

Lung as target of fungi

Surgical treatment : for whom and when ?

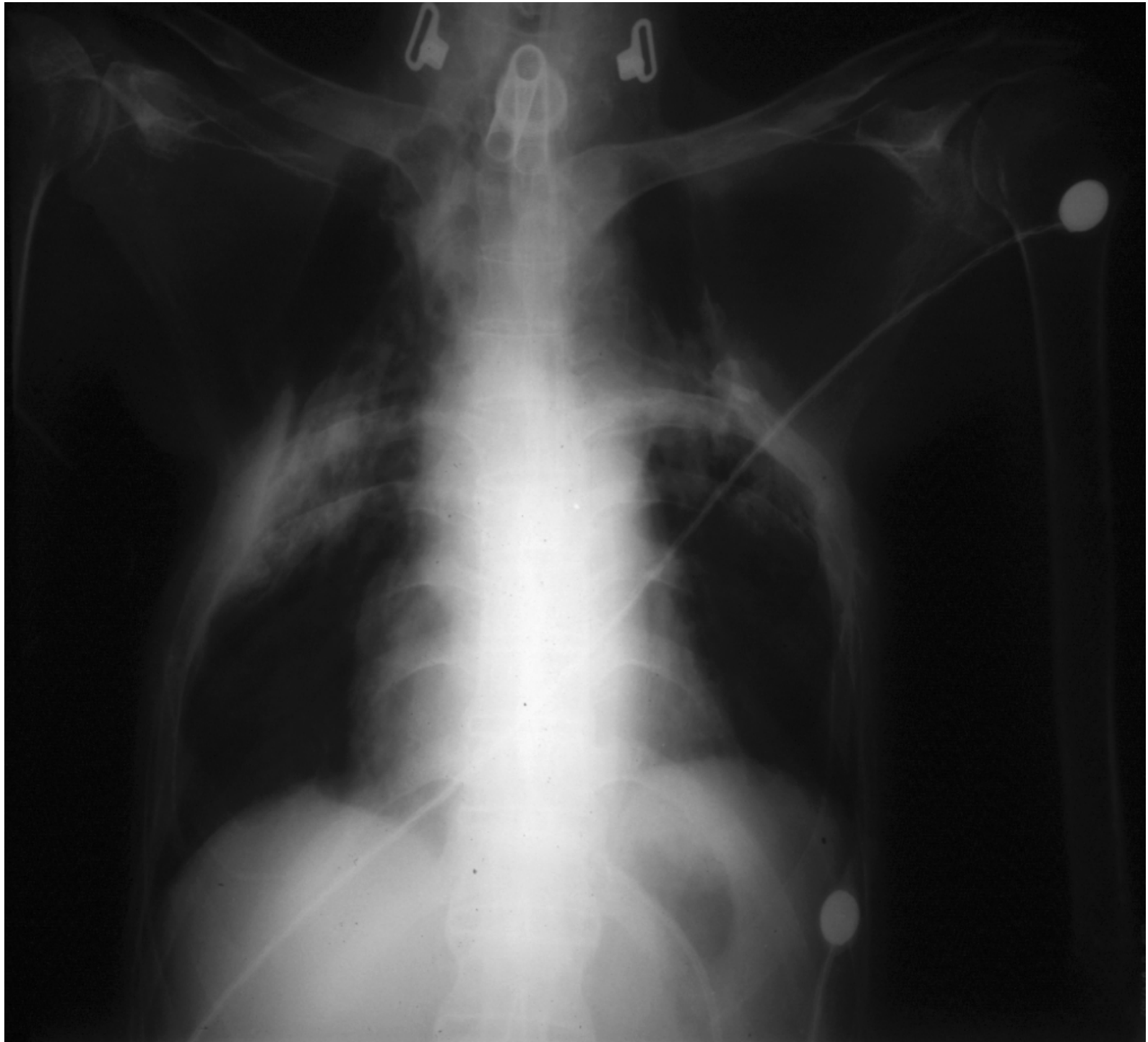


Gilbert Massard

Pôle de Pathologie Thoracique

Hôpitaux Universitaires de Strasbourg



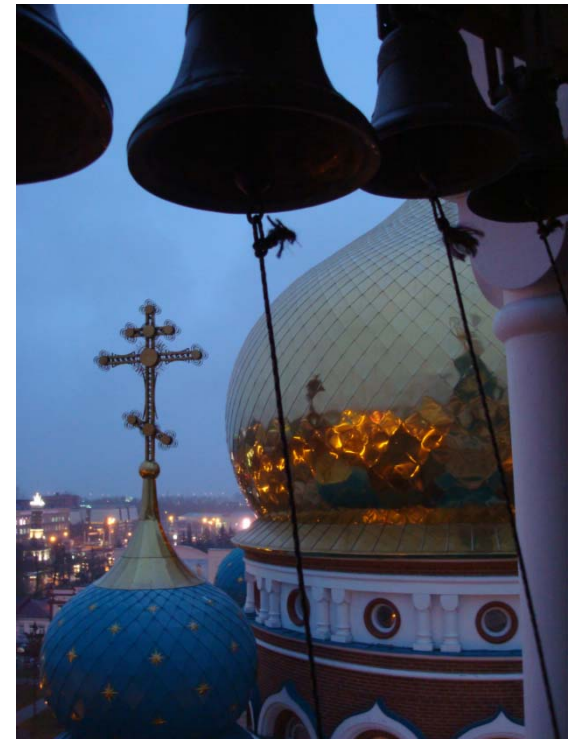




Traditional classification

- Allergic aspergillosis
- Invasive aspergillosis
- Saprophytic aspergillosis

pulmonary and pleural aspergilloma



limited place for surgical management !!

Today 's reality....

Allergic A.

Invasive A.

« Aspergilloma »

Bronchitis A.

