

# New Detection Tools for Lung Cancer

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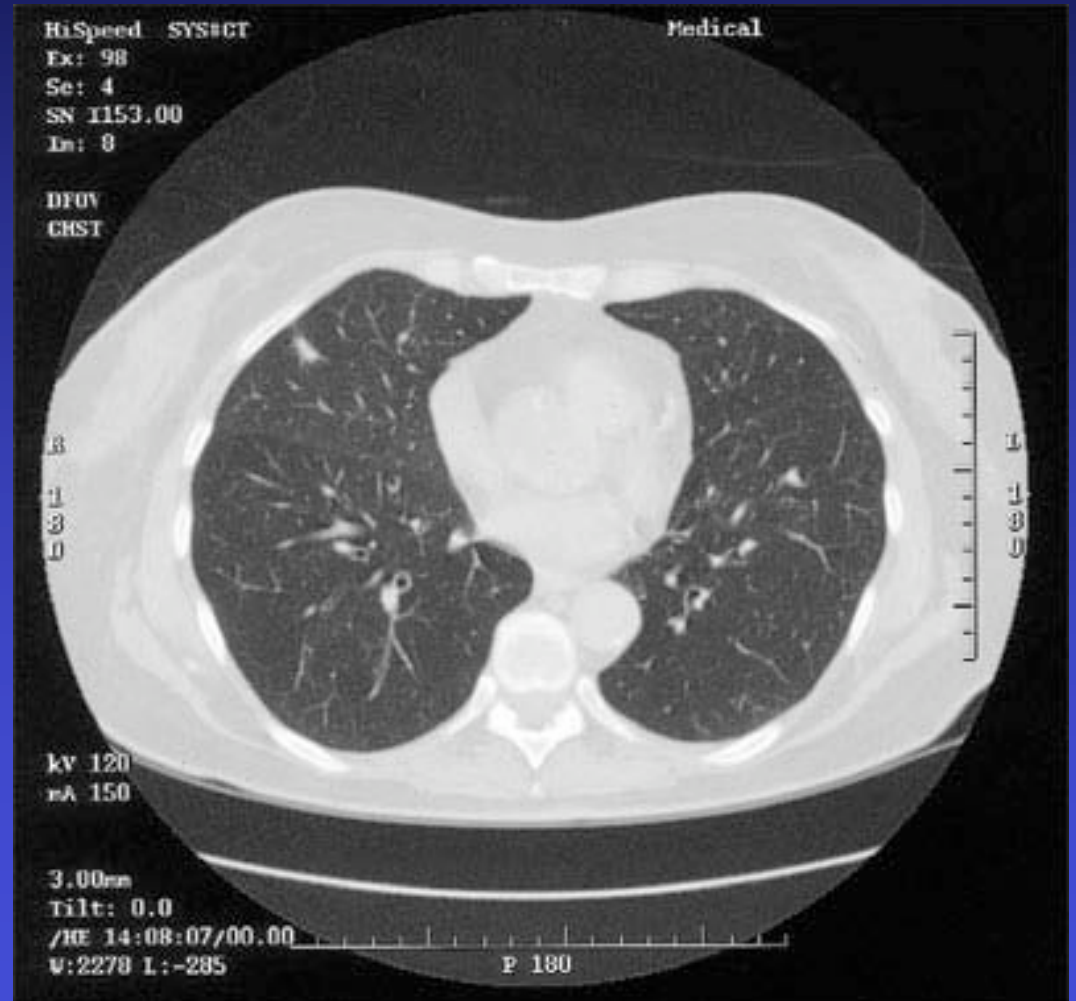
Pulmonary & Critical Care

