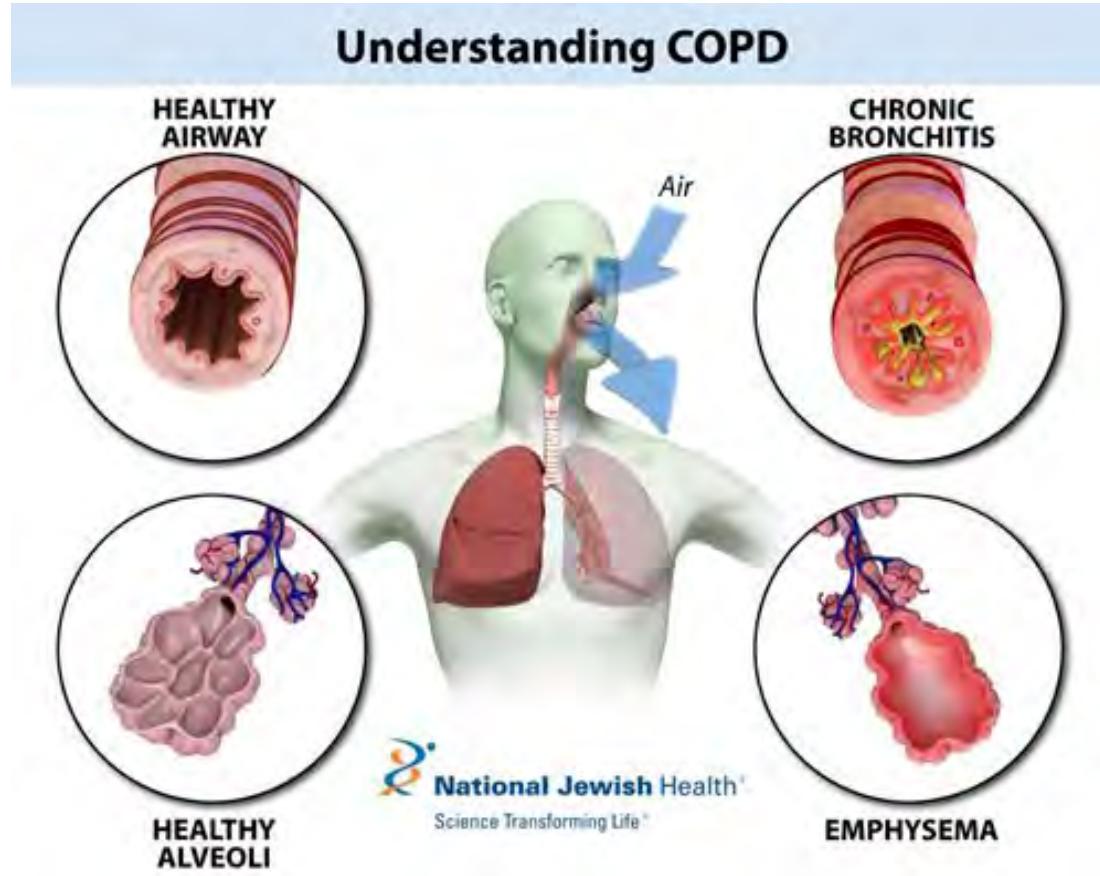


Table 2.1. Key indicators for considering a diagnosis of COPD

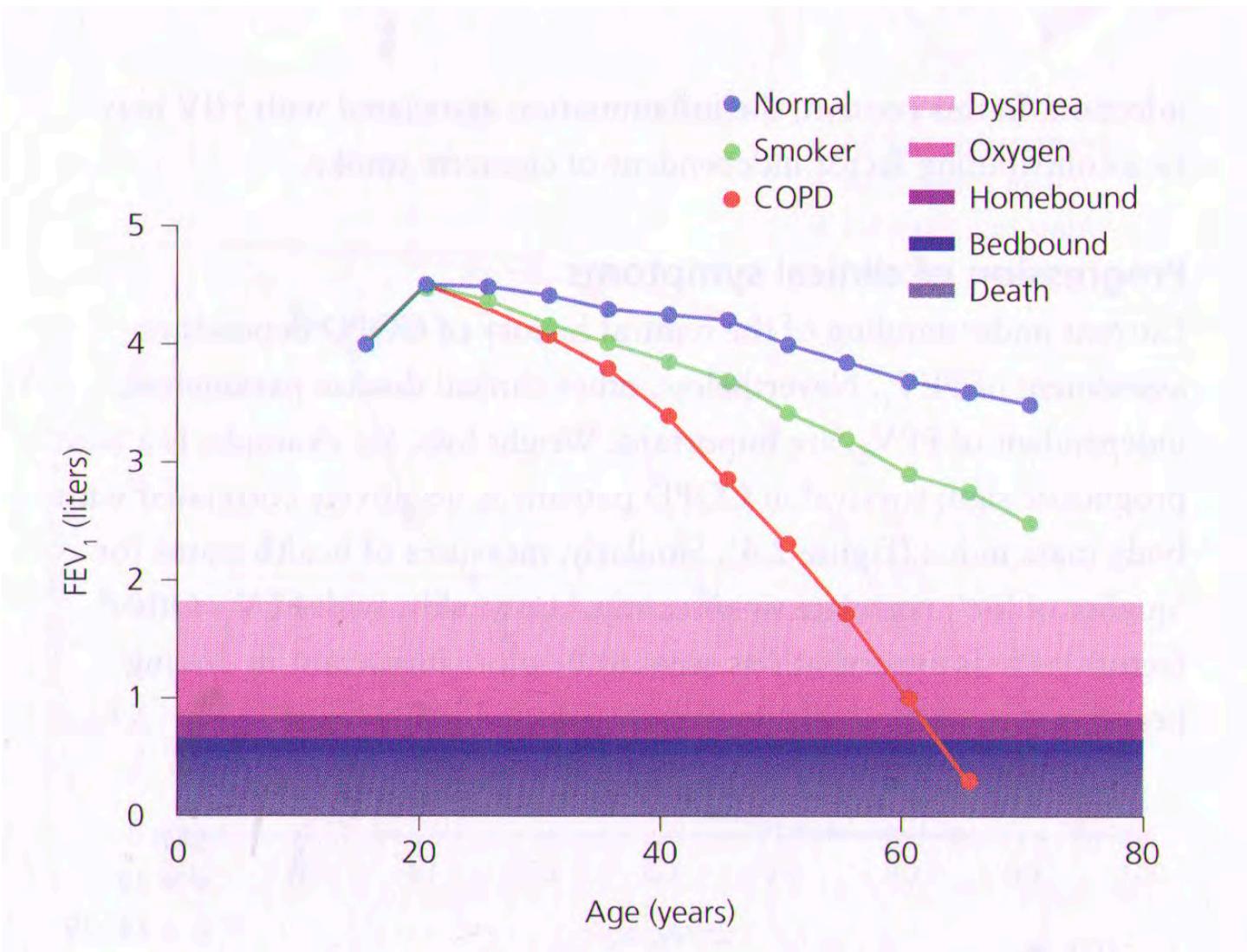
Consider COPD, and perform spirometry, if any of these indicators are present in an individual over age 40. These indicators are not diagnostic themselves, but the presence of multiple key indicators increases the probability of a diagnosis of COPD. Spirometry is required to establish a diagnosis of COPD.

Dyspnea that is:	Progressive over time. Characteristically worse with exercise. Persistent.
Chronic cough:	May be intermittent and may be unproductive. Recurrent wheeze.
Chronic sputum production:	Any pattern of chronic sputum production may indicate COPD.
Recurrent lower respiratory tract infections	
History of risk factors:	Host factors (such as genetic factors, congenital/developmental abnormalities etc.). Tobacco smoke (including popular local preparations). Smoke from home cooking and heating fuels. Occupational dusts, vapors, fumes, gases and other chemicals.
Family history of COPD and/or childhood factors:	For example low birthweight, childhood respiratory infections etc.

Table 2.4. Classification of airflow limitation severity in COPD (Based on post-bronchodilator FEV₁)

In patients with FEV₁/FVC < 0.70:

GOLD 1:	Mild	FEV ₁ ≥ 80% predicted
GOLD 2:	Moderate	50% ≤ FEV ₁ < 80% predicted
GOLD 3:	Severe	30% ≤ FEV ₁ < 50% predicted
GOLD 4:	Very Severe	FEV ₁ < 30% predicted



2 year mortality after first admission is 32%

COPD - Investigations

RESPIRATORY FUNCTION TESTS**SPIROMETRY**

(Post-BD = 400ug Salbutamol via spacer unless otherwise indicated in comments)

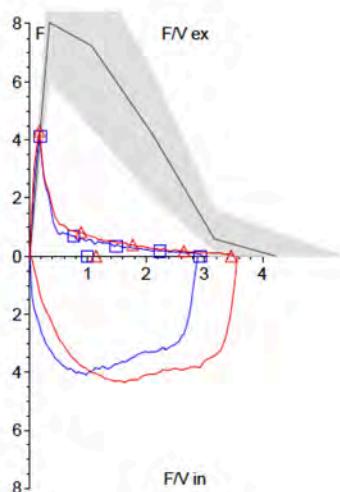
		Pre	Pre%...	Post	Post%...	%Change	Pred	Pred LL
FEV 1	L	0.98	31	1.14	36	16	3.14	2.22
FVC	L	2.92	69	3.45	82	18	4.22	3.08
FEV 1 % FVC	%	34	45	33	44	-2	75	61
MMEF 75/25	L/s	0.32	14	0.32	14	-1	2.26	0.91
PEF	L/s	4.13	51	4.29	53	4	8.04	6.05

LUNG VOLUMES

TLC	[L]	9.52	129				7.38	6.23
VC	[L]	3.22	75				4.29	3.37
IC	[L]	1.88	58				3.26	3.26
FRCpleth	[L]	7.64	200				3.82	2.83
ERV	[L]	1.33	129				1.03	1.03
RV	[L]	6.31	226				2.79	2.12
RV % TLC	[%]	66	153				43	34
sR 0.5	[kPa*s]	2.19						
R 0.5	[kPa/(L/s)]	0.27	89				0.30	0.30

GAS TRANSFER

DLCO_SB	[ml/(min*mmHg)]	7.92	29				27.26	20.33
DLCoSB	[ml/(min*mmHg)]	7.81	29				27.26	20.33
VA_SB	[L]	5.25	73				7.23	7.23
KCO_SB	[ml/(min*mmHg*L)]	1.51	41				3.69	2.59
KCOC_SB	[ml/(min*mmHg*L)]	1.49	40				3.69	2.59
VIN_SB	[L]	3.48	81				4.29	3.37
Hb	[g(Hb)/100mL]	15.10						

**INTERPRETATION**

Severe airflow limitation with significant improvement in FVC after salbutamol. Moderate hyperinflation and gas trapping with reduced gas transfer c/w emphysema.

Prof Matthew Peters MD FRACP

(Physician 02.02.2017 06:26PM)

Tests meet ATS standards for acceptability & repeatability. Hb from pathology 28/1/17.

Investigations

Detail	Value w/Units	Normal Range	Comment Ind
FIO2	21 %		
pH	7.48	7.36-7.44	
pO2	56 mmHg	80-100	
pCO2	34 mmHg	35-45	
O2 Saturation	89 %	95-99	
Bicarbonate	27 mmol/L	22-30	
Base Excess	3 mmol/L	-2-2	

