

Con il patrocinio di



Associazione Italiana Pneumologi Ospedalieri



PNEUMOLOGIA 2016

Milano, 16 – 18 giugno 2016 · Centro Congressi Palazzo delle Stelline



PNEUMOLOGIA 2016

Aggiornamenti di Radiologia Interventistica

L'angiografia ha ancora un ruolo?

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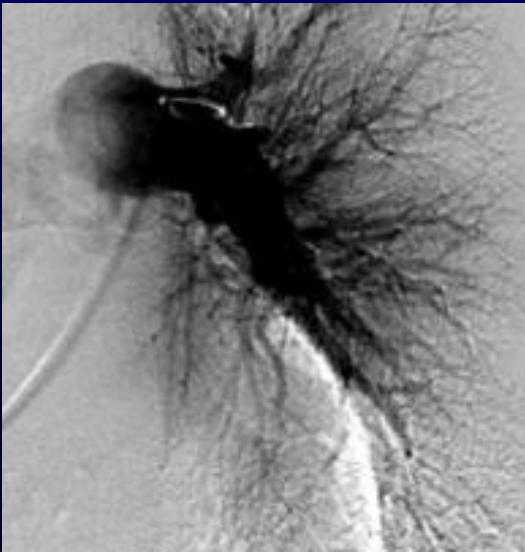
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DSA & Pulmonary District

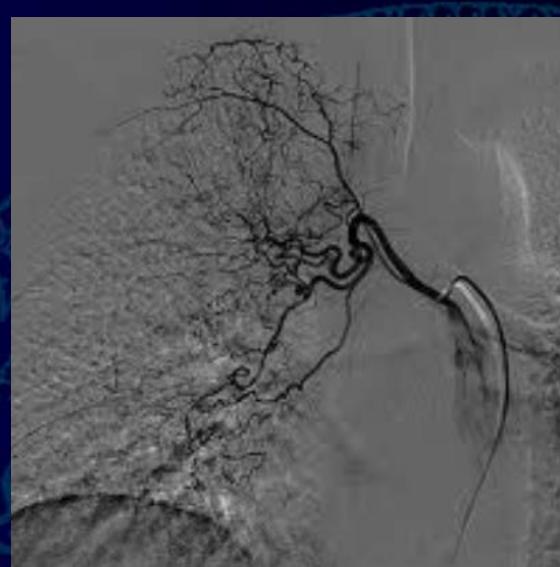
- *Systemic Circulation
(Bronchial A.)*



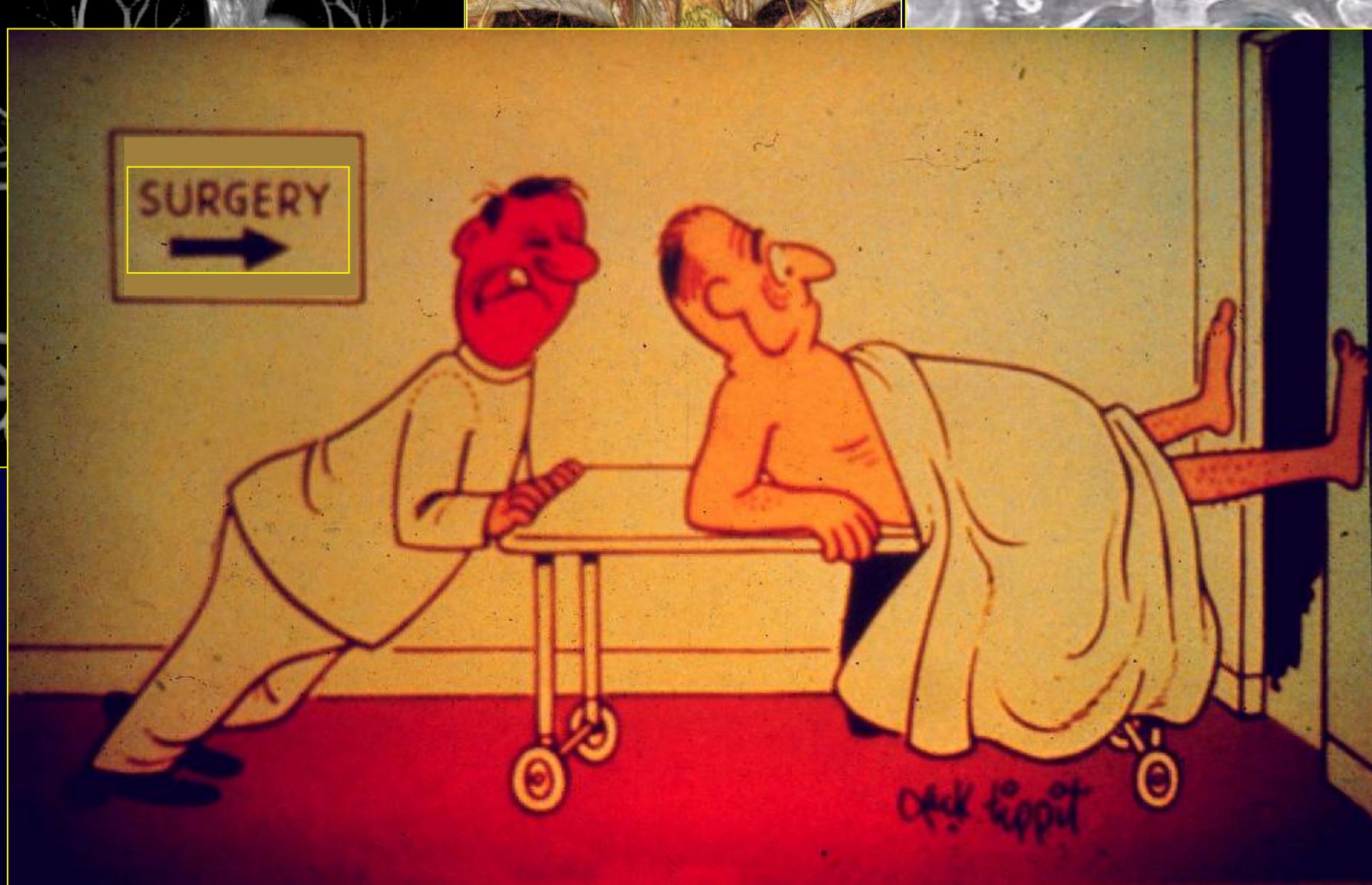
- *Pulmonary Circulation*



- *Venous Circulation*



DSA & Pulmonary District



DSA & Systemic Circulation

Hemoptysis

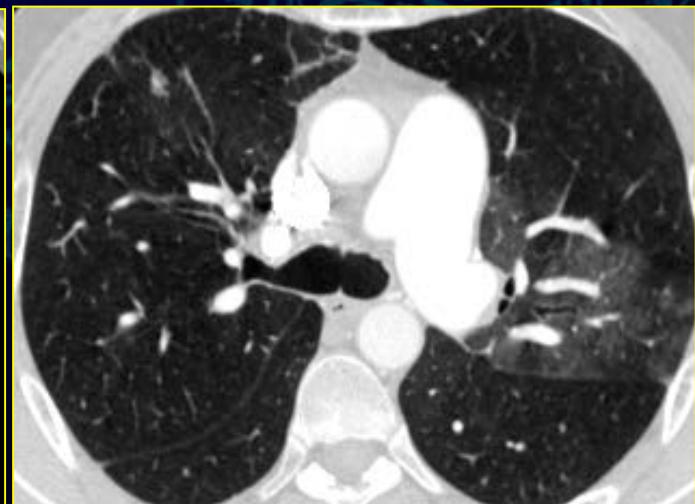
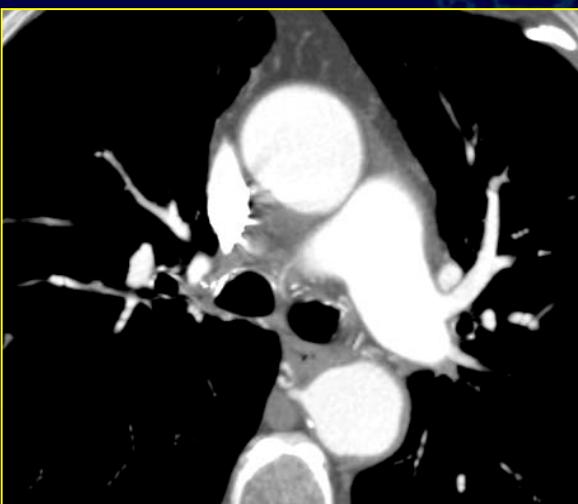
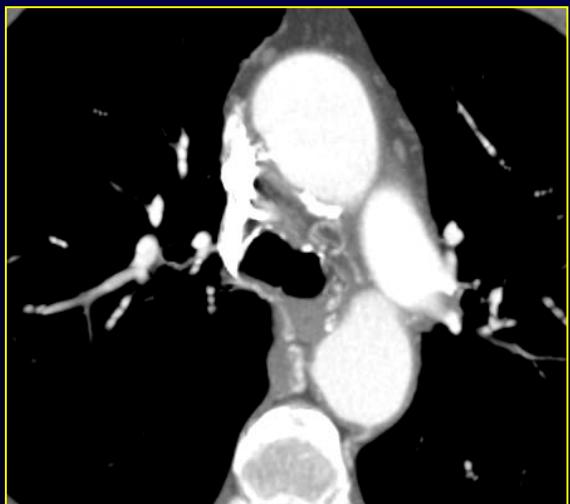
- *Bleeding that originates from the lower respiratory tract (massive: 300-600ml/24h)*
 - *multiple causes: parenchymal diseases
airway diseases
vascular diseases*
 - *Tuberculosis*
 - *Bronchiectasis*
 - *Chronic Inflammatory Diseases*
 - *Cystic Fibrosis*
 - *Bronchogenic Carcinoma*
 - *Aspergillosis*

DSA & Systemic Circulation

Hemoptysis

Pathophysiology: Pulmonary / Systemic A.

- Diseases that reduce pulmonary arterial supply
(chronic PE, vasculitis)

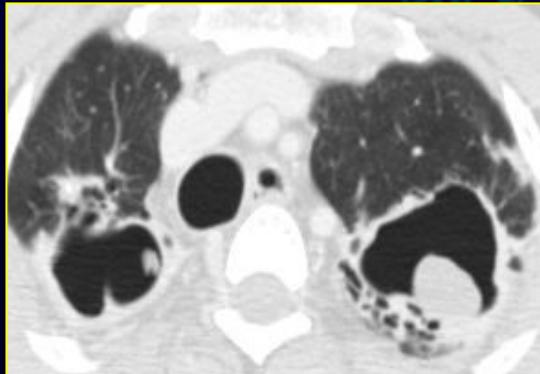


DSA & Systemic Circulation

Hemoptysis

Pathophysiology: Pulmonary / Systemic A.

- Diseases that reduce pulmonary arterial supply
(chronic PE, vasculitis)
- Chronic inflammatory diseases/neoplasms that lead to neovascularization



DSA & Systemic Circulation

Hemoptysis

Pathophysiology: Pulmonary / Systemic A.

