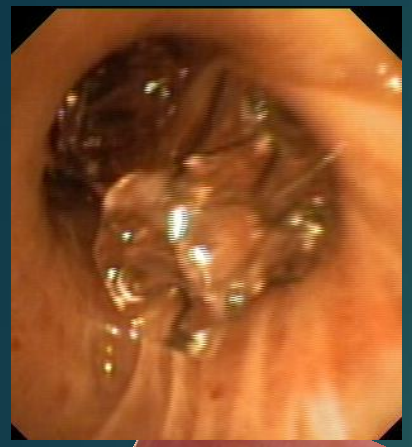
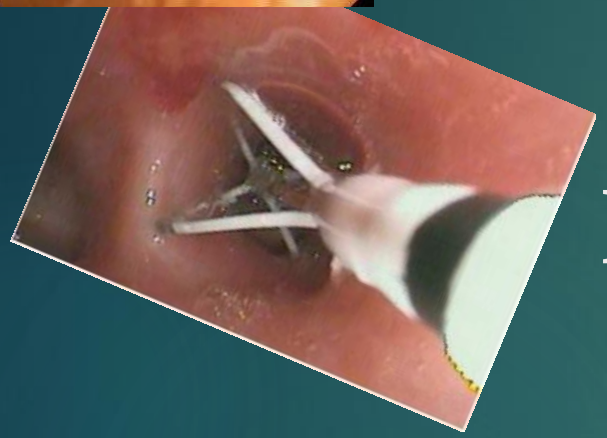




Βρογχοσκοπικές θεραπείες ΧΑΠ και άσθματος;;

BLVR/BT/TLD: *Επιλογή ασθενών και μέθοδοι*

Γρ. Στρατάκος MD, FCCP

Επ. Καθηγητής Πνευμονολογίας

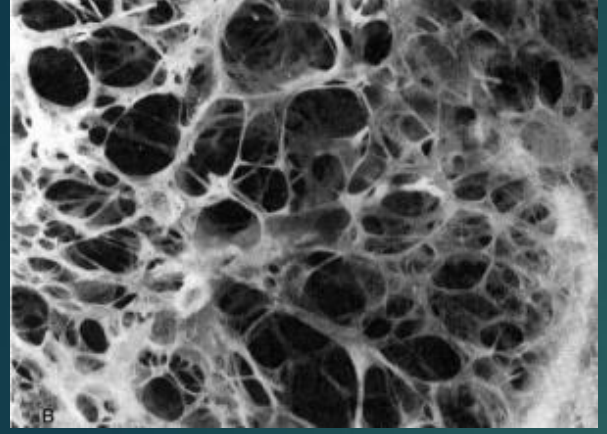
Μονάδα Επεμβατικής Πνευμονολογίας,

1η Πνευμονολογική Κλινική ΕΚΠΑ, ΝΝΘΑ «Σωτηρία»

"Η ΣΩΤΗΡΙΑ"

Εθνικό και Καποδιστριακό ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ

(Βαρύ)
Πνευμονικό Εμφύσημα



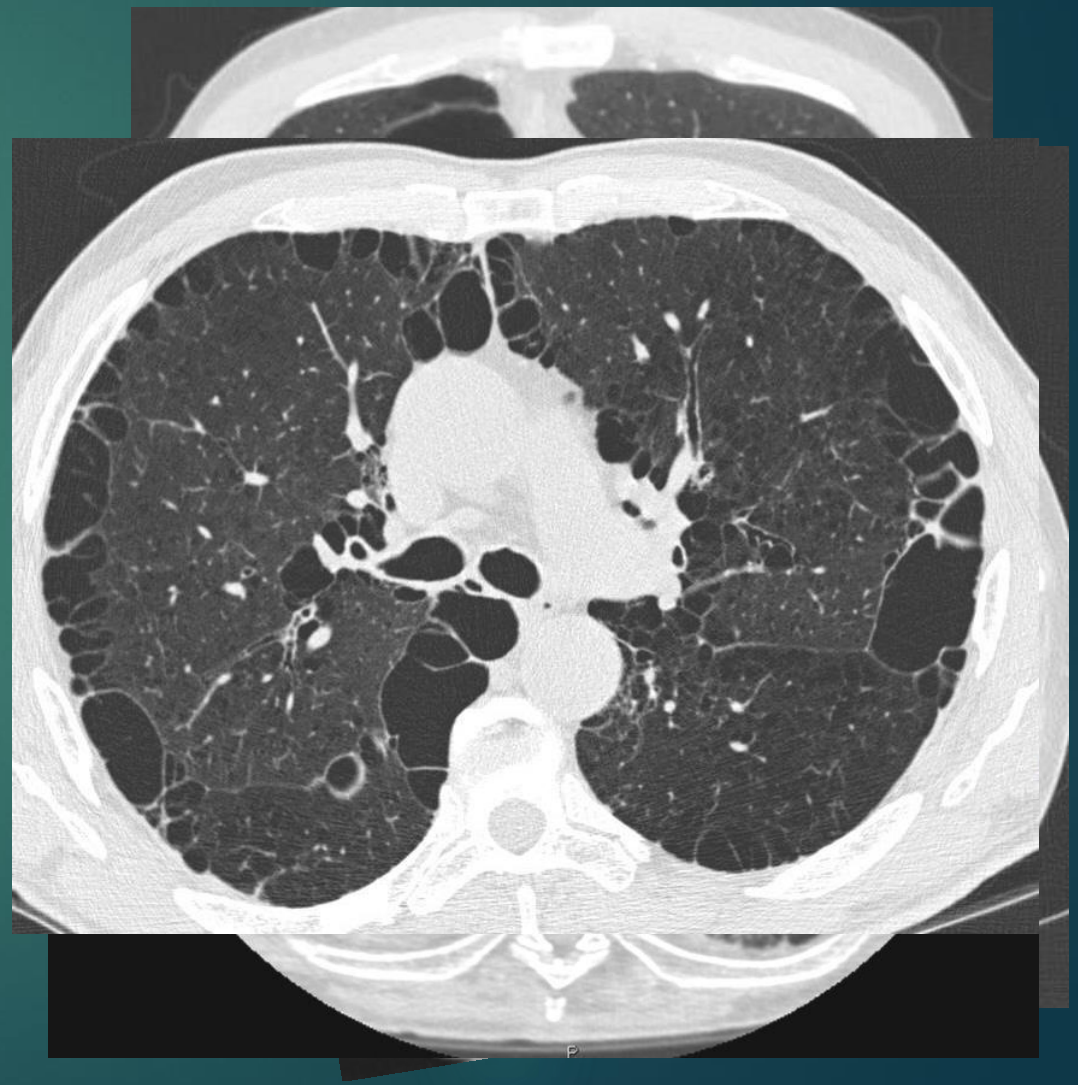
Ένας ορισμός για το εμφύσημα…

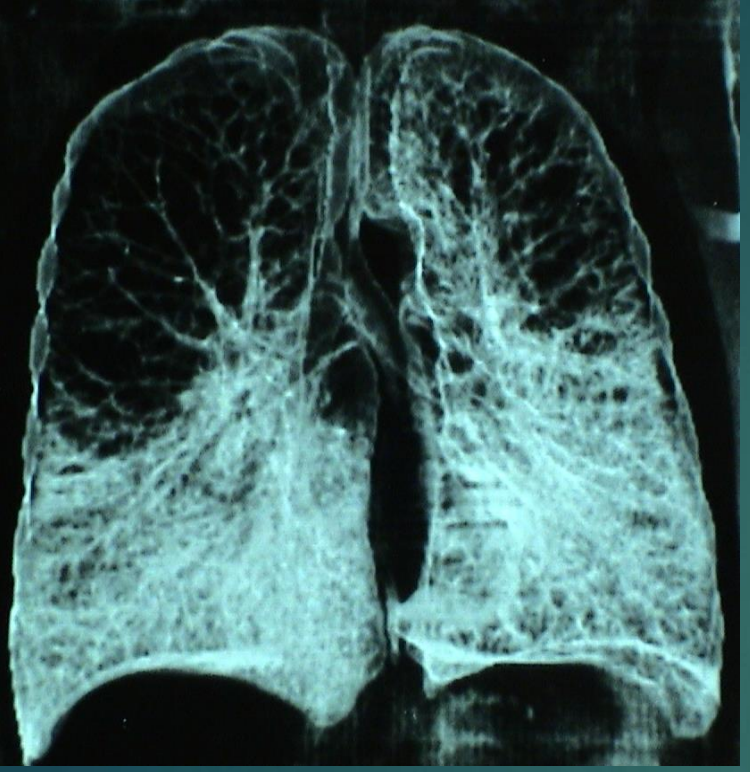
- Όλοι οι ασθενείς είχαν ΥΤ όπου υπολογίστηκε το ποσοστό των voxels με τιμές λιγότερο από **-950 Hounsfield** units.
- Η ομάδα αυτή συγκρίθηκε με σημαντικά κλινικά χαρακτηριστικά (outcomes)
- Οι ασθενείς με >5% εμφυσηματικό πνεύμονα (<-950 Hounsfield units), είχαν περισσότερες παροξύνσεις, χειρότερο St George's RQ και μεγαλύτερη θνητότητα.
- Η συσχέτιση αυτή ίσχυε μόνο για τους ασθενείς με αποφρακτικό σύνδρομο ($FEV_1/FVC < 70\%$ με GOLD criteria).

Association between Emphysema and Chronic Obstructive Pulmonary Disease Outcomes in the COPDGene and SPIROMICS Cohorts: A Post Hoc Analysis of Two Clinical Trials.
Am J Resp Criti Care Med, 2018;198: 265–267

FEV1/FVC<70, >5% (-950HU)
που δεν έχουν «ειδικού» τύπου νόσο:

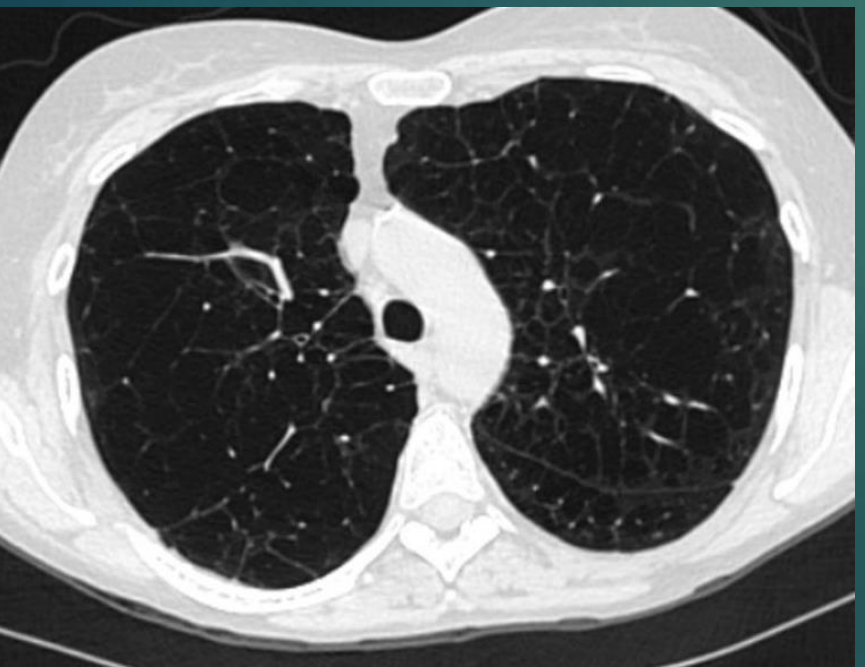
- A_1AT deficiency
- Bullous Disease
- Paraseptal Emphysema
- CPFE





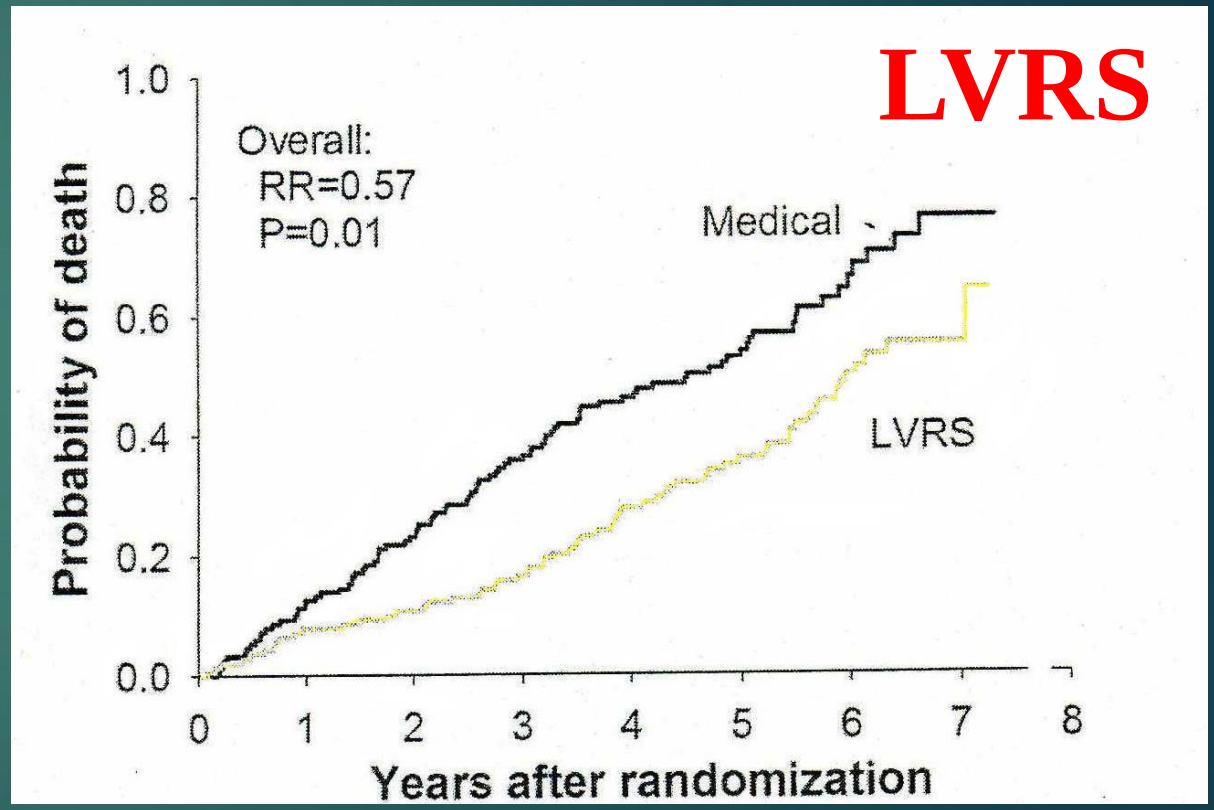
Κεντρολοβιώδες με εντόπιση στους άνω λοβούς DLCO> 20% και μειωμένη αντοχή στην άσκηση :

Low exercise capacity :post rehab baseline max work of ≤ 25 watts for women and ≤ 40 watts for men.