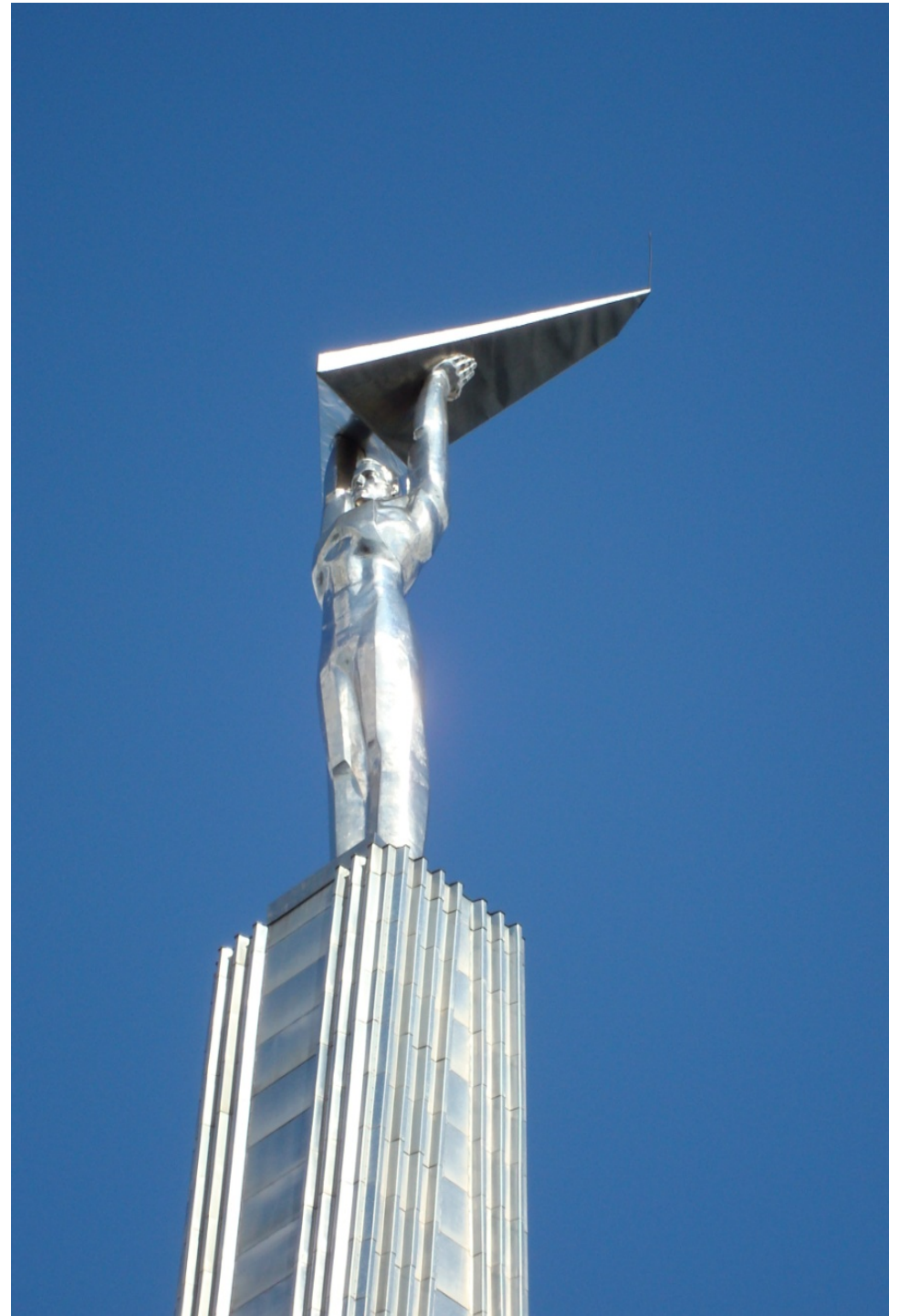
Semi-invasive A.

Parietal A.

Pleural A.



Invasive
aspergillosis



Invasive Aspergillosis

pathophysiology

- **1st stage : medular aplasia**

pulmonary infarction owing to vascular invasion

Xray : halo sign

- **2nd stage : medular recovery**

granulocytes determine tissular necrosis

Xray : air-crescent sign



Invasive Aspergillosis

indications for surgery

- **1st option : prophylaxis of lethal hemoptysis**

emergency operation during aplasia

close radiological monitoring essential

- **2nd option : eradicate foci at risk for reinfection**

following complete recovery of bone marrow

following medical treatment during ???

Subsequent bone marrow graft is a viable option*



Invasive Aspergillosis

Prophylaxis of hemoptysis

- early detection of the halo sign
- monitoring / 48 hours if lesions close to great vessels
- disappearing of perivascular fat rim precedes disruption
- **resection is limited to the most dangerous lesion !**

Report from Dijon, F:

- *8 patients 1988-94*
- *no intra-operative death.*
- *2 progressed ; death at 1 and 3 months*



any new cases ?

Invasive Aspergillosis

To resect mycotic sequestra : operative risk (30 j)

	N patients	deaths
Baron	12	0
Bernard	7	0
Lupinetti	6	1
Robinson	16	5
Wong	16	1
Young	8	0
<i>total</i>	<i>65</i>	<i>7</i>

Invasive Aspergillosis

To resect mycotic sequestra : risk for recurrence

	N patients	recurrences	site
Baron	12	1	CNS
Bernard	7	0	
Robinson	16	1	diffuse
Lupinetti	6	3	CNS/lung
Wong	12	0	
<i>total</i>	<i>53</i>	<i>5</i>	

Main cause of death : recurrent hematologic disease !