- Diseases that reduce pulmonary arterial supply
(chronic PE, vasculitis)
- Chronic inflammatory diseases/neoplasms that lead to neovascularization



increased bronchial arterial blood supply with hypertrophy and rupture of anastomotic vessels

DSA & Systemic Circulation

Hemoptysis

Conservative Treatment
High mortality rate: 55-95%

Surgical Treatment

- *Elective Surgery: mortality of 18%*
- *Emergent Surgery: mortality of 40%*

Najaraian et al. J Thorac Im 1998
Haponik et al. Chest 2000

DSA & Systemic Circulation

Hemoptysis

Systemic Circulation: 90-95%

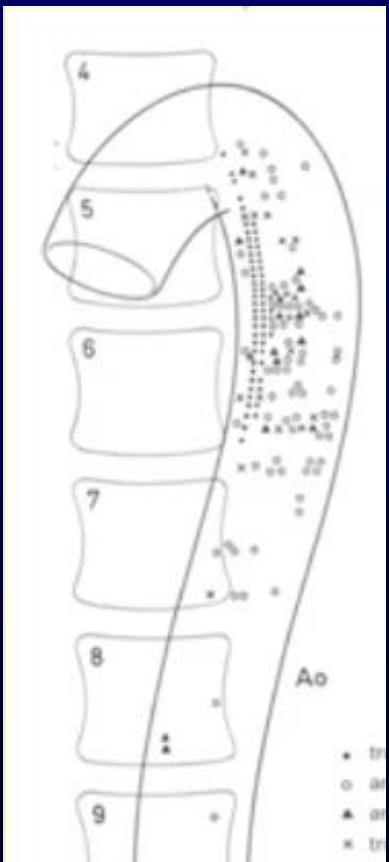
- *Bronchial Arteries (65-95%)*

Pulmonary Circulation: 5-10%

- *Other Systemic Arteries (40-70%)*

DSA & Systemic Circulation

Hemoptysis & Bronchial Arteries



70%
Desc Ao (Th5-6)



Ectopic:

- Subclavian
- Internal Mammary
- Pericardiophrenic
- Brachiocephalic
- Costocervical Trunk
- Inferior Phrenic
- Abdominal Aorta

Walker CM et al.
Radiographics 2015

DSA & Systemic Circulation

Hemoptysis & Bronchial Arteries

- *normal* $< 1.5 \text{ mm at the origin}$
 $= 0.5 \text{ mm distally}$
- *abnormal* $> 2 \text{ mm}$ (*potential source of hemoptysis*)
traceability to the hilum is more frequent for bronchial arteries causing hemoptysis (74%)
*contrast medium extravasation (4-11%)**

*Chung MJ, AJR 2006; 186:649

DSA & Systemic Circulation

Hemoptysis & BAE

MDCT Workup

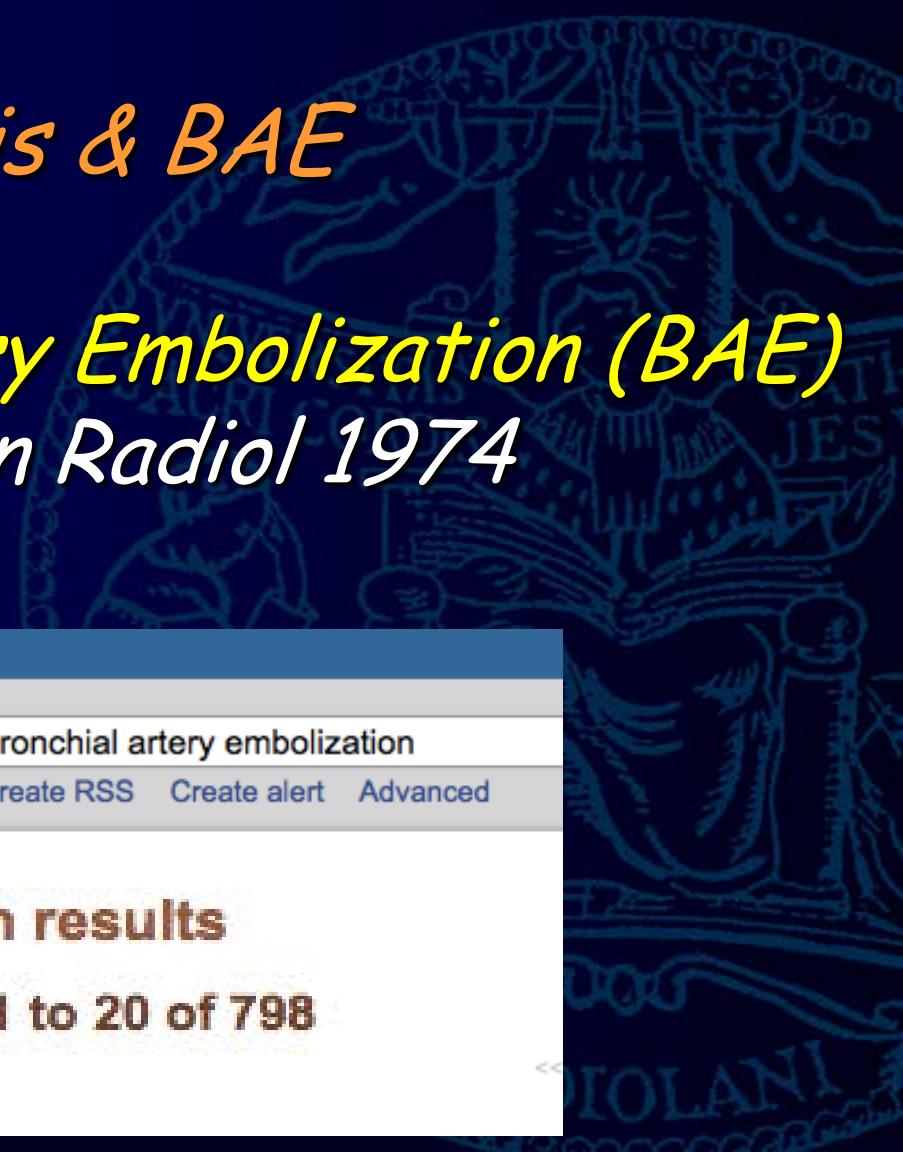
- *Underlying Disease*
- *Bleeding Site*
- *Predict Culprit Vessel*
- *"Road map" for interventional rad*



DSA & Systemic Circulation

Hemoptysis & BAE

First Bronchial Artery Embolization (BAE)
J. Remy - Ann Radiol 1974



NCBI Resources How To

PubMed US National Library of Medicine National Institutes of Health

PubMed bronchial artery embolization Create RSS Create alert Advanced

Article types Clinical Trial Review Customize ...

Text availability Abstract

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Items: 1 to 20 of 798

DSA & Systemic Circulation

Hemoptysis & BAE

Embolic Materials

- *Absorbable Gelatin Sponge*
- *Spherical Embolics (350-900micron)*
- *Liquid Agents*
- *Coils (proximal embolization/aneurysms)*