Nationa Emphysema Treatment Trial 1218 pts

LVRS

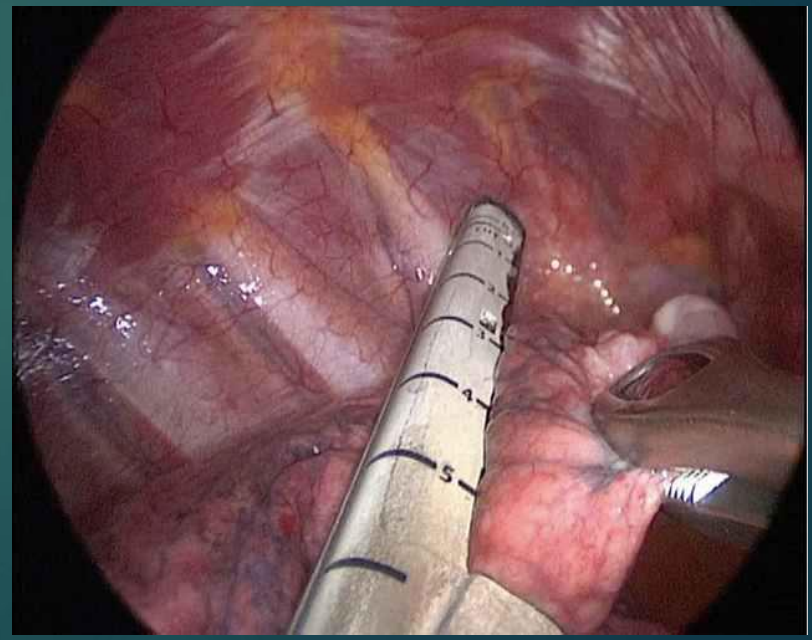


Ann Thorac Surg 2006;82:431-3

Lung Volume Reduction Surgery Since the National Emphysema Treatment Trial: Study of Society of Thoracic Surgeons Database

J Thorac Cardiovasc Surg. 2014 December ; 148(6): 2651–2658.

- Μεταξύ 2003 και 2011 (8.5 χρόνια) μόνο 538 ασθενείς <65 ετών χειρουργήθηκαν στις ΗΠΑ (20-118/έτος)
  Υπολογισμός ασθενών 4.7x 10^6
- FEV_1 31% pred κατά MO (έναντι 28% της NETT)
- Περισσότεροι ασθενείς έγιναν θωρακοσκοπικά
- Η θνητότητα σε ασθενείς όχι υψηλού κινδύνου ήταν παρ'όλα αυτά 3% μεγαλύτερη της NETT ($p<0.005$)



THE ANNALS OF THORACIC SURGERY

2018;105:379–385

Official Journal of The Society of Thoracic Surgeons and the Southern Thoracic Surgical Association

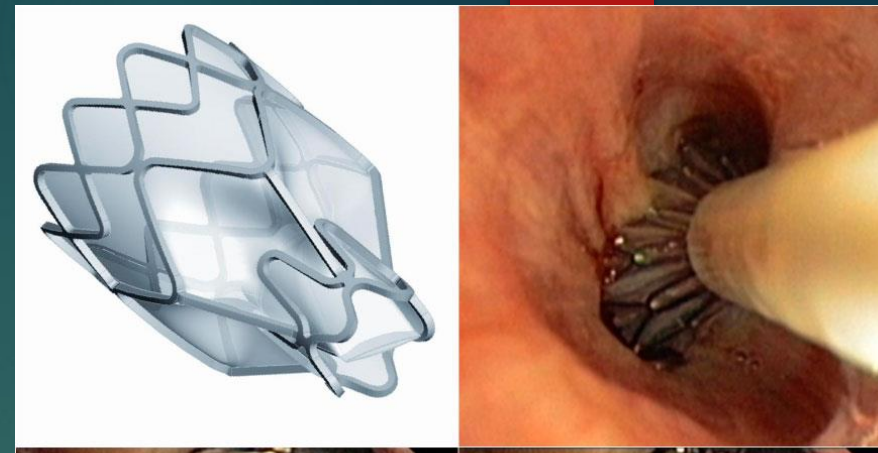
- 33 pts 2009-2014. DLCo <20% The 90-day mortality was 0%.
- FEV1 % at 3 months increased from 23% to 29% ($p < 0.001$).
- Dlco increased from 15% to 24% ($p < 0.001$), and median hyperinflation decreased from 76% to 63% ($p < 0.001$).
- A prolonged air leak exceeding 7 days occurred in 48.5%, and 6 required reoperation for fistula closure

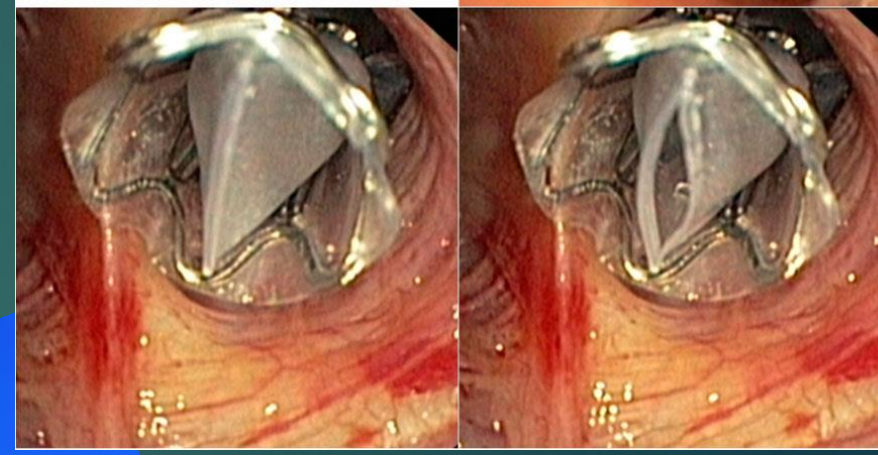
- Selected patients with severely impaired DLCo of less than 20% can cautiously be considered as potential candidates if hyperinflation is severe and the lungs show areas with advanced destruction as targets for resection.

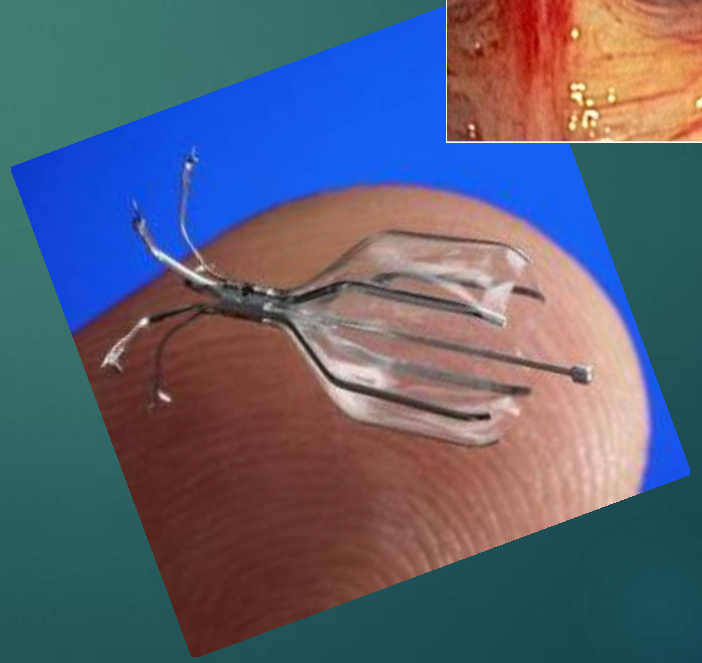
Endoscopic LVR

Α. Τροποποίηση αεραγωγών και ροής
Endobronchial valves

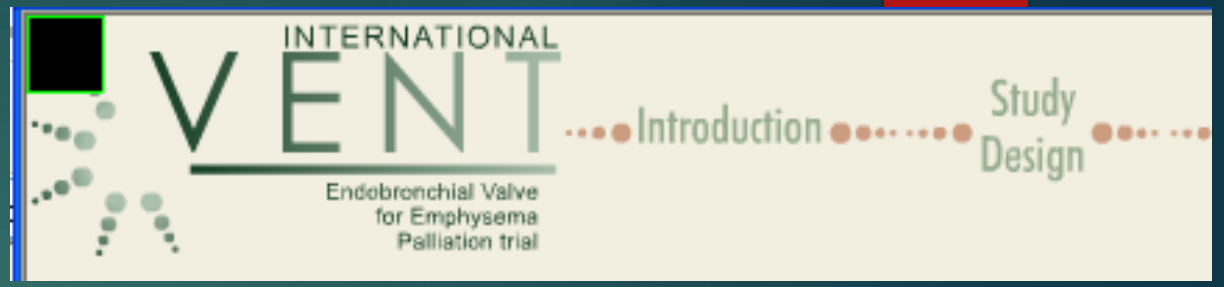
- Emphasis-Zephyr (Pulmonx): One-way Valve
- Spiration: Umbrella







Pulmonx valves

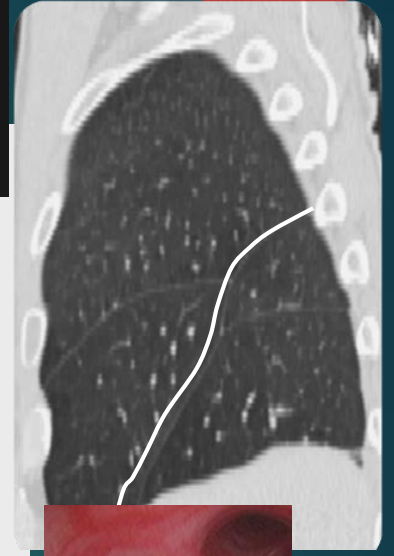


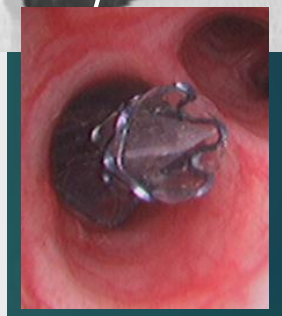
nal medical treatment

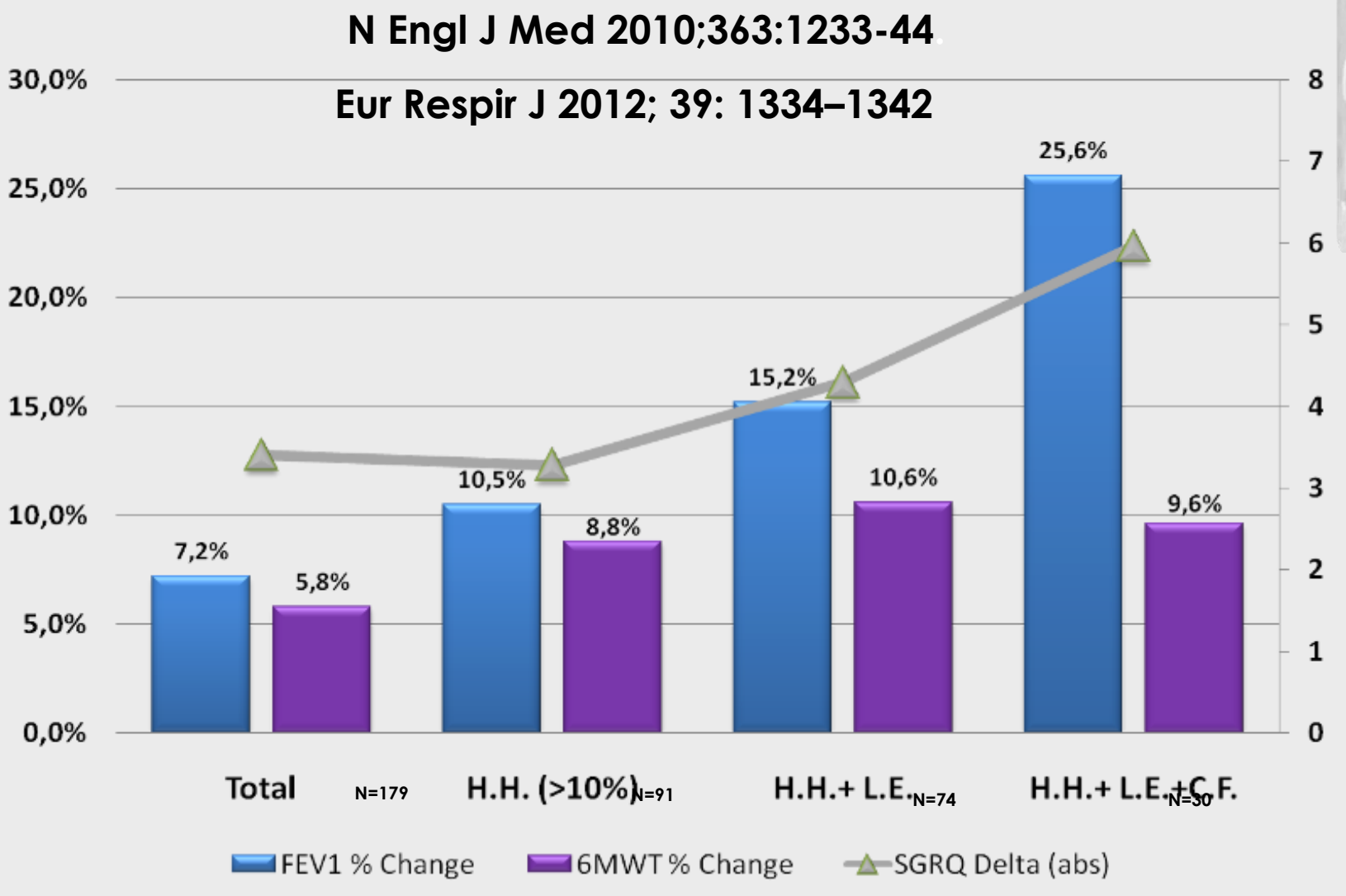
	Primary Safety Endpoint 6 months			Additional Safety Analysis 12 months (cumulative)		
	Control n=101	EBV n=220	p value	Control n=101	EBV n=220	p value
Major Complication Composite (MCC)	1.1%	6.1%	0.0748	4.6%	10.4%	0.1724
Death	0.0%	2.8%	0.1867	3.5%	3.7%	1.0000
Empyema	0.0%	0.0%	----	0.0%	0.0%	----
Massive Hemoptysis	0.0%	0.5%	1.0000	0.0%	0.5%	1.0000
Distal Pneumonia	NA	1.4%	----	NA	4.2%	----
Pneumothorax/ air leak > 7 days	1.1%	1.4%	1.0000	1.2%	1.9%	1.0000

VENT Responder Summary

(Delta Treatment & Control @ 6mons)







H.H. – High Heterogeneity, L.E. – Lobar Exclusion Achieved, C.F. – Low Collateral Flow

Lancet 2015; 386: 1066–73

Bronchoscopic lung volume reduction with endobronchial valves for patients with heterogeneous emphysema and intact interlobar fissures (the BeLieVeR-HIFi study): a randomised controlled trial

	BLVR		Control (n=24)	p value*
	All (n=23)	CV-positive excluded (n=19)		
FEV_1	9 (39%)	--	1 (4%)	0·0044
>15% improvement	--	9 (47%)	1 (4%)	0·0022
RV	11 (48%)	--	7 (29%)	0·24
0·35 L reduction[20]	--	11 (58%)	7 (29%)	0·07
6MWD	12 (52%)	--	4 (17%)	0·012
26 m improvement[20]	--	12 (63%)	4 (17%)	0·004
Endurance cycle time	10 (43%)	--	2 (8%)	0·008
105 s improvement[21]	--	9 (47%)	2 (8%)	0·005
SGRQc	11 (48%)	--	11 (46%)	1·0
4 points reduction[21]	--	11 (58%)	11 (46%)	0·5
CAT	13 (57%)	--	7 (29%)	0·080
2 points reduction[22]	--	13 (68%)	7 (29%)	0·015

Data are n (%). CV-positive=collateral ventilation using Chartis system. BLVR=bronchoscopic lung volume reduction. FEV_1=forced expiratory volume in 1 s. RV=residual volume. 6MWD=6 min walking distance. SGRQc=St George's respiratory questionnaire for chronic obstructive pulmonary disease (COPD). CAT=COPD assessment test score. * Fisher's exact test (this analysis does not include imputed values).

