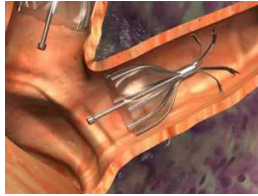


## Endoskopické volum redukující techniky jako léčba plicní hyperinflace u pacientů s CHOPN

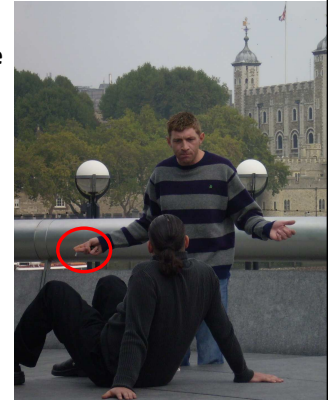


V. Koblížek  
Plicní klinika FN HK a LF UK HK

Pátek 4. listopadu 11h  
Tyršův dům, Praha

## Emfyzém bez obstrukce

Quantitative Computed Tomography Of Emphysema In Smokers Without Airflow Obstruction.  
Friedlander et al. *AJRCCM* 2010; 181: A1544

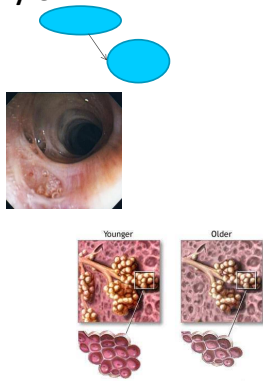


## Stárnutí plic není emfyzém

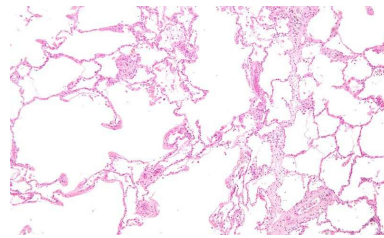
Δ tvaru hrudníku a plic

kalcifikace chrupavek  
více žlázek  
dilatace centrálních DC

dilatace respiračních bronchiolů a duktulů („ductectasia“)



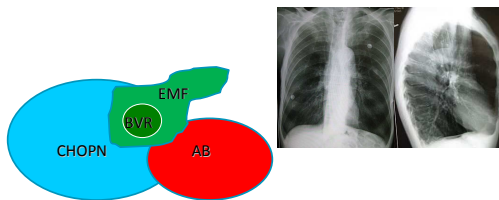
## Plicní emfyzém



dilatace respiračních bronchiolů a duktulů  
+  
abnormální a trvalé rozšíření acinů s destrukcí alveolární stěny (bez fibrózy)

## Emfyzém

Emfyzém – svébytná nosologická jednotka i součást CHOPN či AB  
Lze mu předcházet (léčit?)



## Typy plicního emfyzému

Centrilobulární (centriacinární) **KOUŘENÍ, HIV**  
Panlobulární (panacinární) ↓A1AT, methadon, talek, methylfenydat  
Paraseptální (distální acinární) kouření, kokain, heroin, PCP  
Bulózní (kdekoliv byly)  
Pericikatrikózní (nepravidelný)  
Intersticiální (PIE) a mediastinální emfyzém barotrauma  
Kongenitální lobární emfyzém

## Diagnostika plicního emfyzému

Fyzikálně + spirometrie + RTG - JEN ORIENTAČNÍ

Bodypletsymografie - RV, RV/TLC

Transfer faktor - TLco

**CT - automatická denzitometrie a volumetrie**

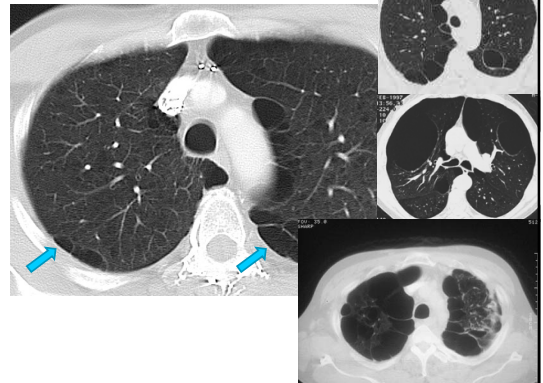
MRI - hyperpolarizované s inhalací  $^3\text{He}$  či  $^{129}\text{Xe}$