Invasive Aspergillosis

minor operative morbidity

- young patients
- no underlying lung disease
 - normal compliance
 - minimal pleural adhesions
 - normal respiratory function (prior to bone marrow graft !)
- limited resections +++

Invasive Aspergillosis

Exploratory thoraco - scopy / tomy

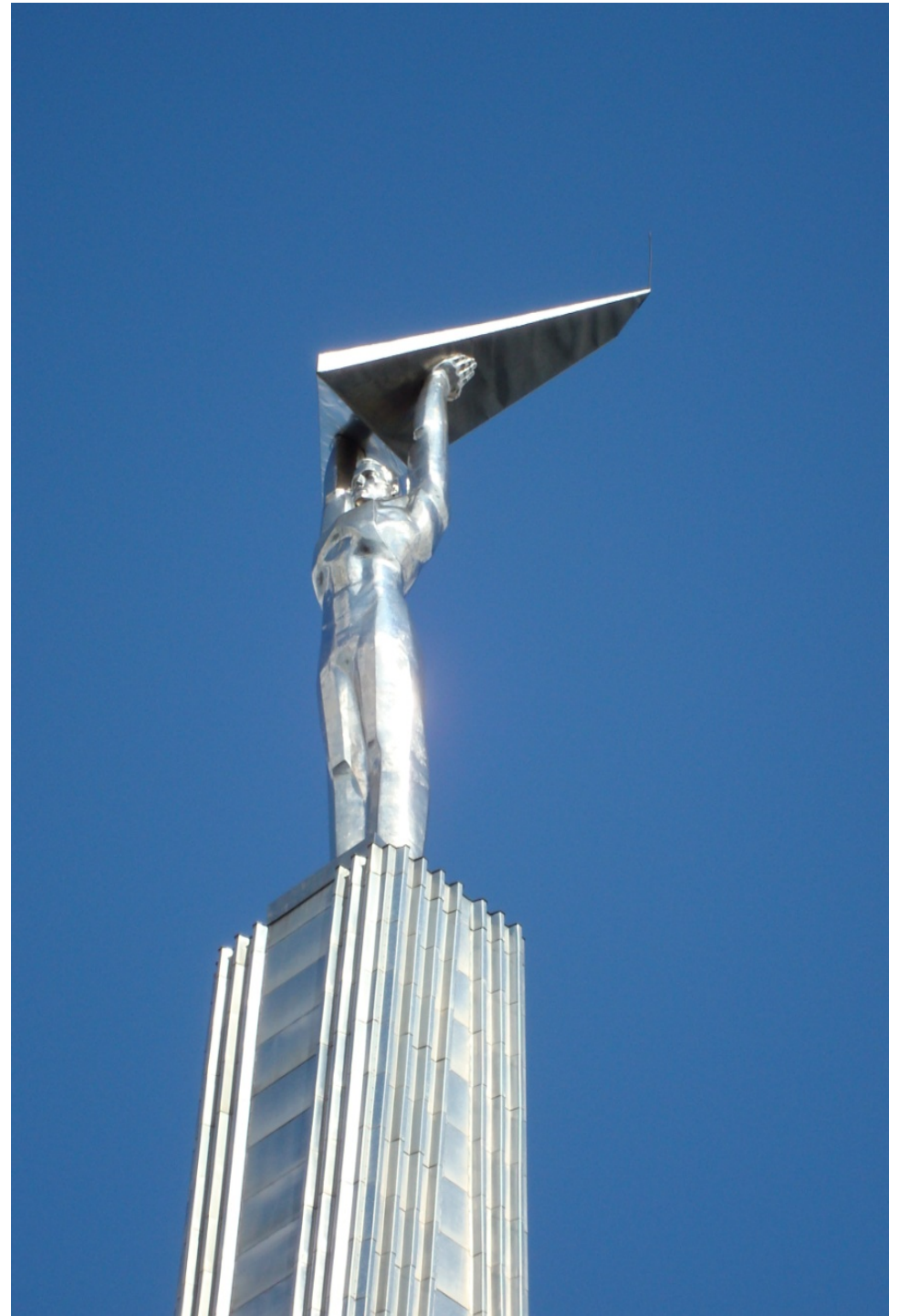
- logical step prior to potentially toxic treatment
- complete resection should be planned
- anatomic spread may go beyond radiologic appearance



Real value of VATS ?