Table 5: Responder rates according to lung function, health status, and exercise criteria

(n=24)	Between group
7-7.1)	20.9 (4.3-37.5)
3-0.0)	-0.4 (-0.7-0.0)
1-1.7)	2.8 (0.3-5.6)

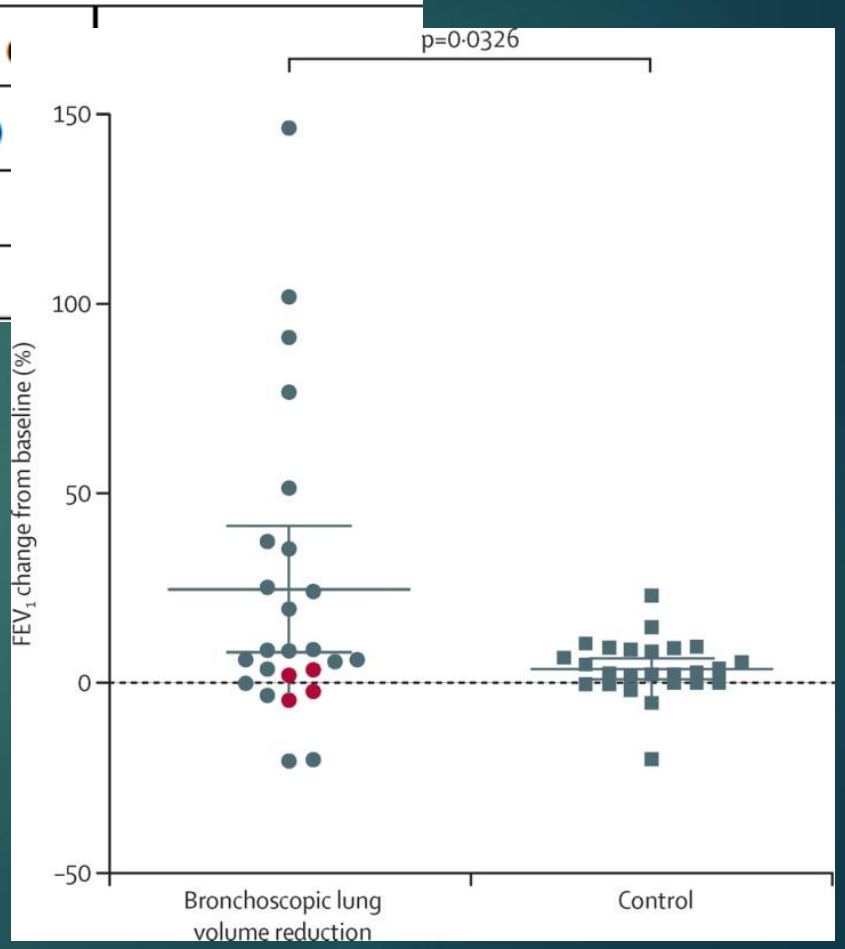


Table 3. Serious Adverse Events during 6 Months of Follow-up.*

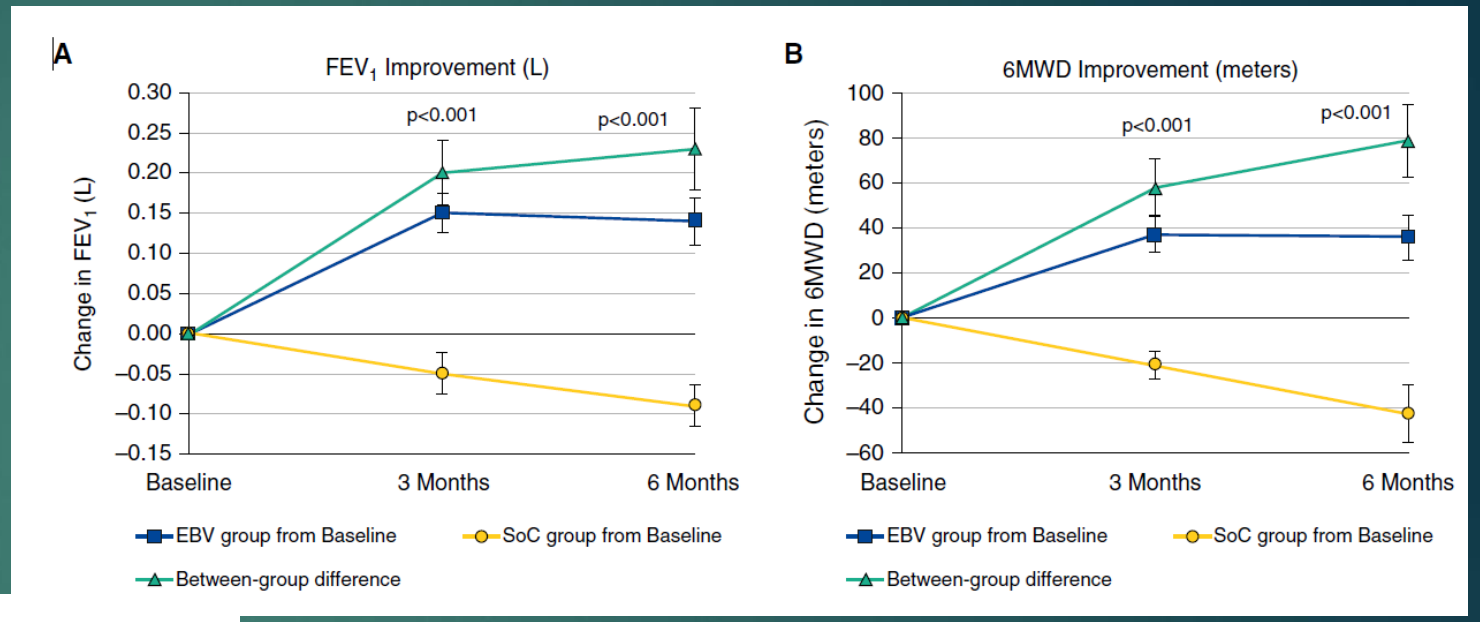
Event	EBV Group (N=34)	Control Group (N=34)	P Value†
	no. (%)		
Total no. of serious events	23	5	<0.001
Pulmonary events			
Death	1 (3)‡	0	1.00
COPD exacerbation with hospitalization	4 (12)	2 (6)	0.67
Pneumonia	2 (6)	1 (3)	1.00
Pneumothorax	6 (18)	0	0.02
Resolved ≤14 days after onset, without drainage	1 (3)	0	1.00
Resolved ≤14 days after onset, with drainage	2 (6)	0	0.49
Required temporary valve removal	1 (3)§	NA	NA
Required permanent valve removal because of recurrent pneumothorax	1 (3)	NA	NA
Required permanent valve removal, after temporary removal and reimplantation, because of recurrent pneumothorax	1 (3)	NA	NA
Other EBV-related events requiring permanent removal of all valves			
Torsion of the bronchus	2 (6)¶	NA	NA
Pneumonia distal to valve	1 (3)‖	NA	NA
Increased sputum, dyspnea, or coughing without patient-perceived treatment benefit	2 (6)	NA	NA
Other EBV-related events requiring valve replacement			
Valve migration	2 (6)	NA	NA
Valve expectoration	0	NA	NA
Valve dislocation due to formation of granulation tissue	1 (3)	NA	NA
Increased sputum, dyspnea, or coughing	1 (3)	NA	NA
Stroke	1 (3)	2 (6)	1.00

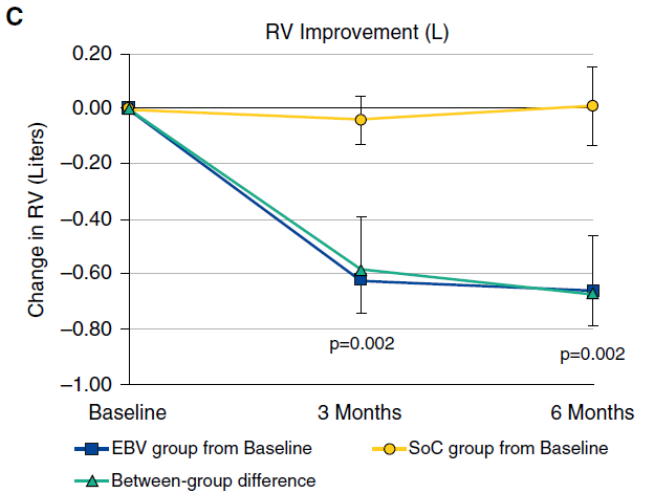
N Engl J Med 2015;373:2325-35

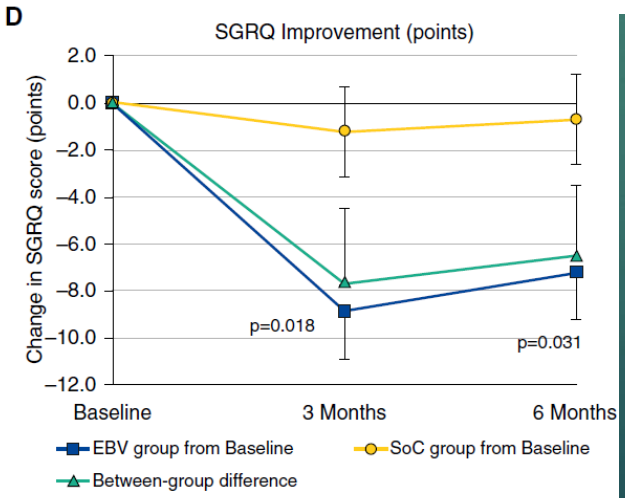
A Multicenter Randomized Controlled Trial of Zephyr Endobronchial Valve Treatment in Heterogeneous Emphysema (TRANSFORM)

Am J Respir Crit Care Med 2017;196:1535–1543

97 pts (65 vs32)
55.4% of EBV and 6.5% of SoC subjects had an FEV_1 improvement of ≥12%.





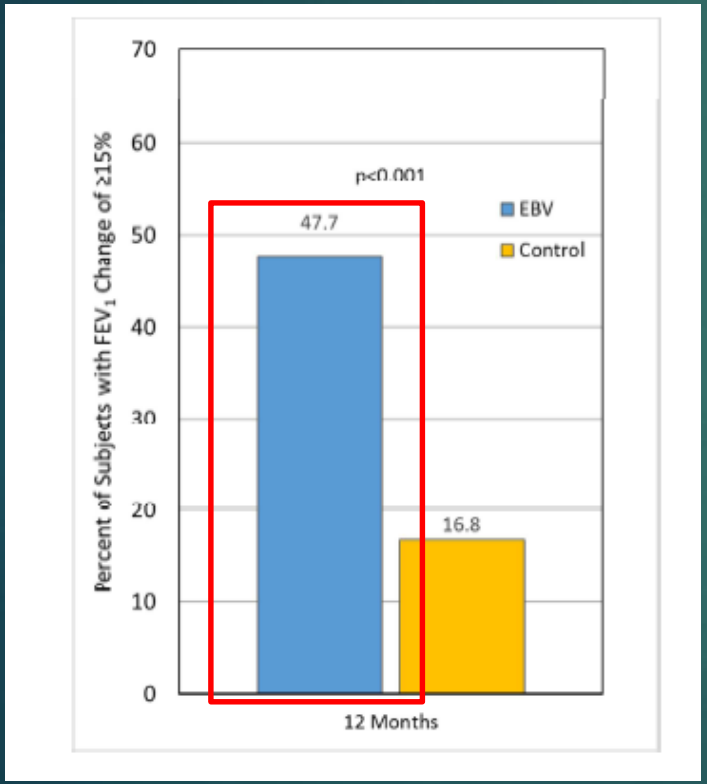


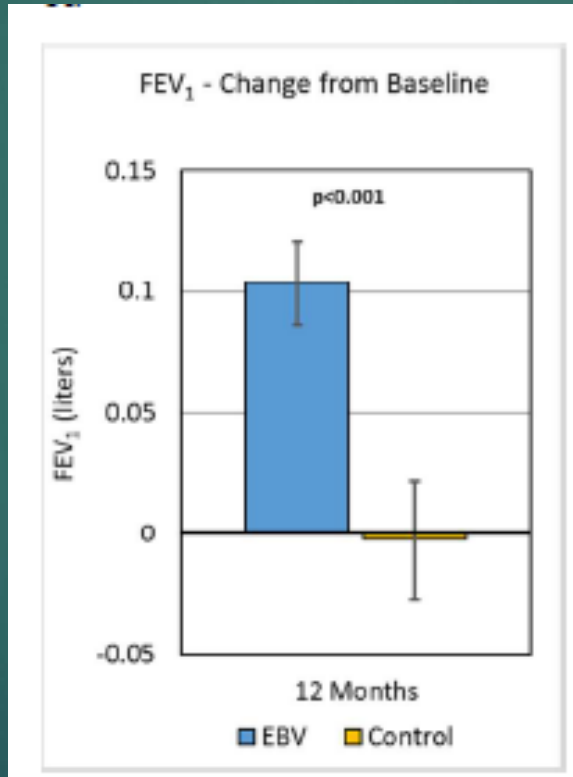
LIBERATE STUDY:

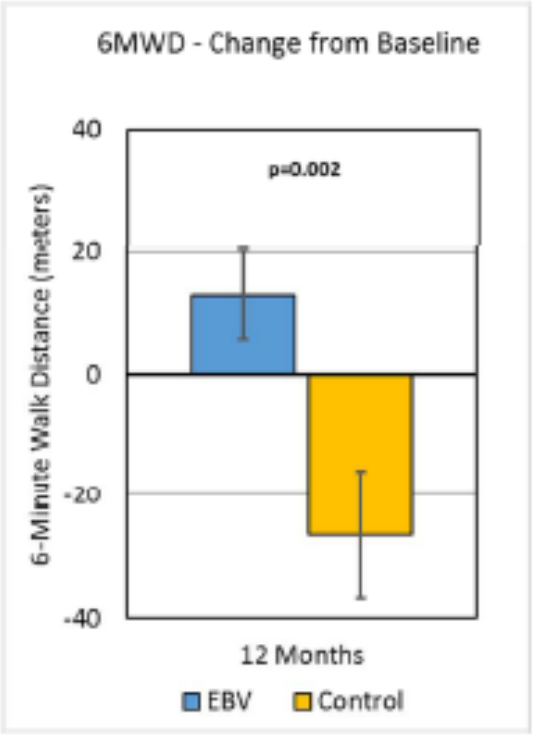
Multicenter RCT to evaluate effectiveness and safety of Zephyr® Endobronchial Valve EBV® out to 12-months.