OCT - experiment

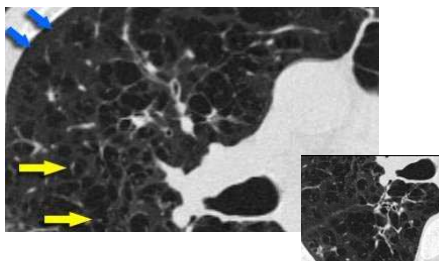
Patologie – POSTMORTEM



## Paraseptální až bulózní EMFYZÉM

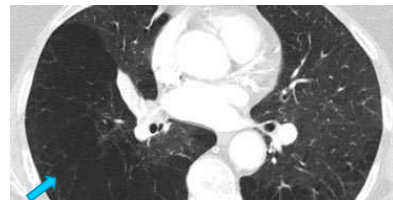


## NEJBĚŽNĚJŠÍ FORMA EMFYZÉMU



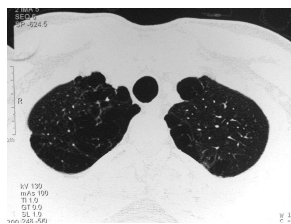
Centrilobulární emfyzém (CL)

TENTO TYP JE samostatně méně častý, spíše spolu s CL



Panlobulární emfyzém

## Léčba emfyzému



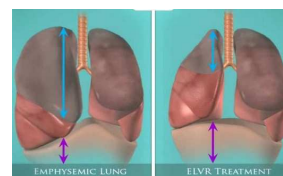
Farmaka ??

Chirurgická – LVRS

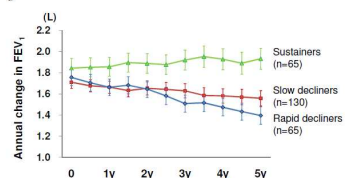
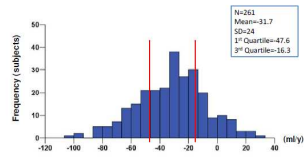
Bronchoskopická – BVR

## Bronchoskopická léčba E

BVR  
EBVR  
EBVRT  
ELVR



## Heterogenita CHOPN populace (deklinace plicních funkcí)



AJRCCM Nishimura 2011

## Heterogenita populace s emfyzémem

HETEROGENNÍ E.  
 predominantně kraniálně  
 predominantně non-kraniálně

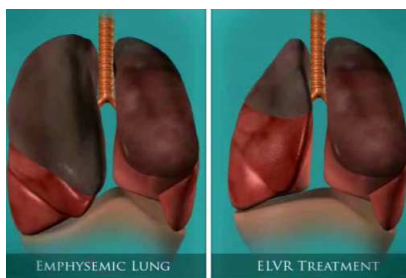
HOMOGENNÍ E.  
 se sníženou perfuzí kraniálně  
 s nesníženou perfuzí kraniálně

E. s kompletními fisurami a nepřítomností kolaterální ventilace  
 E. s nekompletními f. a přítomností k.v.

BVR respondeři  
 non-responděři

ERS 2011 ECE – ISTANBUL  
 ERS 2011 VALIPOUR – VIENNA

## Co je to BVR ?



ERS 2011 EBV presentation

## Možnosti BVR

- Chlopně (Valves)
- Lepidla (Sealant)
- Pára (Steam)
- Metalické implantáty (Coils)
- Spojky (Bypass)