Seldom required with modern antifungal therapy

Parietal aspergillosis

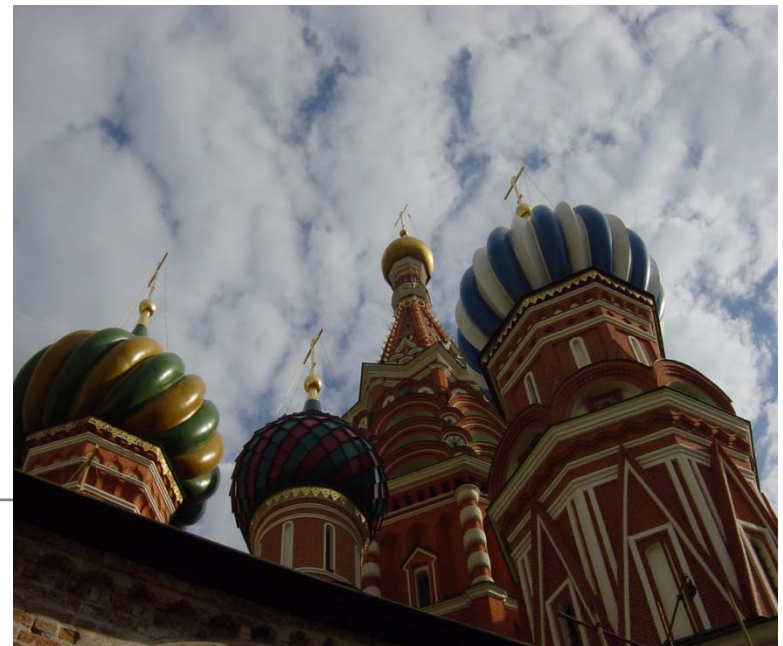


Parietal Aspergillosis

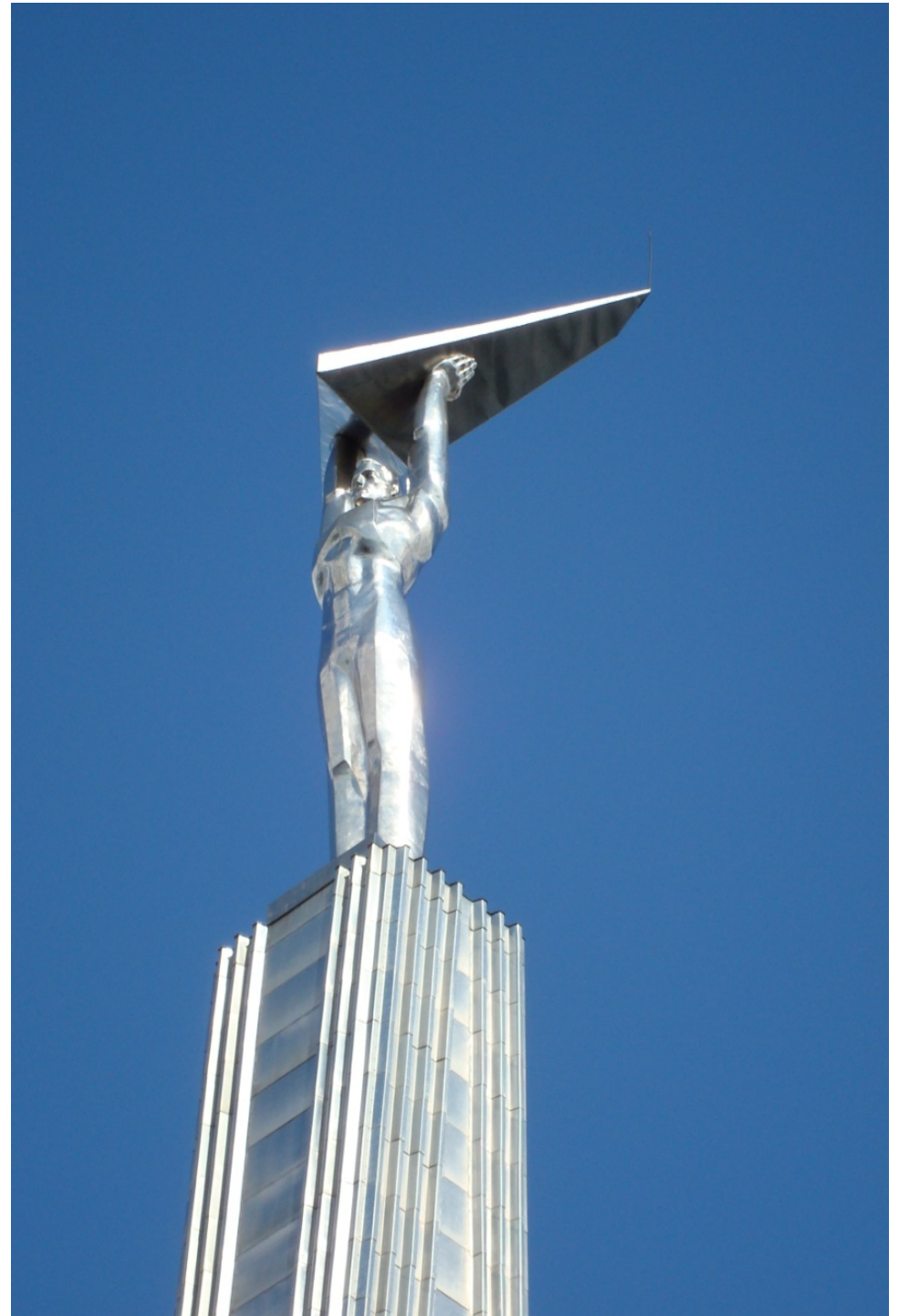
exceptional condition !

- 3 reported cases (2 narco., 1 leukemia)
- hematogenous spread
- favorable outcome :
 - surgical debridement
 - systemic antifungals

Walker & Pate, Ann Thorac Surg 1991;52:868-70
Buescher et al, Chest 1994;105:1283-5



Invasive
bronchial
aspergillosis



Invasive bronchial aspergillosis

complication following lung transplantation (n = 6)

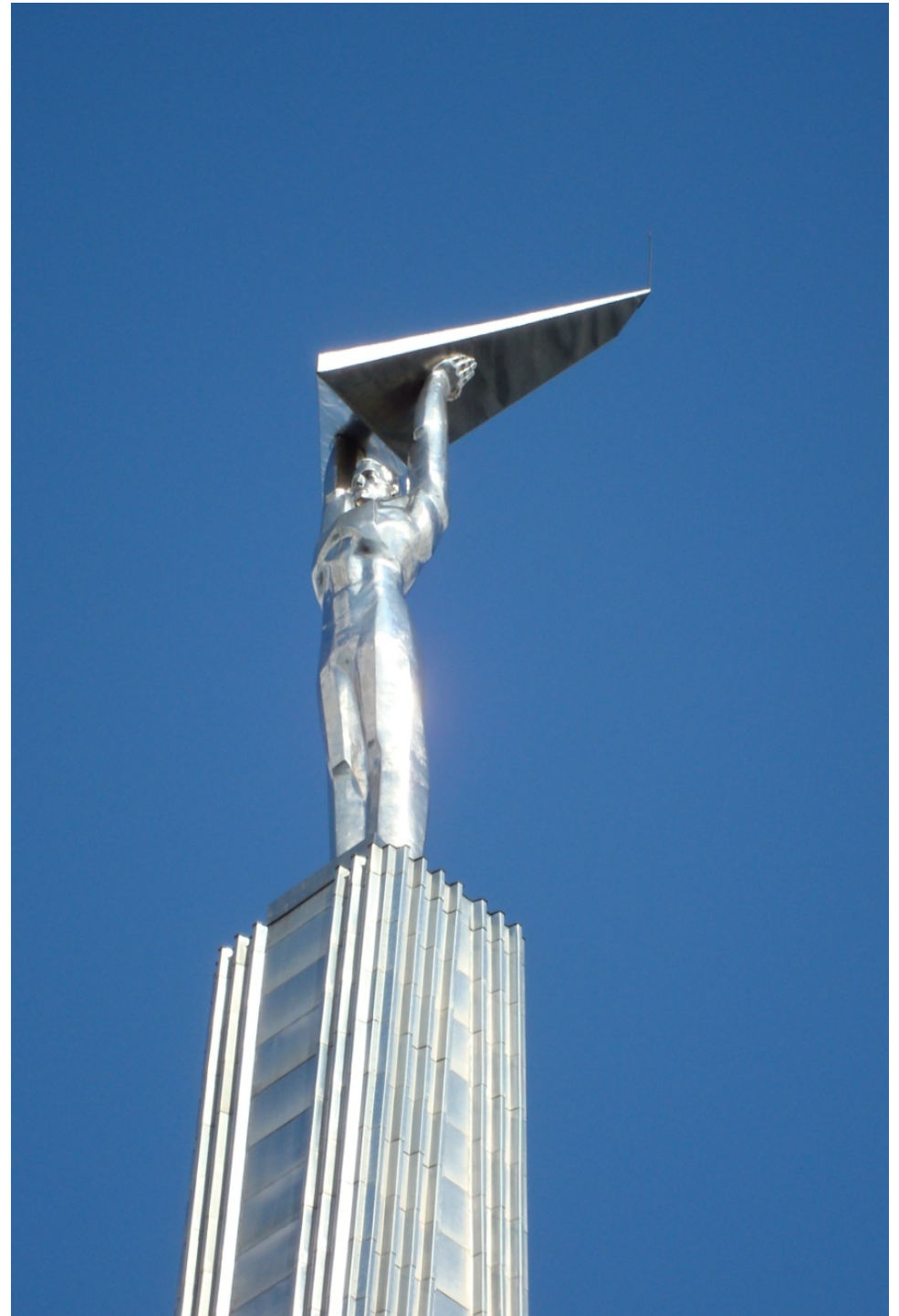
- ulcerative tracheo-bronchitis
 - peri-anastomotic location
 - involvement of proximal donor bronchus
- fibrinous deposits positive for *Aspergillus*
- outcome :
 - 4 healed with Ampho-B - 1 recurred
 - 2 died owing to progression to pneumonia