# Case One

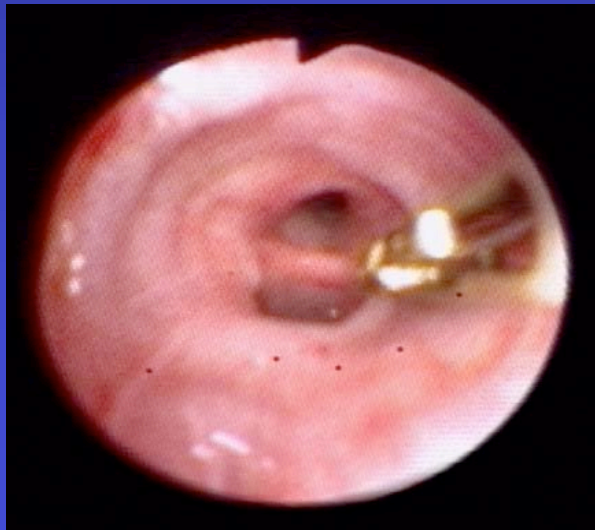
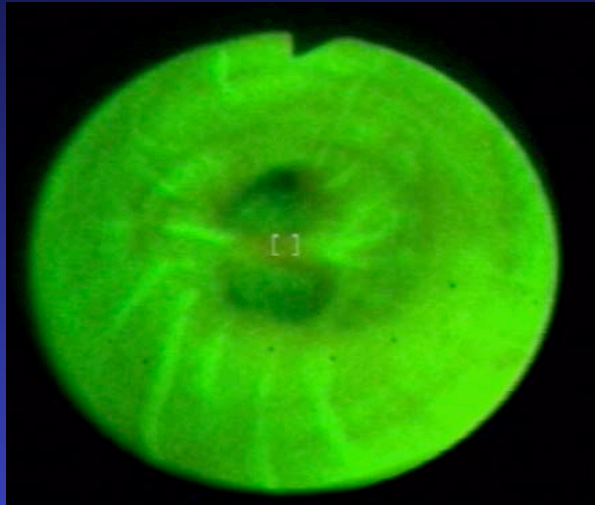
- A 55 year old male smoker reports that he is worried about his risk for lung cancer. He has smoked for 28 years and he smokes 2-3 packs of cigarettes per day. Lung function demonstrates moderate emphysema
- What do you tell this patient about his risk for lung cancer?
- What tests could be considered for the early detection of lung cancer?

# Case Two

- 76 year old female former smoker with COPD had a 6mm nodule on initial LDSCT.
- It increases to 9mm on follow up CT. PET scan is negative.
- What do you recommend?



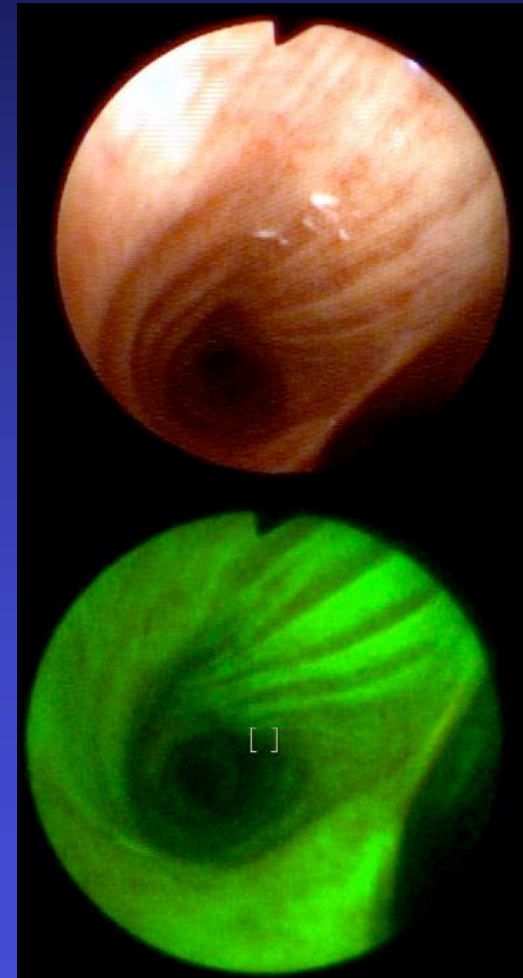
# Case Three



- 52 year old former smoker who was cured of lung cancer five years ago undergoes routine Autofluorescence bronchoscopy.
- Small area of “pre-cancer” is detected.
- What would you offer this patient?