ERS 2011 ECE – ISTANBUL  
 ERS 2011 VALIPOUR – VIENNA

## 1. BVR – endobronchiální chlopně

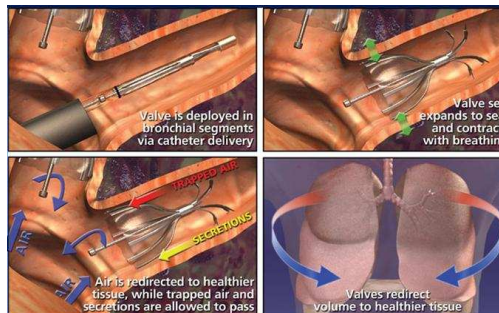
Zephyr EBV

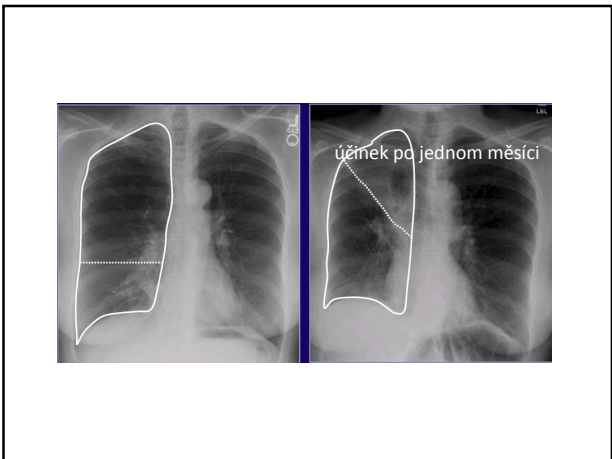
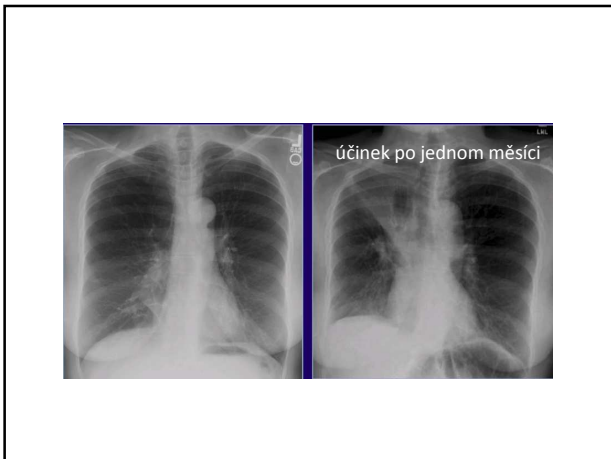
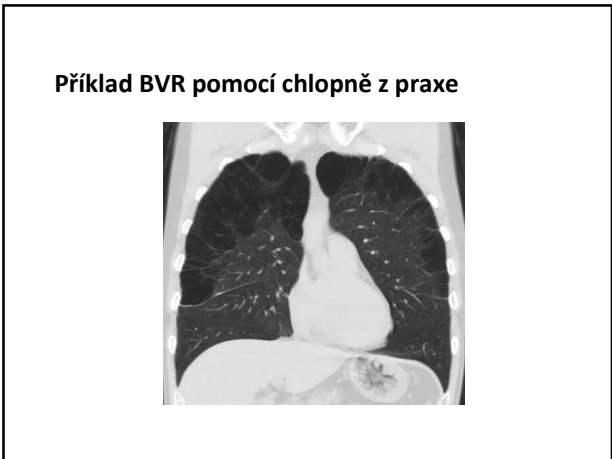
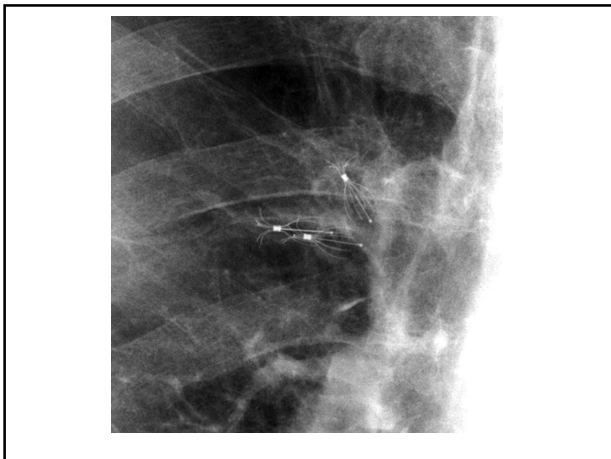


Spiration IBV



## Zavedení a funkce BVR (Spiration IBV)





[Thorax Surg Clin](#), 2009 May;19(2):247-53, ix-x.