Invasive bronchial aspergillosis

a cause for broncho-vascular fistula

- right single lung transplant for emphysema
 - 4ple immunosuppression
 - ulcerative bronchitis POD 15 / Clear lungs on Xray
 - Aspergillus isolated from lavage + biopsies
- favorable response to treatment with Ampho-B
 - no pulmonary progression
 - regression of distal ulcerations
- sudden death owing to massive hemoptysis at 3 months

Pleural aspergillosis



Pleural Aspergillosis

Pathophysiology

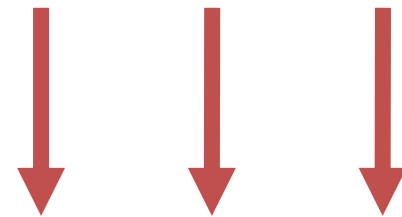
- Early pleural asp
 - >intraoperative seeding.
 - + failing reexpansion
- Late pleural asp
 - > broncho-pleural fistula
 - + residual pleural space

healing = obliteration of residual space

Pleural Aspergillosis

Guide-lines for management

- Pneumoperitoneum, antifungals
seldom sufficient
- Decortication
applies only to patients without parenchymal loss !
- Myoplasty
debatable :
 - previous thoracotomy /
 - ize of pleural space /
 - nutritional status.
- Open window thoracostomy
palliation ...



Thoracoplasty !!!!!

Pleural A. : results with thoracoplasty

- Patients : n = 14

 - 5 early A.

 - 9 late A.

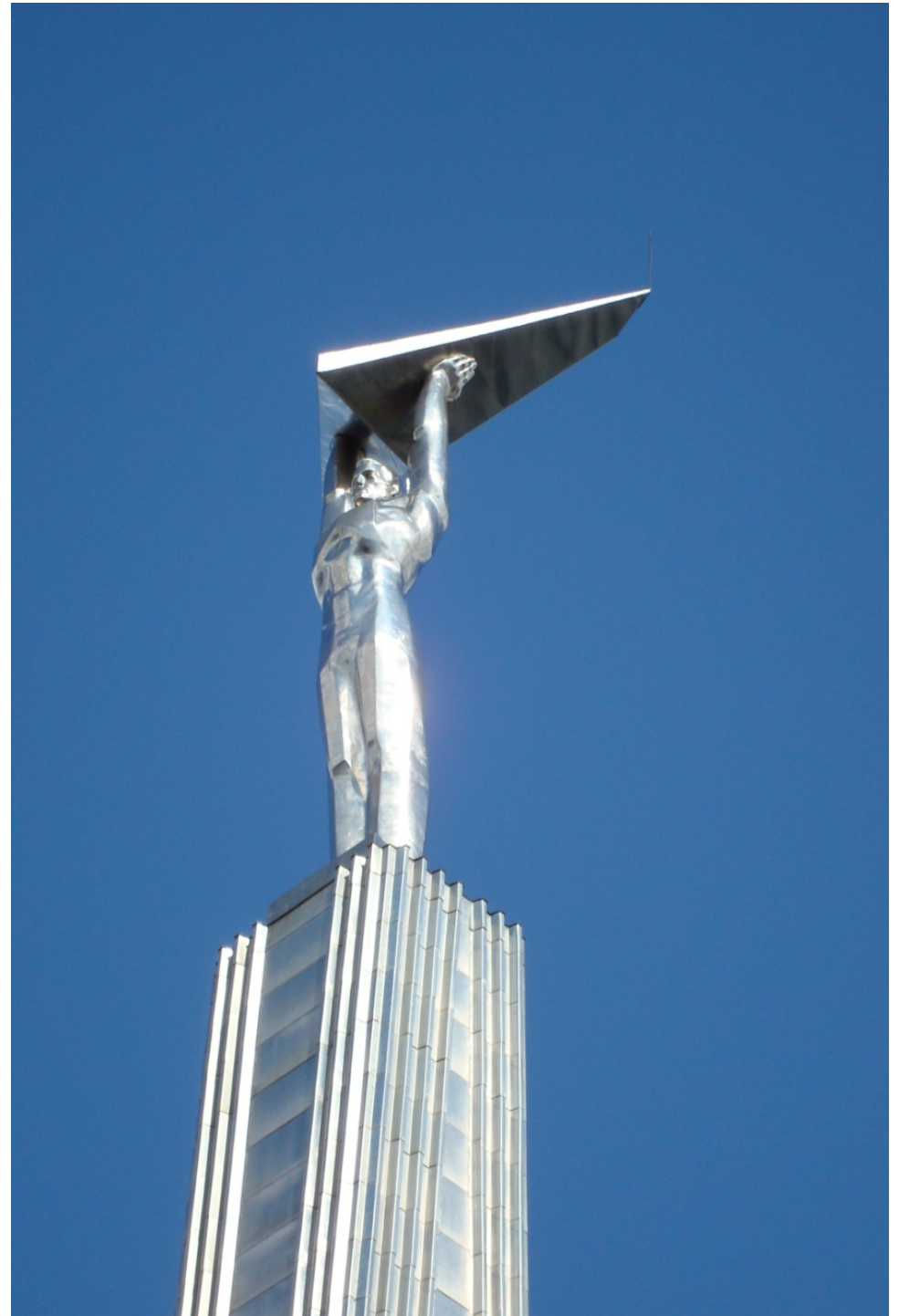
- 1 post-operative death (late A.)