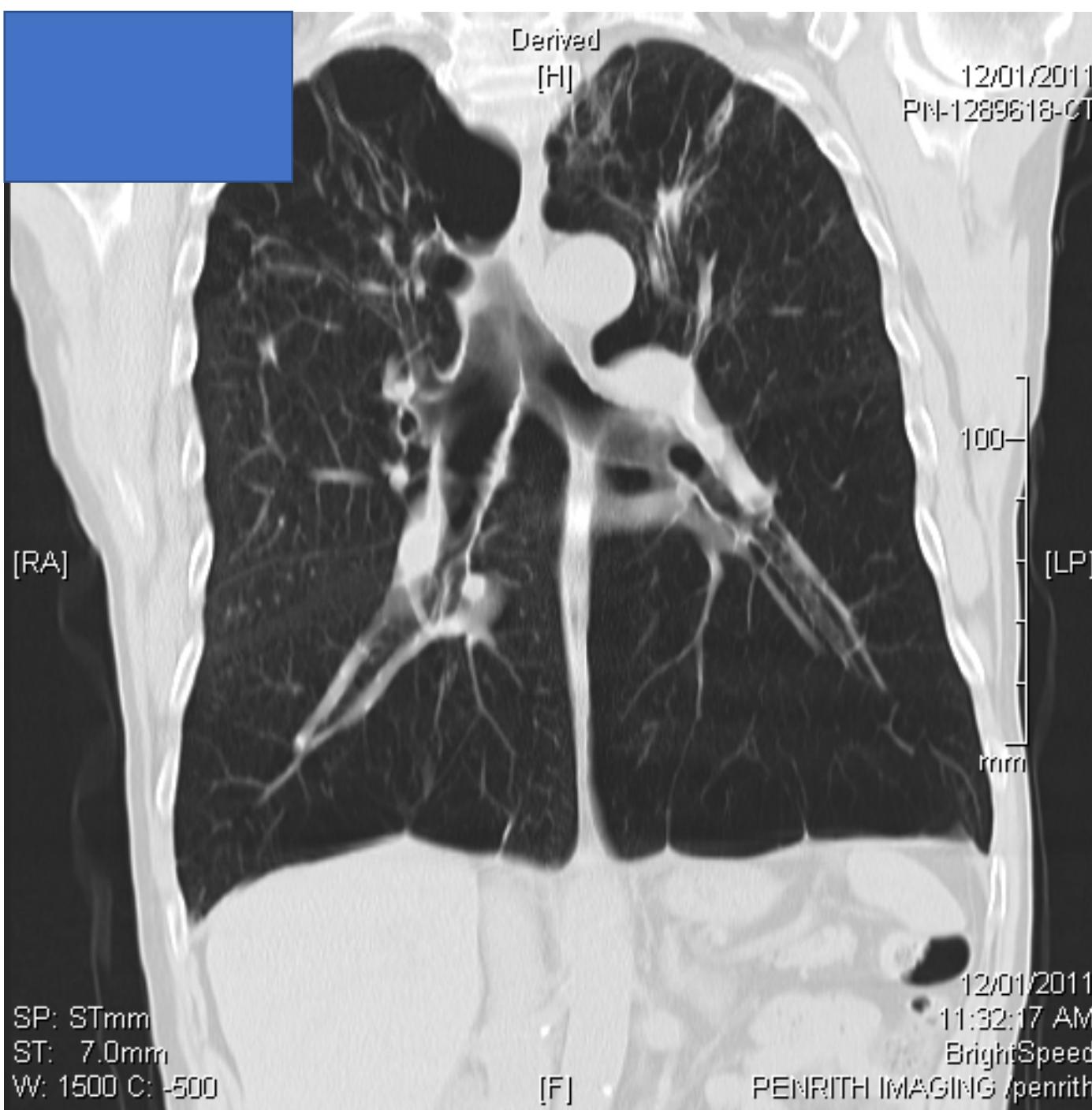
Blood Gases

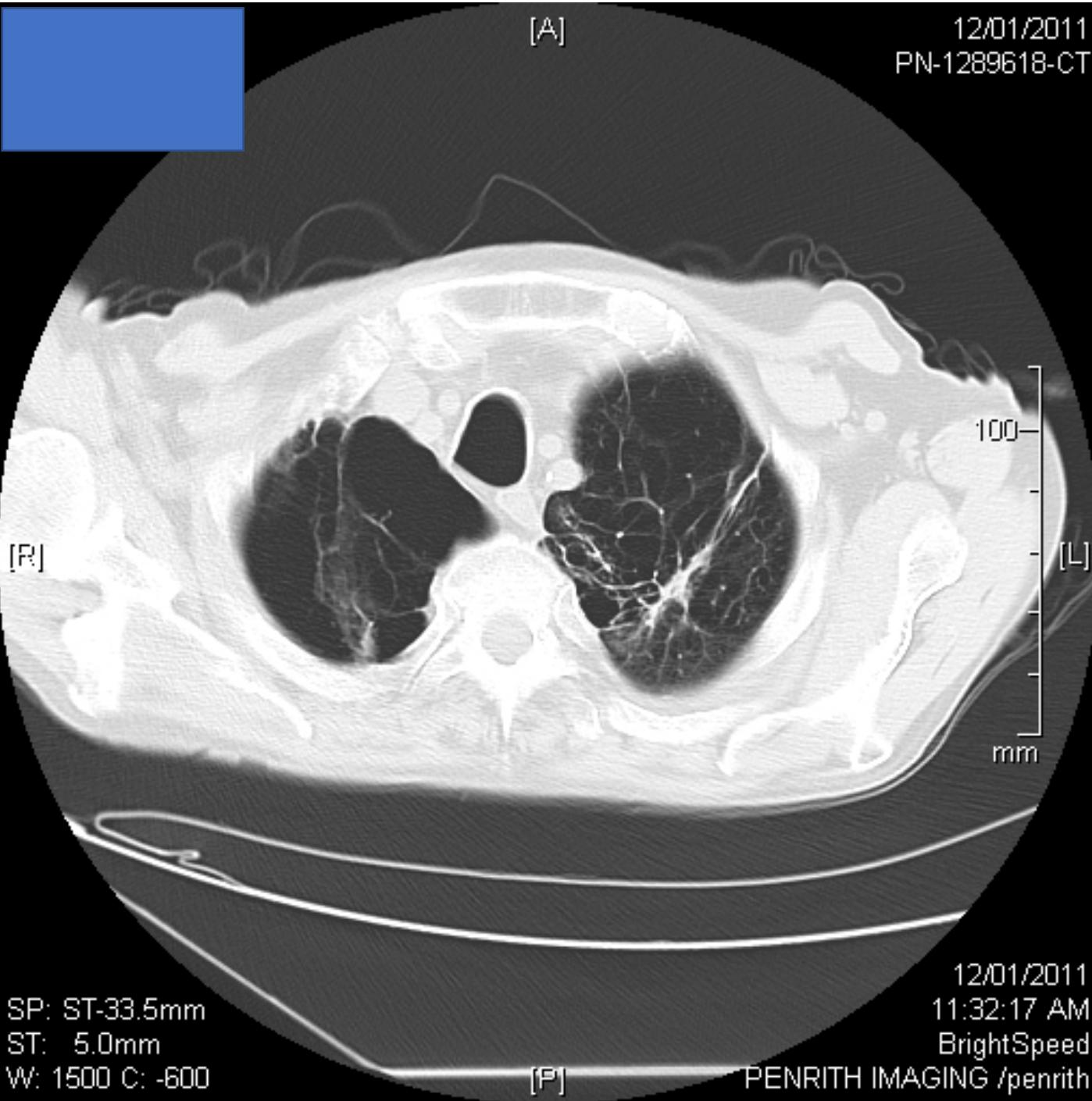
Gas Sample Type

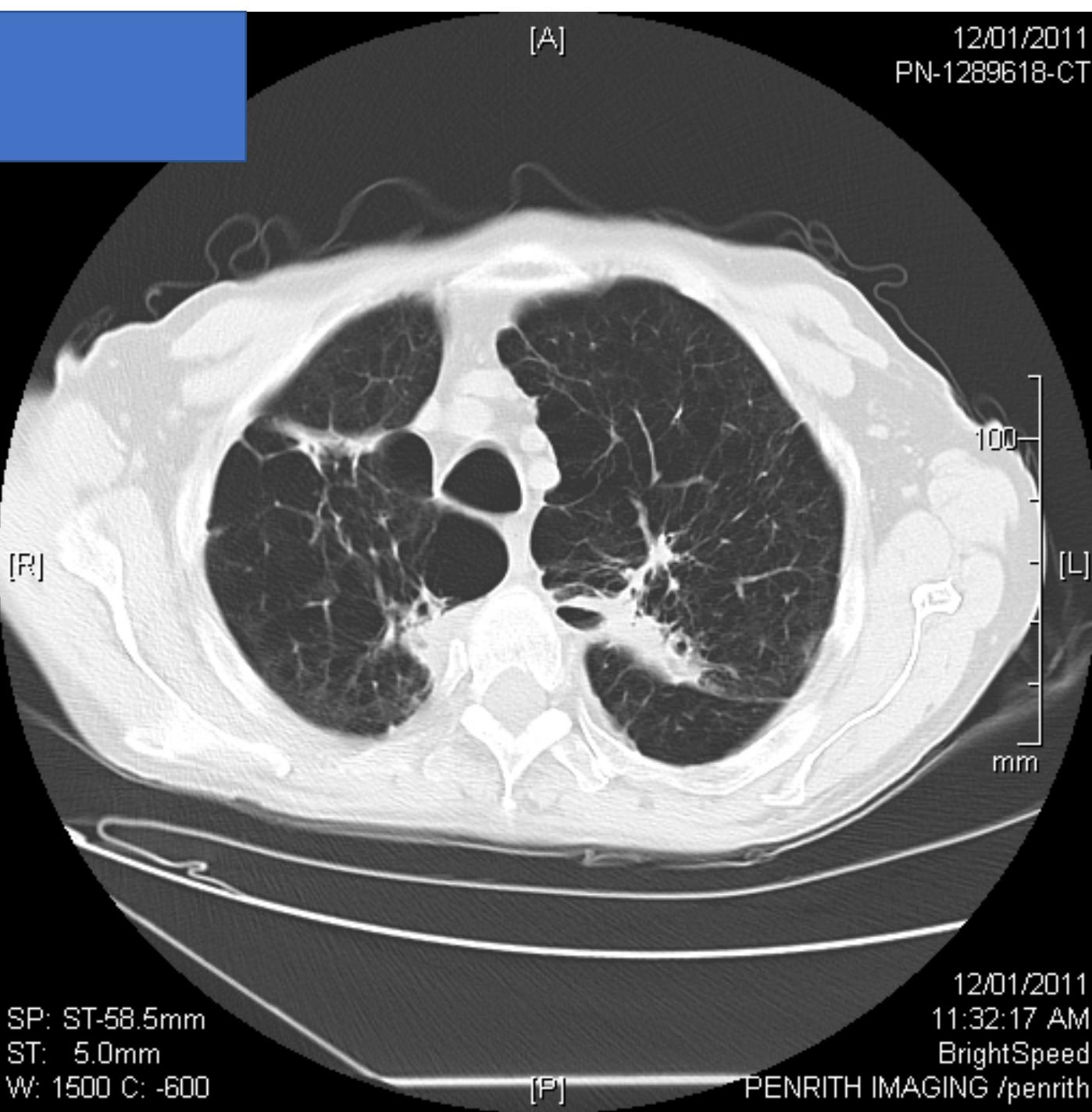
Arterial

COPD Phenotypes







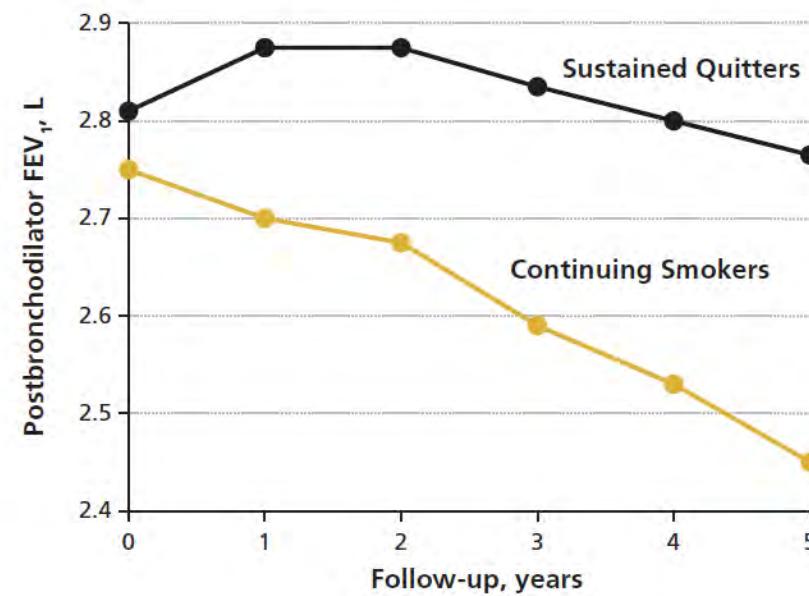


COPD Management

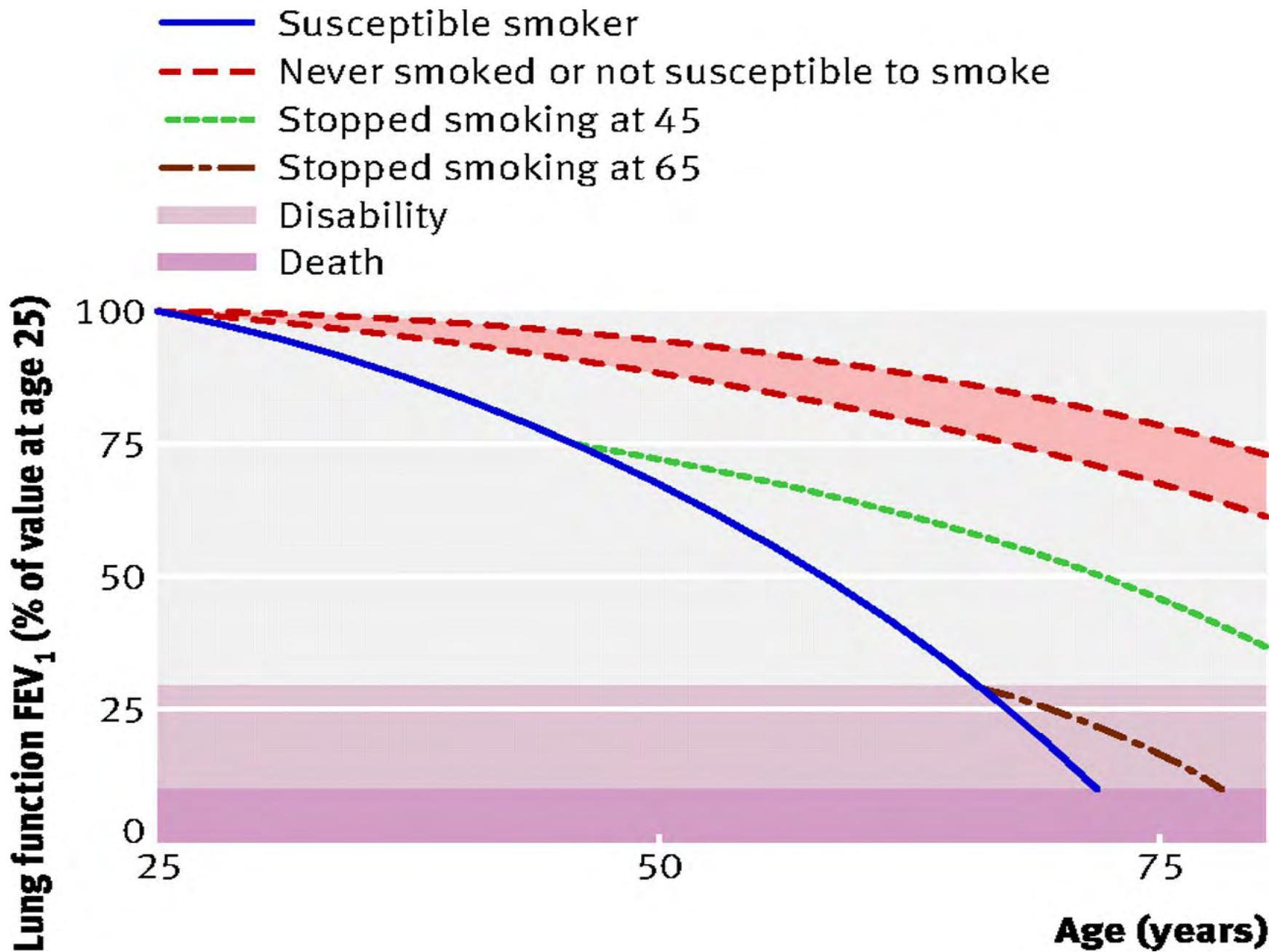
- Smoking Cessation
- Medical therapy:
 - Long acting anti-cholinergics
 - Long acting Beta Agonists
 - Low dose Macrolides - anti-inflammatory agent**
 - LTOT
- Pulmonary Rehabilitation**
- Ultra Long acting Beta Agonists**
- Lung Volume Reduction
- Transplantation

Smoking Cessation / Avoiding Inhaled Particulate Matter

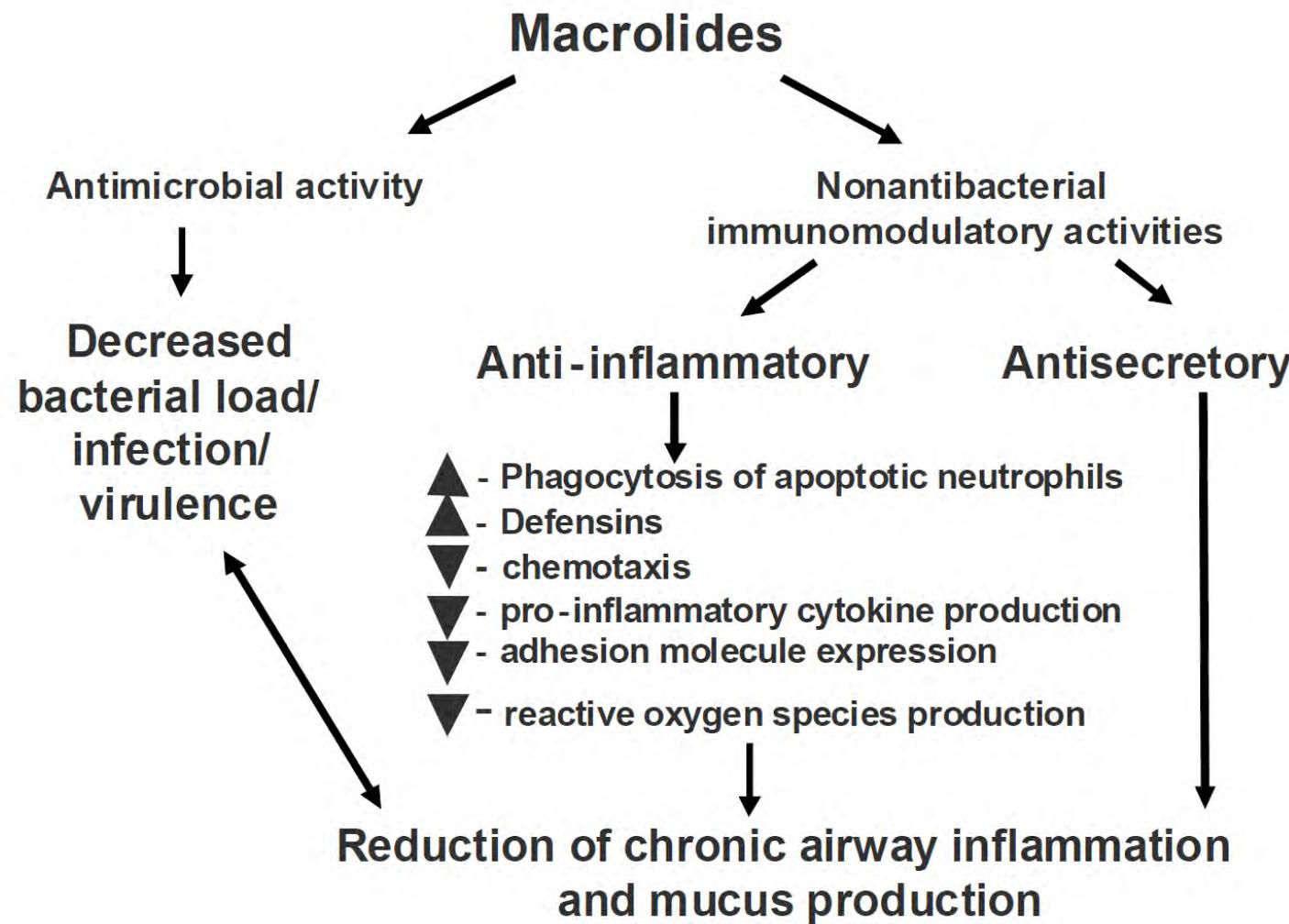
Figure 1. Effect of quitting smoking on progression of airflow limitation in COPD.



Redrawn from Anthonisen NR, et al. JAMA, November 16, 1994—Vol 272, p. 1497. Copyright © 1994 American Medical Association. All rights reserved.



Macrolide Therapy in COPD



Long Term Oxygen Therapy

- NOTT and BHMRC studies
- Improved mortality and morbidity
- $\text{paO}_2 < 55 \text{ mmHg}$ / $\text{paO}_2 < 60 \text{ mmHg}$ with pul HT / polycythemia

Pulmonary rehabilitation

- Improves exercise tolerance
- Improves symptoms and QOL. Improved gas exchange
- Reflected in improved 6 min walk / CAT scores and SQRQ
- No improvement in RFT
- Vital prior to ELVR

Lung Volume Reduction Surgery

- Improves lung function, QOL and mortality in selected pts with advanced COPD
- Rapid increase in bilateral LVRS procedures 1993-1997
- Tempered by initial mortality and morbidity of the procedure
- NETT Trial – 90 day mortality 7.9% (1.3% medical group)

Interventional Therapy in Stable COPD

Table 3.11

Lung Volume Reduction Surgery	<ul style="list-style-type: none">Lung volume reduction surgery improves survival in severe emphysema patients with an upper-lobe emphysema and low post-rehabilitation exercise capacity (Evidence A)
Bullectomy	<ul style="list-style-type: none">In selected patients, bullectomy is associated with decreased dyspnea, improved lung function and exercise tolerance (Evidence C)
Transplantation	<ul style="list-style-type: none">In appropriately selected patients with very severe COPD, lung transplantation has been shown to improve quality of life and functional capacity (Evidence C)
Bronchoscopic Interventions	<ul style="list-style-type: none">In select patients with advanced emphysema, bronchoscopic interventions reduce end-expiratory lung volume and improve exercise tolerance, health status and lung function at 6-12 months following treatment. Endobronchial valves (Evidence A); Lung coils (Evidence B); Vapor ablation (Evidence B)
Bronchoscopic Interventions Under Study	<ul style="list-style-type: none">Phase III trials are currently being conducted to determine the efficacy of treatments for patients with refractory exacerbations and chronic bronchitis using cryospray, rheoplasty and targeted lung denervation technology



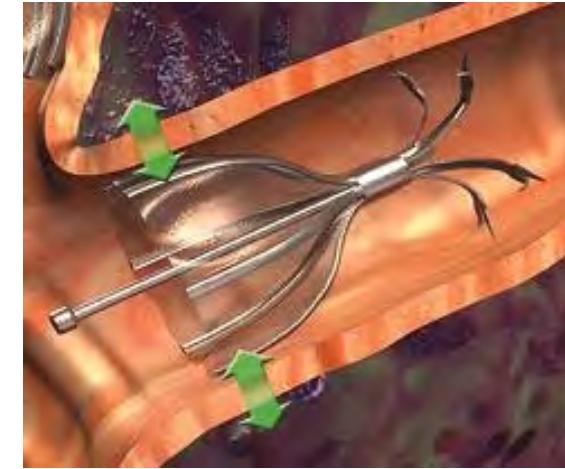
2023
REPORT

LVRS		LVRS		
Valves	Valves			
Vapor (UL)	Vapor	Vapor (UL)	Vapor	
Vapor (LL)		Vapor (LL)		
Coils (RV>200%, RV/TLC>0.58, LAA>20%,no bronchitis)	Coils (RV>200%, RV/TLC>0.58, LAA>20%,no bronchitis)	Coils (RV>200%, RV/TLC>0.58, LAA>20%,no bronchitis)	Coils (RV>200%, RV/TLC>0.58, LAA>20%,no bronchitis)	Consider lung transplant
Foam	Foam	Foam	Foam	
Heterogeneous	Homogeneous	Heterogeneous	Homogeneous	
FI complete (QCT)/chartis negative		FI incomplete (QCT)/chartis positive		
Emphysema optimal Rx FEV1 <50% and RV >175%, RV/TLC >0.58, 6 MWT 150–450 m				
Optimal pharmacological and non-pharmacological treatments Smoking cessation, optimal diet, vaccination Pulmonary rehabilitation Consider long-term oxygen therapy, non-invasive ventilation				
<input type="checkbox"/> Approved <input type="checkbox"/> RCTs have been completed, at least within registries <input checked="" type="checkbox"/> Clinical trials in progress				

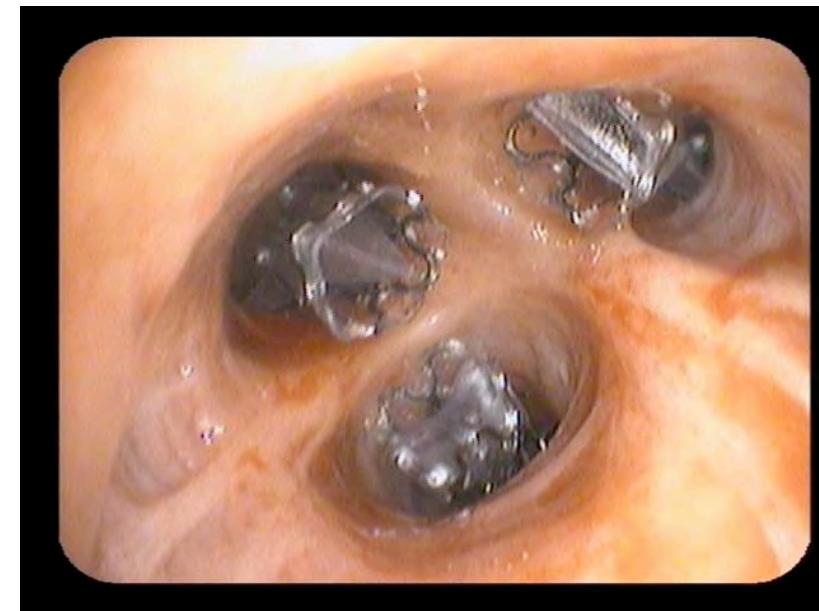
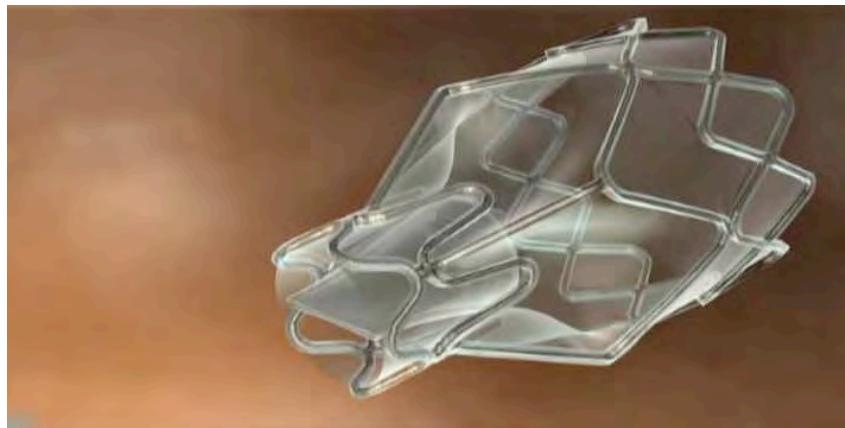
Felix J.F. Herth, Dirk-Jan Slebos, Gerard J. Criner, Arschang Valipour, Frank Sciurba, Pallav L. Shah

ELVR Expert Panel Recommendations.
Respiration, 5th March 2019.