**Treatment of heterogeneous emphysema using the spiration IBV valves.**

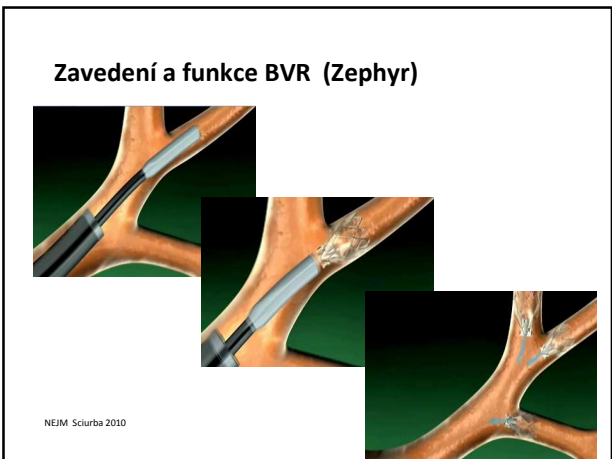
[Springmeyer SC, Bolliger CT, Waddell TK, Gonzalez X, Wood DE; IBV Valve Pilot Trials Research Teams.](#)

**Collaborators (7)**

School of Medicine, University of Washington, Seattle, WA, USA. [sspringmeyer@spiration.com](mailto:sspringmeyer@spiration.com)

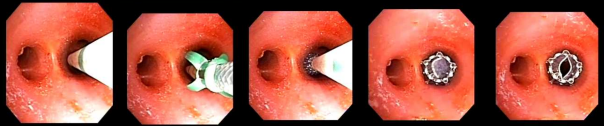
**Abstract**

Nine-eight emphysema patients were treated at 13 international sites during a 3-year series of single-arm, open-label studies with the IBV valve and a multi-lobe treatment approach. Fifty-six percent of subjects had a clinically meaningful improvement in health-related quality of life, but standard pulmonary function and exercise studies were insensitive effectiveness measures. Quantitative CT analyses of regional lung changes showed lobar volume changes in over 85% of subjects. Lung volume reduction was an uncommon mechanism for a treatment response with bilateral upper lobe treatment. A redirection of inspired air, an interlobar shift to healthier lung tissue, was the most common mechanism for a valve treatment response.

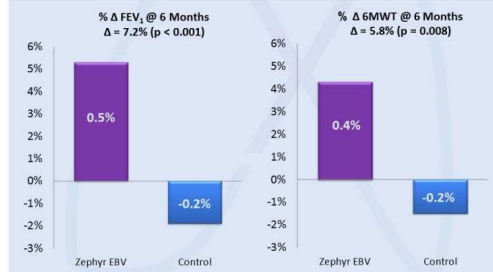


### VENT: Endobronchial Valve for Emphysema Palliation Trial

- Multicentre (34 U.S. sites)
- Prospective/Randomised
  - 220 treatment, 101 control
- All subjects received optimal medical management
- Key Entry Criteria
  - Severe heterogeneous disease determined by HRCT, pulmonary function testing
  - Clinically stable (i.e., no severe concurrent acute events)
- Co-primary Effectiveness Endpoints
  - % Change at 6 months in FEV<sub>2</sub> and 6MWT