- complications :

- bleeding :	9	(64 %)
- space problems :	6	(43 %)
- reoperation :	4	(28 %)
- hosp > 30d :	9	(64 %)

At medium term, serodiagnosis had negativated in 12patients !

Traditionnal
aspergilloma



« Traditional » Aspergilloma

recent publications

- Csekeo et al, Eur J Cardio-thorac Surg 1997;12:876-9
- Chen et al, Thorax 1997;52:810-3
- Oakley et al, Thorax 1997;52:813-5
- Chatzimichalis et al, Ann Thorac Surg 1998;65:927-9
- Regnard et al, Ann Thorac Surg 2000;69:898-903
- Babatasi et al, J Thorac Cardiovasc Surg 2000;119:906-12

« Traditional » Aspergilloma

pathophysiology

- Parenchymal cavitation *
- aerosolized seeding
- growth - extension by secretion of enzymes

* Semi-invasive Asp :

(e.g. radiation pneumonitis)



acute « lobitis »
secondary cavitation
mycetoma

« Traditional » Aspergilloma

diagnosis

- radiogramms : air-crescent sign *
- Serology :
 - 2 bows on immuno-diffusion/electrophoresis
 - chymotrypsine / catalase +

* absent in about 1/3 of cases :

thick walled cavitation
peripheral coin lesion

« Traditional » Aspergilloma

fears and questions

- technical challenge for the surgeon
- substantial mortality
- high post-operative morbidity

When to operate ?

On a routine basis for prophylaxis ?
Select patients with symptoms ?