# Case Four

- A 52 year old male former smoker with COPD, is found to have squamous metaplasia in the lung. His father died from lung cancer.
- What are his management options?



# New Tools

- AutoFluorescence Bronchoscopy
- Wang Needle aspiration of lymph nodes
- SuperDimension Electromagnetic Navigation system

# Lung Cancer: Who is at Risk?

- Patients that are former (or current) smokers with COPD/Emphysema
- Patients with prior lung, esophageal, head/neck cancers
- Patients with pulmonary fibrosis
- Patients with pulmonary asbestosis

<b>Lung Cancer risk factors</b>	<b>Relative Risk</b>	<b>Population Frequency</b>
<b>Active Cigarette Smoking (&gt;20PY)</b>	<b>10.0</b>	<b>30%</b>
<b>Passive Cigarette Smoking (&gt;40-80PY)</b>	<b>1.2</b>	<b>90%</b>
<b>Asbestos Exposure</b>	<b>15.1</b>	
<b>COPD (FEV1&lt;70%)</b>	<b>7.0</b>	
<b>Diet (Fruits and Vegetables &gt;5 servings/day)</b>	<b>0.5</b>	<b>33%</b>
<b>Selenium (&gt;0.63 µg/g)</b>	<b>0.5</b>	<b>20%</b>
<b>Family History (Parent/Child/Sib)</b>	<b>2.4</b>	<b>4-10%</b>



# Squamous Cell Lung Cancer: Perspective

- Squamous cell is the 2<sup>nd</sup> most common form of lung cancer in North America and Japan
- The most common form of lung cancer in Europe
- 174,470 new cases of Lung Cancer expected in 2006 in the US (Jemal 2006) 29% Squamous cell histology (Travis 1995)
- ~ 50,596 cases of squamous cell lung cancer will be diagnosed in the US in 2006.

Squamous cell cancer of the lung is preceded by **Intraepithelial Neoplasia** metaplasia, dysplasia, and carcinoma-*in-situ*

“Some experts argue that there is no relationship between adenomatous polyps and malignancy, while others believe that progression to malignancy will occur in a high percentage of benign polyps unless they are removed.”