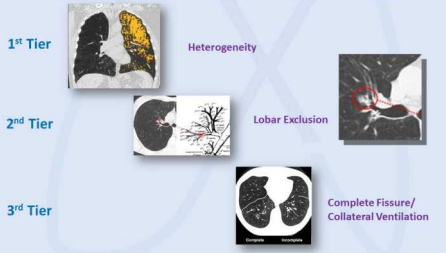


### VENT Efficacy Results – Statistical Significance

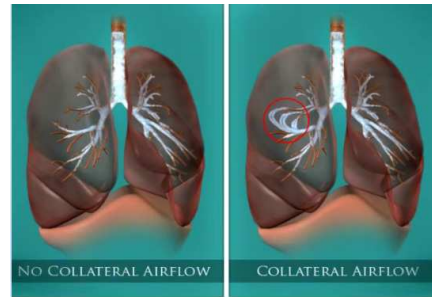


Sclurba NEJM 2010

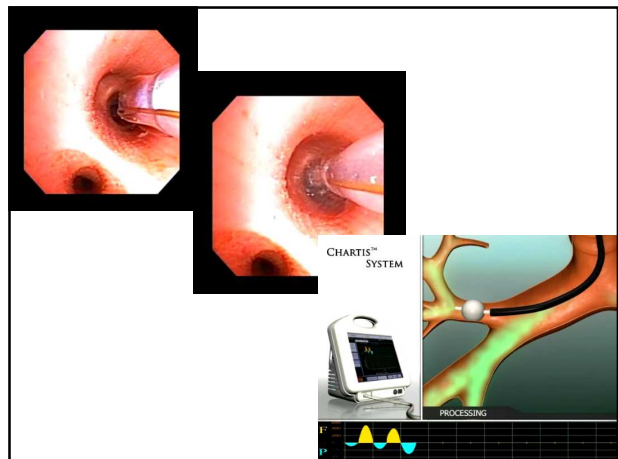
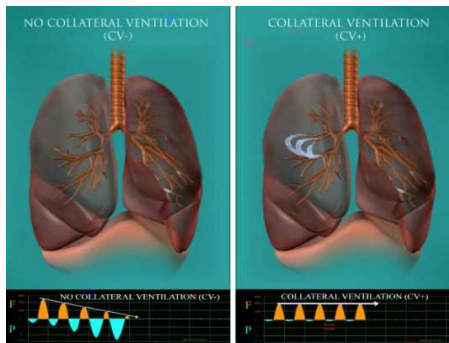
### Patient Subgroup Responders



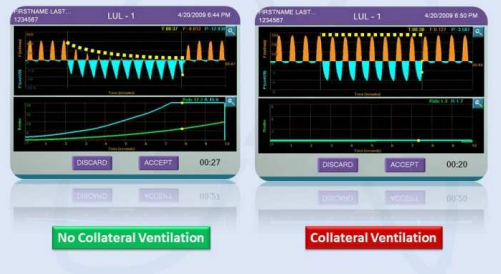
### Kolaterální ventilace



### Chartis System – detekce kolaterální ventilace



### Chartis CV Assessment System



### Interim Analysis of Prospective, Multicentre European Trial with Chartis® System and Zephyr® Endobronchial Valve

#### Chartis Multicentre Study

- **Enrollment criteria**
  - Heterogeneous emphysema (clinician discretion and visual CT analysis)
  - FEV<sub>1</sub> between 15% and 50% predicted
  - Not actively enrolled in a clinical study
  - No active pulmonary infection
  - Able to withstand bronchoscopy
  - Valid Chartis assessment

### Predictability for Lung Volume Reduction with EBV (n=57)

| CT Reading<br>TLVR with EBV | CV Status (Chartis Assessment result) |             |
|-----------------------------|---------------------------------------|-------------|
|                             | CV -                                  | CV +        |
| ≥350 ml                     | 30 (81%)                              | 4 (20%)     |
| <350 ml                     | 7 (19%)                               | 16 (80%)    |
|                             | N=37 (100%)                           | N=20 (100%) |