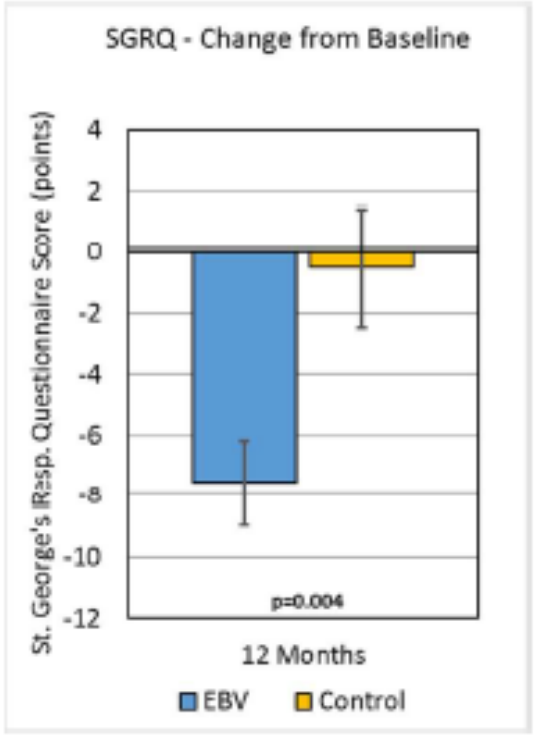
Heterogeneous emphysema with little to no collateral ventilation (CV) in the treated lobe. **190 subjects, 128 EBV and 62 controls.**

Pneumothorax was the most common serious adverse in 34/128 (26.6%) of EBV subjects. Four deaths occurred in the EBV group during this phase, and one each in the EBV and SoC groups between 46 days and 12-months.

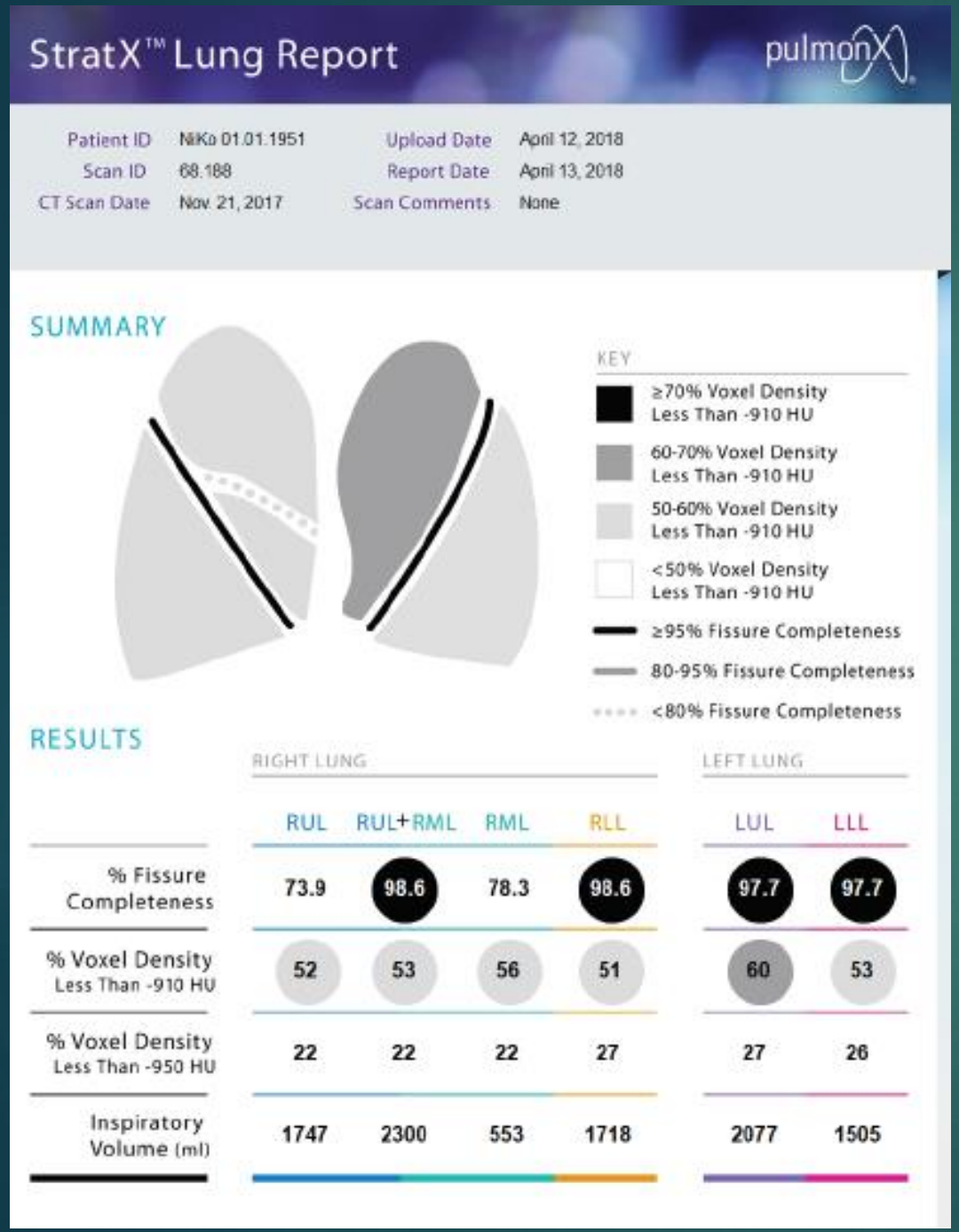








Am J Respir Crit Care Med 2018;198:1151–1164



STRAT-X
assessment system

FEV1<50%, TLC> 100%, RV>150%, RV/TLC >0.58, DLCO > 20%, 6MWT 150-400m &MRC ≥3

With complete Fissures and no collateral ventilation

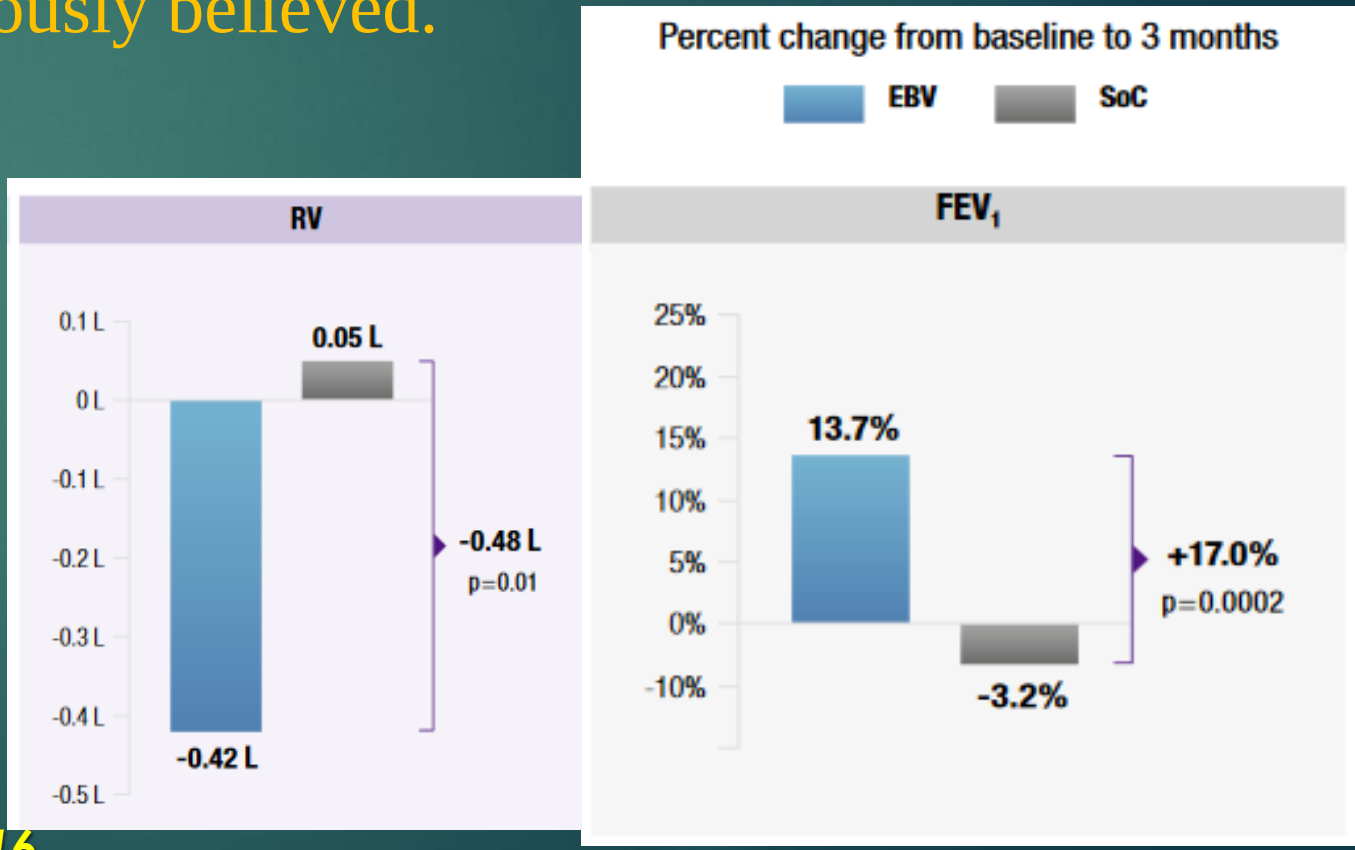
Optimal pharmacological and non pharmacological treatment

ΟΜΟΙΟΓΕΝΕΣ ΕΜΦΥΣΗΜΑ: IMPACT - RCT

93 ασθενείς με σοβαρό, ομοιογενές εμφύσημα και απουσία παράπλευρου αερισμού στον λοβό-στόχο.

These data indicate that EBV therapy can benefit substantially more patients than previously believed.

EBV-treated pts experienced improved exercise tolerance, with a 40-meter increase over the control group in the 6MWD, and improved QuoL, with a 10-point improvement in the SGRQ score over the control group.

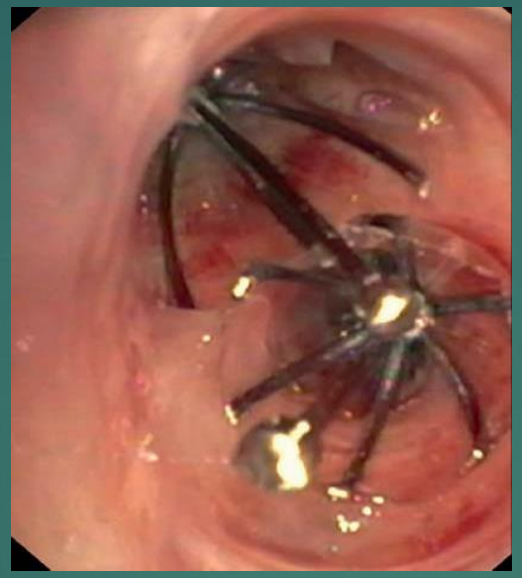


Valipour A, et al. Am J Respir Crit Care Med. 2016.

Endoscopic LVR

Inferior Results

Spiration Intrabronchial Valves (IBV)

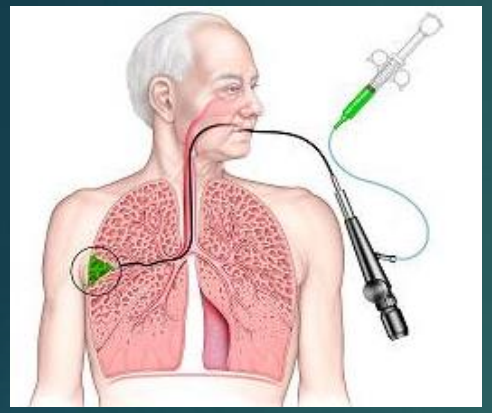


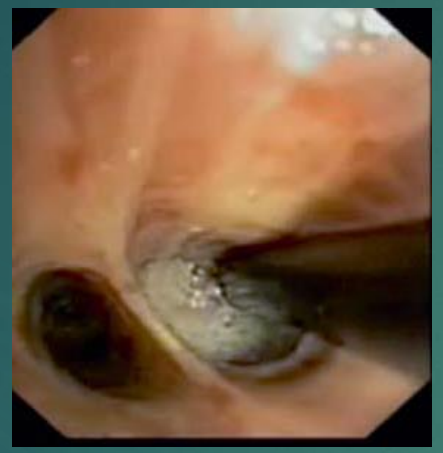
Multicentre European study for the treatment of advanced emphysema with bronchial valves

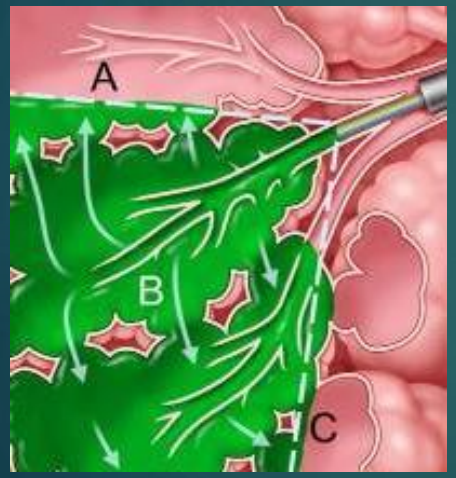
Eur Respir J 2012; 39: 1319–1325

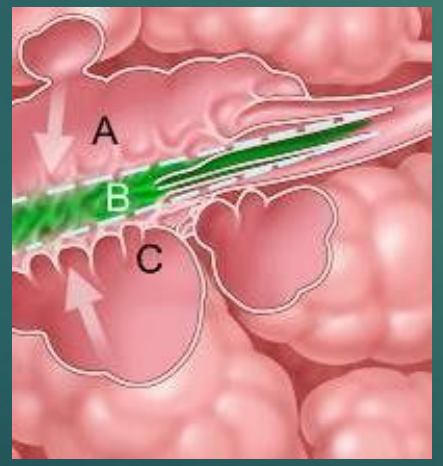
Treatment with bronchial valves without complete lobar occlusion in both upper lobes was safe, but not effective in the majority of patients

Β. Τροποποίηση πνευμονικού παρεγχύματος :
1. Polymer sealant LVR









Chest 2007;131:1108–1113.