---Harrison's Principles of Internal Medicine *1980*

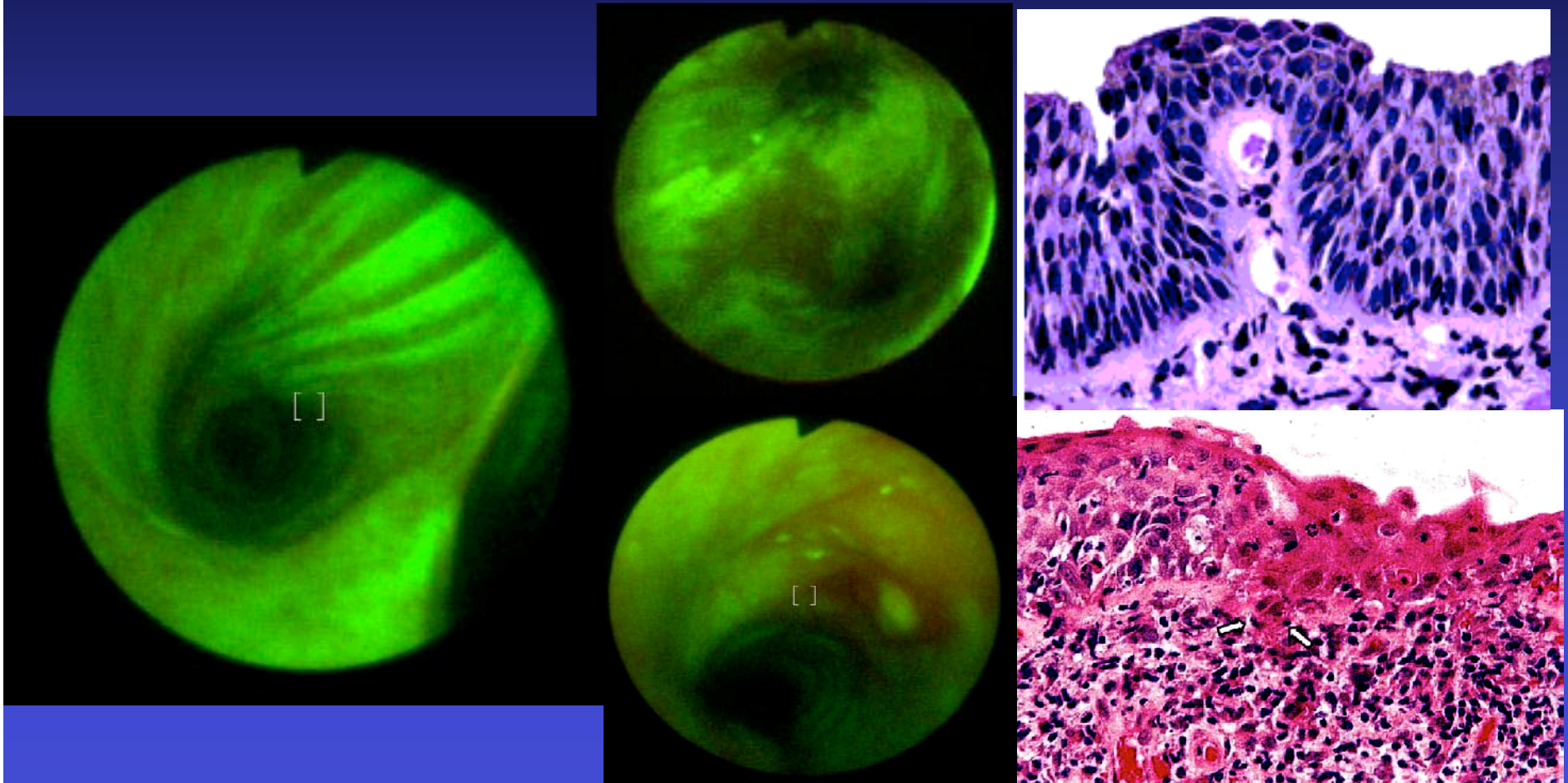
# Progression Rates of IEN

Author	N= lesions	N= patients	Metaplasia progression	Dysplasia progression	Years follow up
Bota	416	104	31%	<b>3-37%</b>	2
Hoshino	99	50	?	<b>3%</b>	4
Moro Sibilot	31	27	Not given	<b>63% *</b>	3
Breuer	134	52	9%	<b>9-32%</b>	8