DSA & Systemic Circulation

Hemoptysis & BAE

Results

- *Control of Hemoptysis:*

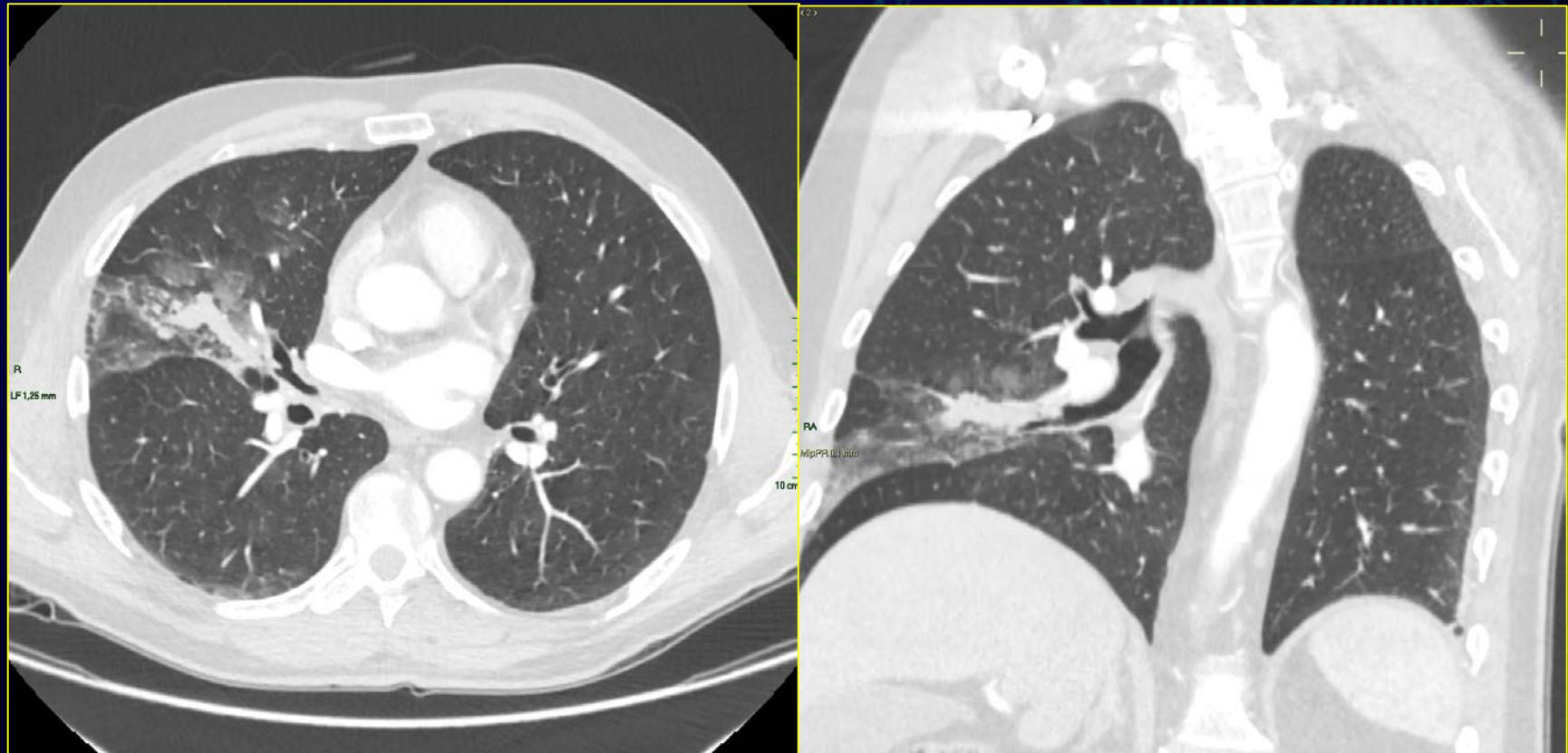
73% - 98%

Park HS et al. CVIR 2007
Won S et al. Radiology 2013

DSA & Systemic Circulation

Hemoptysis & BAE

♂ 49yo - severe Hemoptysis



DSA & Systemic Circulation

Hemoptysis & BAE

♂ 49yo - severe Hemoptysis



DSA & Systemic Circulation

Hemoptysis & BAE

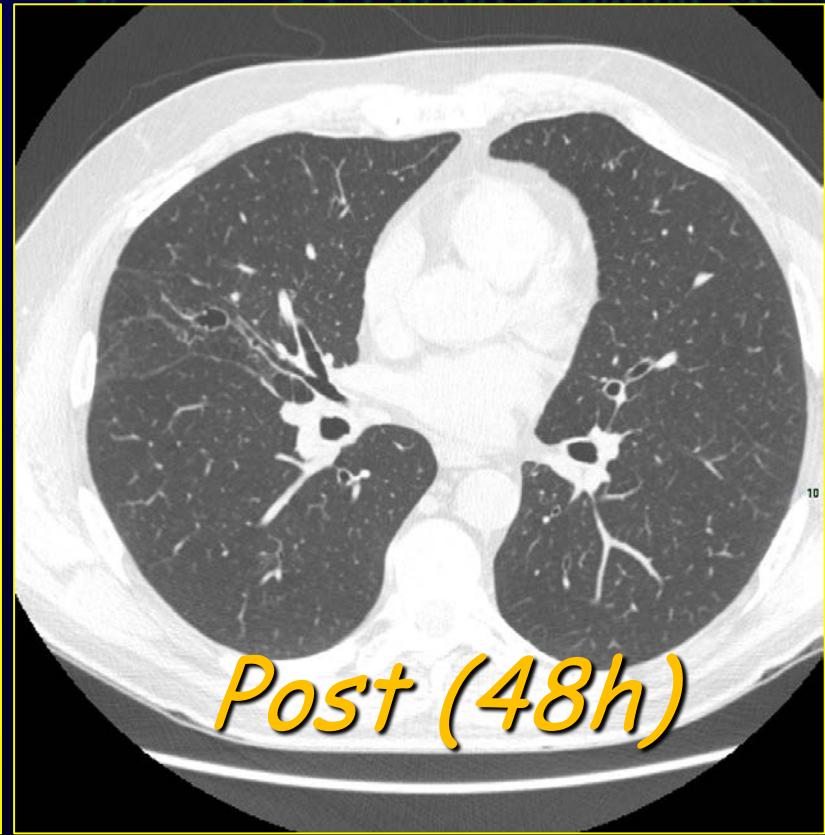
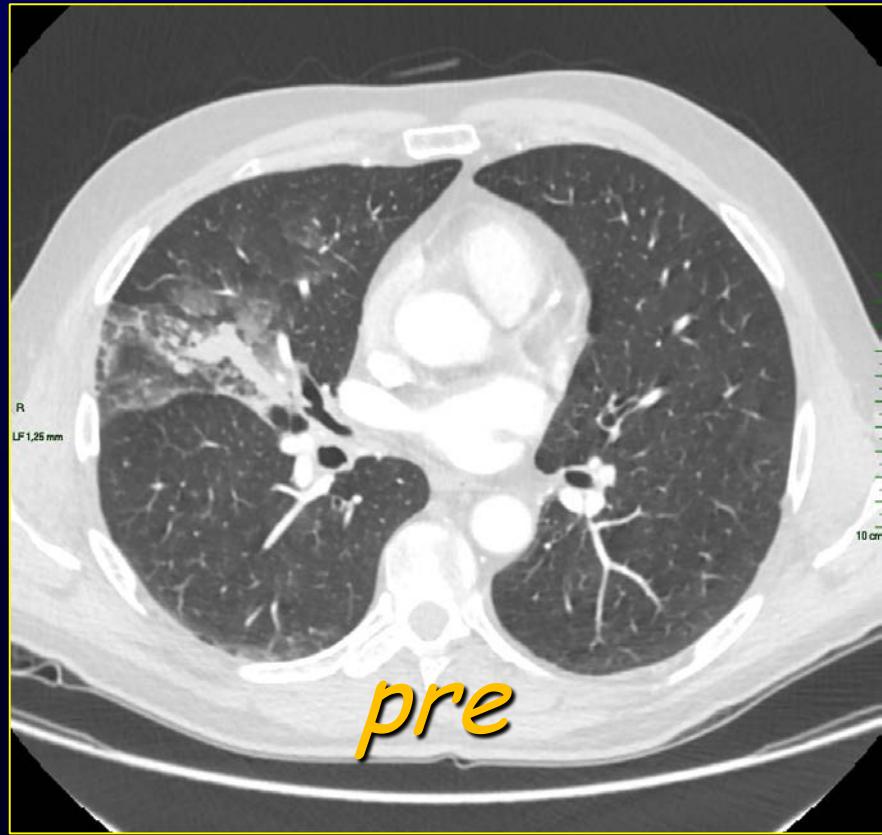
♂ 49yo - severe Hemoptysis



DSA & Systemic Circulation

Hemoptysis & BAE

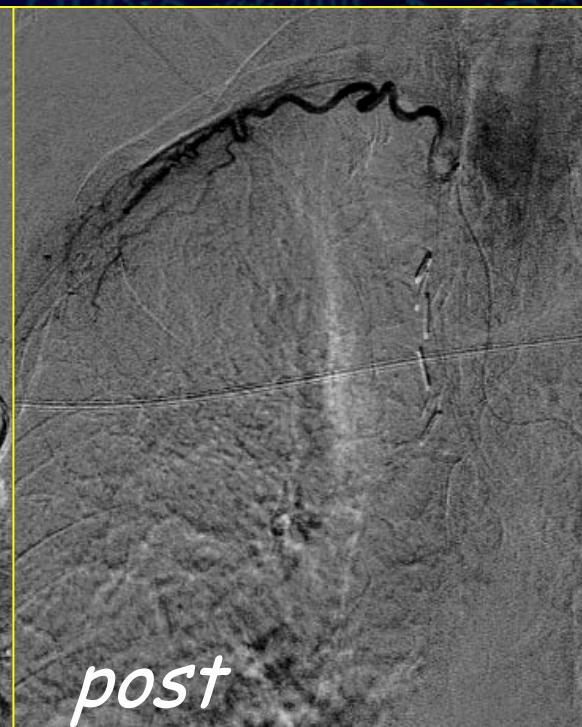
♂ 49yo - severe Hemoptysis



DSA & Systemic Circulation

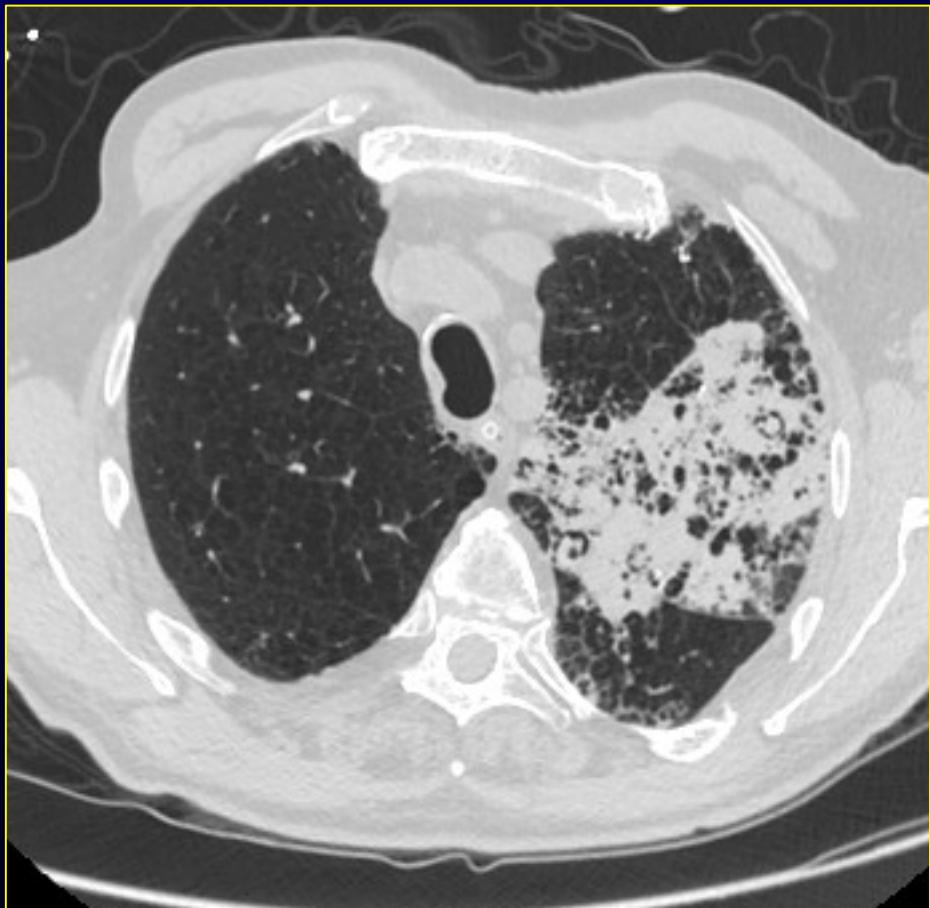
Hemoptysis & BAE

♂ 64yo - smokers



DSA & Systemic Circulation

Hemoptysis & BAE



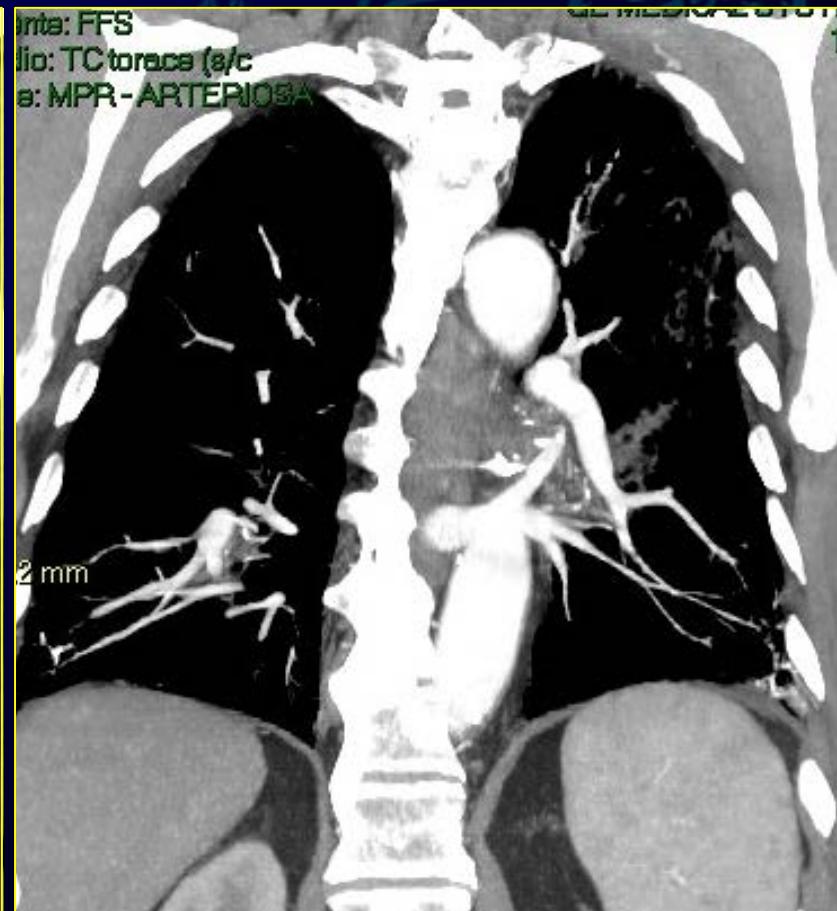
DSA & Systemic Circulation

Hemoptysis & BAE



DSA & Systemic Circulation

Hemoptysis & BAE



DSA & Systemic Circulation

Hemoptysis & BAE

Results

- *Control of Hemoptysis:*

73% - 98%

- *Long-term Recurrent Rate:*

10% - 52%

*Park HS et al. CVIR 2007
Won S et al. Radiology 2013*

DSA & Systemic Circulation

Hemoptysis & BAE

Recurrent Hemoptysis

- *Tuberculosis, Aspergilloma, Neoplasm*

- *Incomplete embolization*
- *Recanalization*
- *Revascularization by collaterals*
- *Progression of the Disease*