Criner G et al. BLVR in Advanced Upper lobe Emphysema: Phase 2 Results.
Am J Respir Crit Care Med 2009; 179:791-798
Bilateral upper lobes treatment (8 subsegments).
Increase of FEV_1 by 15% FVC 9% TLC 6% and SGRQ in 12 weeks. NO significant complications.
Rafaely Y et al. BLVR in Advanced Homogeneous emphysema. Eur Respir J 2010;36:20-27
17 pts, (Upper lobes or apical of the lower lobes) 29-47% increase >12% in FEV1 and FVC 65-75% improvement of SGRQ No deaths. 20% AE COPD

CHEST

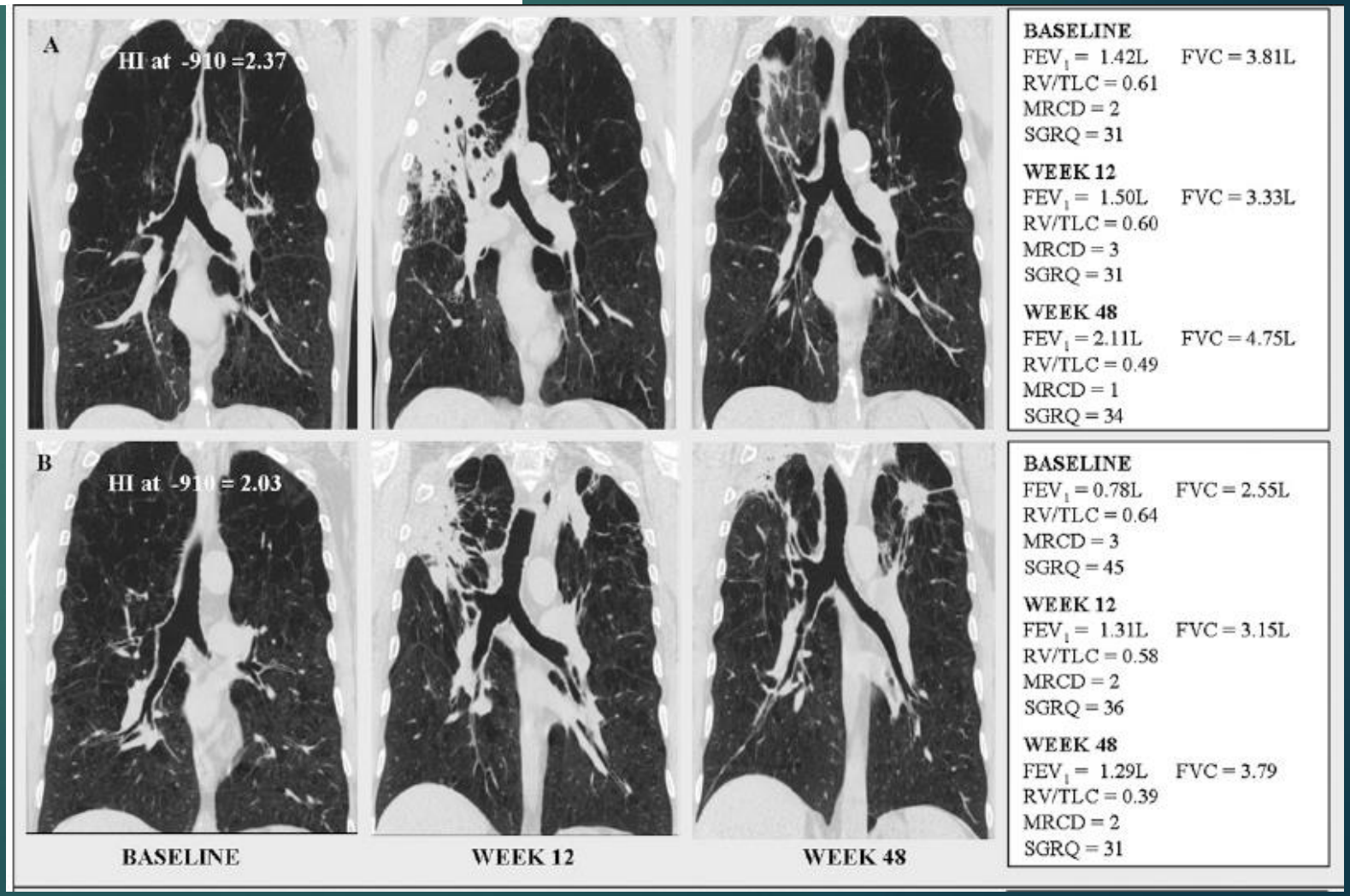
Original Research

COPD

Bilateral Endoscopic Sealant Lung Volume Reduction Therapy for Advanced Emphysema

Mordechai R. Kramer, MD, FCCP; Yael Refaely, MD; Nimrod Maimon, MD; Dror Rosengarten, MD; and Oren Fruchter, MD

CHEST 2012; 142(5):1111–1117

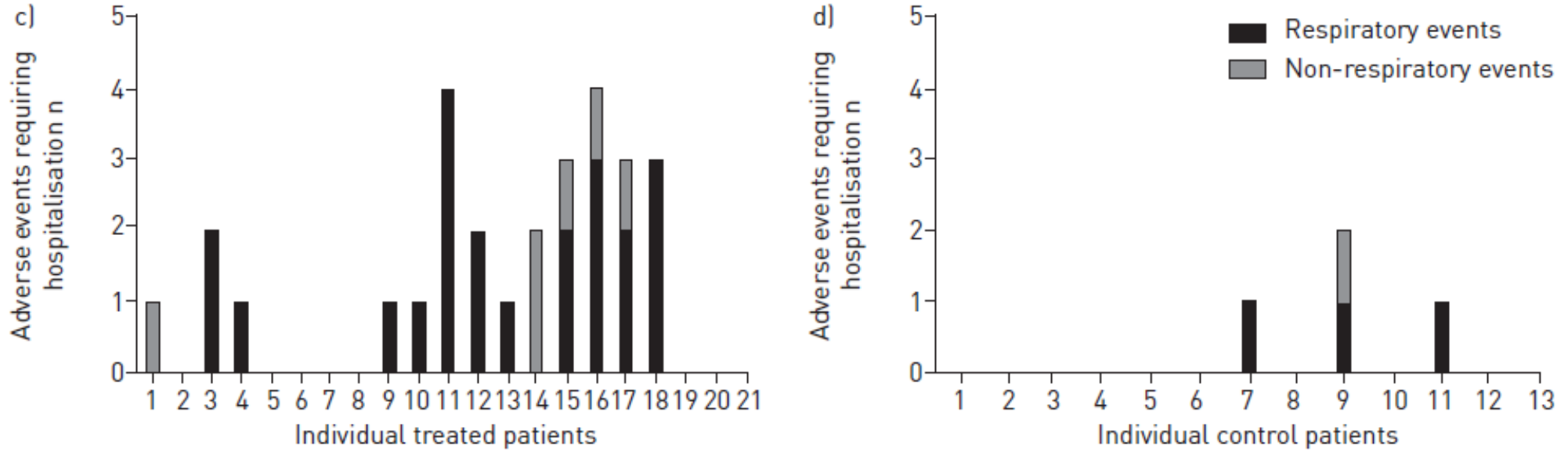


ORIGINAL ARTICLE
IN PRESS | CORRECTED PROOF

Eur Respir J. 2015 Apr 2. [Epub ahead of print]

ASPIRE

A randomised trial of lung sealant *versus* medical therapy for advanced emphysema

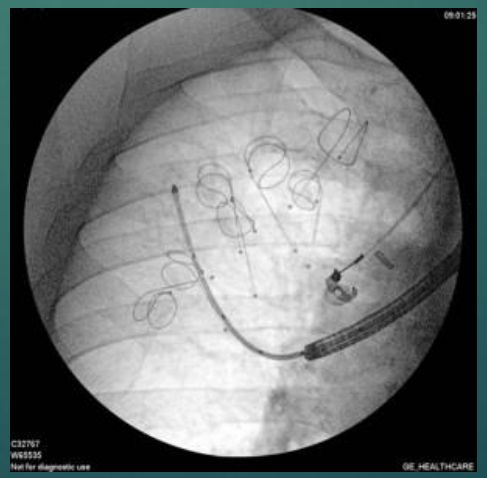


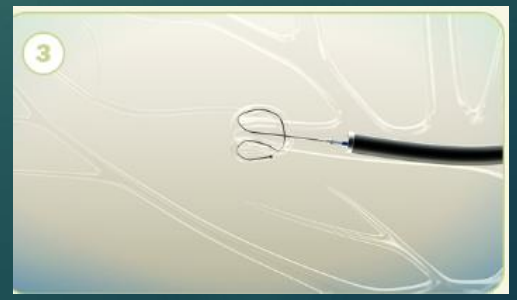
	Δ from baseline	6m Treatment G	6m Control G	p
Subjects n FEV1# SGRQ¶ mMRC+ 6MWD§	FEV1(% ; mL)	26±42 %; 174±317mL	3±11; 31±145	0.03
	SGRQ(U)	-13±15	-3±6	0.02
	MRCD(U)	-0.6±1.2	-0.5±0.7	0.61
	6MWT(m)	16±52	-17±46	0.08

Data are p
George's R
6-min walki
FEV1 from t
[25]; §: MCI

Modifying the pulmonary parenchyma: Endobronchial coils made from nitinol– Pneum RX®

- Introduction under fluoroscopy.
- Not affected by collateral ventilation.
- 10 coils per lobe for volume reduction.
- Not in extreme destruction of the parenchyma-improve elastic properties of the lung.
- Once introduced difficult if not impossible to remove.





RESET trial: randomized, 22 pts vs 23 controls

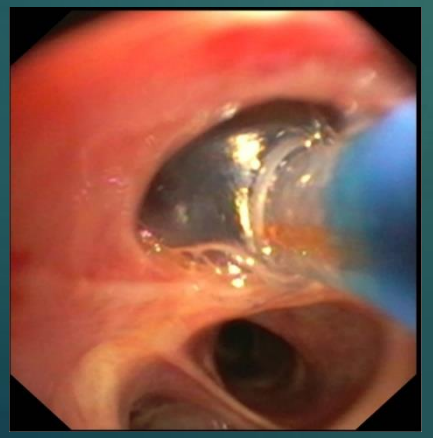
	Treatment	Usual care	Between group difference in change from baseline	P value
Primary outcome				
SGRQ	-8.11(-13.83 to -2.39)	0.25 (-5.58 to 6.07)	-8.36 (-16.24 to -0.47)	0.04
Secondary outcome				
TLC (L)	-0.24 (-0.38 to -0.10)	-0.13 (-0.27 to 0.01)	-0.11 (-0.29 to 0.07)	0.22
RV (L)	-0.51 (-0.73 to -0.30)	-0.20 (-0.42 to 0.02)	-0.31 (-0.59 to -0.04)	0.03
6 MWT	51.15 (27.65 to 74.66)	-12.39 (-36.61 to 11.83)	63.55 (32.57 to 94.53)	<0.001
%change in FEV1	14.19 (6.84 to 21.55)	3.57 (-4.02 to 11.17)	10.62 (1.12 to 20.12)	0.03
mMRC	-0.24 (-0.57 to 0.09)	-0.09 (-0.44 to 0.26)	-0.15 (-0.60 to 0.30)	0.5

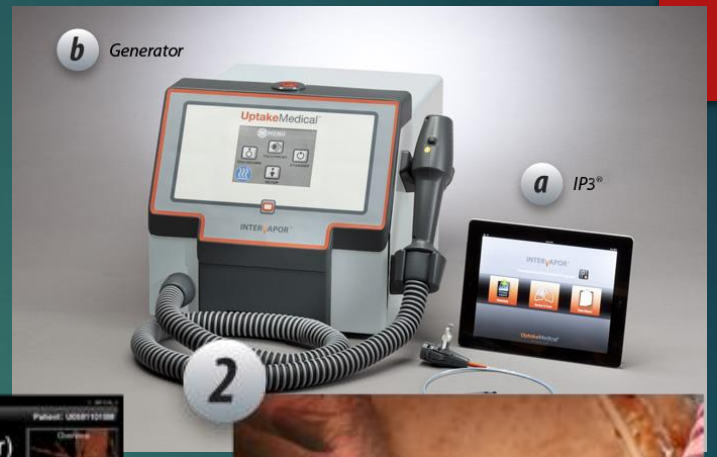
No between-group difference in serious adverse events

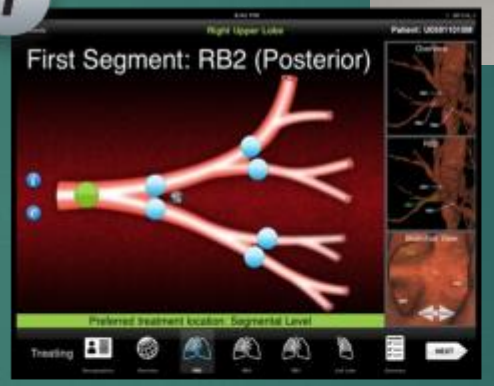
Lancet Respir.Med. 2013; 1: 233–40.

Modifying the pulmonary parenchyma: Bronchoscopic Thermal Vapor Ablation InterVapor® System

- Steam administration (5-10 cal/gr) with endobronchial catheter with balloon at segments of targeted lobe.
- Thermal damage that causes scarring and atelectasis.
- Not affected by collateral ventilation.

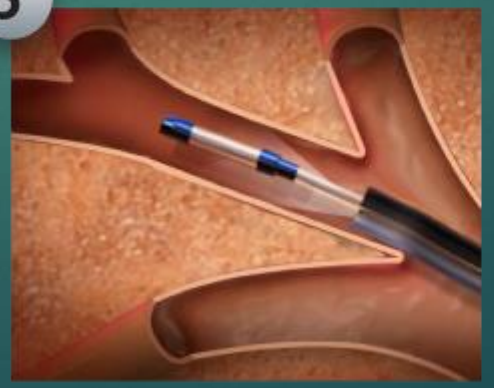




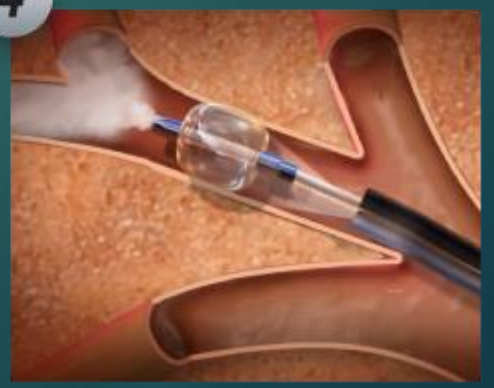


IP3 identifies airway targets for procedure

Bronchoscope is inserted into target segment airway



InterVapor catheter is placed



Occlusion balloon is inflated and

THE LANCET Respiratory Medicine

Vapor Ablation in the Presence of Incomplete Fissures: 12-Month Results from the STEP-UP Randomized Controlled Study

ULP- E, 45 patients, 24 control, one lobe treated per session.