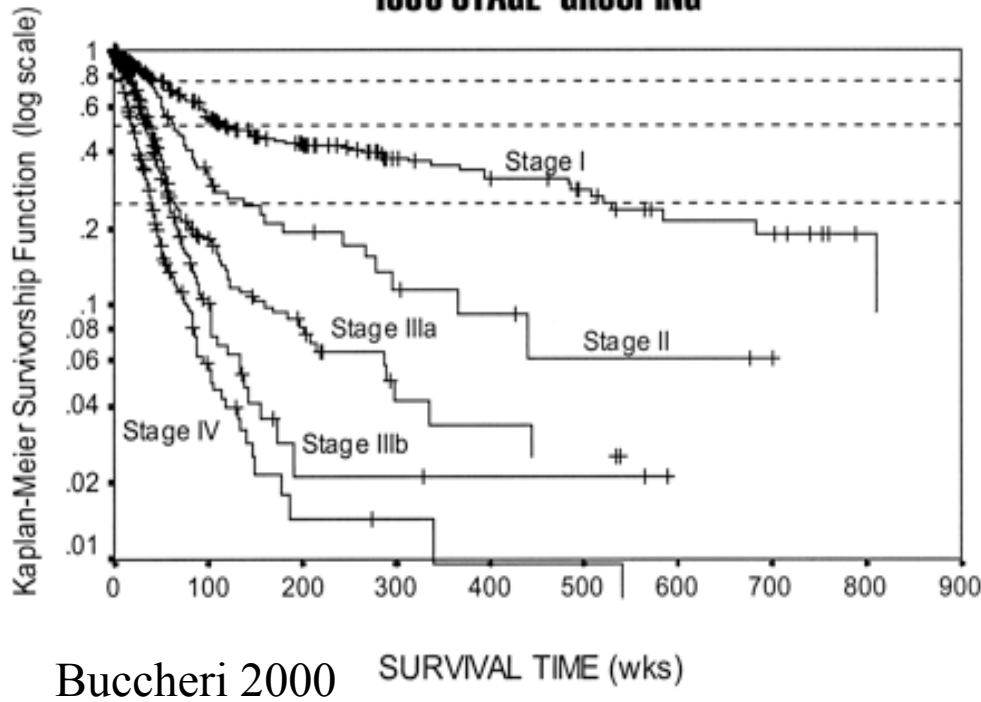
\* Included Cis

Early Detection with  
**Autofluorescence**  
**Bronchoscopy**

# Intraepithelial Neoplasia (IEN)



## 1986 STAGE GROUPING



## Stage

## TNM System

IA	M0	T1	N0
IB	M0	T2	N0
IIA	M0	T1	N1
IIB	M0	T2	N1
III	M0	T3	N0
IIIA	M0	T3	N1
IIIB	M0	T1-3	N2
IIB	M0	T4	N0-2
IV	M1	T1-4	N3
IV	M1	T1-4	N1-3

# Stage 0

29% of  
all lung cancer  
will pass this way

# Why is conventional Bronchoscopy for *Early Squamous Cell and its precursors* so challenging?

- *“Suspicious lesions” are often advanced:*  
Nodular/polypoid lesions, or irregularities of the bronchial mucosa appear after cartilage invasion.
- *Early stage lesions* are a few cell layers thick and may be few mm in surface diameter
- *Mucosal changes of early lesion may be subtle on normal bronchoscopy.*

# **AutoFluorescence compared with normal bronchoscopy**

- Studied in over 3000 patients in over 50 studies:
- Relative sensitivity for early stage lesions **increases an average of two-fold (1.5 – 6.3)**.
- The addition of AutoFluorescence to normal bronchoscopy doubles the number of patients classified as positive.

# Autofluorescence Imaging Systems



- Exploit the natural “autofluorescence” of the bronchial epithelium
- Do not require the use of photosensitizers