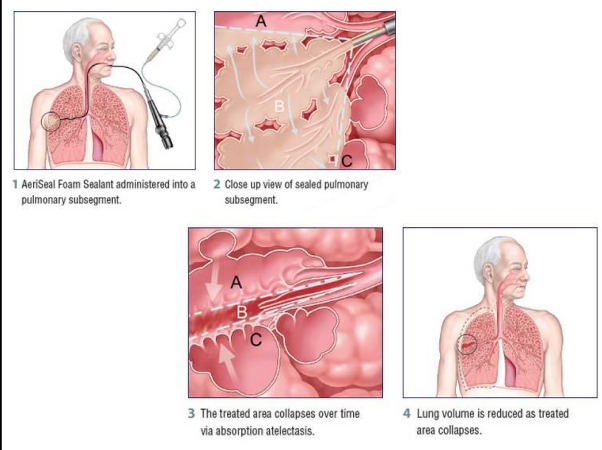
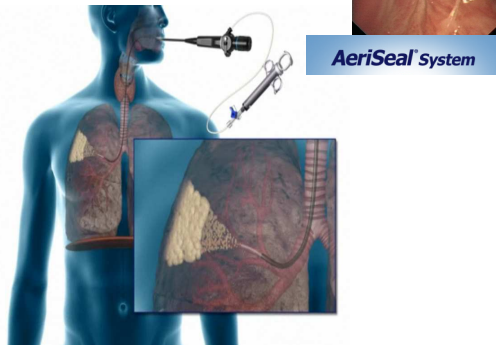
  

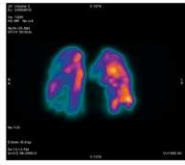
|           | Median Target Lobe Volume Reduction |       |
|-----------|-------------------------------------|-------|
|           | CV-                                 | CV+   |
| TLVR (ml) | -1031.7                             | -82.0 |
| TLVR (%)  | -61.6%                              | -3.9% |

### Chlopně – rizika

- Pneumotorax (9%)
- AE CHOPN (7%)
- Migrace chlopně (3%)

### 2. BVR – lepidla (tissue polymer sealant)





Homogenní emfyzém – s nižší peruzí horních laloků  
Dobrý efekt lepidla – AeriSeal System

ERS 2011 Vallpouir - Vienna

### Lepidlo – rizika

Zvýšená teplota  
Pleurální bolest po výkonu  
Leukocytóza  
Karcinom ?

### 3. BVR – pára (steam – neboli BTVA)



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Ann Thorac Surg 2009;88:1993-1998. doi:10.1016/j.athoracsur.2009.06.038  
© 2009 The Society of Thoracic Surgeons

#### New Technology

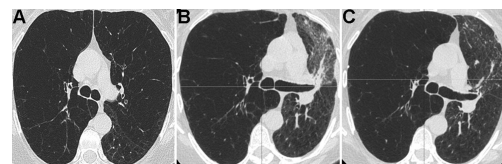
#### A Feasibility and Safety Study of Bronchoscopic Thermal Vapor Ablation: A Novel Emphysema Therapy

Gregory I. Snell, MD<sup>1\*</sup>, Peter Hopkins, MBBCh<sup>2</sup>, Glen Westall, PhD<sup>3</sup>, Lynda Holsworth, BNSc<sup>2\*</sup>, Anne Cagle, RN<sup>2</sup>, Trevor J. Williams, MD<sup>1\*</sup>

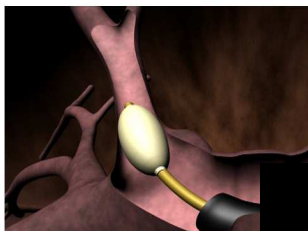
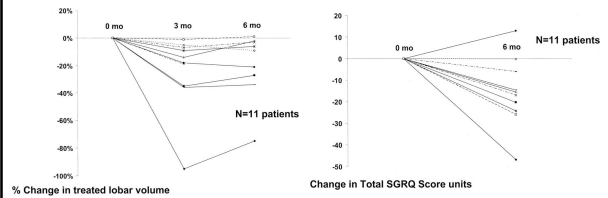
<sup>1</sup> Alfred Hospital and Monash University, Melbourne, Australia  
<sup>2</sup> Prince Charles Hospital, Brisbane, Australia

Accepted for publication June 12, 2009.