	Bronchoscopic vapour ablation group	Control group	Difference between groups (95% CI)	p value
FEV_1 (mL)	70·5 (SD 179·9)	−32·2 (SD 114·3)	102·6 (30·5 to 174·8)	0·0060
FVC (mL)	110·2 (SD 395·4)	−128·3 (SD 409·2)	238·5 (28·6 to 448·3)	0·0269
Residual volume (mL)	−159·1 (SD 572·4)	78·3 (SD 470·0)	−237·4 (−499·2 to 24·5)	0·0747
FRC (mL)	−163·6 (SD 564·5)	82·6 (SD 417·4)	−246·2 (−490·0 to −2·5)	0·0477
6MWT (m)	8·8 (SD 66·5)	5·1 (SD 73·4)	3·6 (−33·3 to 40·6)	0·8442

FEV_1=forced expiratory volume in 1 s. FVC=forced vital capacity. FRC=functional residual capacity. 6MWT=6 min walk test.

Table: Change in secondary endpoint measures at 12 months after vapour ablation

47 patients: 23 to treatment and 24 to usual care . SGRQ response at 90 days after treatment was greater in the treatment group than it was in the usual care group (between-group difference in change from baseline **−8 ·36 points** [95% CI −16 ·24 to −0 ·47]; p=0 ·04).

Shah et al, Lancet Resp Med 2016

Lung Volume Reduction with Vapor Ablation in the Presence of Incomplete Fissures: 12-Month Results from the STEP-UP Randomized Controlled Study

Respiration 2016;92:397–403

- 78% of treated patients were found to have 1 or more incomplete fissures adjacent to a treated lobe and were considered to be CV+

Table 1. Results for primary efficacy endpoints for patients with incomplete fissures

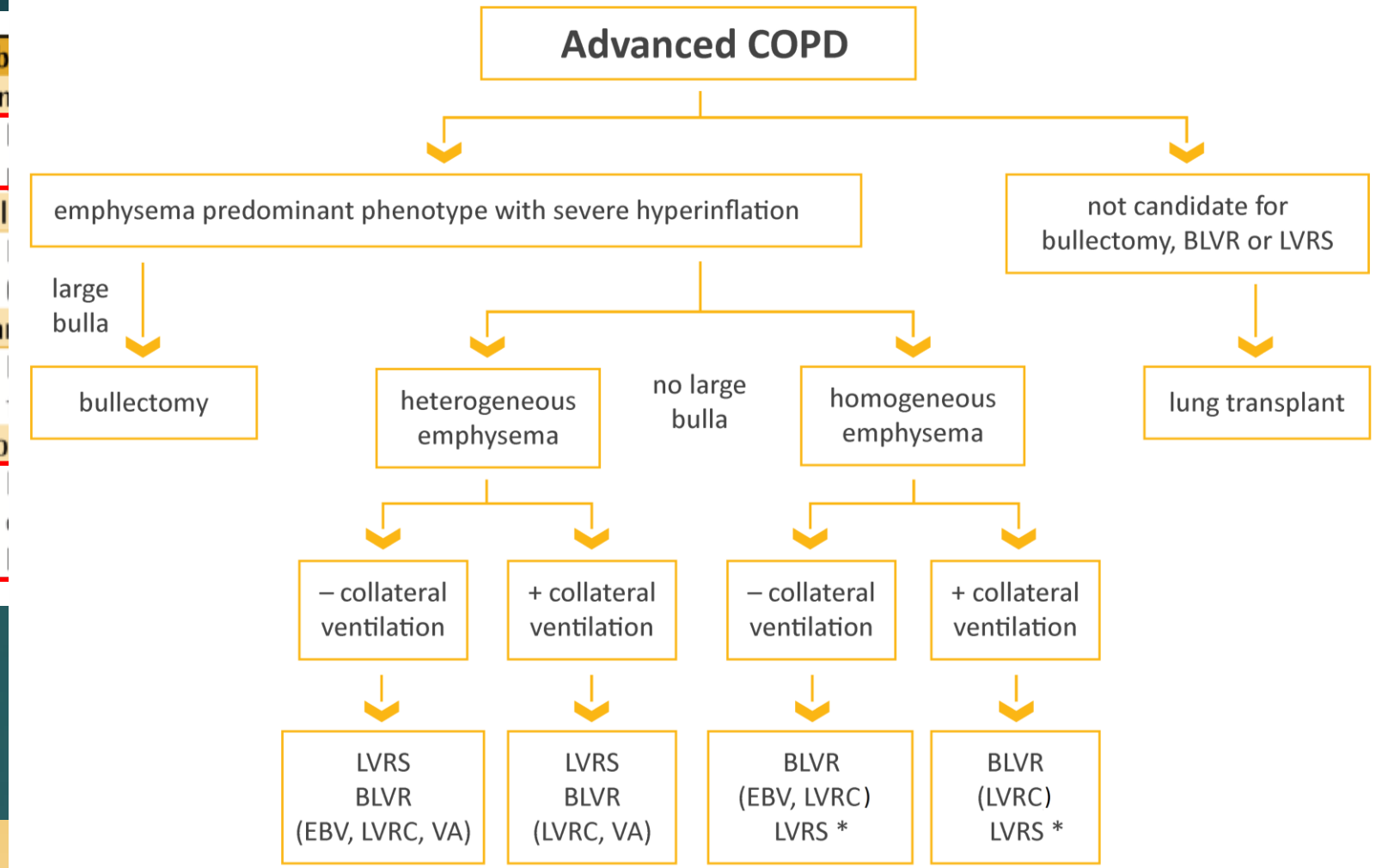
	Bronchoscopic vapor ablation group	Control group	Difference between groups (95% CI)	*p* value
Patients with incomplete fissures, *n*	35	19		
Δ FEV_1, %				
3 months	7.9	–1.2	9.1 (0.1 to 18.1)	0.0056
6 months	7.6	–3.4	10.9 (3.6 to 18.4	0.0024
12 months	9.2	–5.4	14.6 (3.1 to 26.7)	0.0137
Δ SGRQ-C (points)				
3 months	–7.7	–2.2	–5.5 (0.5 to –11.5)	0.0697
6 months	–6.8	–0.6	–6.1 (1.3 to –13.7)	0.1089
12 months	–9.4	–1.0	–8.4 (0.7 to –17.5)	0.0712

Vapor Ablation in the Presence of Incomplete Fissures: 12-Month Results from the STEP-UP Randomized Controlled Study. Adverse events

Table 3. SAEs and hospital admissions

	Treatment group (n = 35)		Control group (n = 19)	
	0–180 days after treatment[1]	181–365 days after treatment[1]	0–180 days after randomization	181–365 days after randomization
COPD exacerbation	3 (9)	0	1 (5)	2 (11)
Pneumonia or pneumonitis	8 (23)	0	1 (5)	1 (5)
Pneumothorax	1[2] (3)	0	0	0
Hemoptysis	0	0	0	0
Death	1 (3)	0	0	0
Any respiratory SAE	9 (26)	0	2 (11)	3 (16)

Respiration 2016;92:397–403



Definition of Abbreviations: BLVR, Bronchoscopic Lung Volume Reduction, EBV, endobronchial Valve, LVRS, Lung volume reduction surgery, LVRC, Lung volume reduction coil, VA, Vapor ablation