**Normal, RML**

**Carcinoma in situ, trachea**



**OncoLIFE images**

# ACCP Guidelines: Indications for Autofluorescence Bronchoscopy

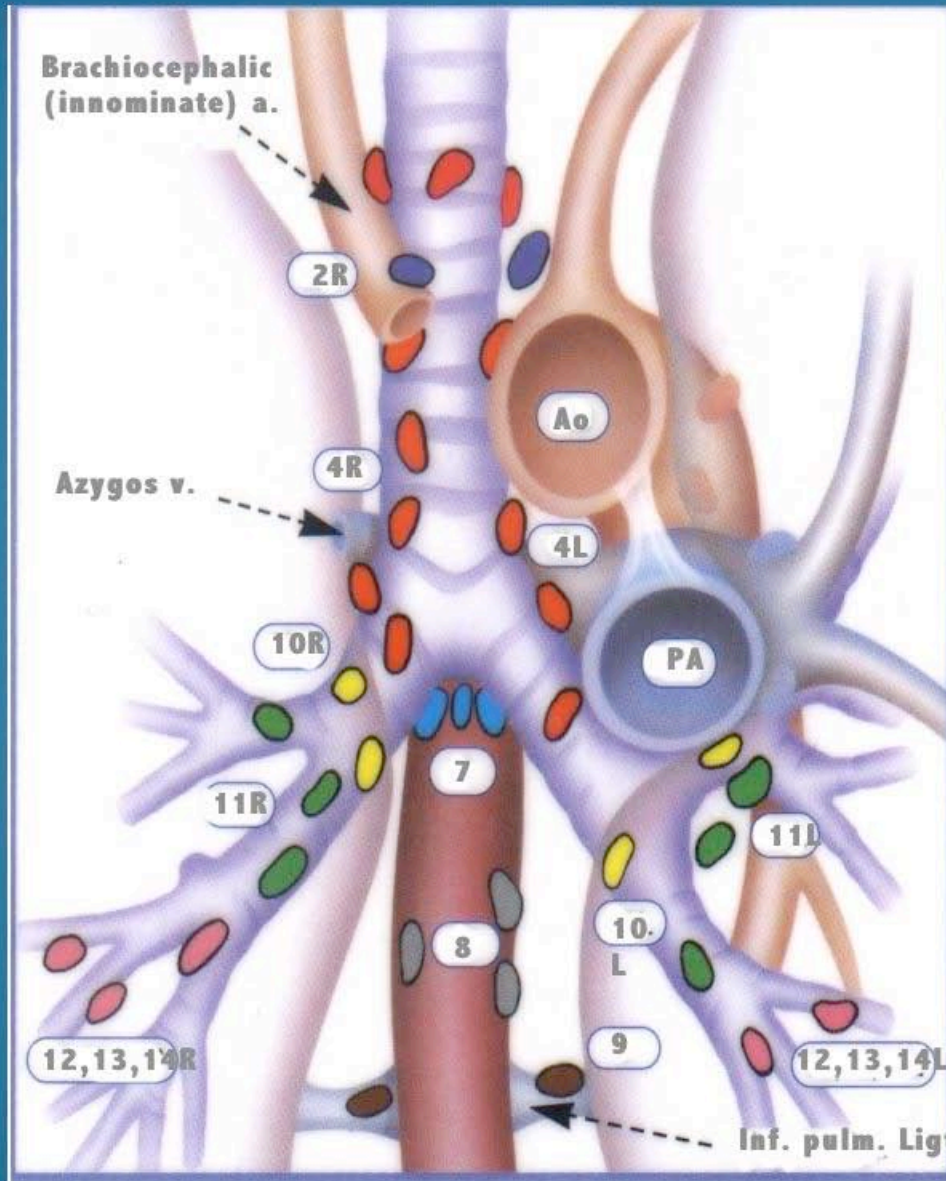
- Investigation of abnormal sputum cytology
- Post–resection surveillance for metachronous primary lung cancers
- Secondary chemoprevention
- Pre-PDT assessment
- **Primary screening in high risk patients (surveillance)**

# Enlarged Lymph Nodes

- Now What?
- Do I need an operation?



# Regional Nodal Stations for Lung Cancer Staging



## Superior Mediastinal Nodes

- 1 Highest Mediastinal
- 2 Upper Paratracheal
- 3 Pre-vascular and Retrotracheal
- 4 Lower Paratracheal (including Azygos Nodes)

$N_2$ =single digit, ipsilateral

$N_3$ =single digit, contralateral or supraclavicular

## Aortic Nodes

- 5 Subaortic (A-P window)
- 6 Para-aortic (ascending aorta or phrenic)