« Traditional » Aspergilloma

classification

- Simple Aspergilloma

thin-walled cavitation

healthy parenchyma

symptomatically silent

normal lung function

- Complex Aspergilloma

thick-walled cavitation

parenchymal scar tissue

pleural peel

annoying symptoms

disabled lung function

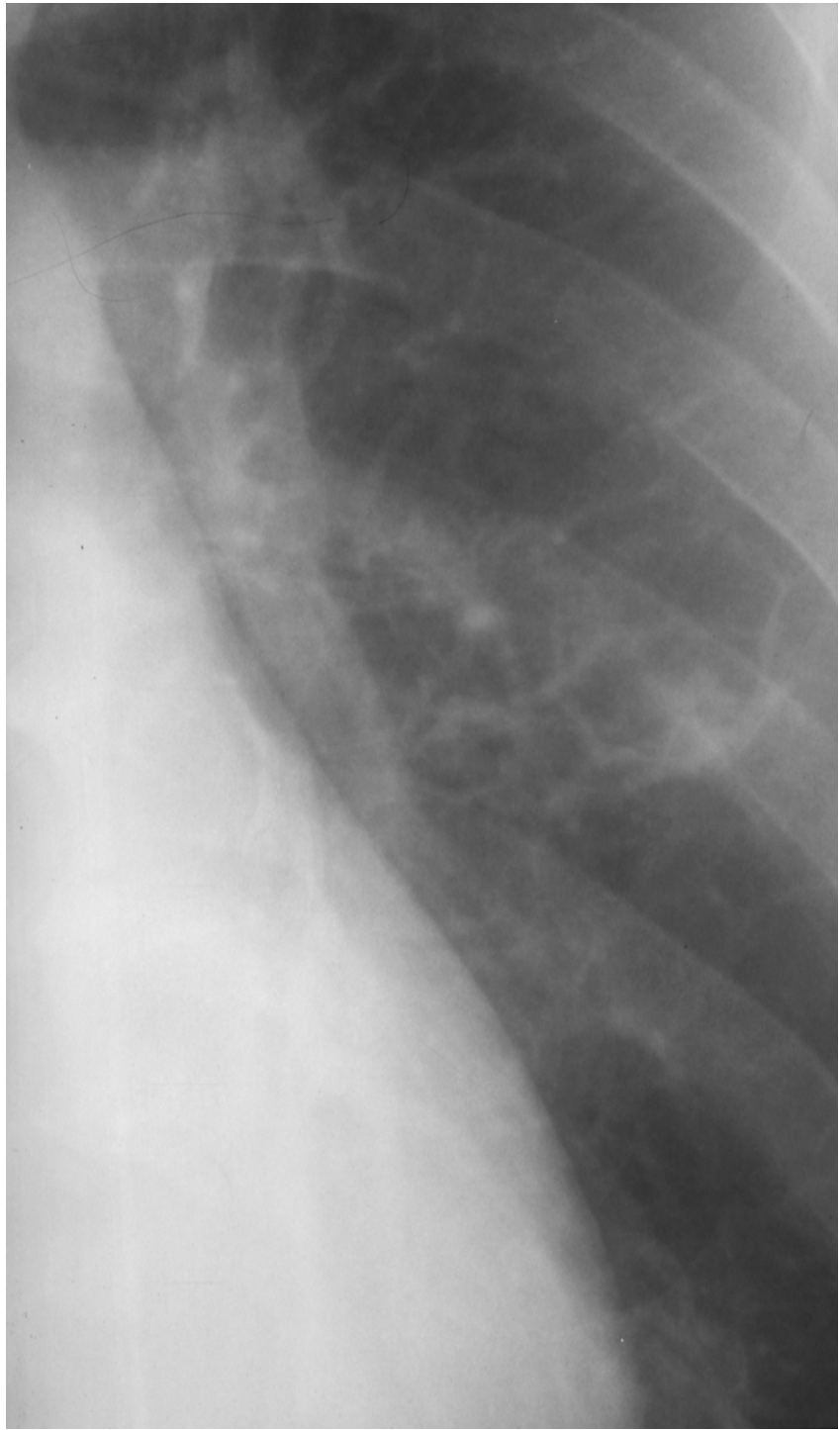
poor performance status

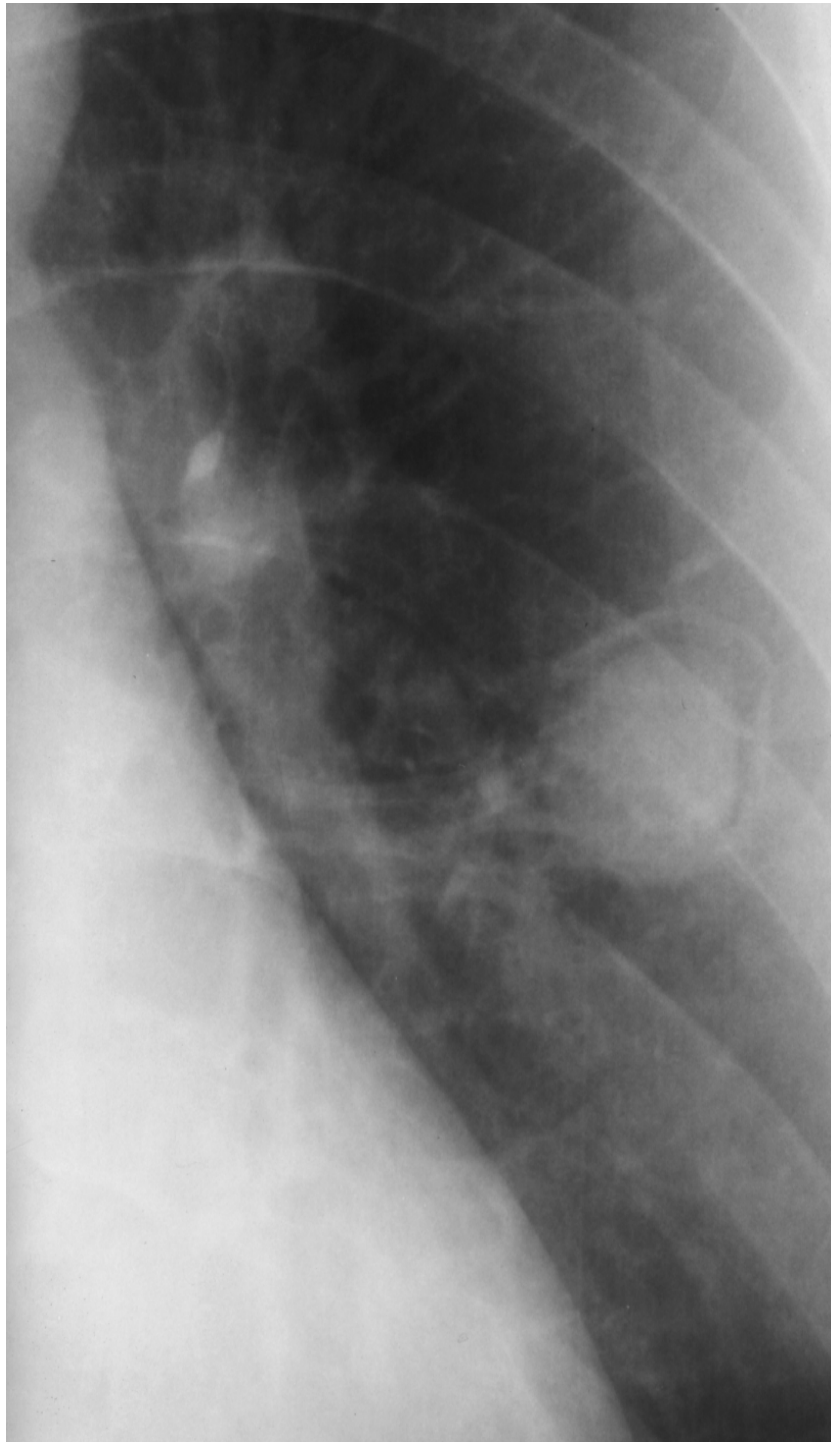
Belcher & Plummer, Br J Dis Chest 1960 ; 54:335-41