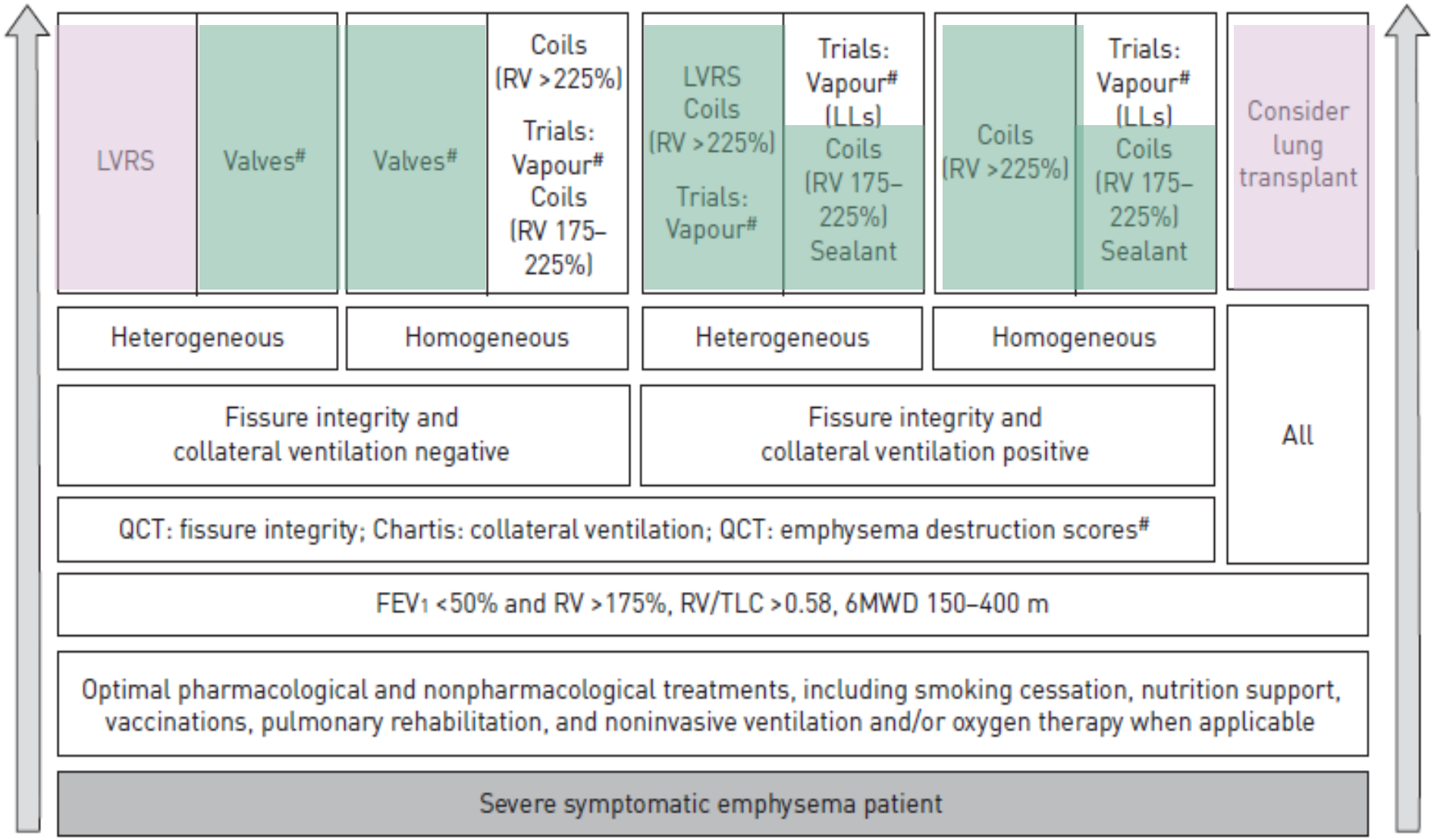
*at some but not all centers

FIGURE 4.5

GLOBAL INITIATIVE FOR CHRONIC OBSTRUCTIVE LUNG DISEASE™

GOLD guidelines 2019

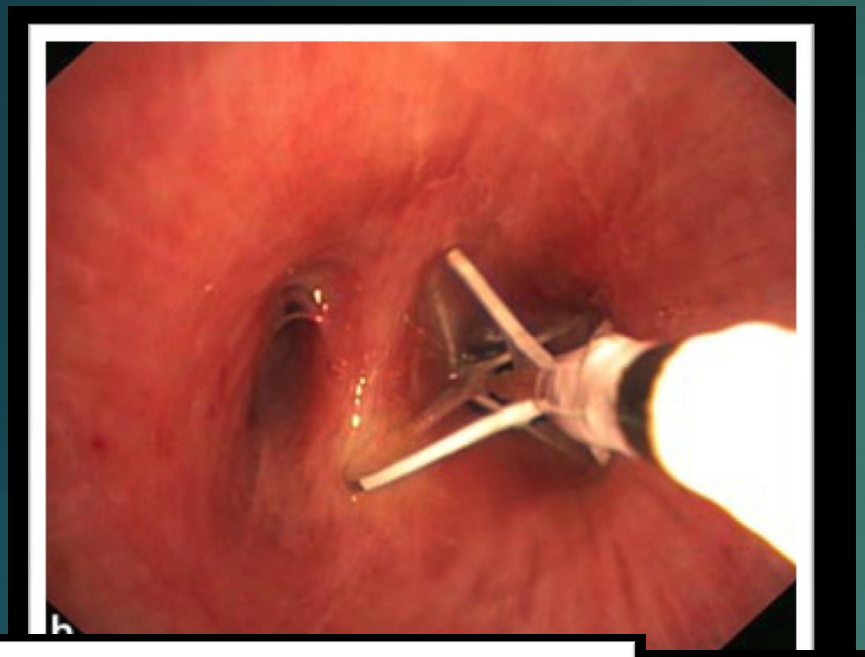
ERS monograph
Number 78
December 2017

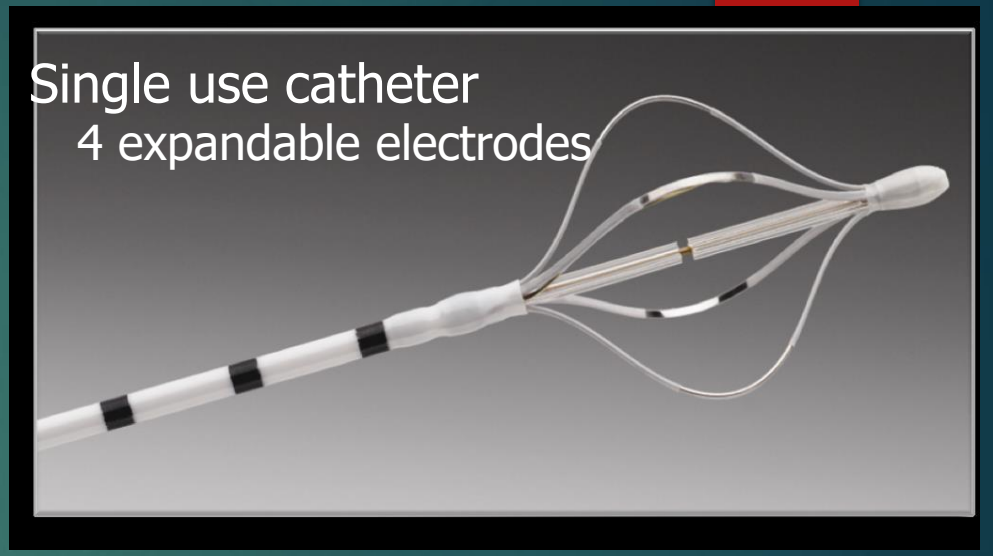


Optimal treatment

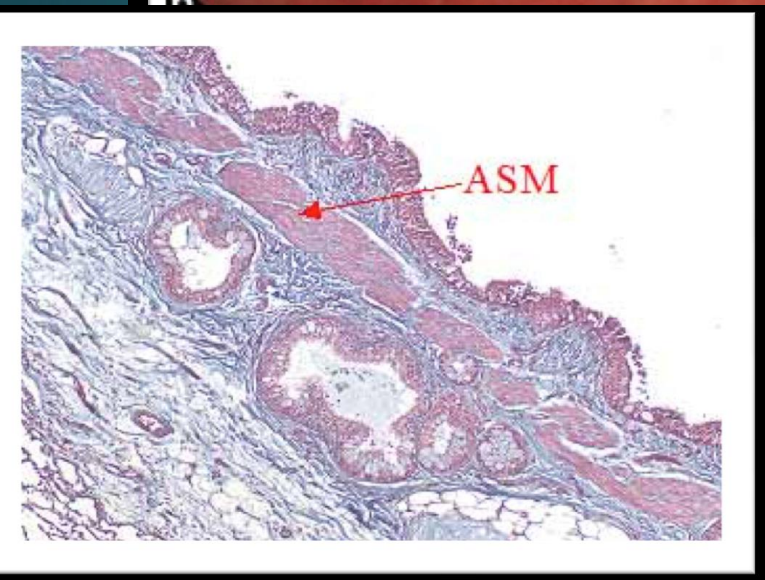
Μη ελεγχόμενο Βρογχικό Άσθμα

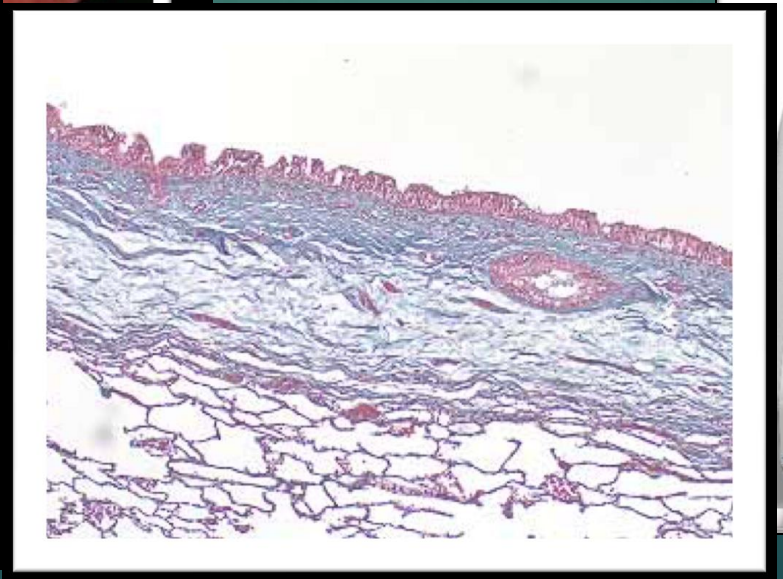
Radiofrequency ... Ablation for ASTHMA

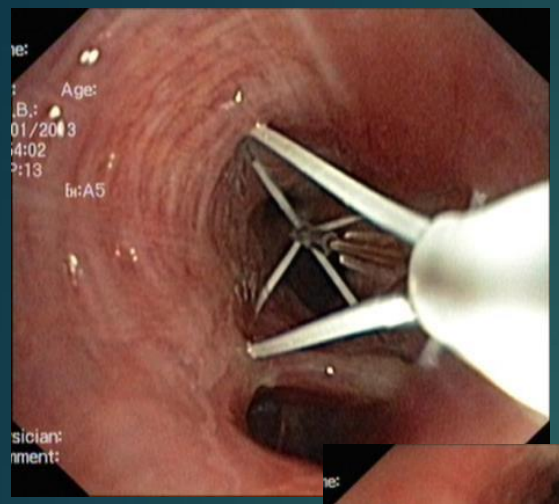


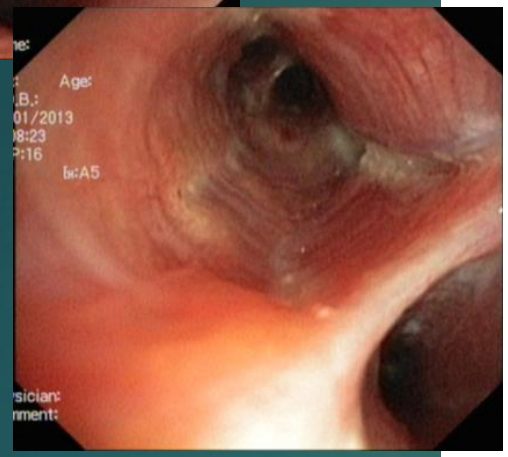


Radiofrequency generator
Monopolar 450 – 500 kHz









40 – 100 activations/register

45 – 60 minutes / BT

Bronchial Thermoplasty
DELIVERED BY THE ALAIR™ SYSTEM

Boston Scientific

Patient ID: _____ Procedure 1: Right Lower Lobe Procedure 2: Left Lower Lobe Procedure 3: Right & Left Upper Lobes

Treatment Date: _____ Treatment Date: _____ Treatment Date: _____

RB¹ (Apical Segment) Activations

RB² (Posterior Segment) Activations

RB³ (Anterior Segment) Activations

Upper Lobe Bronchus Activations

LB¹⁺² (Apicoposterior Segment) Activations

LB³ (Anterior Segment) Activations

Upper Lobe Bronchus Activations

Superior Division Bronchus Activations

LB⁴⁺⁵ (Lingula Segment) Activations

Procedure 3

RB⁶ (Superior Lower Lobe) Activations

RML

Lower Lobe Bronchus Activations

RB⁸ (Anterior Basal) Activations

RB⁷ (Medial Basal) Activations

RB⁹ (Lateral Basal) Activations

RB¹⁰ (Posterior Basal) Activations

Procedure 1

LB⁶ (Superior Lower Lobe) Activations

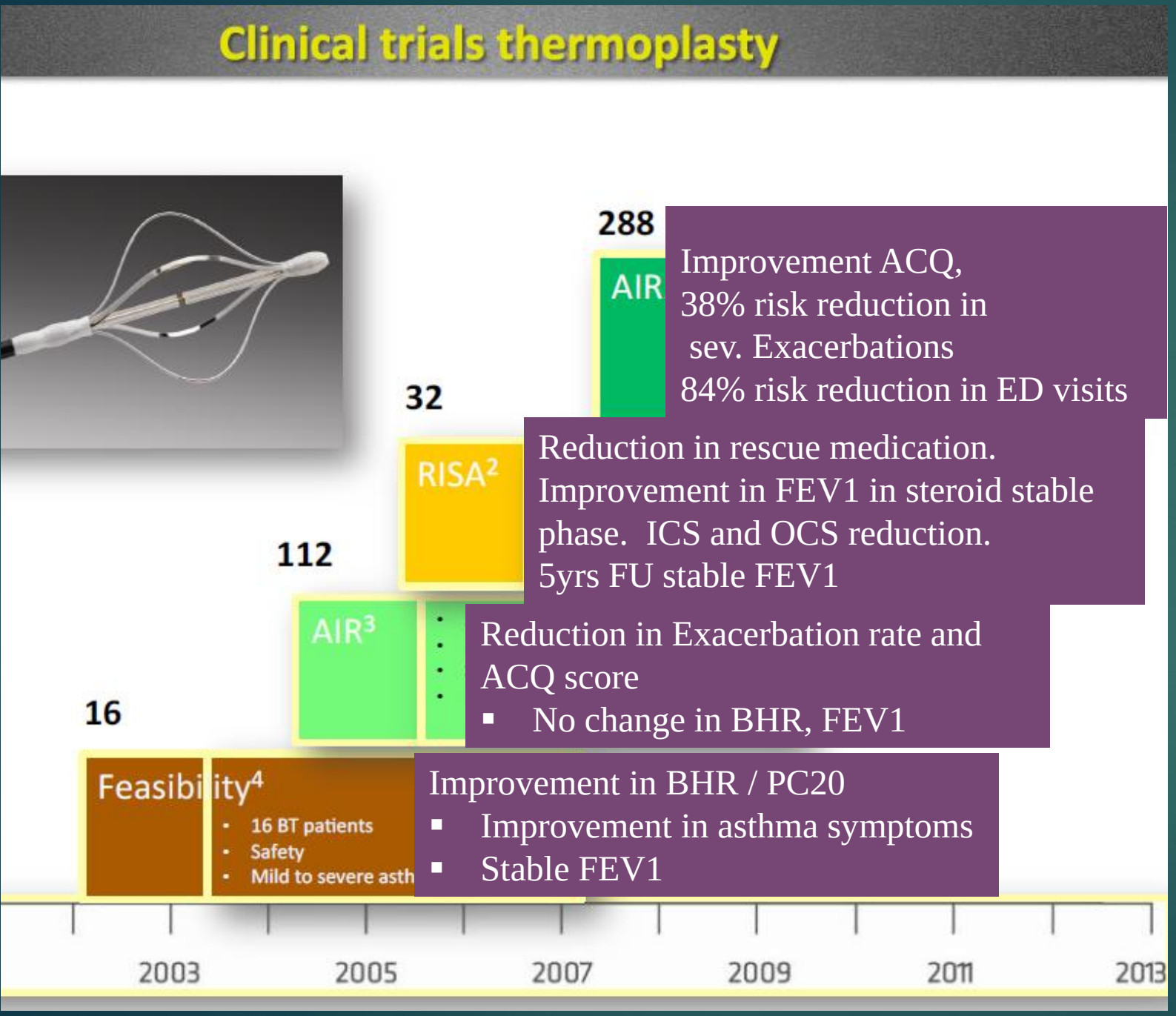
Lower Lobe Bronchus Activations

LB⁷⁺⁸ (Anteromedial Basal) Activations

LB¹⁰ (Posterior Basal) Activations

LB⁹ (Lateral Basal) Activations

Procedure 2



- Πρόκληση θερμότητας ως 65°C
- Ενέργεια 18 W
- Εφαρμογή για 10 sec σε κάθε θέση. Στοχεύει τους βρόγχους από το επίπεδο των λοβαίων ως αυτούς με d: 3mm

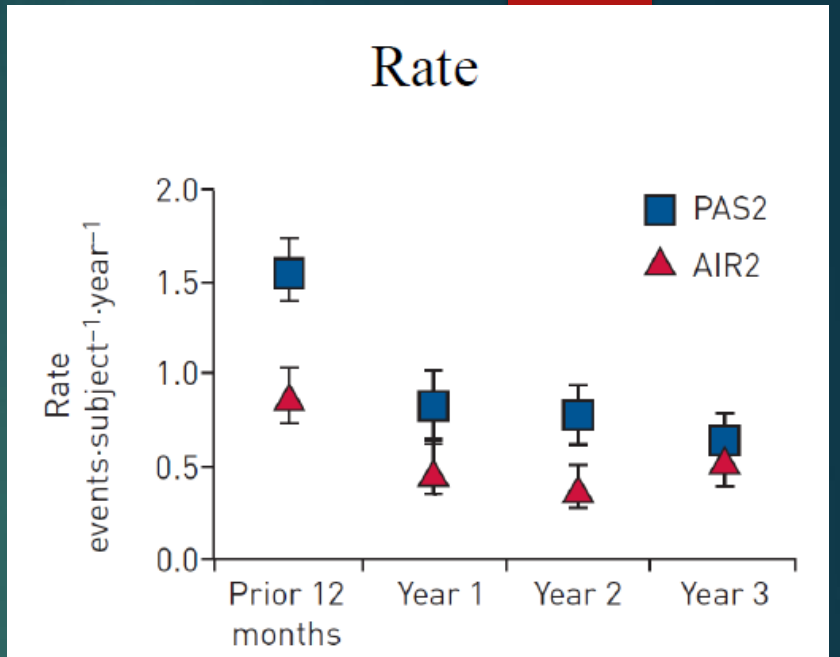
- Μείωση της μάζας των λείων μυϊκών ινών κατά 50%
- Όχι πλήρης καταστροφή τους
- Δεν επηρεάζει το περιβρογχικό πνευμονικό παρέγχυμα

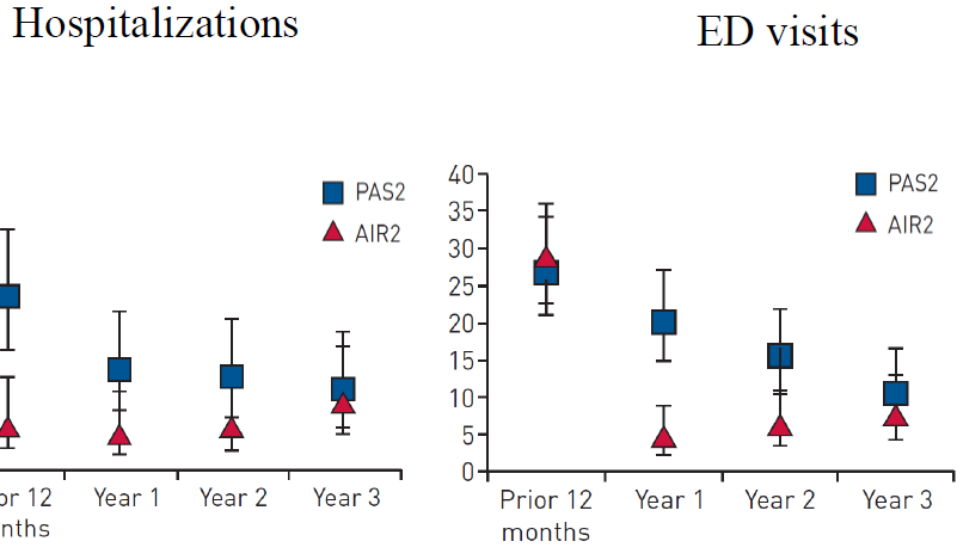
PAS2: FDA 3 yrs FU

284 subjects enrolled from April, 2011 to Oct, 2014

- Comparison of the first 190 PAS2 subjects with poorer asthma control to the 190 BT-treated subjects in the AIR2 trial
- 5 years FU completed in 2020