Olympus IBV



Pulmonx Zephyr EBV



Indications for ELVR with valves

- COPD FEV1: 20–45% RV>175%
- 6MWT > 100-500m
- Stabilised on Medical Therapy, undertaken pulmonary rehabilitation
- Heterogenous disease ?
- Absence of collateral ventilation

Oblique

Ex: 7962

Se:301

A: 37.91 (col)

DFOV 37.3 cm

R
P
I

1.25/Average

100 %

0.6mm 0.984:1/0.62sp

12:28:16 PM

FLA 1500 L = -600

SRP MACQUARIE MEDICAL IMAGING

JID8132

Ex Feb 12 2013

L
A
S

ILA

SUMMARY



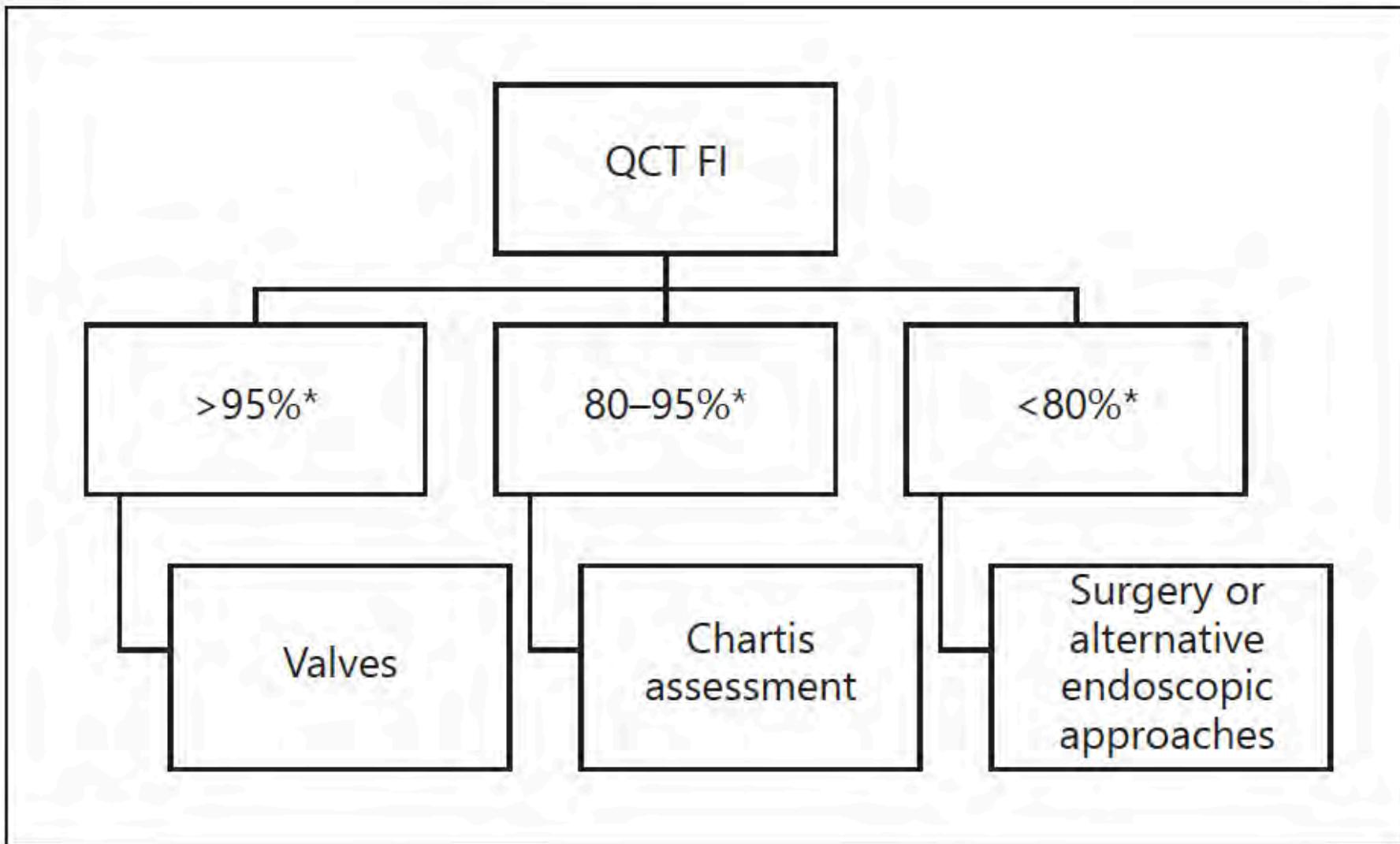
KEY

- ≥70% Voxel Density
Less Than -910 HU
- 60-70% Voxel Density
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- 50-60% Voxel Density
Less Than -910 HU
- <50% Voxel Density
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- ≥95% Fissure Completeness
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RESULTS

	RIGHT LUNG				LEFT LUNG	
	RUL	RUL+RML	RML	RLL	LUL	LLL
% Fissure Completeness	53.8	100.0	57.2	100.0	100.0	100.0
% Voxel Density Less Than -910 HU	54	52	38	43	55	41
% Voxel Density Less Than -950 HU	31	29	14	24	31	17
Inspiratory Volume (ml)	1238	1367	129	1042	1168	1194



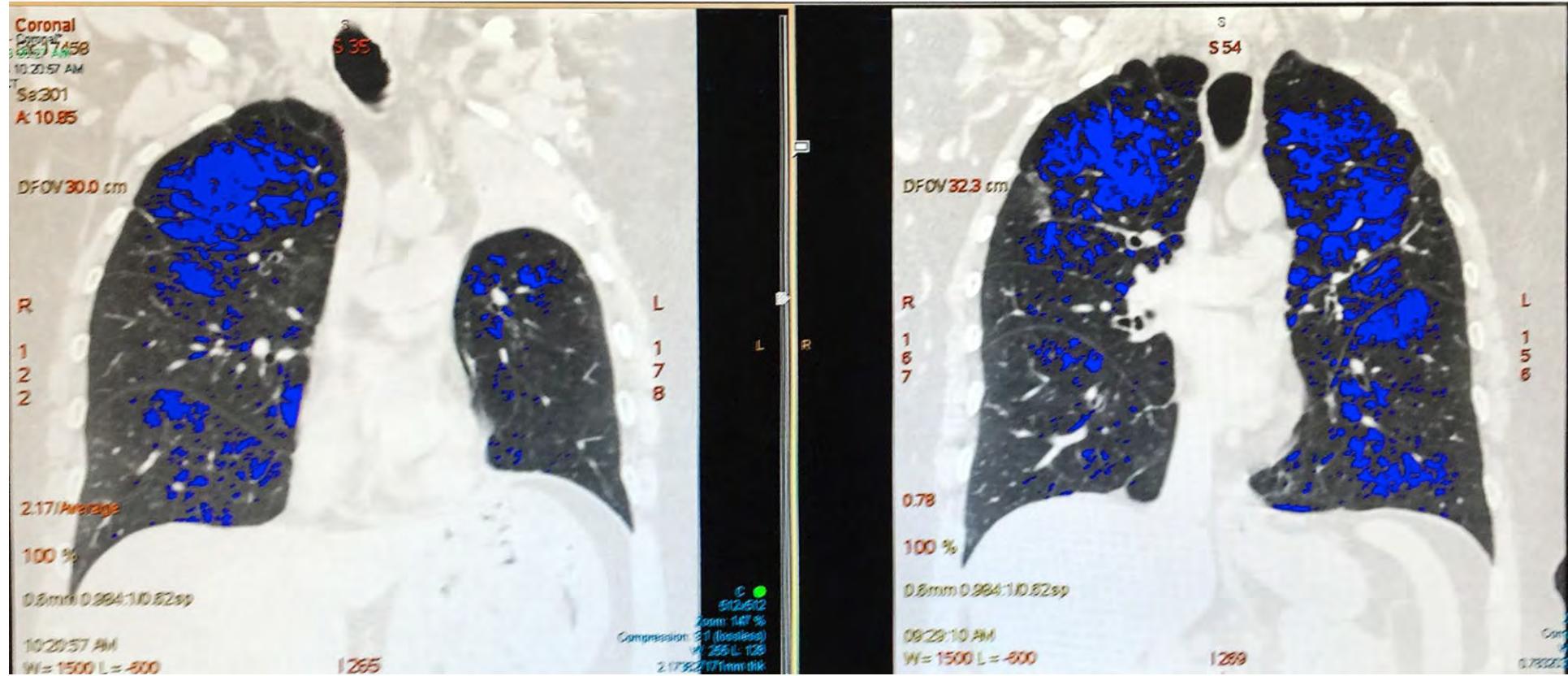


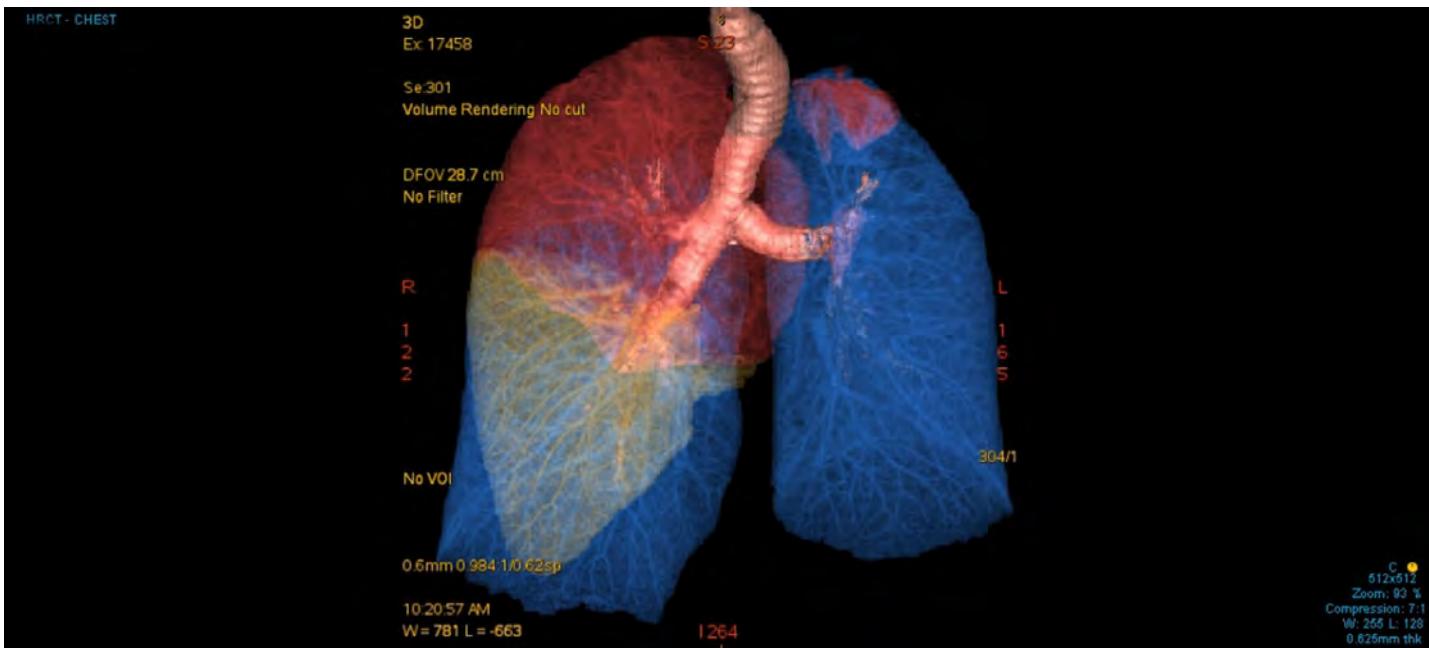
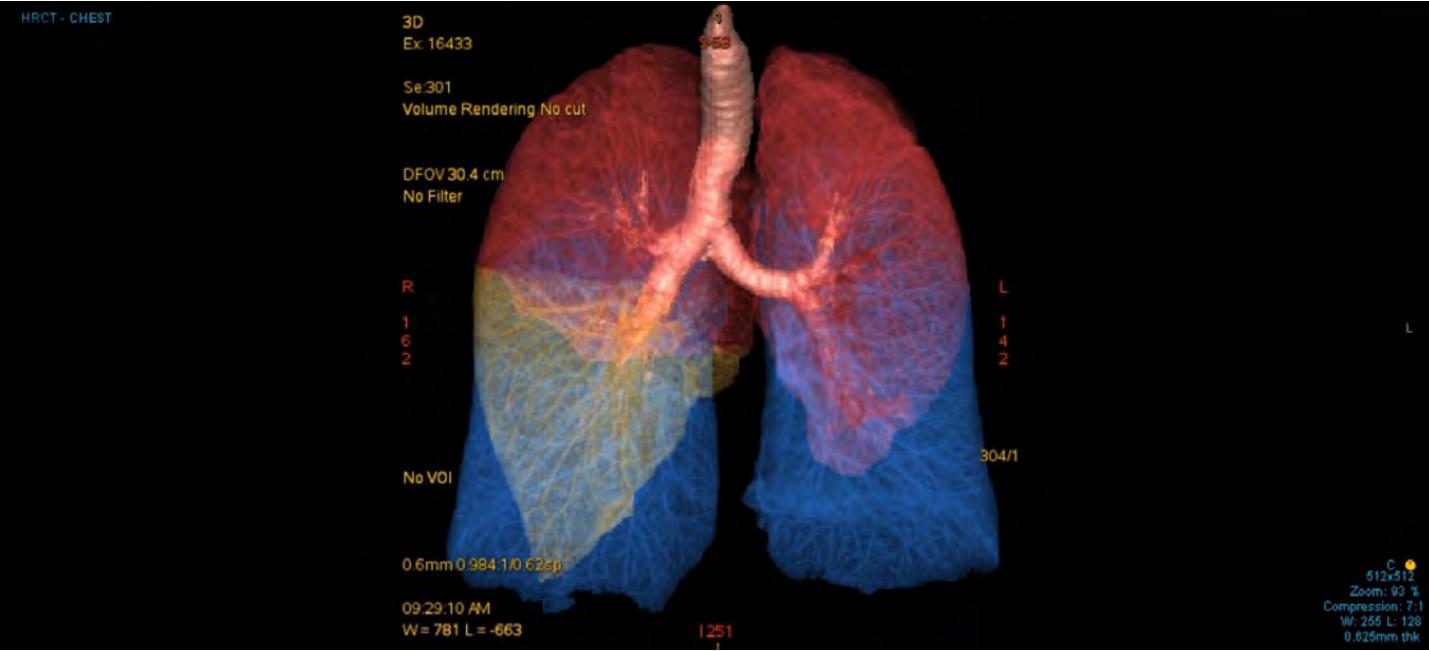


Immediate Post-op



Day 3 Post-op





RESPIRATORY FUNCTION TESTS**SPIROMETRY**

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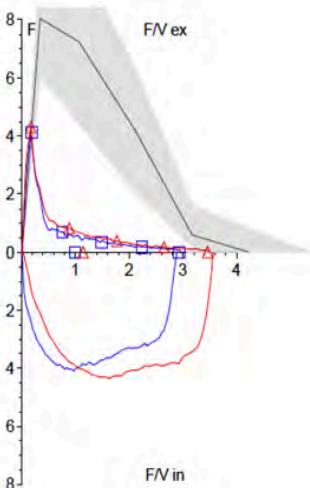
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(Physician 02.02.2017 06:26PM)

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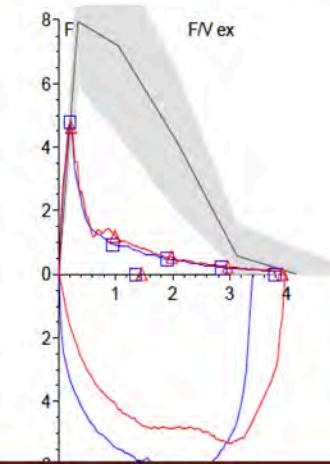
		Pre	Pre%		Post	Post%	%Change	Pred	Pred LL
FEV 1	L	1.34	44		1.45	47	8	3.08	2.16
FVC	L	3.79	91		3.92	94	3	4.16	3.02
FEV 1 % FVC	%	35	47		37	50	5	75	60
MMEF 75/25	L/s	0.42	19		0.46	21	8	2.19	0.86
PEF	L/s	4.78	60		4.62	58	-3	7.95	5.96

LUNG VOLUMES

TLC	[L]	9.53	129						7.38	6.23
VC	[L]	3.78	89						4.24	3.31
IC	[L]	2.50	77						3.23	3.23
FRCpleth	[L]	7.03	183						3.84	2.85
ERV	[L]	1.28	128						1.00	1.00
RV	[L]	5.75	203						2.84	2.16
RV % TLC	[%]	60	137						44	35
sR 0.5	[kPa*s]	1.63								
R 0.5	[kPa/(L/s)]	0.21	71							
									0.30	0.30

GAS TRANSFER

DLCO_SB	[ml/(min*mmHg)]	7.78	29						26.87	19.94
DLCOcSB	[ml/(min*mmHg)]	7.80	29						26.87	19.94
VA_SB	[L]	5.86	81						7.23	7.23
KCO_SB	[ml/(min*mmHg*L)]	1.33	36						3.64	2.54
KCOc_SB	[ml/(min*mmHg*L)]	1.33	37						3.64	2.54
VIN_SB	[L]	3.68	87						4.24	3.31
Hb	[g(Hb)/dL]	14.50								