DSA & Systemic Circulation

Hemoptysis & BAE

Complications

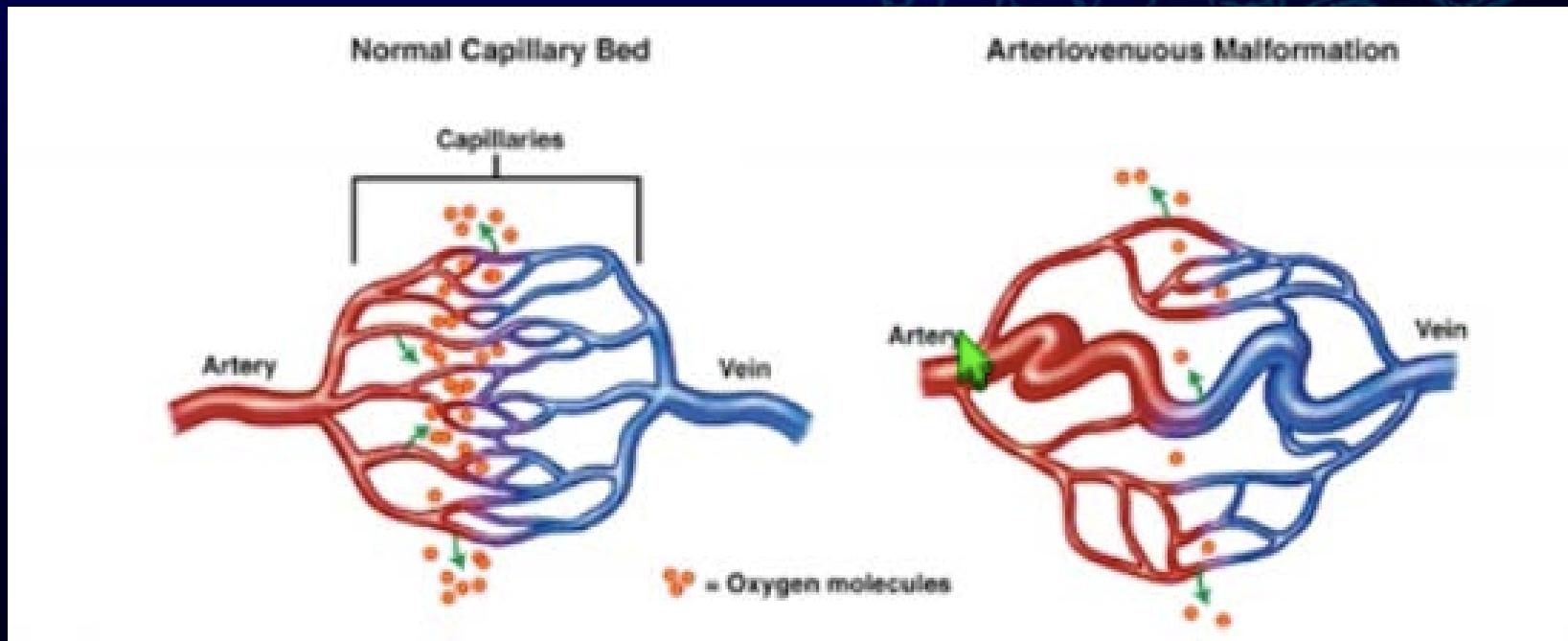
<i>Chest Pain</i>	24-91%
<i>Dysphagia</i>	1-18%
<i>Dissection of bronchial arteries</i>	1-11%
<i>Dissection of aorta</i>	1-6%
<i>Spinal cord ischemia</i>	1-6%

Park HS et al. CVIR 2007
Won S et al. Radiology 2013

DSA & Pulmonary Circulation

Pulmonary AVM

- Direct connection between pulmonary artery and vein
- 80-90% associated with HHT



DSA & Pulmonary Circulation

Pulmonary AVM

Hereditary Hemorrhagic Teleangiectasia

- *Autosomal Dominant Disorder*

- *Vascular Malformations
(Skin / Mucous Membranes / Internal organs)*
- *Symptoms (Bleeding - symptoms associated with PAVM's)*

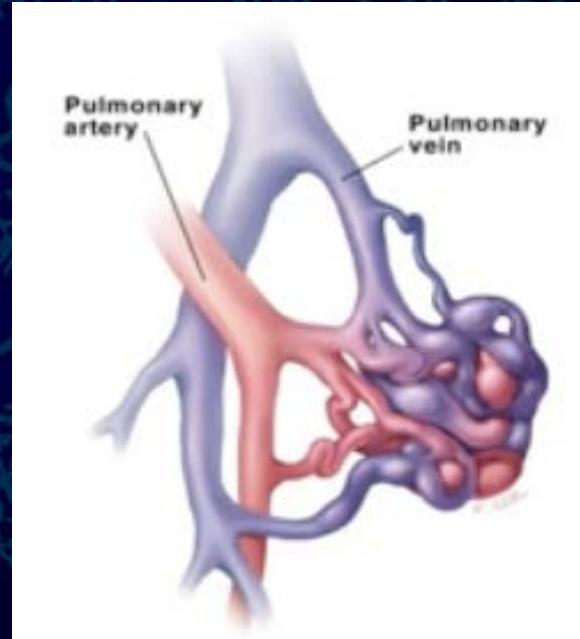


DSA & Pulmonary Circulation

Pulmonary AVM

Symptoms: Right to Left Shunt

- *Hypoxemia*
 - Dyspnea/fatigue
 - Cyanosis
 - Polyglobulia
- *Migraine*
- *Often Asymptomatic (30-60%)*