	PAS2	AIR2
Characteristic	**N=190**	**N=190**
Age (years)	45.87 ± 11.39 (190)	40.69 ± 11.89 (190)*
Female	61.6% (117/190)	57.4% (109/190)
Body Mass Index [kg/m^2]	32.50 ±7.72 (190)	29.29 ± 6.16 (190)*
AQLQ	4.17 ± 1.33 (190)	4.30 ± 1.17 (190)
Severe Asthma (ERS/ATS)	94.7% (180/190)	82.1% (156/190)*
ICS (µg/day)	2301.04 ± 807.46 (189)	1960.74 ± 745.19 (190)*
LABA (µg/day)	106.87 ± 39.36 (189)	116.8 ± 34.39 (189)*
SABA (puffs/day)	2.38 ± 1.48 (182)	2.24 ± 1.29 (168)
OCS (% and mg/day)	18.9% (36/190)	4.2% (8/190)*
	9.13 ± 2.66 (35)	11.88 ± 15.51 (8)
Omalizumab (% and mg/day)	15.8% (30/190)	1.1% (2/190)*
	266.83 ± 88.67 (30)	350.00 ±35.36 (2)



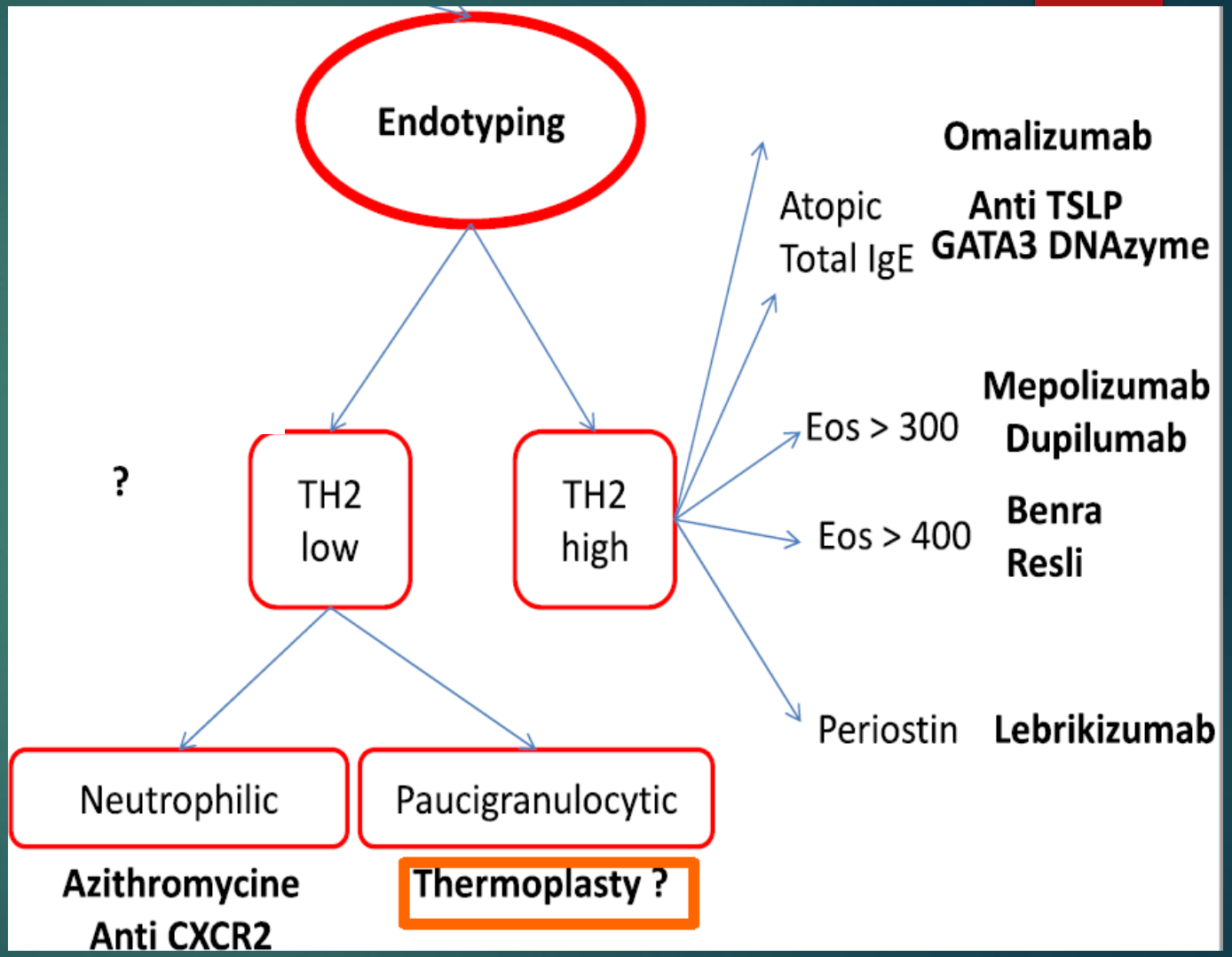


- No mortality
- (S)AEs in treatment period, treatable/predictable
- No long term complications
- HRCT: 3% bronchiectasies
- No device related complications
- Pulmonary function tests: stable FEV1

Chupp G, et al Eur Respir J 2017;

Επιλογή ασθενών

- 21 is a minimum age for BT
- Sedation as per local experience and skills
- Treat patients who have responded but only partially to Omalizumab
- BT can be performed safely in any patient with FEV_1 > 50% pred
- No evidence supporting re-treatment



Take Home message

BLVR for Pulm. Emphysema

- Ασθενείς με απόφραξη και υπερδιάταση (TLC>100% RV>175%), με σοβαρό εμφύσημα (-910HU score). Ελέγχεται η ομοιογένεια/ετερογένεια και η ακεραιό-τητα των μεσολοβίων.
- CV (-) Valves
- CV(+) Coils, Sealant, Vapor
- Ανταπόκριση σε 50-75% των ασθενών
- Βελτίωση FEV1, RV, TLC
- Βελτίωση αντοχής στην άσκηση κ QoL

- **RF Bronchial Thermoplasty for ASTHMA**
- RCTs: AIR/RISA/AIR2:

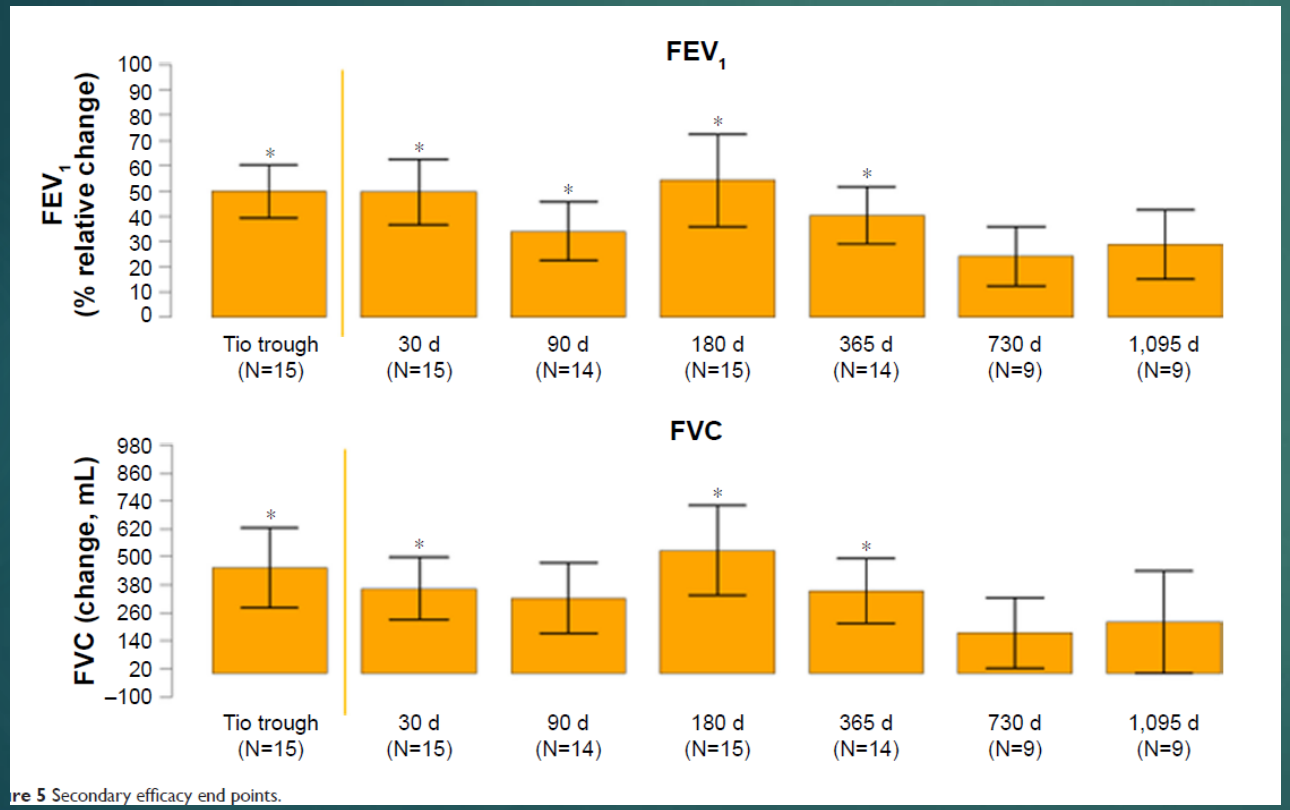
Κλινική Βελτίωση ACQ/AQLQ

- Μείωση ρυθμού παροξύνσεων
- Βρογχική Υπεραντιδραστικότητα και FEV1 παραμένουν σταθερά
- Την περίοδο της επέμβασης παρατηρούνται παροξύνσεις

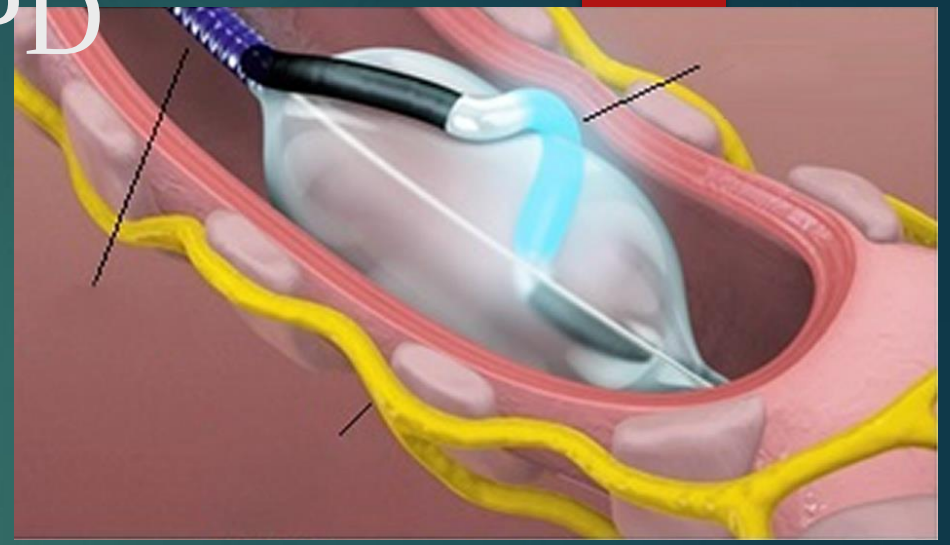
- **Μηχανισμός δράσης της BT?**
- **Ποιοι ασθενείς ωφελούνται περισσότερο?**
- TASMA study: AMC, UMCG, Royal Brompton
- ASTMATERM study: France

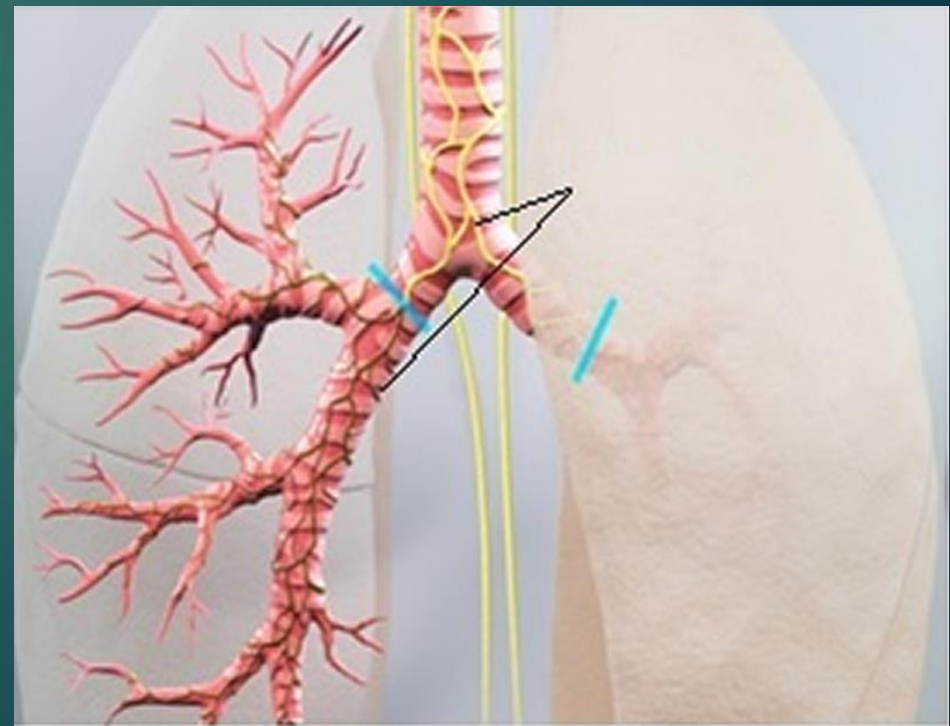
Total Lung Denervation for COPD

- Feasible and safe (no complications in 3 yrs)
- Comparable effect to Tiotropium for FEV1



re 5 Secondary efficacy end points.





A. Valipour et al. Intern J COPD 2018:13 2163–2172

Precision Medicine

PERSPECTIVE
PRECISION MEDICINE FOR AIRWAY DISEASES

Treatable traits: toward precision medicine of chronic airway diseases

Alvar Agusti[1], Elisabeth Bel[2], Mike Thomas[3], Claus Vogelmeier[4], Guy Brusselle[5,6], Stephen Holgate[7], Marc Humbert[8], Paul Jones[9], Peter G. Gibson[10], Jørgen Vestbo[11], Richard Beasley[12] and Ian D. Pavord[13]

Eur Respir J 2016; 47: 410–419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and Interventional Pulmonol
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2021
Organized by
Hellenic Training Association
for Interventional
Pulmonology
EABIP
National & Kapodistrian
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April 22- 24
2021