## Inferior Mediastinal Nodes

- 7 Subcarinal
- 8 Paraesophageal (below carina)
- 9 Pulmonary Ligament

## $N_1$ Nodes

- 10 Hilar
- 11 Interlobar
- 12 Lobar
- 13 Segmental
- 14 Subsegmental

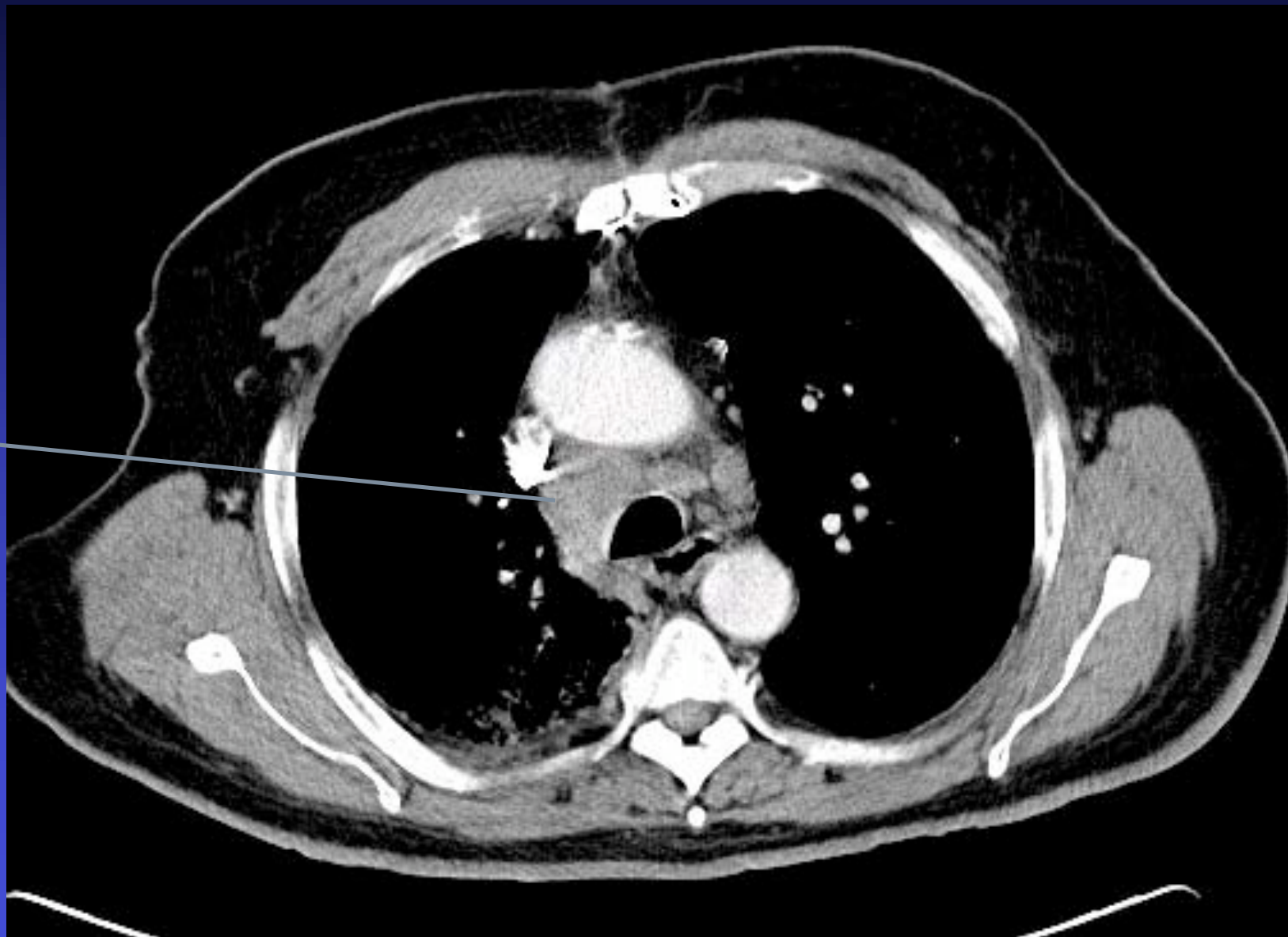
# TBNA Anatomy



4L

# TBNA Anatomy

4R



TBNA of 4R /  
Primary Mass



# TBNA Anatomy

10R



# TBNA: TECHNIQUE

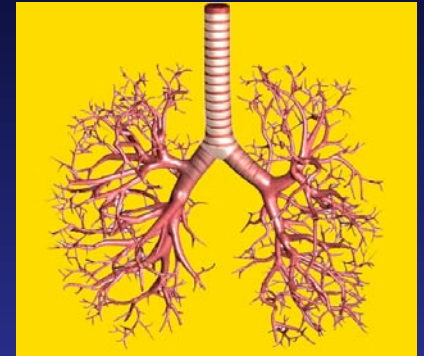


# TBNA: HISTOLOGY



# Superdimension

- Over  $2/3$  of target lesions are outside bronchoscope's reach and vision
- Tool then pushed out without video image and only under two dimension x-ray guidance
- Most peripheral lesions are too small to be seen
- Current method: "integration" of current tool position (from fluoro) and pre-operative CT images is performed only in the physician's mind



# Superdimension:

- Before the bronchoscopy, a 3D roadmap is generated by defining standard airway branch points and target lesion on a virtual bronchoscopy generated from a high resolution CT scan.