DSA & Pulmonary Circulation

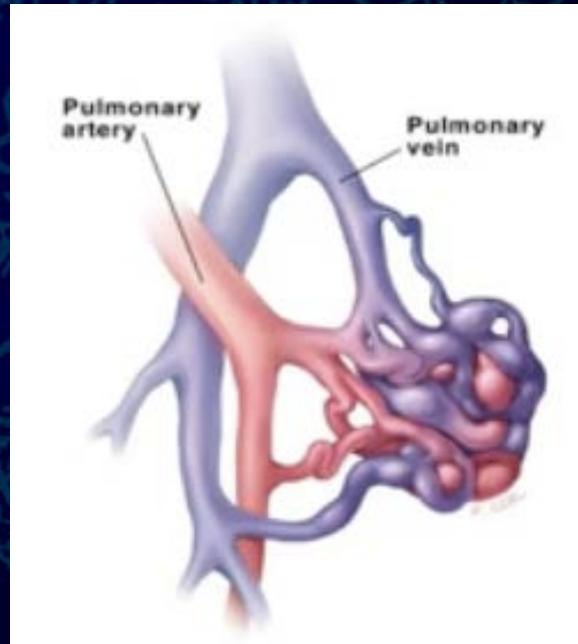
Pulmonary AVM

Complications

- *Paradoxical Emboli*

- *TIA / Stroke*
- *Brain Abscess*

*Conservative Treatment
Mortality Rate: 4-40%*



Treatment: Recommended for Feeding art >3mm

DSA & Pulmonary Circulation

Pulmonary AVM

MDCT Workup

- *Careful Attention to Angioarchitecture*

- *Simple (90%)*



- *Complex (10%)*



DSA & Pulmonary Circulation

Pulmonary AVM Embolectic Materials

- *Coils*



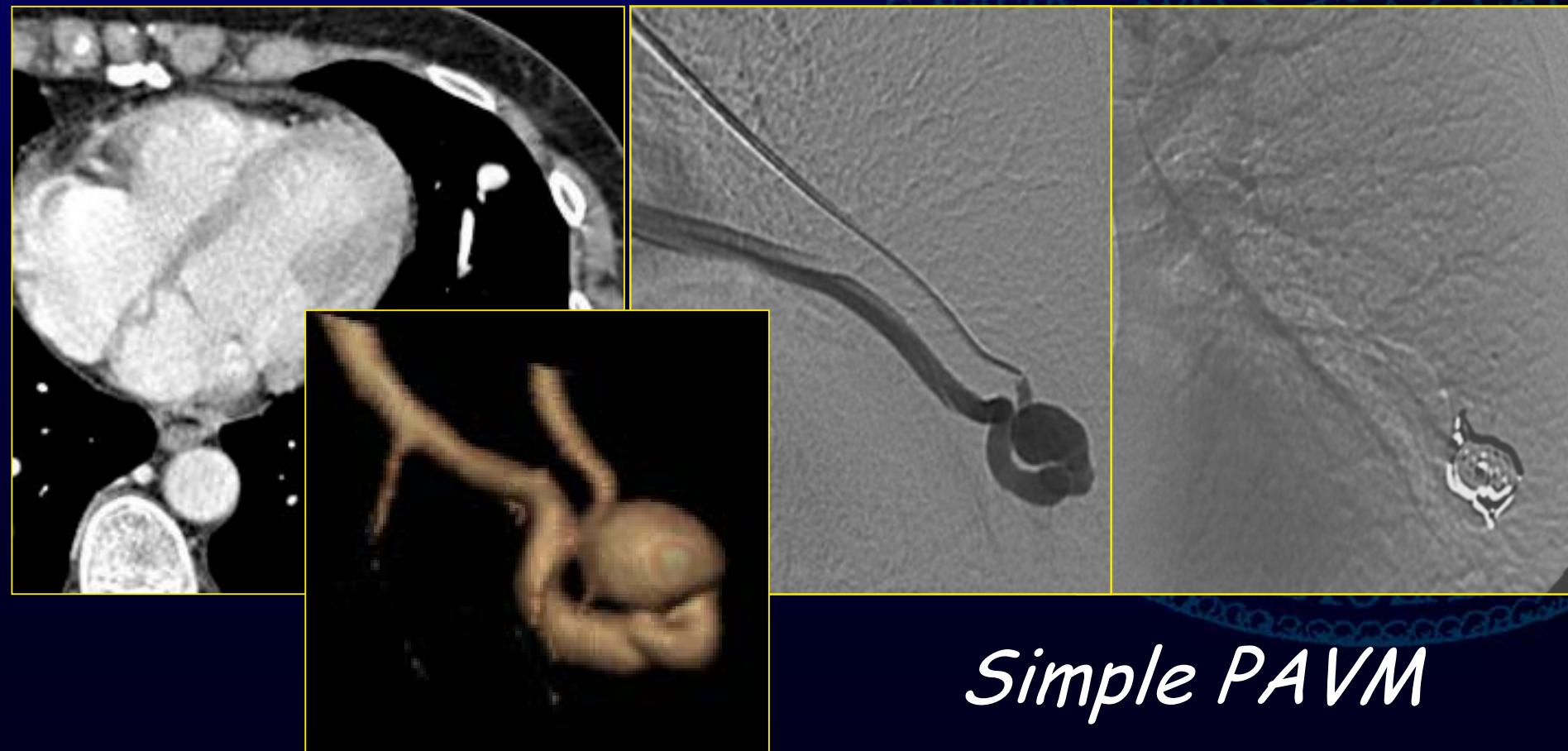
- *Detachable (non coil)
devices*



DSA & Pulmonary Circulation

Pulmonary AVM

♂ 61yo - asymptomatic

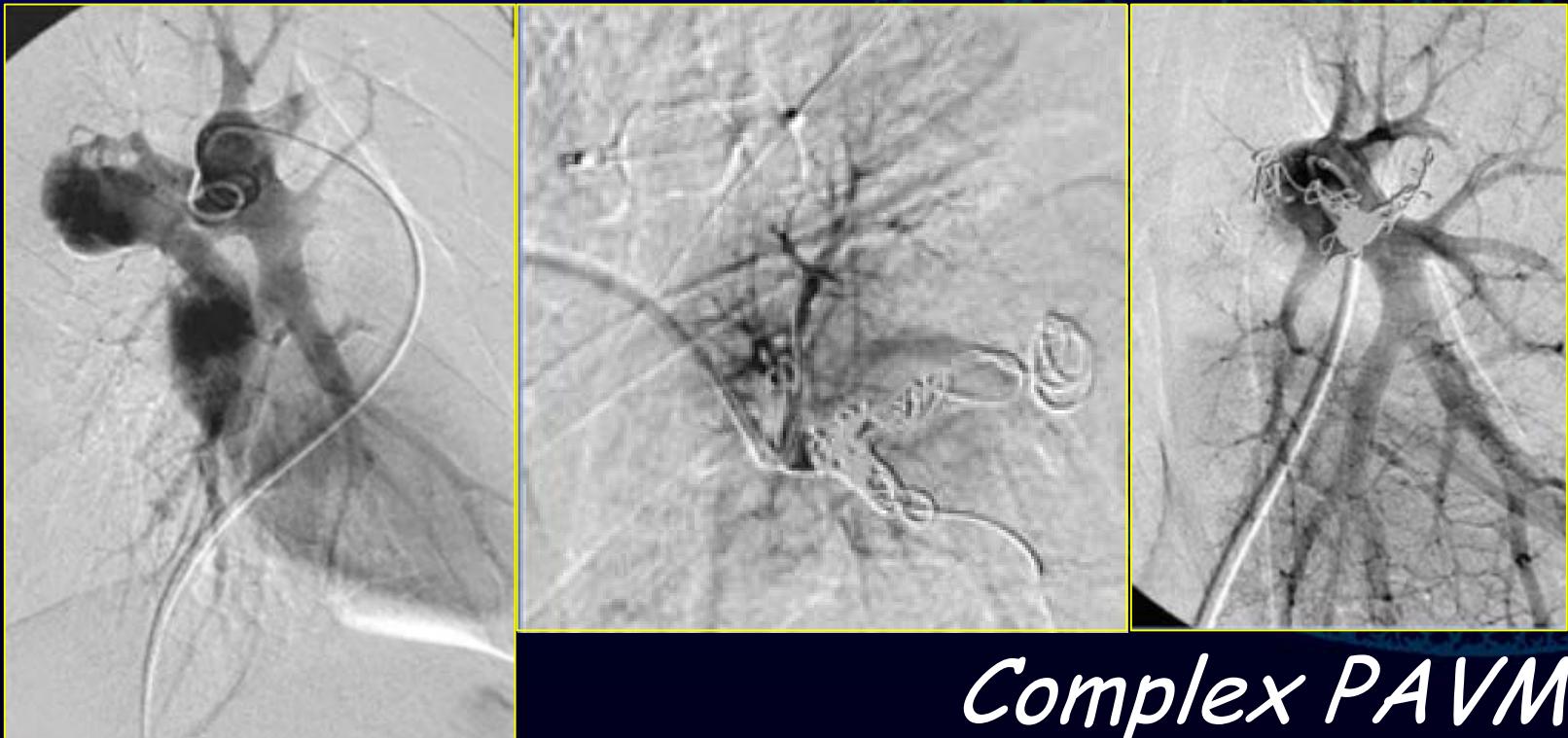


Simple PAVM

DSA & Pulmonary Circulation

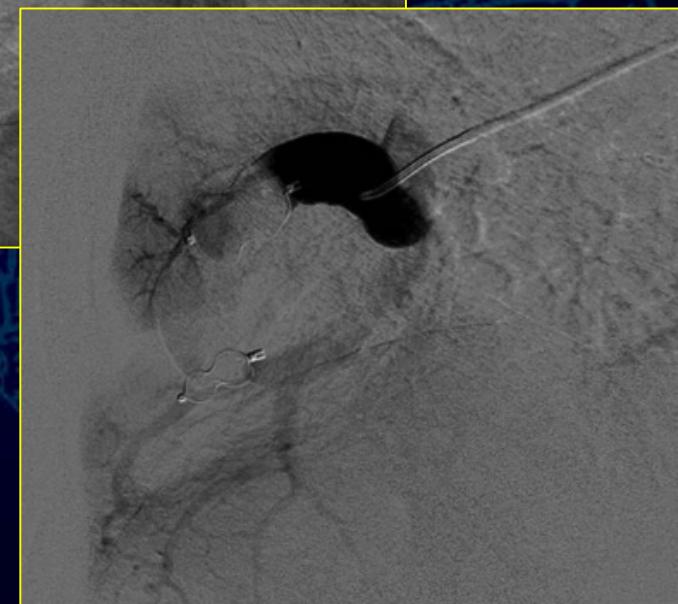
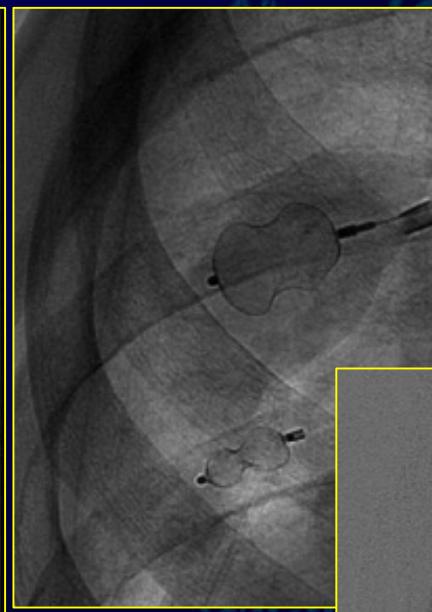
Pulmonary AVM

♀ 58yo - chest pain -
 SaO_2 94% 60% ox mask



DSA & Pulmonary Circulation

Pulmonary AVM



DSA & Pulmonary Circulation

Pulmonary AVM

Sac Embolization

- Popular in Japan
- Reperfusion 50% FA vs 0% sac
- Acknowledge sac embo more time consuming, more expensive

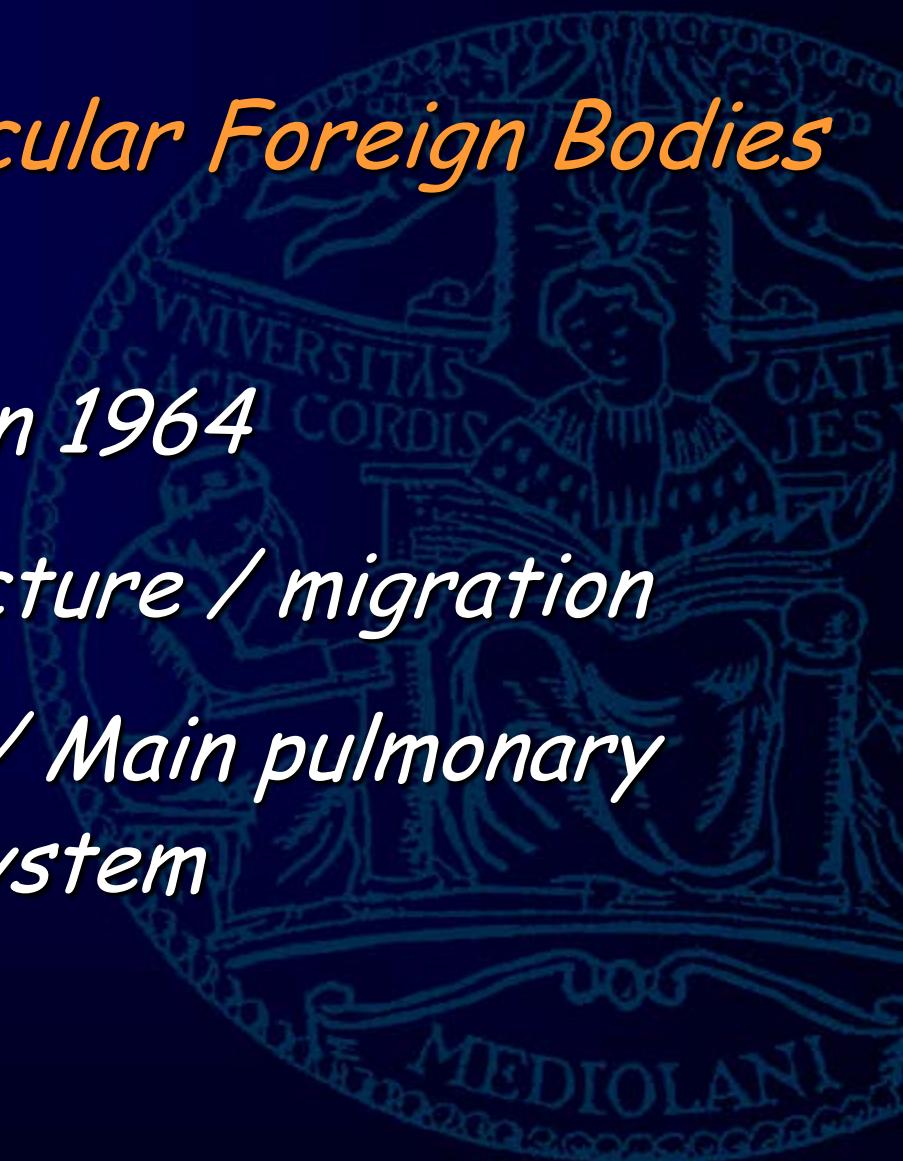
"FA embo still the Gold Standard"



DSA & Venous Circulation

Retrieval of Intravascular Foreign Bodies

- First report in 1964
- Catheter fracture / migration
- Right atrium / Main pulmonary trunk / Caval System