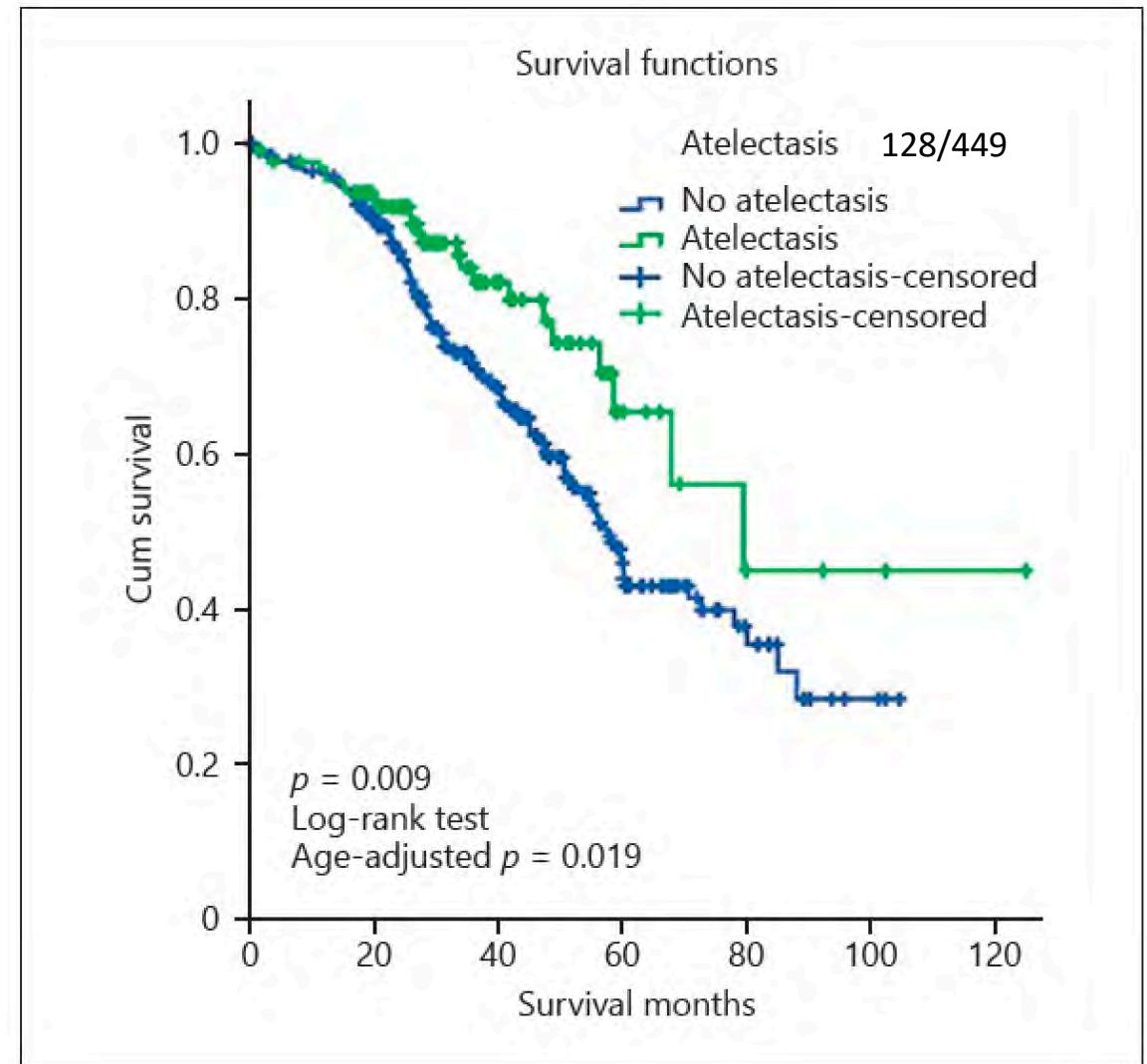
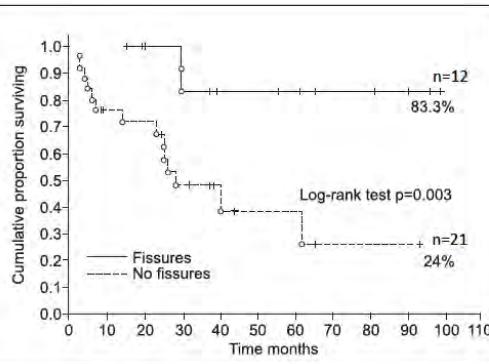
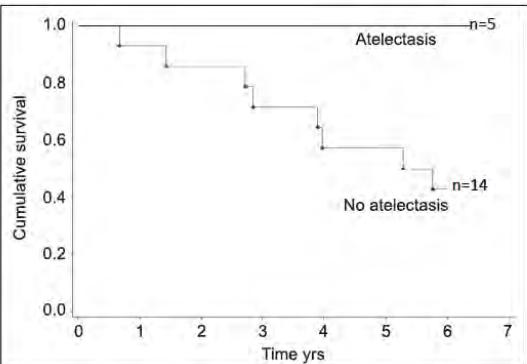
**INTERPRETATION**

FVC is marginally higher than June and FEV1 is improved over pre-ELVR tests. Lung volumes show stable reduction in RV. Stable diffusing capacity.

Prof Matthew Peters MD FRACP

(Physician 04.10.2018 18:40:22)

Symbicort and Spiolto taken approx 2.5hrs prior. Tests meet ATS standards for acceptability and repeatability. Hb taken from previous test.



JOURNAL OF
**Bronchology &
Interventional Pulmonology**

Articles & Issues ▾ For Authors ▾ Journal Info ▾

ORIGINAL INVESTIGATIONS

Endoscopic Lung Volume Reduction in COPD

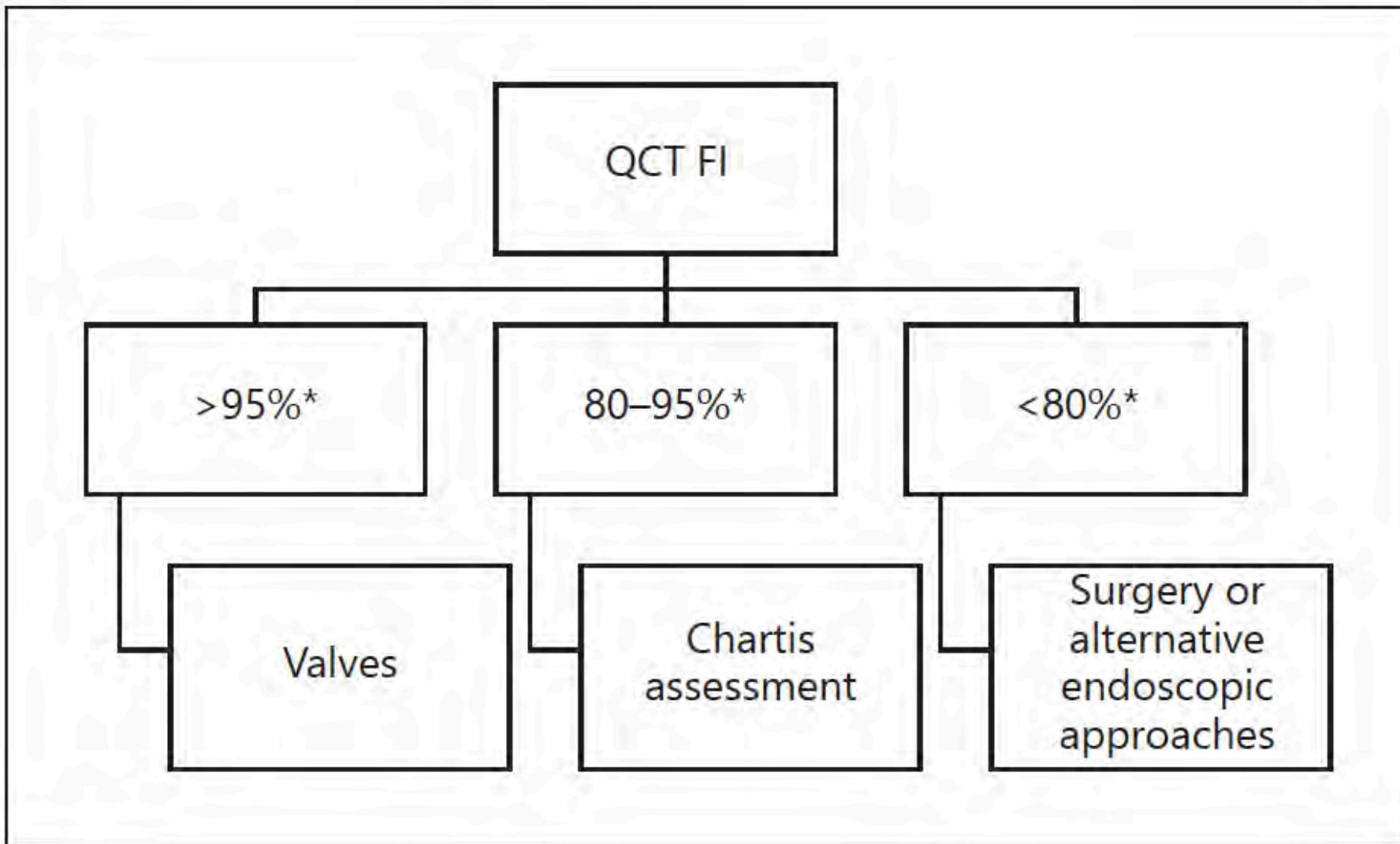
Improvements in Gas Transfer Capacity Are Associated With Improvements in Ventilation and Perfusion Matching

Hsu, Kelvin MBBS, FRACP^{†‡}; Williamson, Jonathan P. MBBS(Hons), PhD, FRACP[†]; Peters, Matthew J. MD, FRACP[‡]; Ing, Alvin J. MBBS(Hons), MD, FRACP^{*}

Author Information ⓘ

Journal of Bronchology & Interventional Pulmonology 25(1):p 48-53, January 2018. | DOI: 10.1097/LBR.0000000000000445





Reversal of Collateral Ventilation Using Endobronchial Polymer Sealant in a Patient With Emphysema Undergoing Endoscopic Lung Volume Reduction (ELVR) With Valves

A Case Report and Proof of Concept

Ing, Alvin MBBS, MD; Sullivan, Cameron BSc, MBBS; Hersch, Nicole MBBS; Saghie, Tajalli MD;
Williamson, Jonathan MBBS, PhD [Author Information](#) 

Journal of Bronchology & Interventional Pulmonology: January 2020 - Volume 27 - Issue 1 - p e14-e16

StratX™ Lung Report



Patient ID: Upload Date: Sept. 9, 2018
Scan ID: Report Date: Sept. 11, 2018
CT Scan Date: Aug. 24, 2018 Scan Comments:

SUMMARY



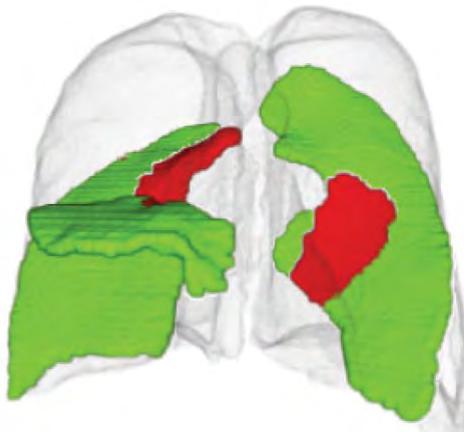
KEY

- ≥70% Voxel Density Less Than -910 HU
- 60-70% Voxel Density Less Than -910 HU
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RESULTS

	RIGHT LUNG				LEFT LUNG	
	RUL	RUL+RML	RML	RLL	LUL	LLL
% Fissure Completeness	84.6	83.3	98.6	83.3	83.2	83.2
% Voxel Density Less Than -910 HU	59	57	52	46	56	45
% Voxel Density Less Than -950 HU	40	38	31	27	37	28
Inspiratory Volume (ml)	1858	2422	564	1750	1906	1945

FRONT



SIDE -
RIGHT LUNG



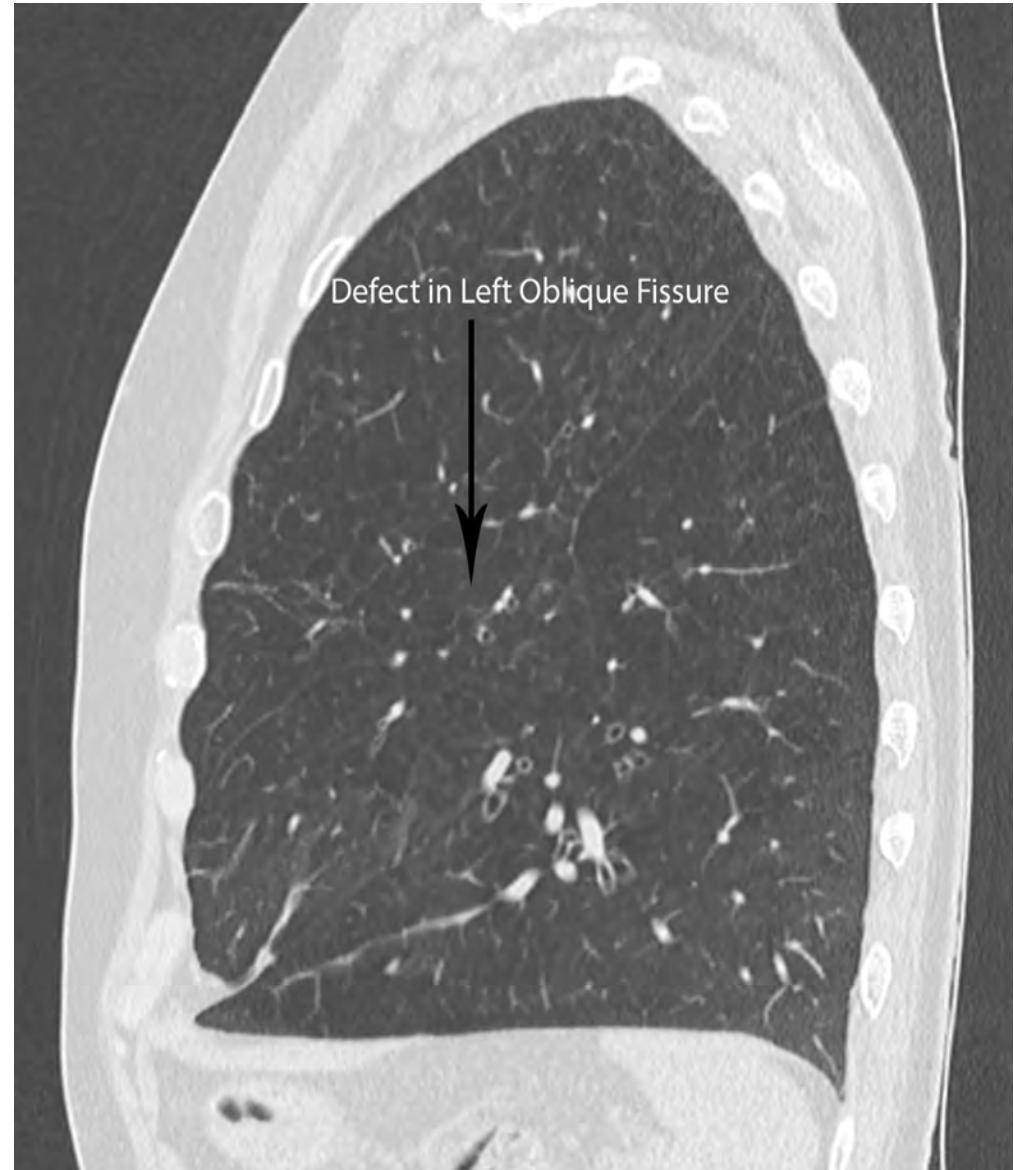
BACK



SIDE -
LEFT LUNG



Segment	Segmental Volume (ml)	% of gap covered by segment
LB1+2	804.8	0
LB3	678.9	0
LB4	102.8	49.7
LB5	322.2	50.3



AeriSeal – Foam Polymer



ID:
Name:

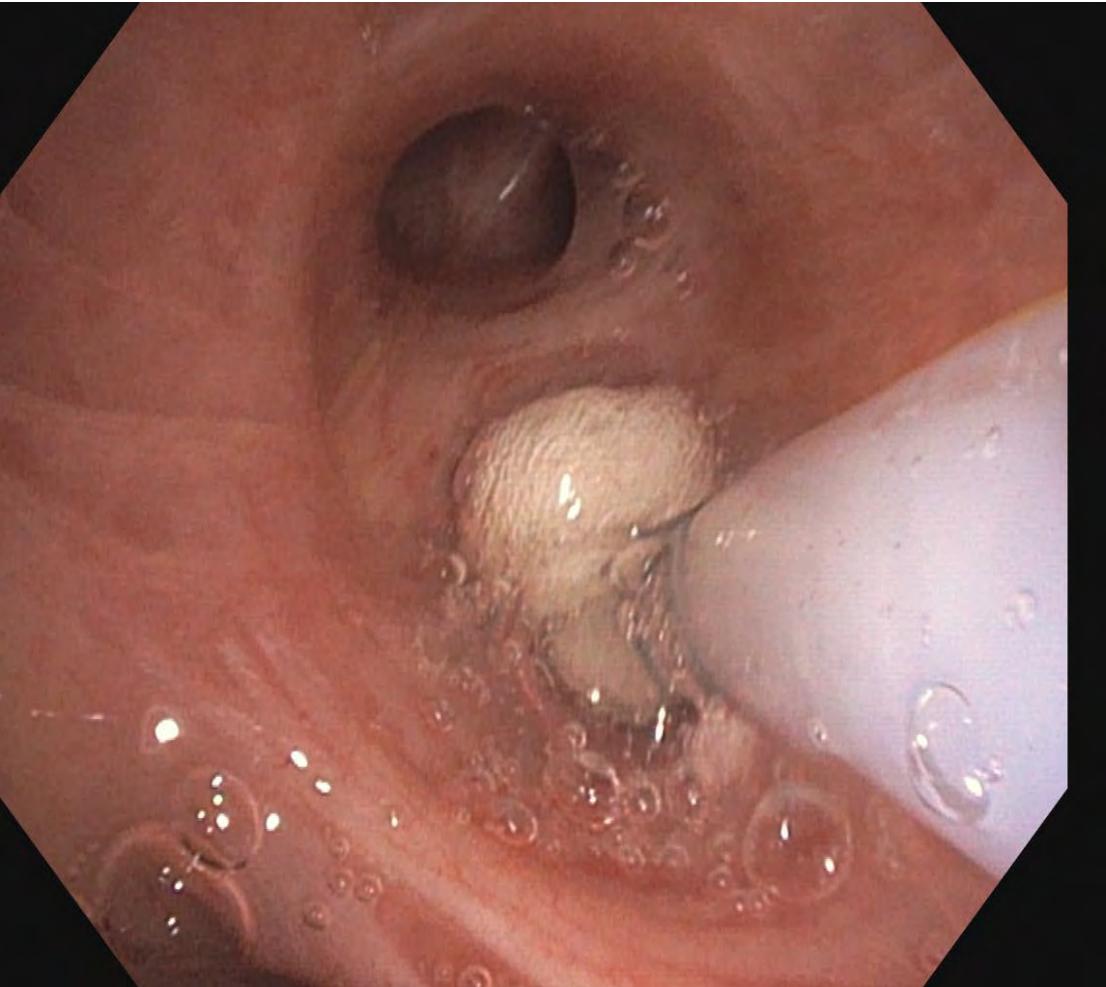
Sex:

16/04/2019
12:10:48

CVP:17

■■■/■■■(16/17)
Eh:A1 Cm:1

-xc|



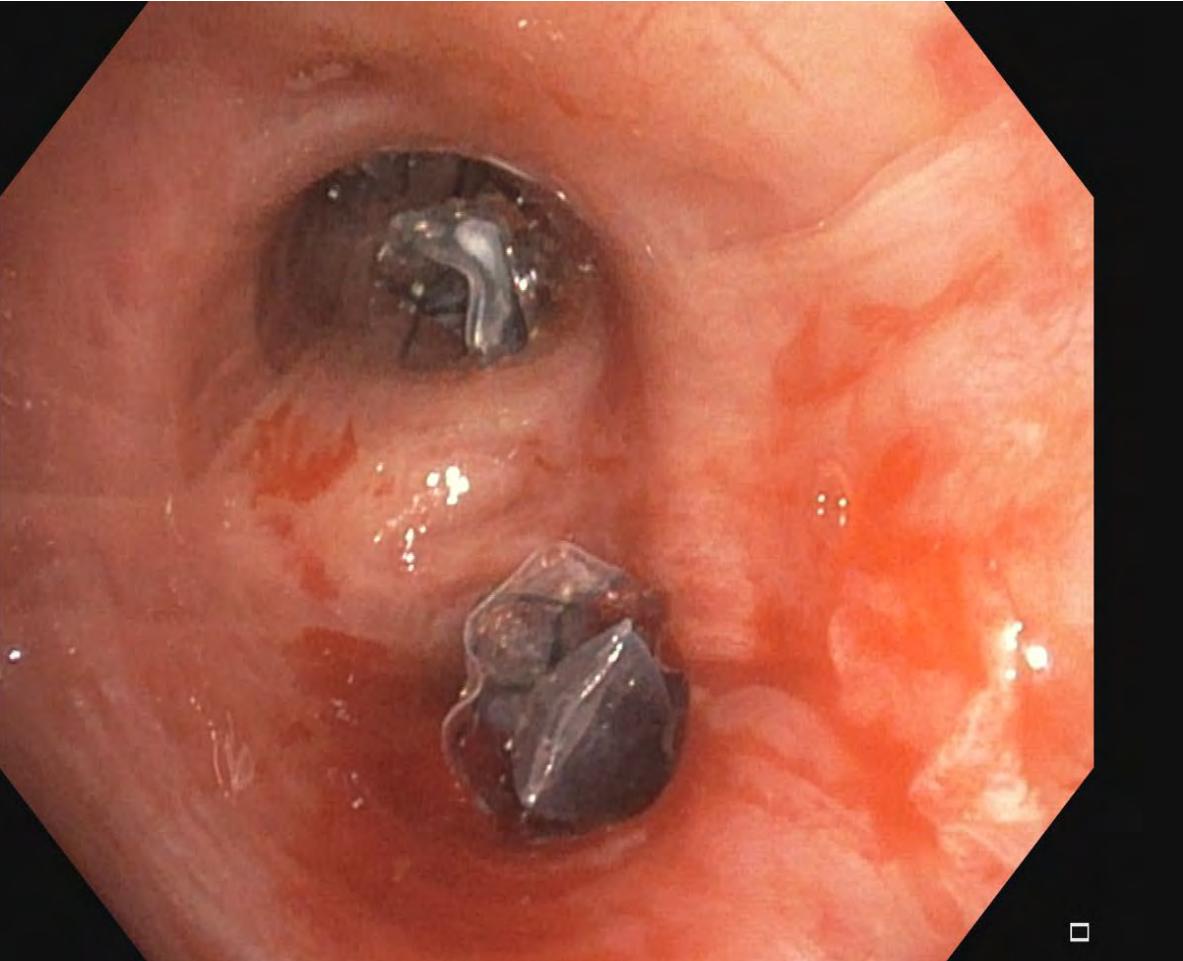
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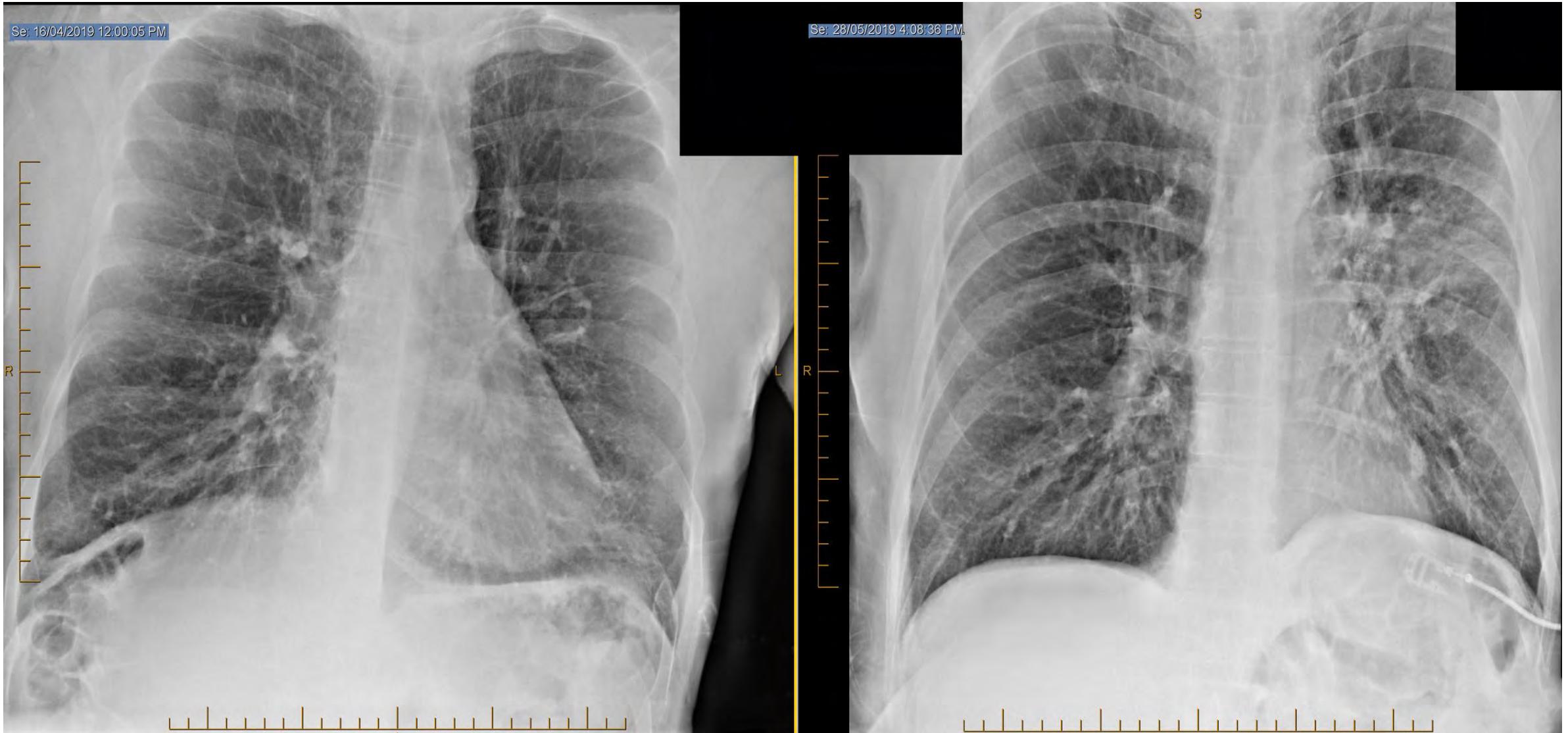
Sex: Age:
D.O.B.:
28/05/2019
16:56:29

CVP:1

■■■/---(0/1)
Eh:A1 Cm:1

Comment:





Received: 25 April 2022

Accepted: 18 July 2022

DOI: 10.1111/resp.14338

ORIGINAL ARTICLE

Official Journal of the Asian Pacific Society of Respirology
Respirology



WILEY

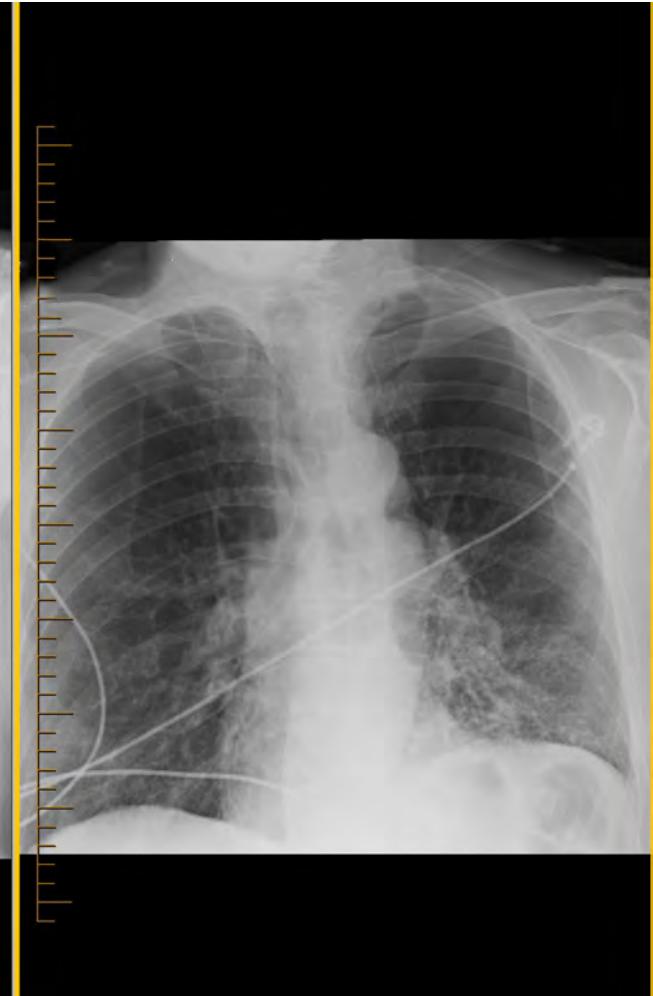
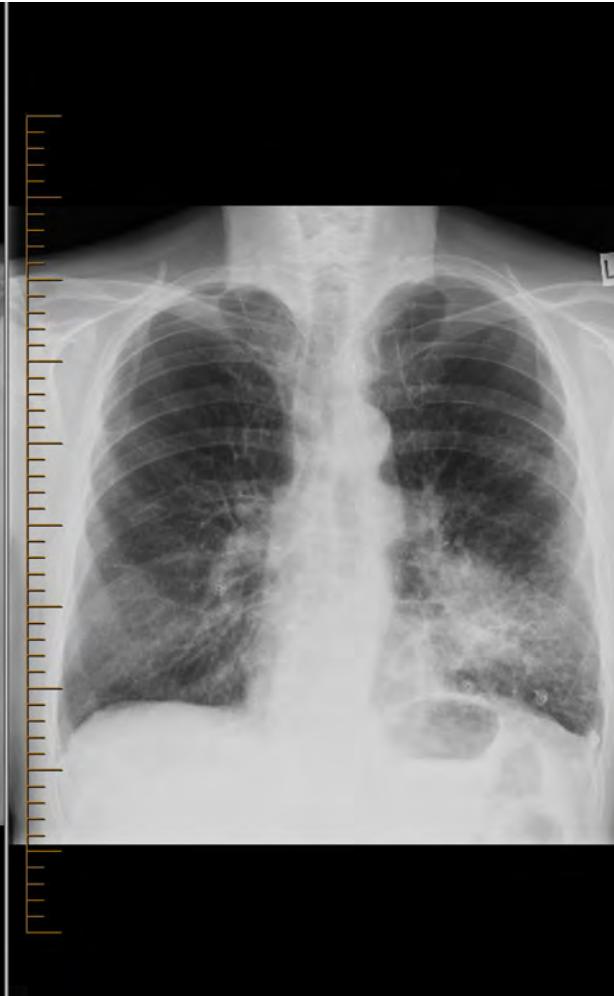
Reversal of collateral ventilation using endoscopic polymer foam in COPD patients undergoing endoscopic lung volume reduction with endobronchial valves: A controlled parallel group trial

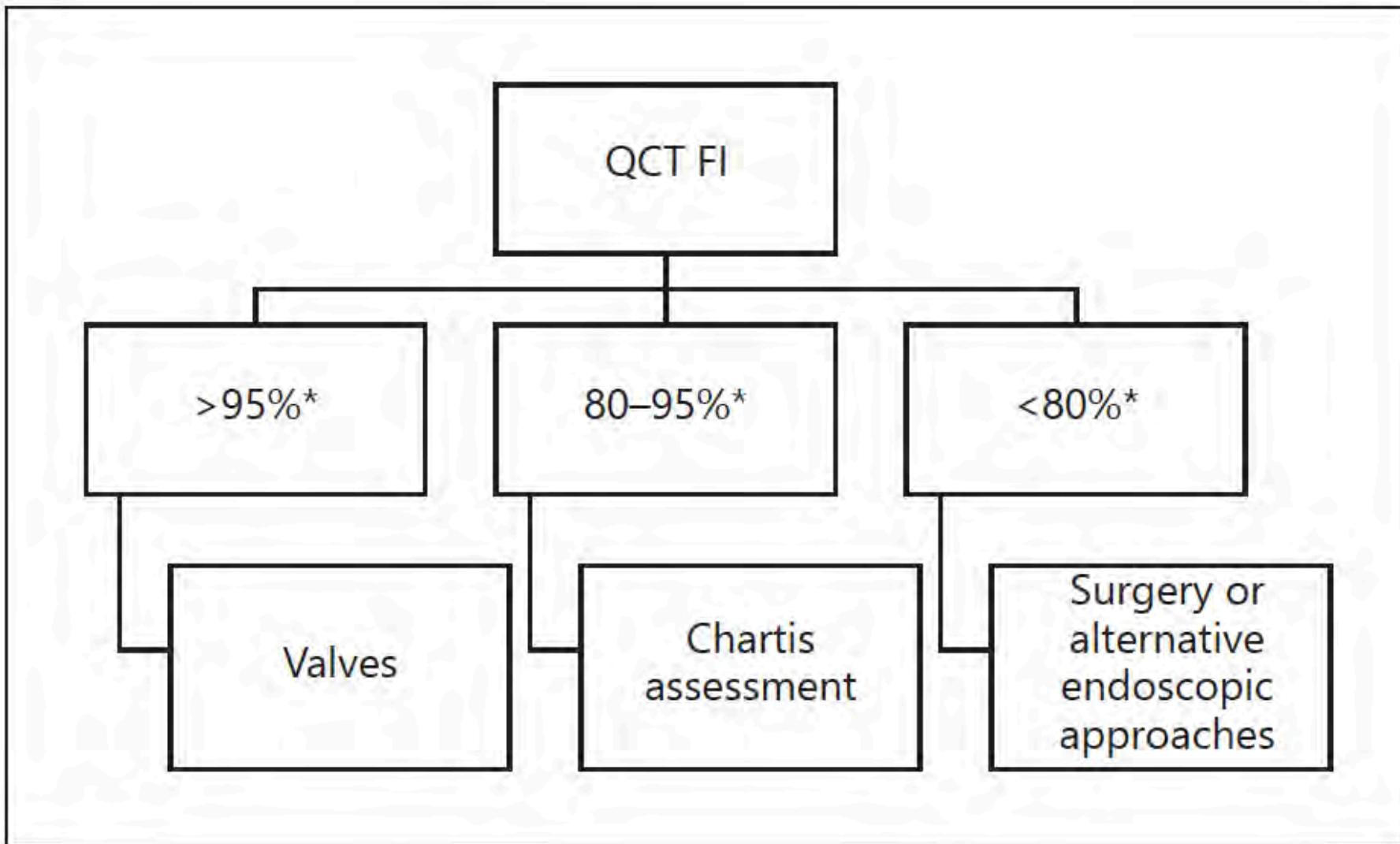
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Table 3 – EPF versus EBV-CTRL Group - % changes post ELVR

N = 14 both groups	CV negative EBV-CTRL difference at 6 month	CV positive EPF Group – difference at 6 months	p value
Post-BD FEV1 (% Change)	27.7 (5.3)	19.7 (6.3)	< 0.05
Post-BD FVC (% Change)	15.9 (5.6)	14.7 (5.2)	NS
TLC (% change)	-5.8 (1.5)	- 4.0 (1.8)	NS
RV (% change)	-20.1 (5.6)	-16.2 (4.7)	NS
DLCO (% predicted)	6.5 (5.0)	6.1 (3.4)	NS
KCO (% change)	9.4 (3.8)	7.0 (3.6)	NS
6MWD (% change)	28.4 (11.0)	25.8 (4.9)*	NS
SGRQ (% change)	-28.8 (4.7)	-22.8 (5.6)	NS
LUL volume (% change)	-46.1 (6.0)	-43.4 (7.2)	NS

Data are presented as n (%) or mean \pm SEM, unless otherwise stated.