- At beginning of procedure, the CT roadmap is correlated to current body position
- The Locatable Guide is “steered” to the target lesion, overlaid in real time on the CT roadmap
- Now any standard bronchoscopic tool can be used at the target

# Superdimension- Case

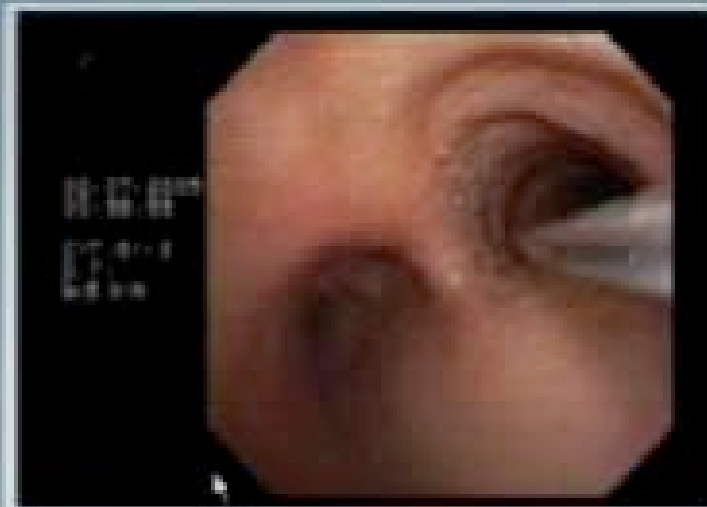
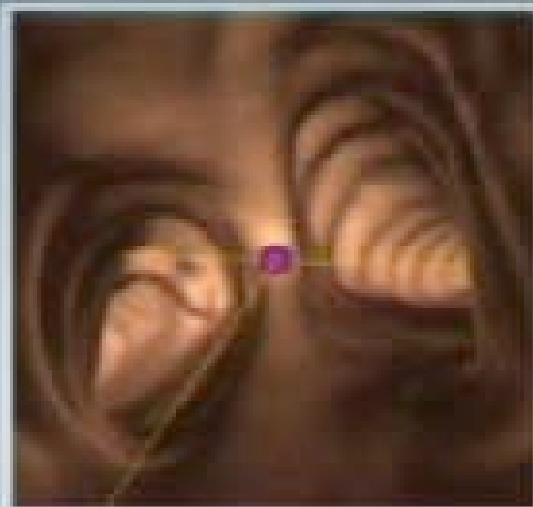


Visit us at [www.superdimension.com](http://www.superdimension.com)

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### Registration

Place the tip of the Locatable Guide at the actual body location of the selected Registration Point, as marked in the Virtual Bronchoscopy image and press the "Acquire" button



#	Name	Status	
1	mc		▲
2	M		
3	W		
4	TL		
5	RL		▼

Video Settings

Acquire

Cancel

Register All

Finish

Cancel



# Center for High Risk Aerodigestive Malignancy

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