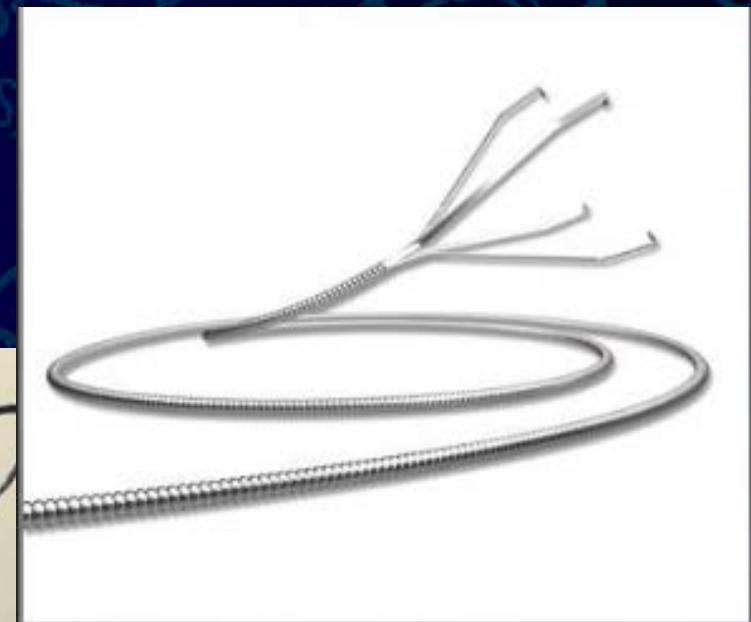
DSA & Venous Circulation

Retrieval of Intravascular Foreign Bodies

- *Successful retrieval reported: 91-100%*
- *Minor Complications: <6%*

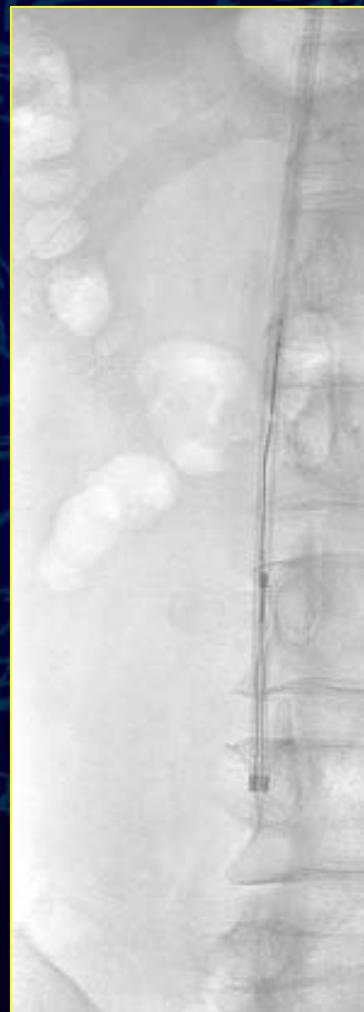
DSA & Venous Circulation

Retrieval of Intravascular Foreign Bodies



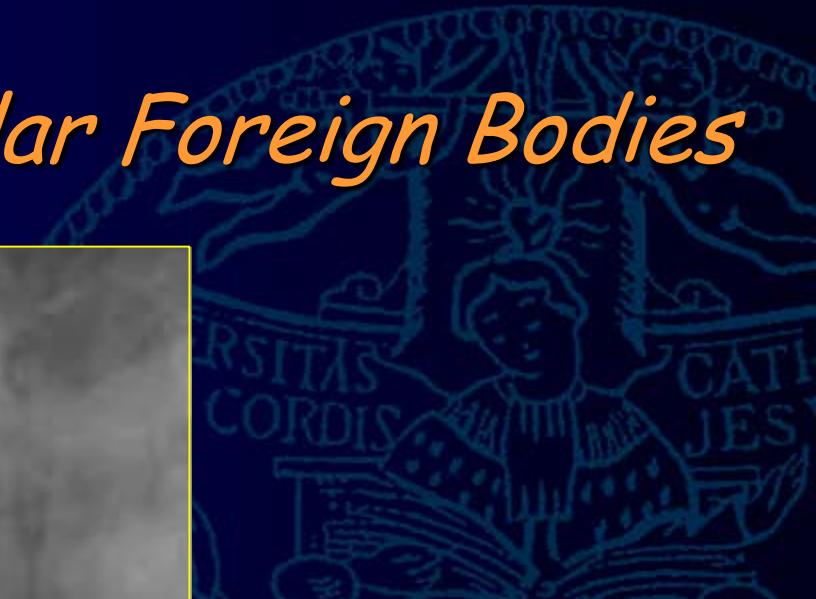
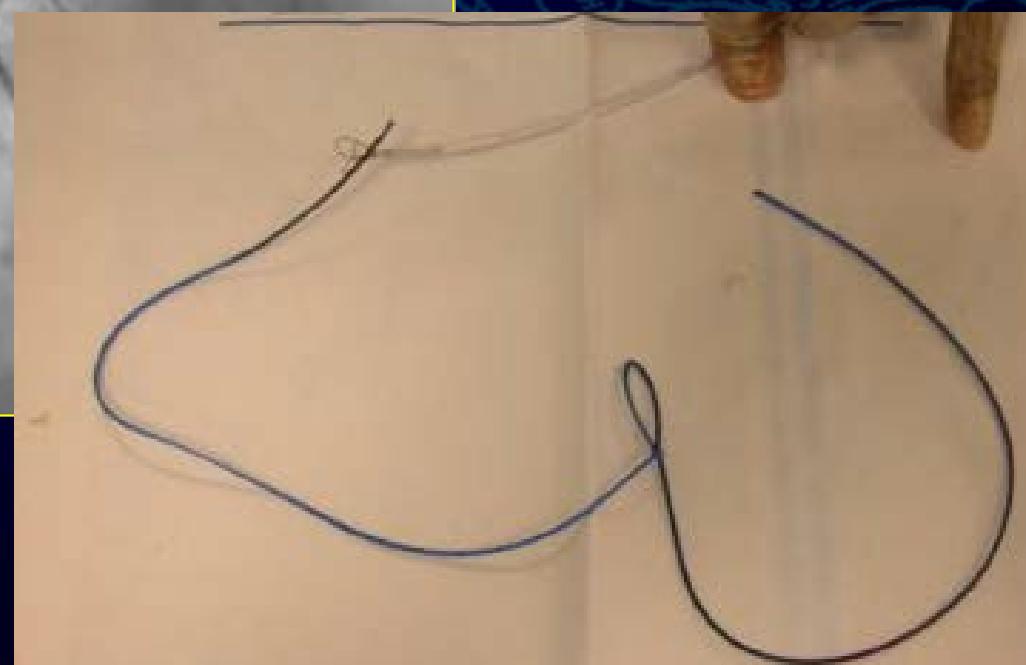
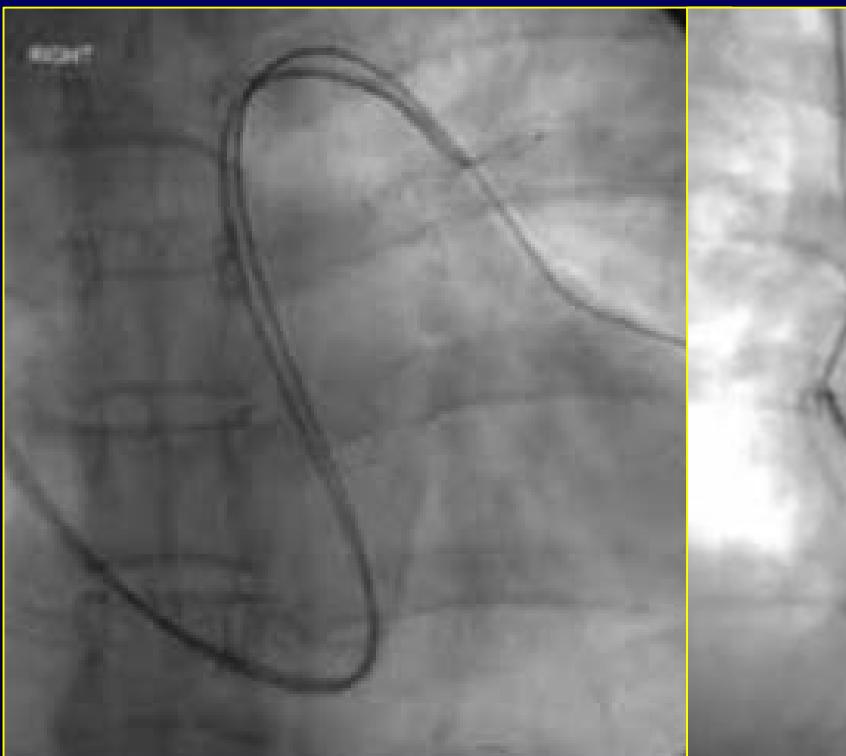
DSA & Venous Circulation

Retrieval of Intravascular Foreign Bodies



DSA & Venous Circulation

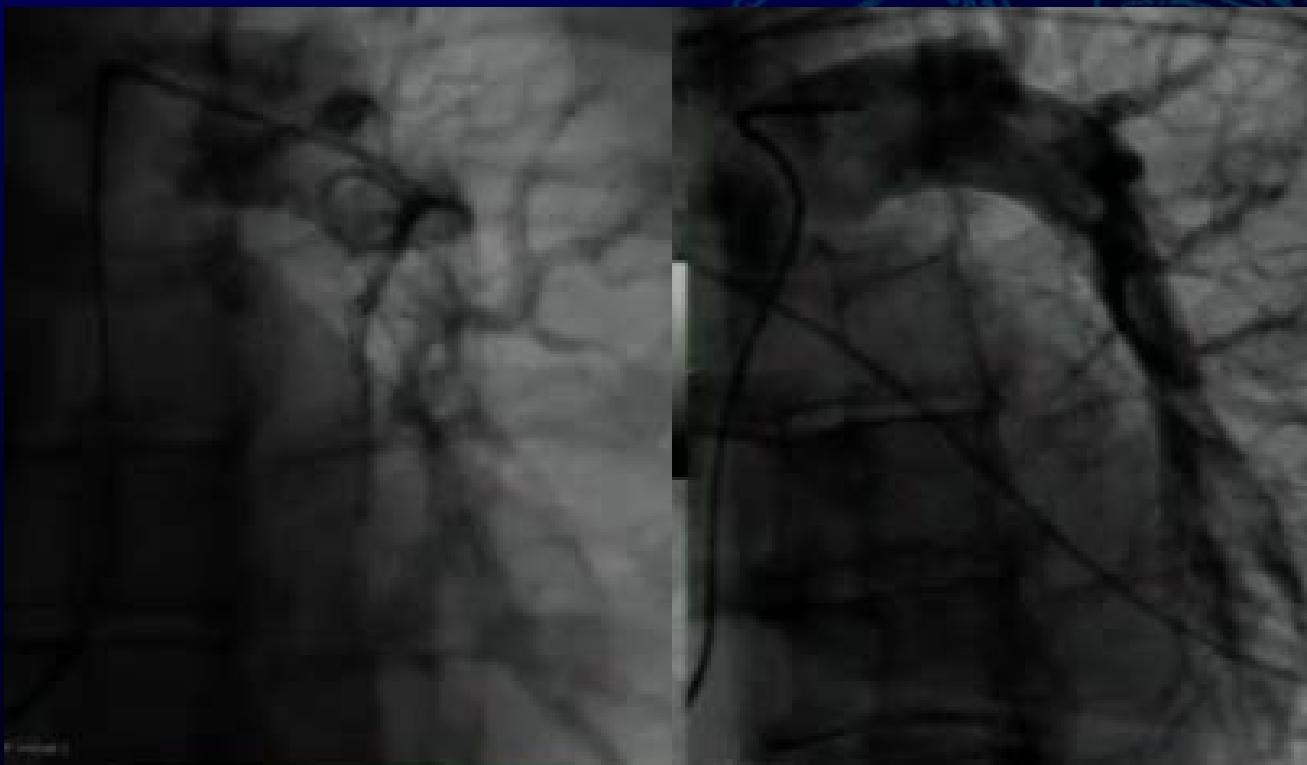
Retrieval of Intravascular Foreign Bodies