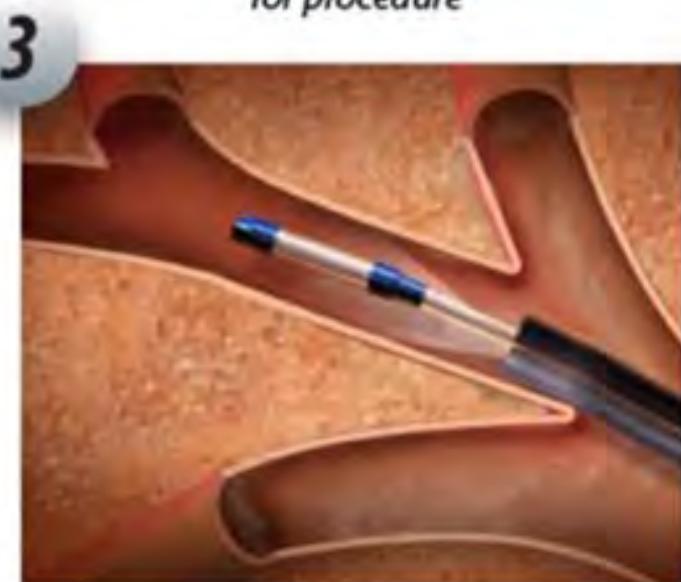


Thermal Vapour Ablation





*IP3 identifies airway targets
for procedure*



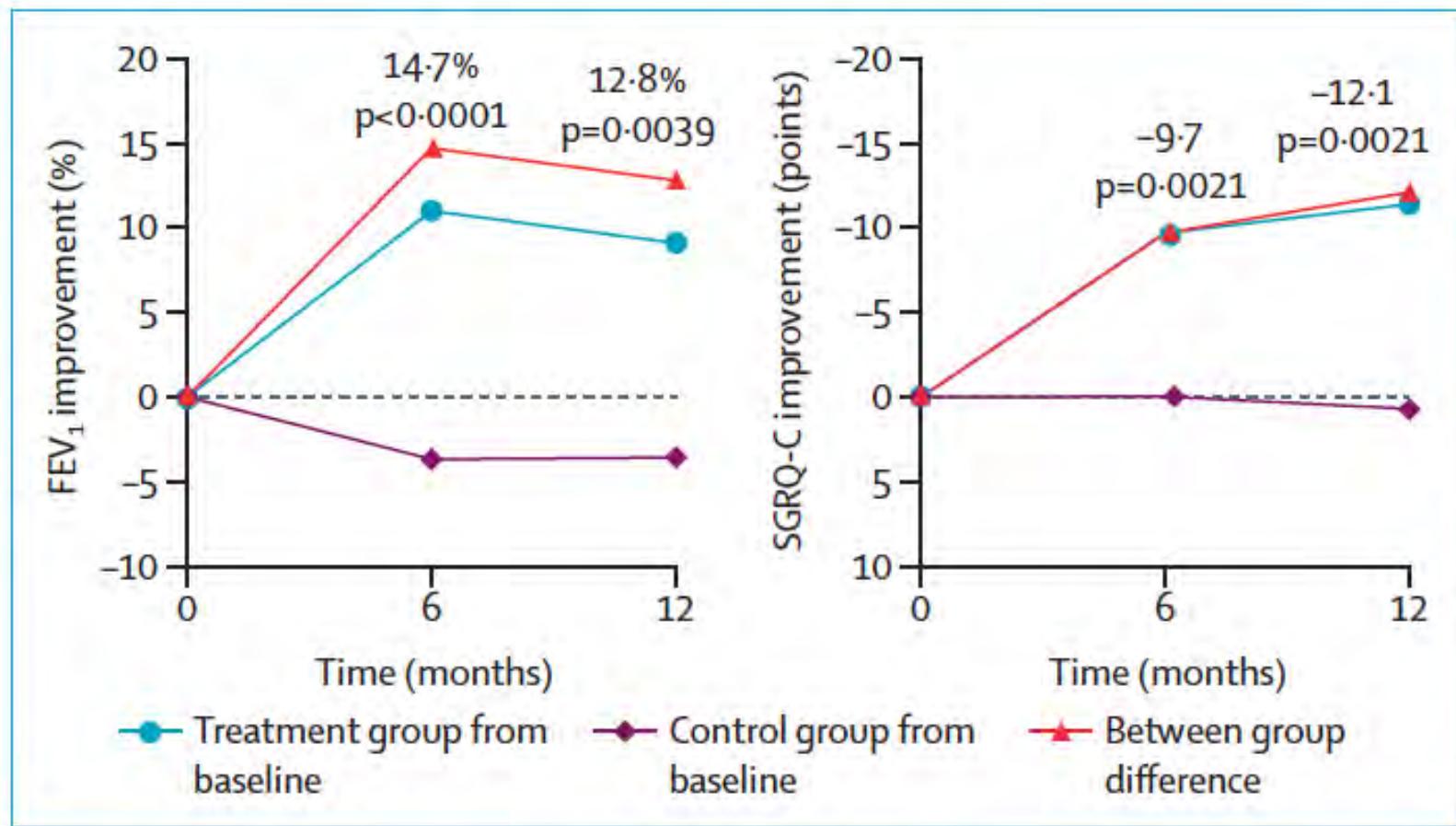
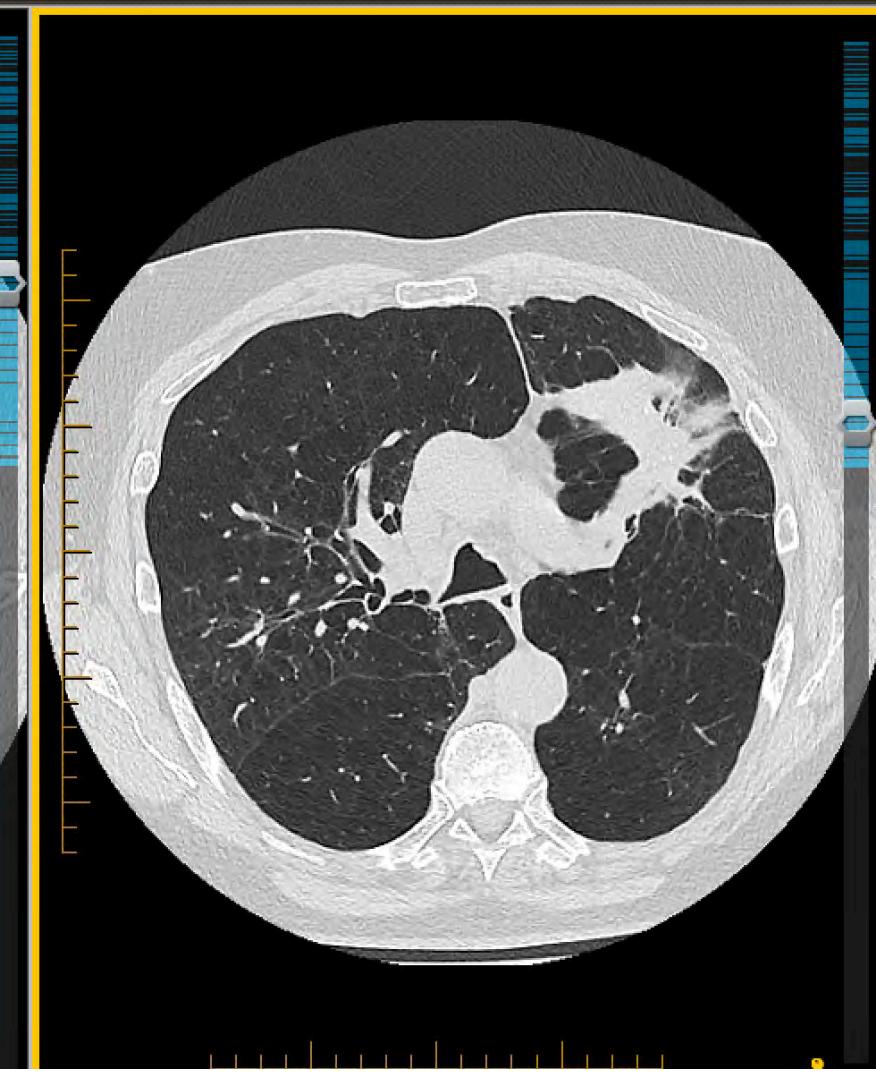
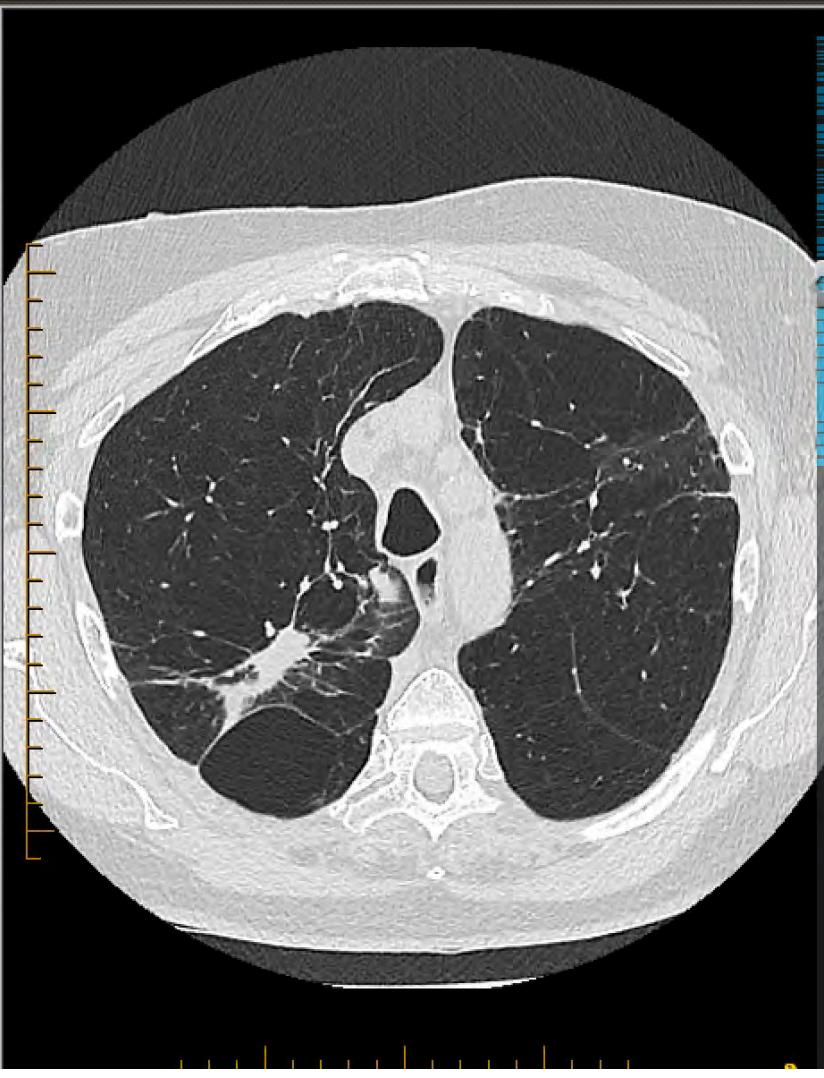
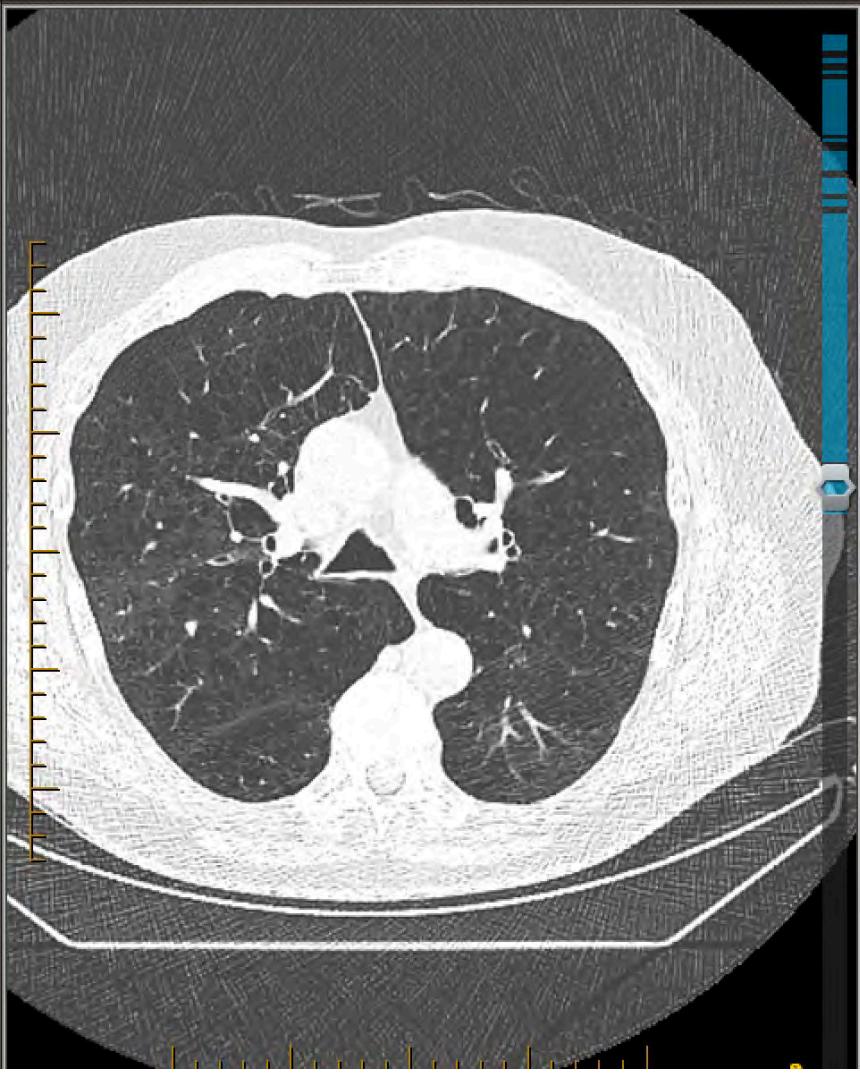
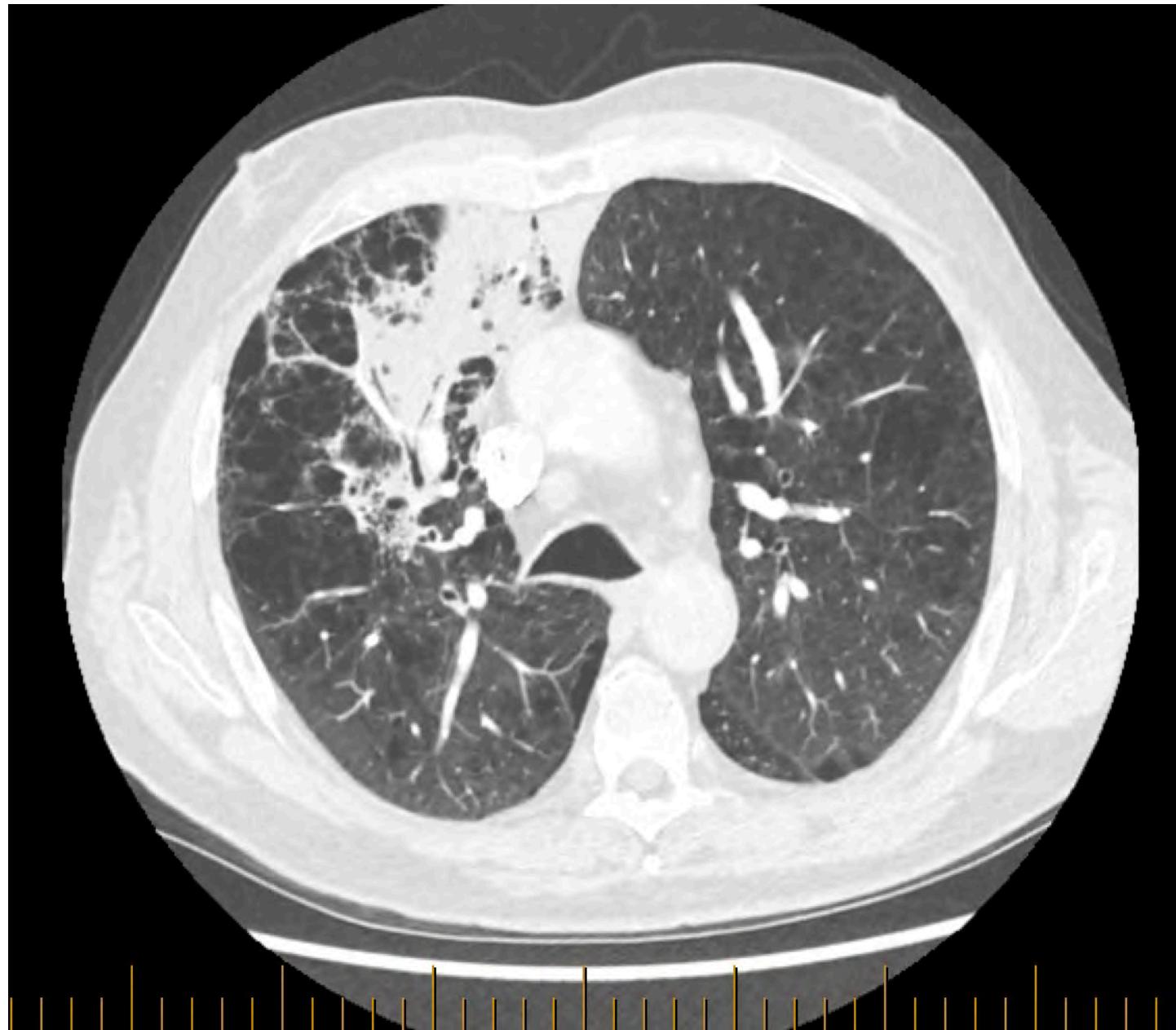


Figure: Primary endpoint efficacy measures at 6 months and 12 months after vapour ablation

p values calculated with two-sample t test. Full statistical plan previously reported.¹³
 FEV_1 =forced expiratory volume in 1 s. SGRQ-C=Saint George's respiratory questionnaire for COPD.