\* Address correspondence to Dr Snell, Alfred Hospital, 5th Fl, Commercial Rd, Melbourne, NSW 3004, Australia (Email: gsnell@alfred.org.au)



(A) před výkonem, (B) 3 měsíce a (C) 6 měsíců po výkonu



UptakeMedical™  
BREATHE BETTER. LIVE BETTER.

Jednostranný výkon u heterogenního emfyzému  
Druhá strana ev. ve druhé době

10 cal/g lung tissue  
VIDA DIAGNOSTIC APOLLO

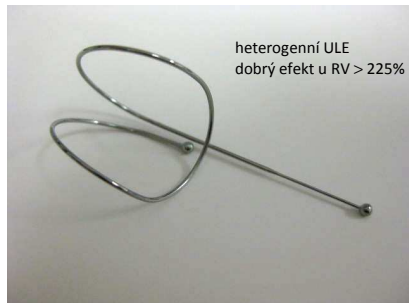
44pts (1+)  
Lepší efekt za delší dobu (za 6 M)

ERS 2011 Herth – Heidelberg

### Pára – rizika

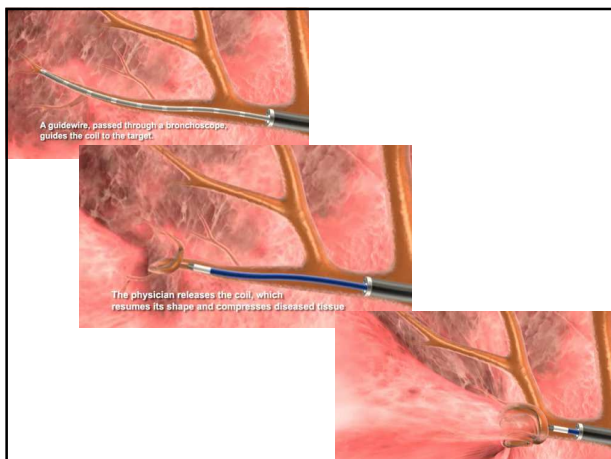
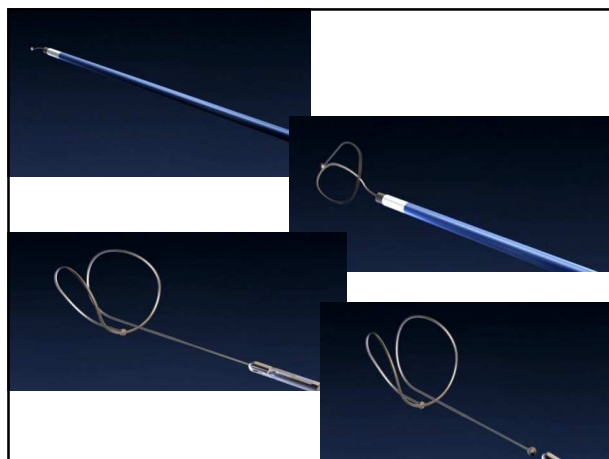
Nauzea  
AE CHOPN  
Karcinom ?

#### 4. BVR – metalické implantáty (coils) neboli LVRC



heterogenní ULE  
dobrý efekt u RV > 225%

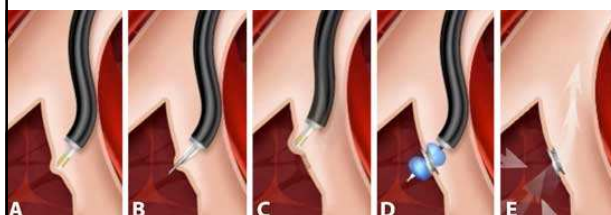
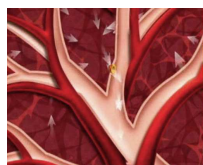
ERS 2011 Slebos - Groningen



#### Coils – rizika

Pleurální bolest  
PNO  
Hemoptýza (vše u 1/3-1/2)  
Pneumonie

#### 5. BVR – spojky



**Závěr**



[Pulm Med.](#) 2011; 2011:610802. Epub 2010 Dec 9.

### Bronchoscopic lung volume reduction.

Ernst A, Anantham D.

