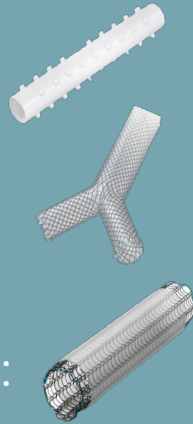


THE IMPORTANCE OF COMPUTED TOMOGRAPHY IN PLANNING THE TREATMENT OF AIRWAY PATHOLOGIES WITH DEVICES

AIRWAY STENTS

Airway Stents are placed bronchoscopically and are made from different materials



The main classes of stents are:

- **Silicone stents**
- **Metal stents**
- **Hybrid stents** (metal covered with either silicone or polypropylene or other covering)

ADVANTAGES AND DISADVANTAGES OF DIFFERENT AIRWAY STENTS

	Silicone	Metal	Hybrid
Migration	+++	+	++
Granulation Tissue Growth	+	+++	+
Airway perforation	-	+	+
Resists extrinsic compression	-	+++	++
Suitability for temporary use	+++	-	±
Suitability for indefinite use	+++	-	±
Stent fracture	±	+	+

ENDOBRONCHIAL VALVES

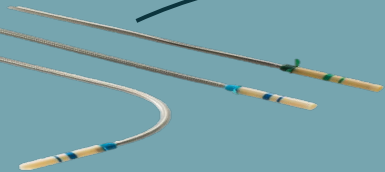
Small umbrella-shaped one-way **removable devices**, designed to **limit airflow** to distal portions of the lung

There are **various sizes for different airway** measurements (4 to 8.5 mm in diameter and 5.2 to 8 mm in length)

Made of a **self-expanding Nitinol** frame that exerts radial force against the airway walls and a **silicone duck-bill** that enables the valve to function independently of the airway wall, thus allowing for effective **occlusion of the airway**



The valves completely **block specific airways**, preventing air from passing through during inhalation. As the valves are designed for **one-way flow**, air or fluids can escape during exhalation

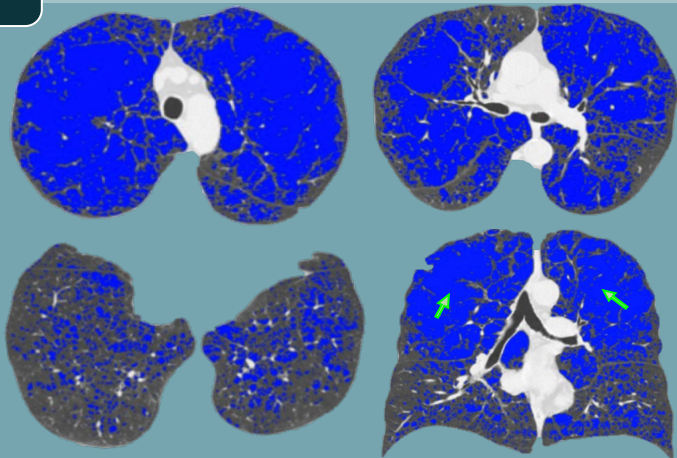


Endobronchial Delivery Catheters are used for **sizing and placing** the valves. They accurately measure the **length and width** of the airways

THE ROLE OF COMPUTER TOMOGRAPHY IN PATIENT SELECTION

1

Quantitative indices of **emphysema severity** and **heterogeneity**

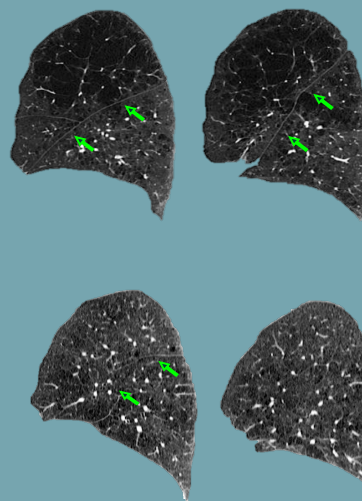


Quantitative CT analysis of **emphysema** revealed extensive involvement of both lungs with bilateral upper lobe predominance (**arrows**), indicating **high heterogeneity**

Lung densitometry software quantitatively analyzes emphysema by setting a density threshold and calculating percentages in each lung lobe. Heterogeneity is determined by comparing upper and lower lobe percentages, with heterogeneity identified if the difference exceeds 15 percentage points.