DSA & Future Prospectives

Pulmonary Embolism

- *300000 cases/year in the European Union*
- *PE & lower limb deep vein thrombosis (DVT)*



DSA & Future Prospectives

Pulmonary Embolism



DSA & Future Prospectives

Pulmonary Embolism

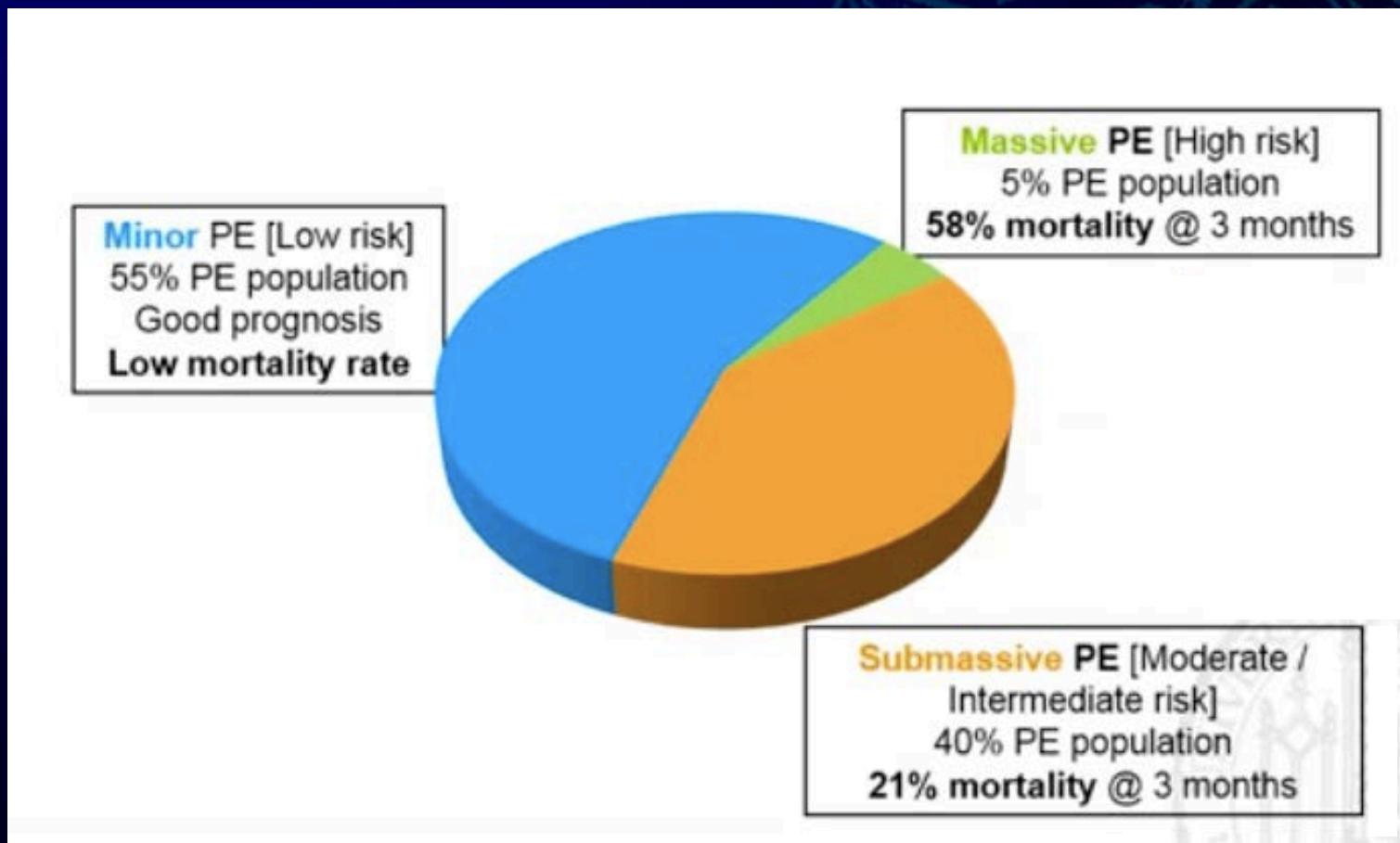
- 300000 cases/year in the European Union
- PE & lower limb deep vein thrombosis (DVT)

Risk Stratification

Low	Intermediate (submassive PE)	High (massive PE)
$BP >90\text{mmHg}$	$BP >90\text{mmHg}$	$BP <90\text{mmHg}$
biomarkers -	biomarkers +	Shock
ECHO -	ECHO +	CPR

DSA & Future Prospectives

Pulmonary Embolism



DSA & Future Prospectives

Pulmonary Embolism

2014 ESC Guidelines: Massive PE

PE with shock or hypotension (high-risk)		
It is recommended to initiate intravenous anticoagulation with UFH without delay in patients with high-risk PE.	I	C
Thrombolytic therapy is recommended.	I	B
Surgical pulmonary embolectomy is recommended for patients in whom thrombolysis is contraindicated or has failed. ^c	I	C
Percutaneous catheter-directed treatment should be considered as an alternative to surgical pulmonary embolectomy for patients in whom full-dose systemic thrombolysis is contraindicated or has failed. ^c	IIa	C

DSA & Future Prospectives

Pulmonary Embolism

2014 ESC Guidelines: Low/Intermediate

PE without shock or hypotension (intermediate or low risk)*			
Reperfusion treatment			
Routine use of primary systemic thrombolysis is not recommended in patients without shock or hypotension.	III	B	
Close monitoring is recommended in patients with intermediate-high-risk PE to permit early detection of haemodynamic decompensation and timely initiation of rescue reperfusion therapy.	I	B	
Thrombolytic therapy should be considered for patients with intermediate-high-risk PE and clinical signs of haemodynamic decompensation.	IIa	B	
Surgical pulmonary embolectomy may be considered in intermediate-high-risk patients, if the anticipated risk of bleeding under thrombolytic treatment is high. ¹	IIb	C	
Percutaneous catheter-directed treatment may be considered in intermediate-high-risk patients, if the anticipated risk of bleeding under thrombolytic treatment is high. ¹	IIb	B	

DSA & Future Prospectives

Pulmonary Embolism

2014 ESC Guidelines: Low/Intermediate

- *RV/LV ratio > 0.9 is an independent predictor of mortality*
- *CM in IVC*



DSA & Future Prospectives

Pulmonary Embolism

Goals of Catheter Embolectomy

- *Decrease in pulmonary vascular resistance and pulmonary artery pressure*
- *Recovery of right ventricular dysfunction*
- *Increase in systemic arterial pressure*
- *Improvement of symptoms and survival*

DSA & Future Prospectives

Pulmonary Embolism

Catheter-Directed Low-Dose Fibrinolysis

- *Avoids the high risk of major bleeding associated with systemic fibrinolysis*
- *More complete thrombus resolution*
- *More effective for subacute thrombus*

DSA & Future Prospectives

Pulmonary Chemoembolization

Unresectable Primary/Secondary Lung Tumors

*Transcatheter
chemotherapeutic drug injection*

+

*Intra-arterial Embolization
(feeding artery)*

Selective
CHT

Ischemia

Tumoral
Necrosis

DSA & Future Prospectives



Regional Chemotherapy of the Lung: Transpulmonary Chemoembolization in Malignant Lung Tumors

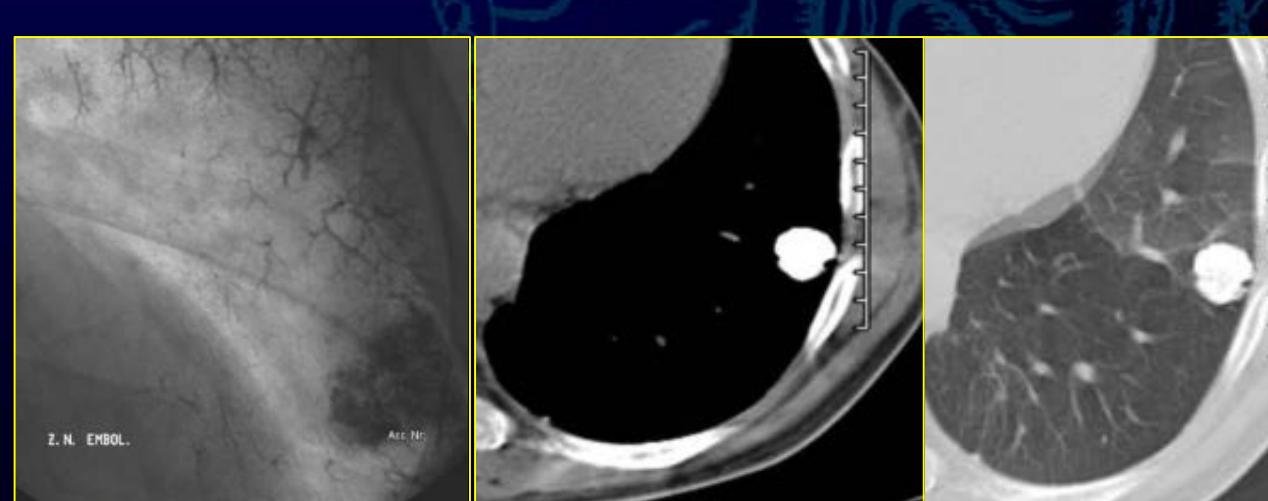
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Semin Intervent Radiol 2013;30:176–184

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- *Mitomycin C*
- *Doxorubicin*
- *Irinotecan*
- *Cisplatin*
- *Lipiodol*
- *Microspheres*





DSA & Future Prospectives

Radiology

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Francesco Armenise, MD
Luigi D'Aluisio, MD
Angela Gaudiano, MD
Girolamo Ranieri, MD
S. Nahum Goldberg, MD

Radiology: Volume 267: Number 2—May 2013

Unresectable Lung Malignancy: Combination Therapy with Segmental Pulmonary Arterial Chemoembolization with Drug-eluting Microspheres and Radiofrequency Ablation in 17 Patients¹