Pulmonary, Critical Care and Sleep Medicine, St. Elizabeth Medical Center, VP Thoracic Disease and Critical Care Service Line, Caritas Christi Health Care, Seton 6 East, 736 Cambridge Street, Brighton, MA 02135, USA.

#### Abstract

The application of lung volume reduction surgery in clinical practice is limited by high postoperative morbidity and stringent selection criteria. This has been the impetus for the development of bronchoscopic approaches to lung volume reduction. A range of different techniques such as endobronchial blockers, airway bypass, endobronchial valves, thermal vapor ablation, biological sealants, and airway implants have been employed on both homogeneous as well as heterogeneous emphysema. The currently available data on efficacy of bronchoscopic lung volume reduction are not conclusive and subjective benefit in dyspnea scores is a more frequent finding than improvements on spirometry or exercise tolerance. Safety data are more promising with rare procedure-related mortality, few serious complications, and short hospital length of stay. The field of bronchoscopic lung volume reduction continues to evolve as ongoing prospective randomized trials build on earlier feasibility data to clarify the true efficacy of such techniques.

[Ann Thorac Surg.](#) 2011 Jan;91(1):270-3.

### Endobronchial valve treatment for prolonged air leaks of the lung: a case series.

Gillespie CT, Sterman DH, Cerfolio RJ, Nader D, Mulligan MS, Mularski RA, Musani AI, Kucharczuk JC, Gonzalez HK, Spinnenger SC.

Department of Medicine, University of Pennsylvania Medical Center, Philadelphia, Pennsylvania 19104, USA.

#### Abstract

**PURPOSE:** An endobronchial valve developed for treatment of severe emphysema has characteristics favorable for bronchoscopic treatment of air leaks. We present the results of a consecutive case series treating complex alveolo-pleural fistula with valves.

**DESCRIPTION:** Patients with air leaks that persisted after treatment gave consent and compassionate use approval was obtained. Bronchoscopy with balloon occlusion was used to identify the airways to be treated. IBV Valves (Spiration, Redmond, WA) were placed after airway measurement.

**EVALUATION:** During a 18-month period, 8 valve placement procedures were performed in 7 patients and all had improvement in the air leak. The median duration of air leakage was 4 weeks before and 1 day after treatment, with a mean of 4.5 days. Discharge within 2 to 3 days of the procedure occurred in 57% of the patients. A median of 3.5 valves (mode, 2, 4) were used, and all valve removals were successful. There were no procedural or valve-related complications.

**CONCLUSIONS:** Removable endobronchial valves appear to be a safe and effective intervention for prolonged air leaks.

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## Co bychom měli při pomýšlení na BVR vědět?

Funkční: FEV<sub>1</sub>, RV, TLC, TLC0

CT hrudníku: heterogenní či homogenní

CT hrudníku: nahoře/jinde

CT hrudníku: zjistit kompletnost fissur

Chartis System: zjistit kolaterální ventilaci (CV+ / CV-)

Scintigrafie: s dobrou či se špatnou perfúzí UL



## Jak možné (zatím) postupovat ?

HETEROGENNÍ UL: operabilní → LVRS

HETEROGENNÍ UL: neoperabilní CV- → chlopně

HETEROGENNÍ UL – neoperabilní CV+ → lepidlo, pára

HETEROGENNÍ non-UL → ?

HOMOGENNÍ se sníženou perfúzí UL → lepidlo, pára

HOMOGENNÍ s nesníženou perfúzí UL → ?

ERS 2011 Valpou - Vienna

## Teoretický význam BVR metod

odpadnutí nutnosti chirurgického zákroku  
přístupnost pro nemocné neschopné chirurgického výkonu  
finanční úspora (ambulantní, minimum komplikací)  
zlepšení subjektivních (i objektivních) parametrů jinak neléčitelných nemocných ??

existují i další indikace (BP pšštěle)

## Současná situace v ČR

jednání o kódu zavedení endobronchiální chlopně + další

reálný předpoklad několika center

CT analýza a Chartis System