2

Estimate **collateral ventilation** by the analysis of **fissure integrity**



The assessment of fissure integrity indicated complete interlobar fissures (arrows), which align with the patient selection criteria

Sagittal CT images show an incomplete oblique fissure (arrows), indicating collateral ventilation and serving as a poor prognosis factor in this case

Collateral ventilation prediction involves assessing interlobar fissure integrity using CT. Qualitative analysis, conducted by two radiologists, identifies complete fissures if seen in over 90% of their length in any plane. Artificial intelligence software is available for automated fissure gap assessment, reducing interobserver variability in qualitative analysis.

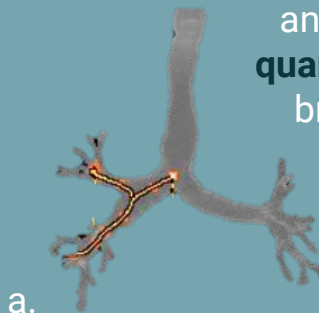
THE ROLE OF COMPUTER TOMOGRAPHY IN PROCEDURE PLANNING

Since **variants** of normal **bronchial tree anatomy**, bronchial stenosis and bronchiectasis may **hinder the intervention**, careful **evaluation of large airways anatomy** is paramount

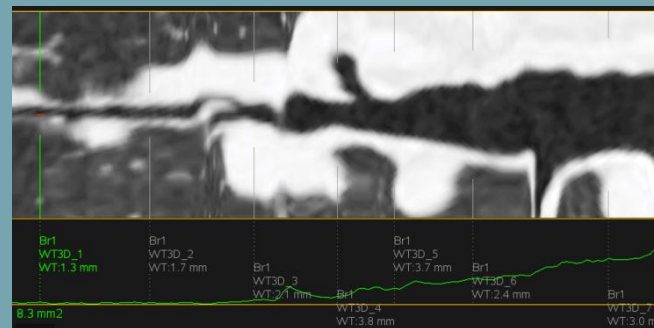
Teaching Point

In order to provide a precise evaluation of the large airways it is recommended to use **multiplanar reconstruction** with **quantitative measurement** and **3D reformatting** of the central airways, as well as **virtual bronchoscopy**

3D reconstruction of the anatomy airway (a) with **quantitative CT analysis** of bronchial diameter (b)



a.



b.

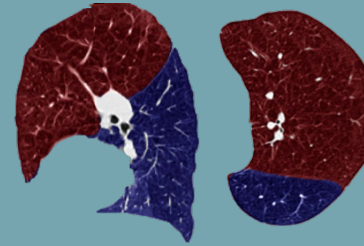
THE ROLE OF COMPUTER TOMOGRAPHY IN THE FOLLOW UP

The time to clinical improvement in response to treatment is variable and can occur in 15 days or 60 days after the procedure. CT can be used after endobronchial procedure for assessing lung volumes, the positioning of valves and possible complications related to treatment.

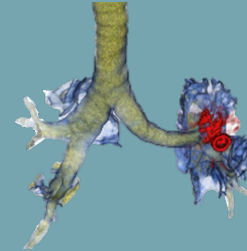
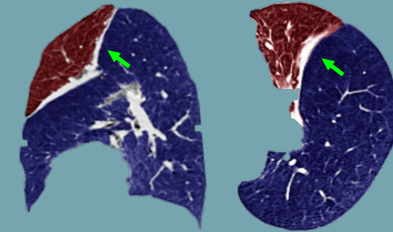
Teaching Point

The control of the positioning of endobronchial valves are particularly important in patients without clinical or radiological improvement after the procedure. In these patients, unsuitable valve-bronchial coupling or valve displacement can be identified.

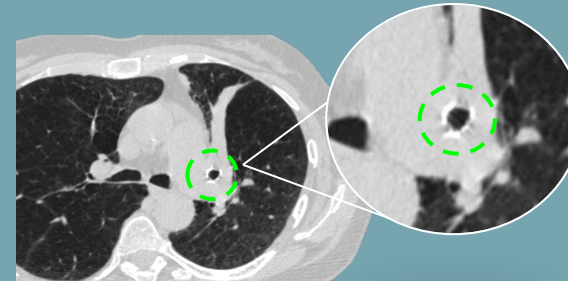
Pre-treatment CT images



Post-treatment CT images demonstrated **sublobar atelectasis** of the left upper lobe (**arrows**) indicating the treatment success



Large airway **3D reconstruction** of another patient depicting adequately positioned valves in left upper lobe bronchi



The same patient post-treatment axial CT image showed an adequately positioned endobronchial valve (dotted circle)