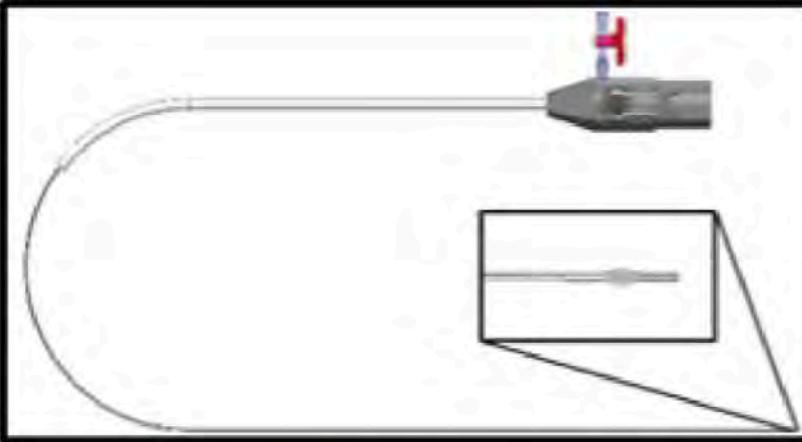
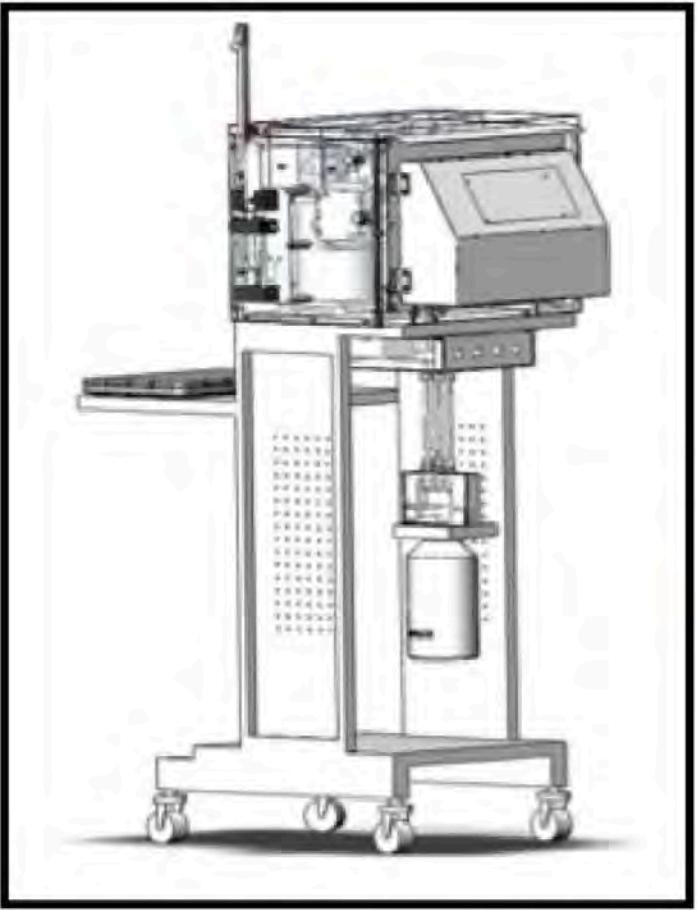


Figure 3. ETLA System (generator, catheter and TRST)

Endobronchial Thermal Liquid Ablation – REDUCE TRIAL

Segmental delivery of Normal Saline at 95 degrees Celsius

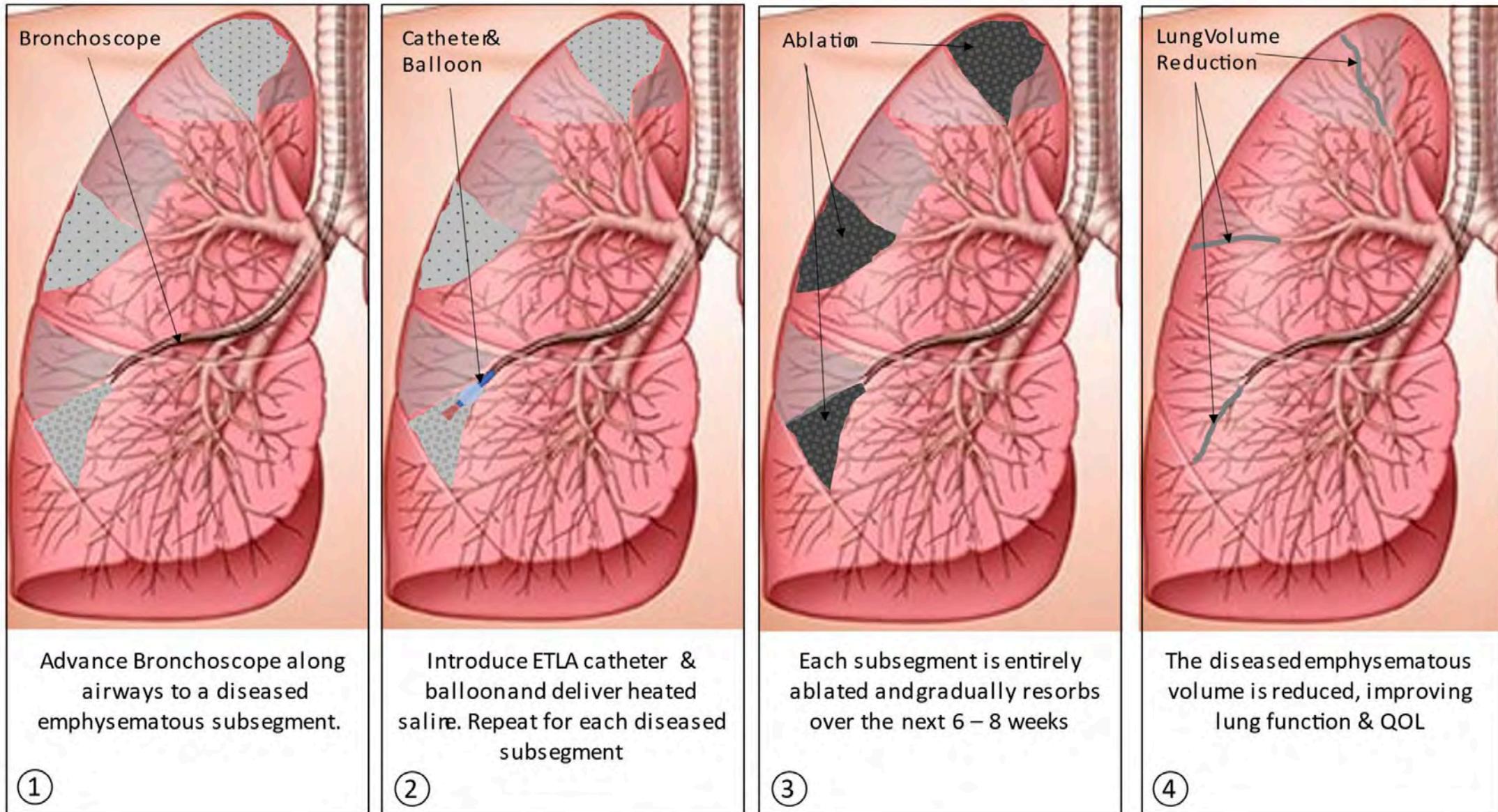


Figure 4. ETLA Mechanism of Action

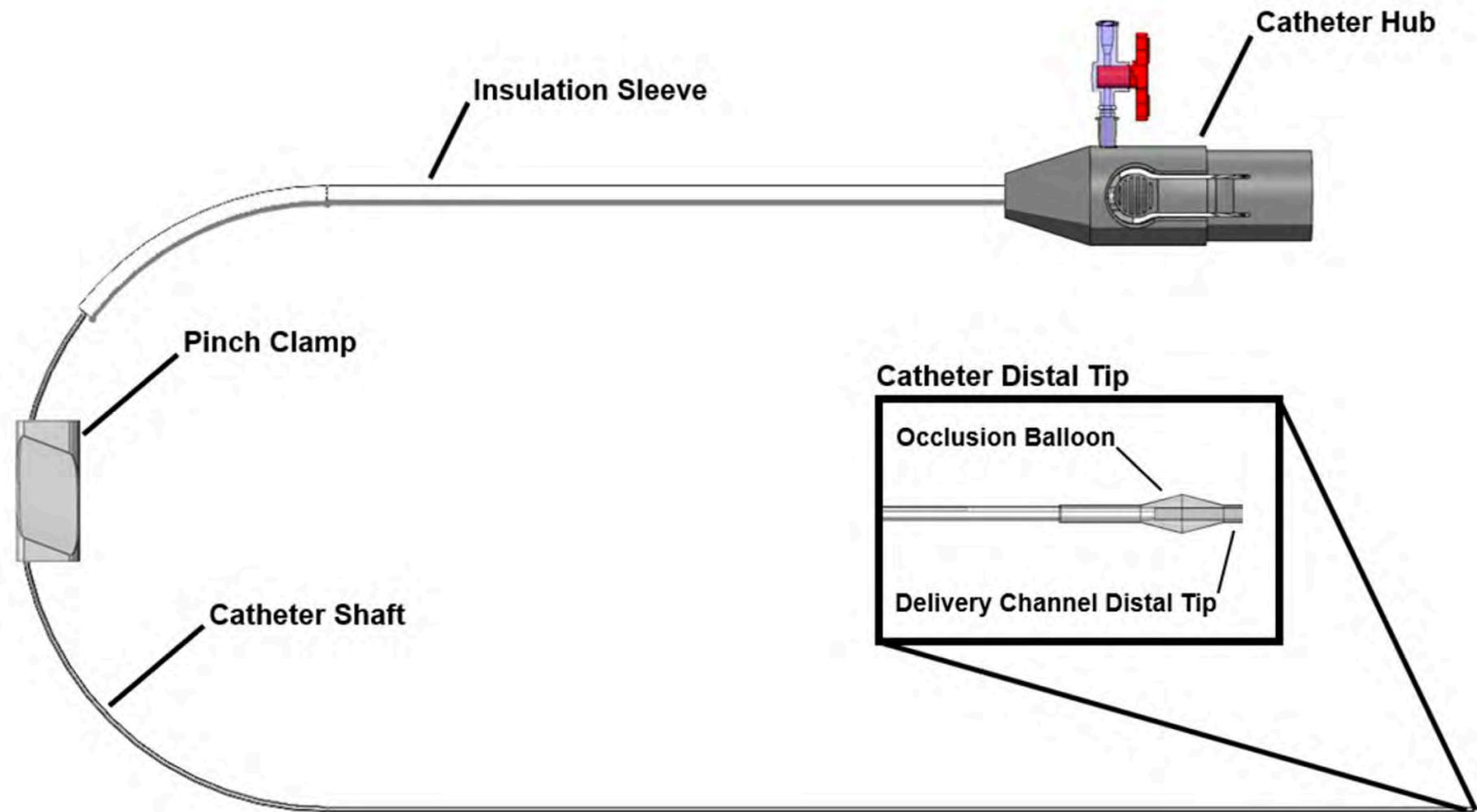
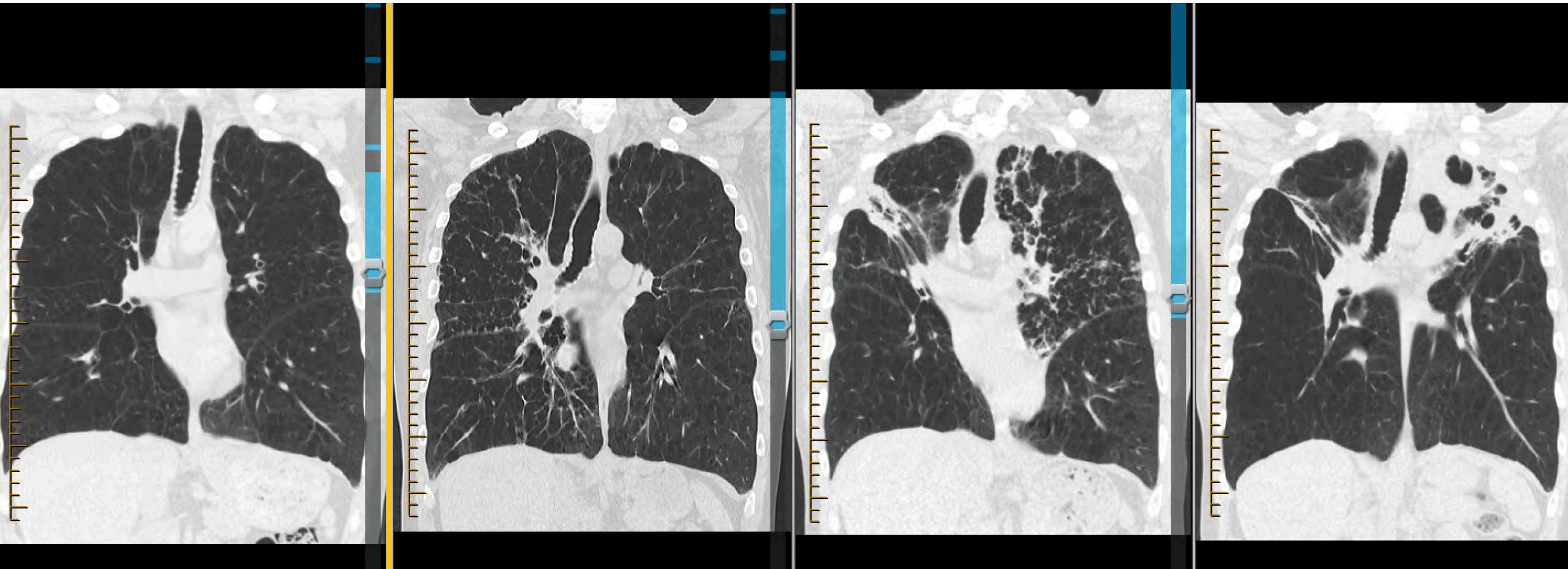


Figure 7. ETLA System Catheter



Measurement Parameter Date	Medication	Spiro			Body			Diff SB			
		FEV1	FVC	FEV...	TLC	FRCpl	RV	DLCO	KCO	VA	DLCOc
		(L)	(L)	(%)	(L)	(L)	(L)	(m...)	(m...)	(L)	(m...)
3/09/2018		1.06	3.73	28	10.06	7.32	6.02	14.05	2.26	6.22	13.90
3/09/2018	Salbutamol	1.33	4.33	31							
30/08/2019		1.09	4.28	25	9.79	6.99	5.51	11.80	1.62	7.27	11.35
30/08/2019	Salbutamol	1.21	4.25	28							
24/02/2020		1.26	4.07	31	10.12	7.42	5.69	13.62	2.10	6.50	13.19
24/02/2020	Salbutamol	1.34	4.41	30							
23/11/2020		1.25	3.93	32	9.66	6.83	5.59	11.19	1.97	5.68	11.29
23/11/2020	Salbutamol	1.28	4.08	31							
18/01/2021		1.16	3.75	31							
18/01/2021		1.16	3.85	30							
5/03/2021		0.95	3.59	26	10.15	7.51	6.44	11.29	1.97	5.72	12.25
5/03/2021	Salbutamol	1.11	3.83	29							
17/11/2022		0.95	3.85	25	9.81	7.23	5.78	9.54	1.56	6.13	9.54
17/11/2022	Salbutamol	1.01	3.93	26							
2/02/2023	Salbutamol	0.95	3.86	25	10.14	7.42	5.84	11.21	1.91	5.86	10.78
13/03/2023	Salbutamol	1.03	4.10	25	9.74	7.05	5.37	10.03	1.75	5.74	10.03
15/05/2023		1.15	4.36	26							
15/05/2023	Salbutamol	1.22	4.32	28	9.88	7.31	5.29	11.63	1.89	6.16	11.63
21/07/2023		1.37	4.52	30							
21/07/2023	Salbutamol	1.49	4.74	32	9.27	6.63	4.20	11.07	1.85	5.99	11.07



Measurement Parameter	Medication	Spiro			Body			Diff SB			
		FEV1 (L)	FVC (L)	FEV... (%)	TLC (L)	FRCpl (L)	RV (L)	DLCO (m...)	KCO (m...)	VA (L)	DLCOc (m...)
Date											
29/04/2022		0.90	3.01	30	8.99	7.18	5.82	7.52	1.32	5.70	7.52
29/04/2022	Salbutamol	1.05	3.09	34							
27/01/2023	Salbutamol	0.93	2.95	32	9.14	7.39	6.06	8.70	1.45	6.02	8.41
13/03/2023		1.02	3.10	33							
13/03/2023	Salbutamol	0.96	3.34	29	8.61	7.16	5.26	8.27	1.48	5.57	8.27
15/05/2023		1.34	3.89	34							
15/05/2023	Salbutamol	1.42	4.02	35	8.28	5.67	3.98	8.64	1.44	5.98	8.64
19/07/2023		1.46	3.91	37							
19/07/2023	Salbutamol	1.48	4.10	36	7.78	5.25	3.51	7.90	1.35	5.85	7.75



Apreo Health – BREATHE-1 Study

Segmental Instillation of Nitinol Airway Bypass Device

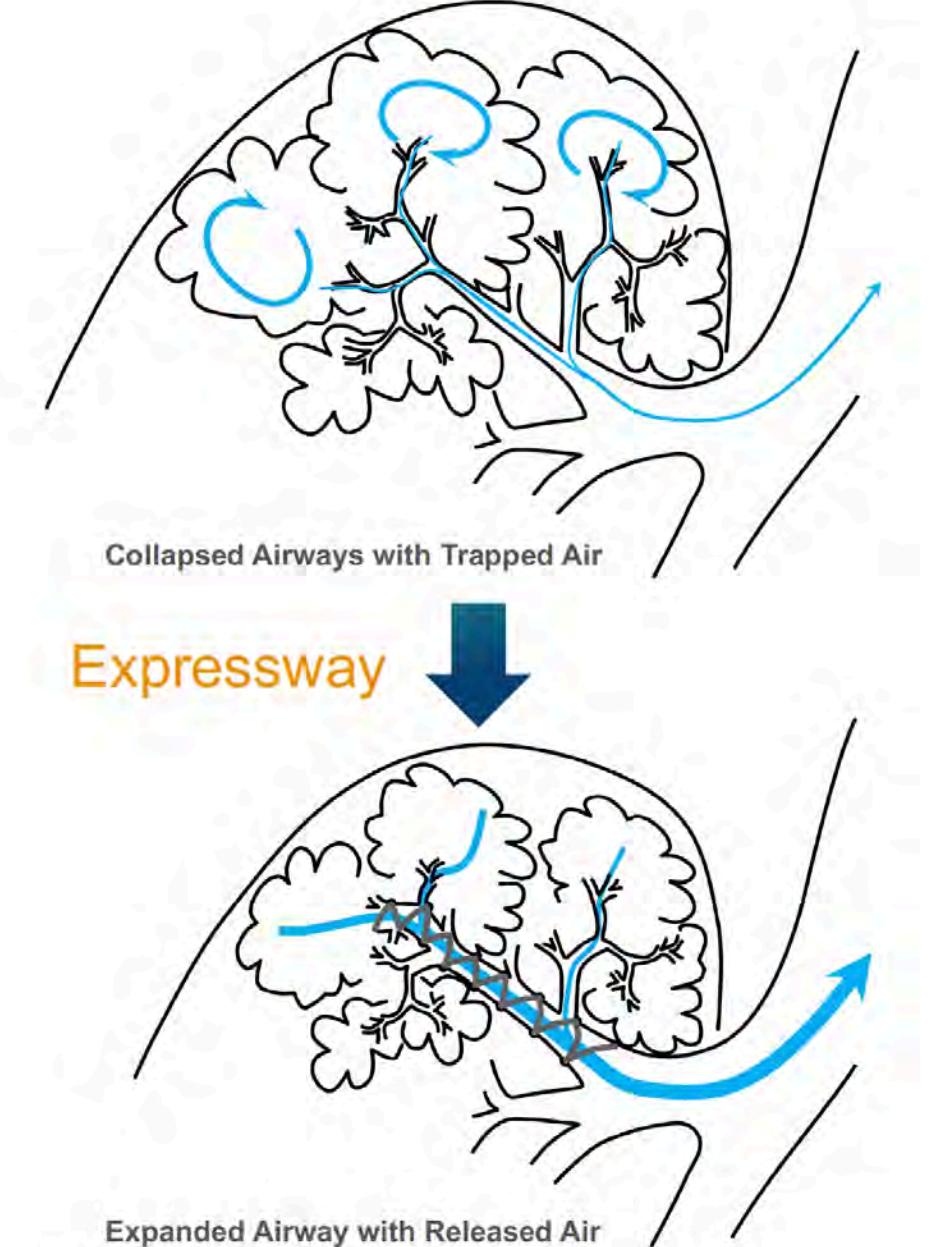
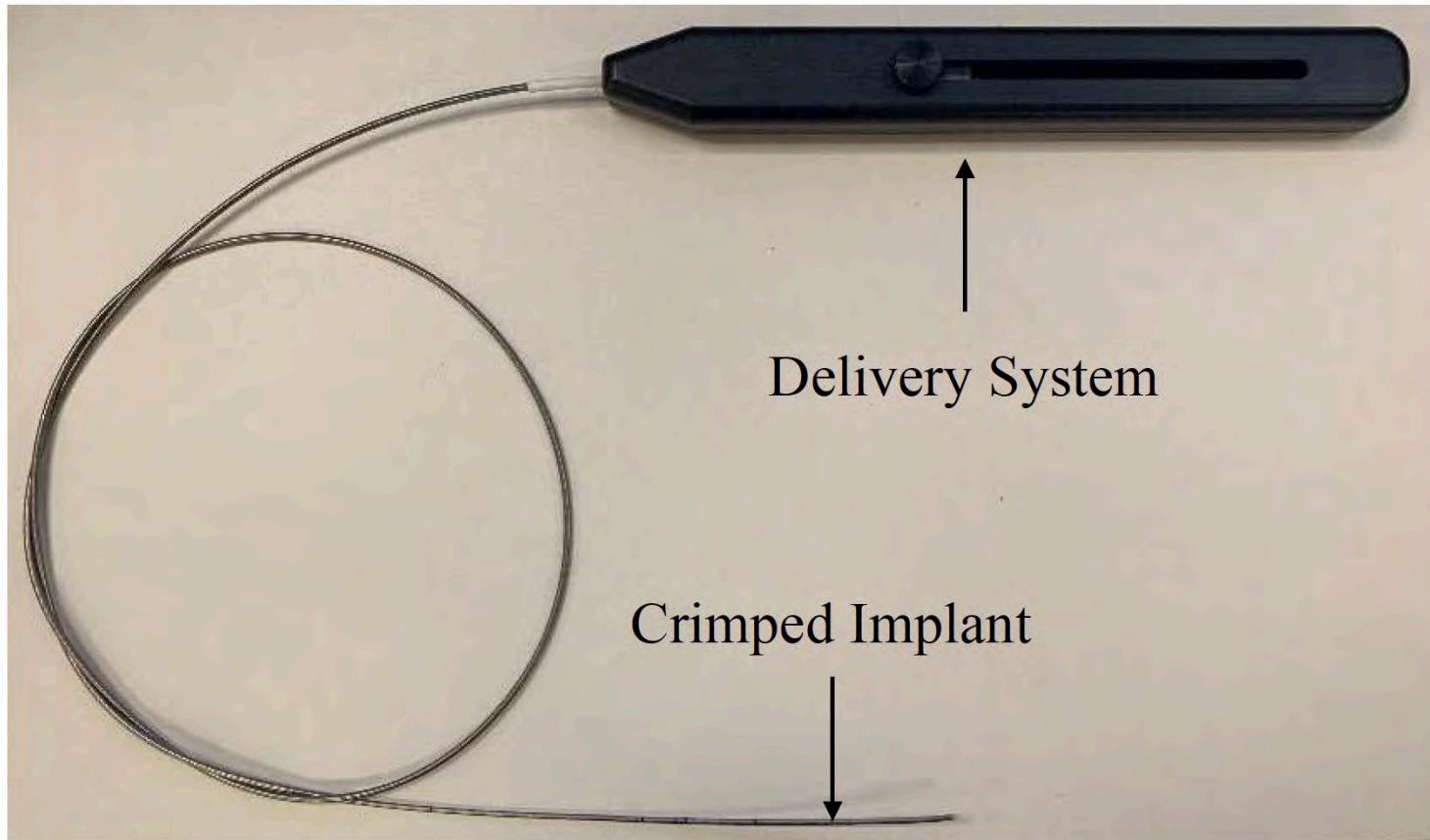
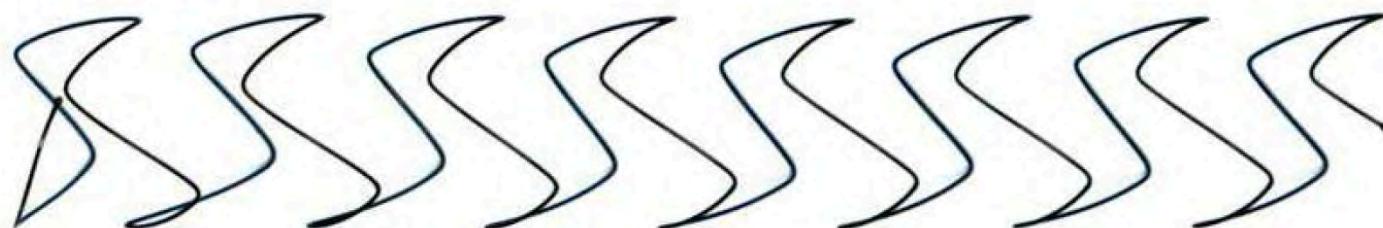