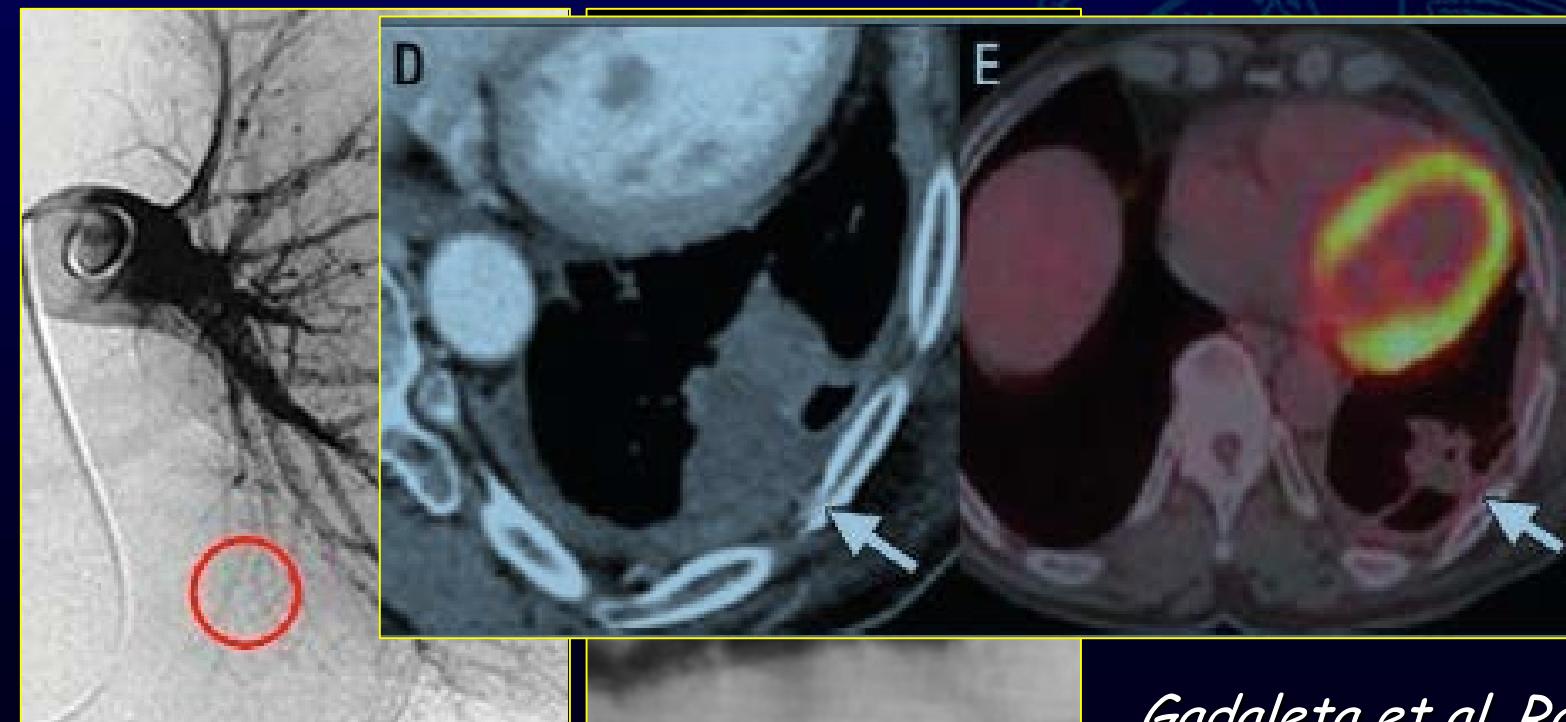
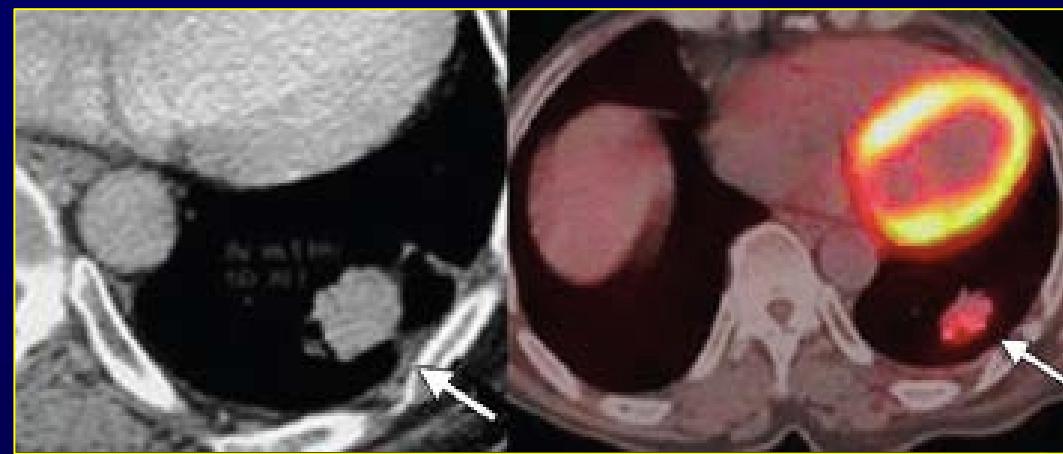
- 17 patients (6 ♂, 66.5yo; 44-81yo)
- 20 nodules (3.2 ± 0.7 cm)

Primary: 3 - Secondary: 17

SPACE + RFA (to reduce heat-sink effect)

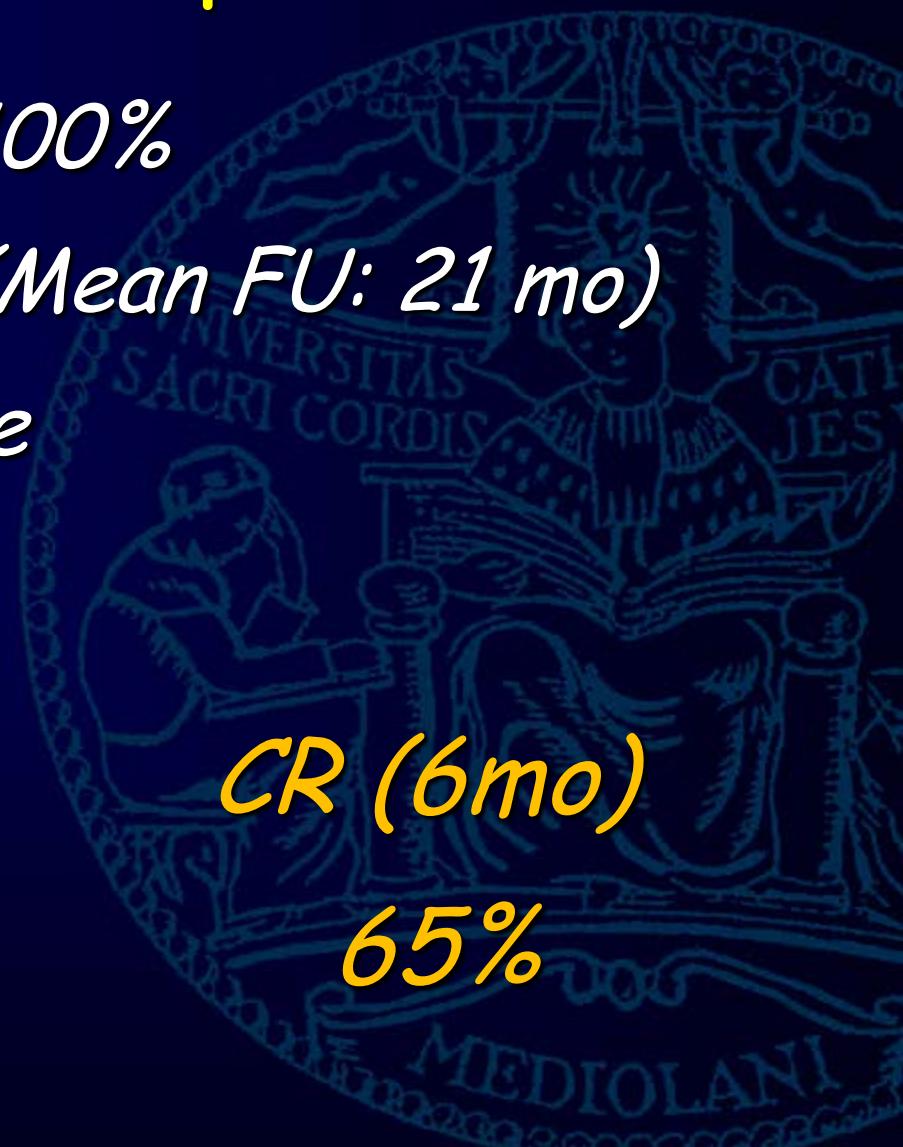
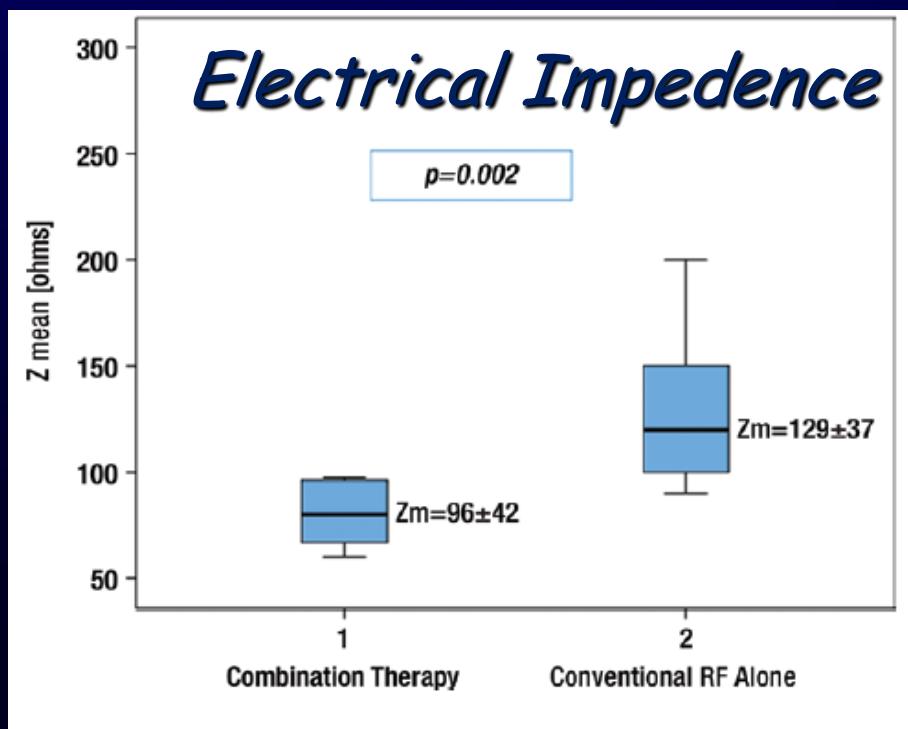
DSA & Future Prospectives

♂ 67yo
Recurrent
Primary Lung
Cancer (NSCLC)



DSA & Future Prospectives

- Technical Success: 100%
- Survival Rate: 53% (Mean FU: 21 mo)
- Electrical Impedence



Conclusions

- *Interventional Radiology & Lung*
- *Percutaneous & Intra-vascular*
- *Technological Innovation*
- *Tailored Procedure (Imaging Workup)*
- *Safety and Efficacy*
- *Multimodality / Multidisciplinarity*



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