Figure 2 Apreo Endobronchial System



Note: Apreo Delivery System shaft is coiled for purposes of the photograph

Figure 3 Apreo Implant



Right Lung

	RB1	RB2	RB3
Emphysema Surrogate - LAA-950HU (%)	67	65	42
Air Trapping Surrogate - LAA-856HU (%)	88	87	72
Total Inspiratory Air Volume (cc)	737	540	399
Path Length Segmental Bronchus to Pleura (mm)	94.4	104.2	119.3
Avg lumen diameter (mm)	6.5	5.4	5.7
Selected Implant Length (mm)			



	RB4	RB5
Emphysema Surrogate - LAA-950HU (%)	9	7
Air Trapping Surrogate - LAA-856HU (%)	50	30
Total Inspiratory Air Volume (cc)	290	151
Path Length Segmental Bronchus to Pleura (mm)	120.2	92.6
Avg lumen diameter (mm)	4.9	5.4
Selected Implant Length (mm)		



	RB6	RB7	RB8	RB9	RB10
Emphysema Surrogate - LAA-950HU (%)	23	15	37	26	15
Air Trapping Surrogate - LAA-856HU (%)	69	32	65	67	53
Total Inspiratory Air Volume (cc)	320	78	141	353	180
Path Length Segmental Bronchus to Pleura (mm)	101.4	95.9	141.9	129.7	112.2
Avg lumen diameter (mm)	5.6	3.5	4.3	5.2	5.0
Selected Implant Length (mm)					

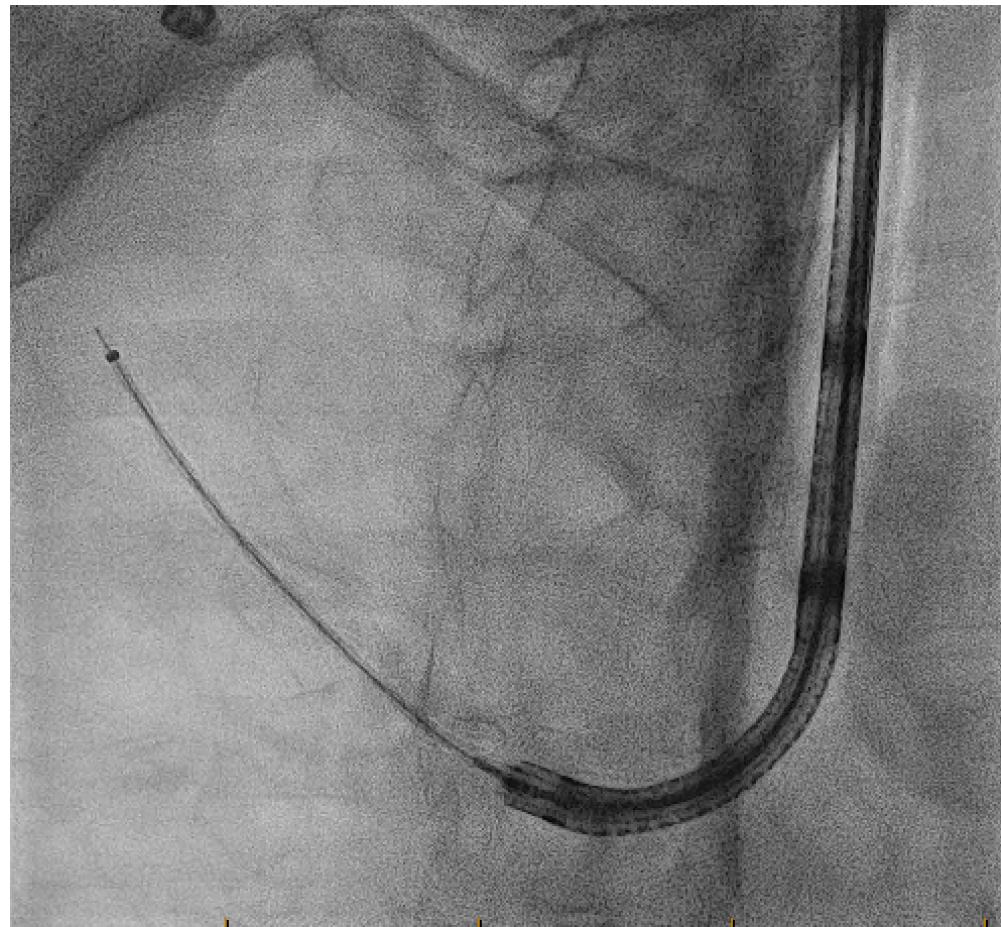


Left Lung



	LB1	LB2	LB3	LB4	LB5
Emphysema Surrogate - LAA-950HU (%)	62	64	41	35	19
Air Trapping Surrogate - LAA-856HU (%)	83	88	77	78	47
Total Inspiratory Air Volume (cc)	385	64	384	254	406
Path Length Segmental Bronchus to Pleura (mm)	100.5	81.2	94.0	86.0	167.0
Avg lumen diameter (mm)	5.5	2.8	6.0	4.5	4.9
Selected Implant Length (mm)					

	LB6	LB8	LB9	LB10
Emphysema Surrogate - LAA-950HU (%)	56	48	49	23
Air Trapping Surrogate - LAA-856HU (%)	87	76	83	64
Total Inspiratory Air Volume (cc)	312	361	326	169
Path Length Segmental Bronchus to Pleura (mm)	72.1	123.6	132.8	100.3
Avg lumen diameter (mm)	5.9	5.0	4.9	5.2
Selected Implant Length (mm)				



+

Name:

Sex:

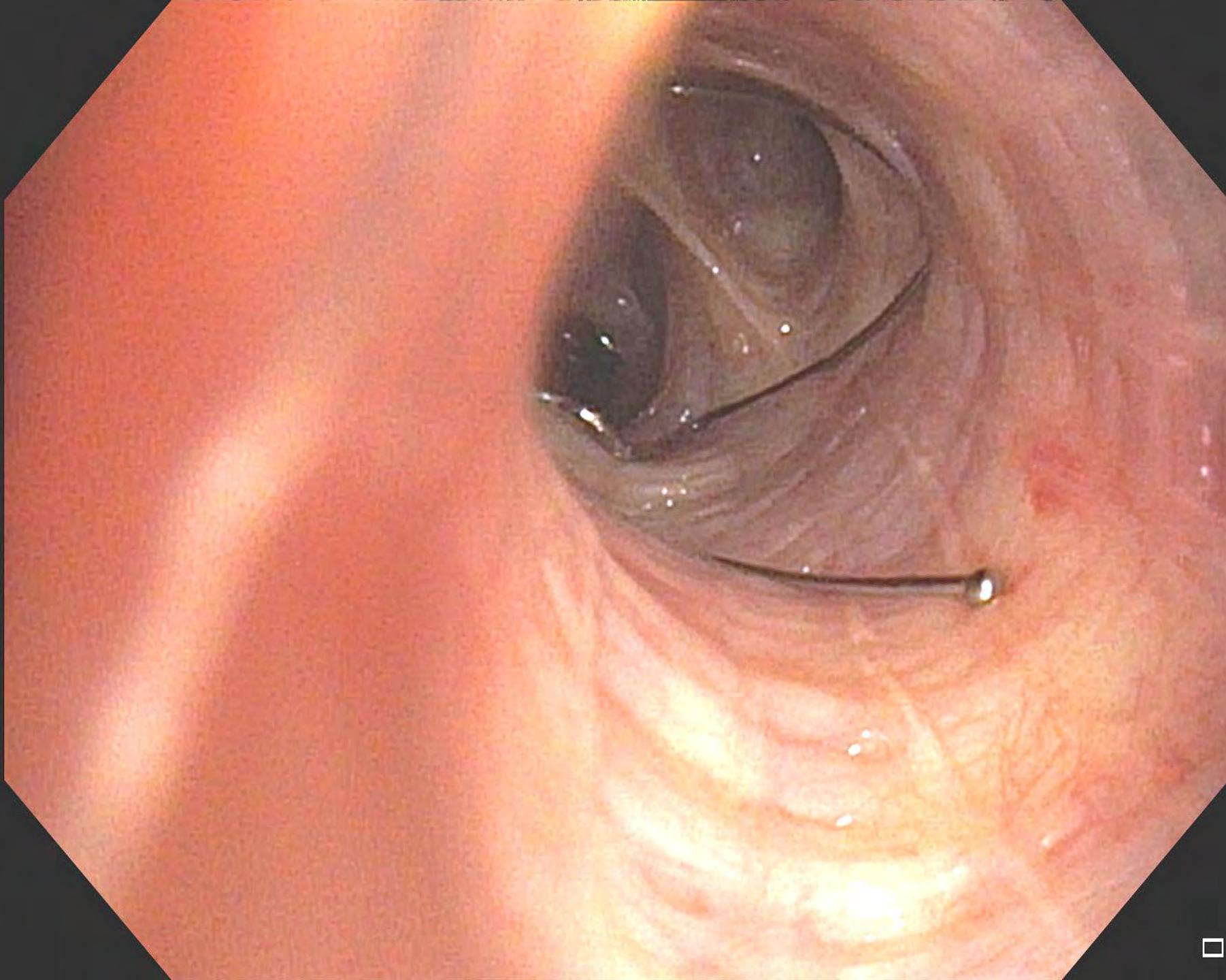
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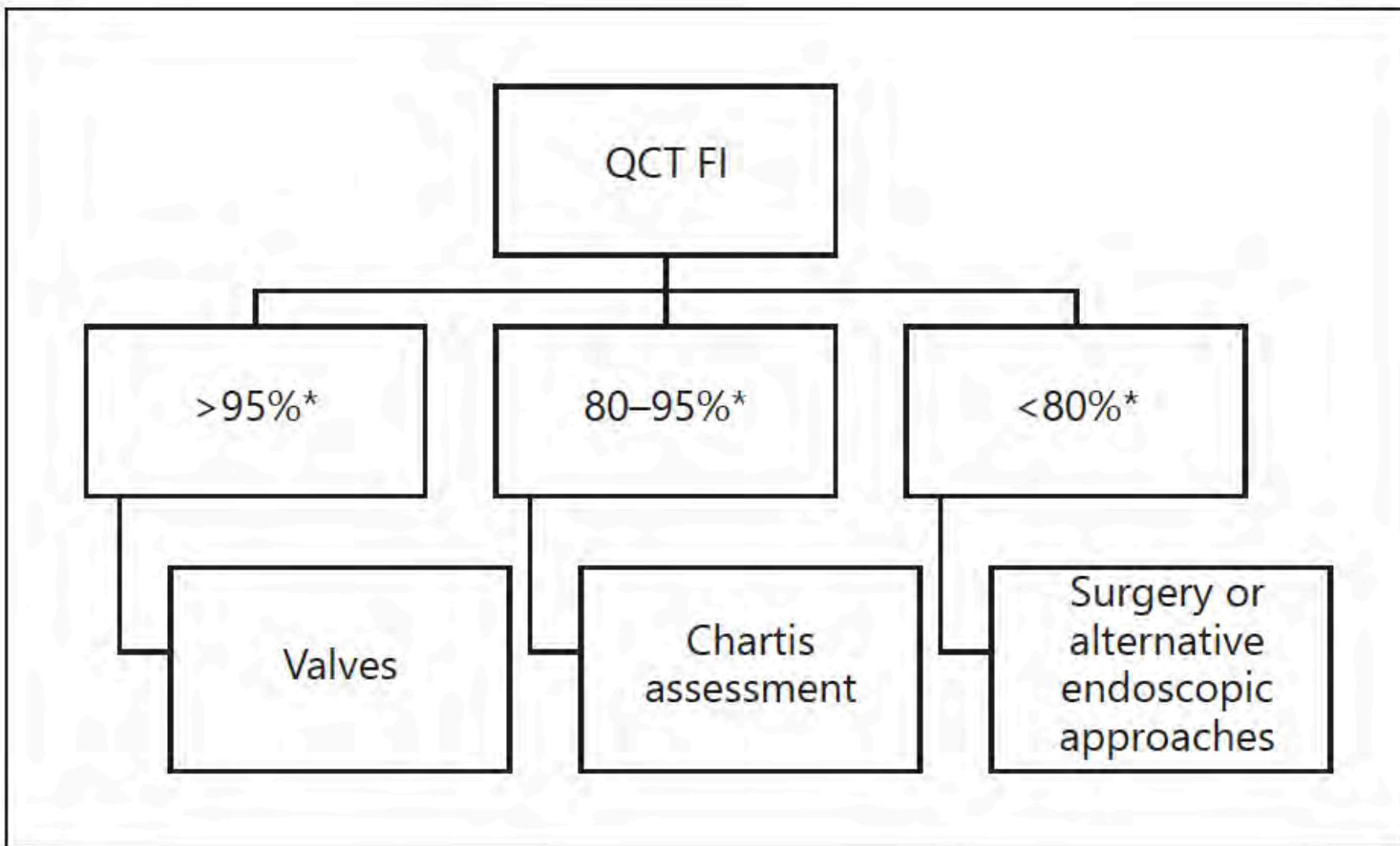


Measurement Parameter Date	Medication	Spiro			Body			Diff SB			
		FEV1	FVC	FEV...	TLC	FRCpl	RV	DLCO	KCO	VA	DLCQc
		(L)	(L)	(%)	(L)	(L)	(L)	(m...)	(m...)	(L)	(m...)
29/05/2023		0.50	1.34	37	6.88	6.02	5.45	6.49	2.23	2.90	6.49
29/05/2023	Salbutamol	0.48	1.54	31							
22/06/2023		0.51	1.78	29							
22/06/2023		0.54	2.01	27	6.92	5.98	5.26	6.45	1.99	3.24	6.45
28/06/2023		0.66	2.13	31							
28/06/2023	Salbutamol	0.70	2.14	33	6.70	5.46	4.55	7.46	1.64	4.55	7.46
24/07/2023		0.64	2.15	30							
24/07/2023	Salbutamol	0.66	2.09	32	6.54	5.43	4.41	6.49	1.50	4.33	6.88
27/07/2023		0.66	2.17	31							
27/07/2023	Salbutamol	0.67	2.10	32	6.40	5.24	4.20	6.01	1.45	4.13	6.01



Measurement Parameter	Medication	Spiro			Body			Diff SB			
		FEV1	FVC	FEV...	TLC	FRCpl	RV	DLCO	KCO	VA	DLCOc
		(L)	(L)	(%)	(L)	(L)	(L)	(m...)	(m...)	(L)	(m...)
12/05/2023		0.41	1.38	30	6.05	5.14	4.85				
12/05/2023	Salbutamol	0.51	1.69	30							
22/06/2023		0.49	1.60	31							
22/06/2023	Salbutamol	0.45	1.65	27	5.81	4.89	4.17	4.86	1.97	2.47	5.27
29/06/2023		0.55	1.93	28							
29/06/2023	Salbutamol	0.58	2.16	27	5.84	4.77	3.71	6.76	1.91	3.54	6.76
24/07/2023		0.49	1.73	29							
24/07/2023	Salbutamol	0.49	1.68	29	5.95	4.98	4.13	5.45	1.83	2.97	5.45
26/07/2023		0.42	1.67	25							
26/07/2023	Salbutamol	0.49	1.87	26	5.60	4.54	3.70				









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