Daly et al, J Thorac Cardiovasc Surg 1986;92:981-8









29
62

200 KV
100 MA
4 S

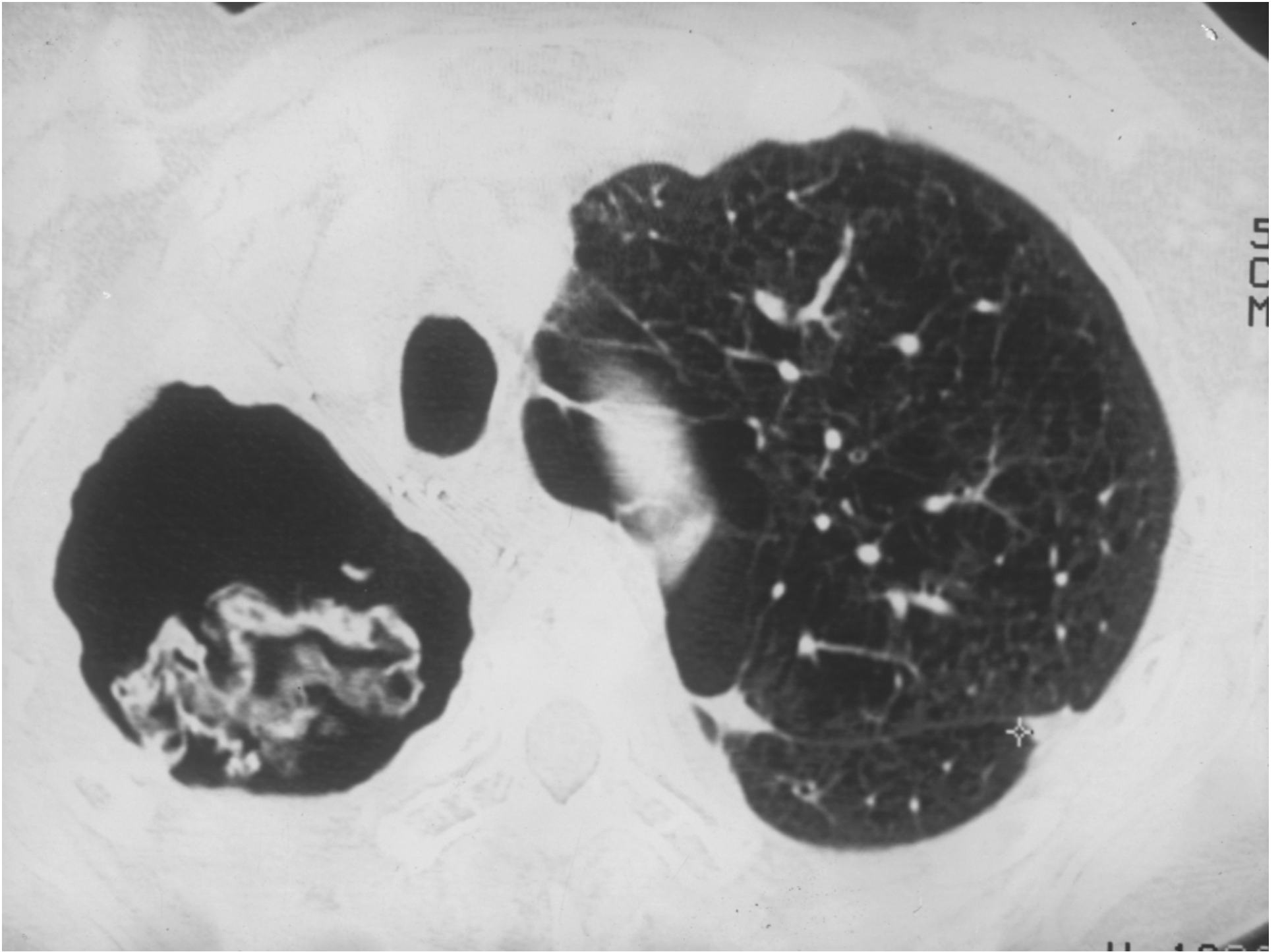
N=-985 * L=20

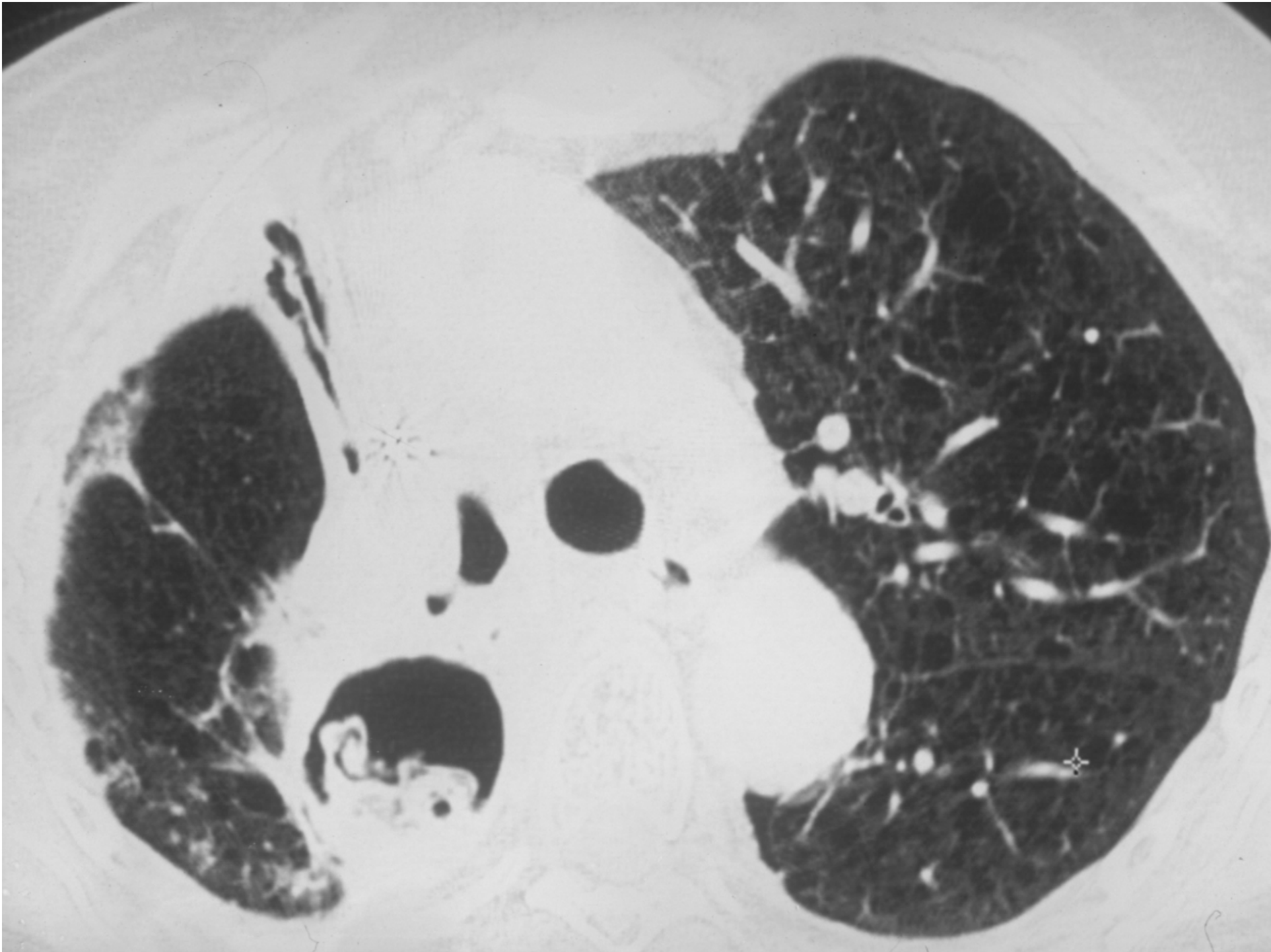


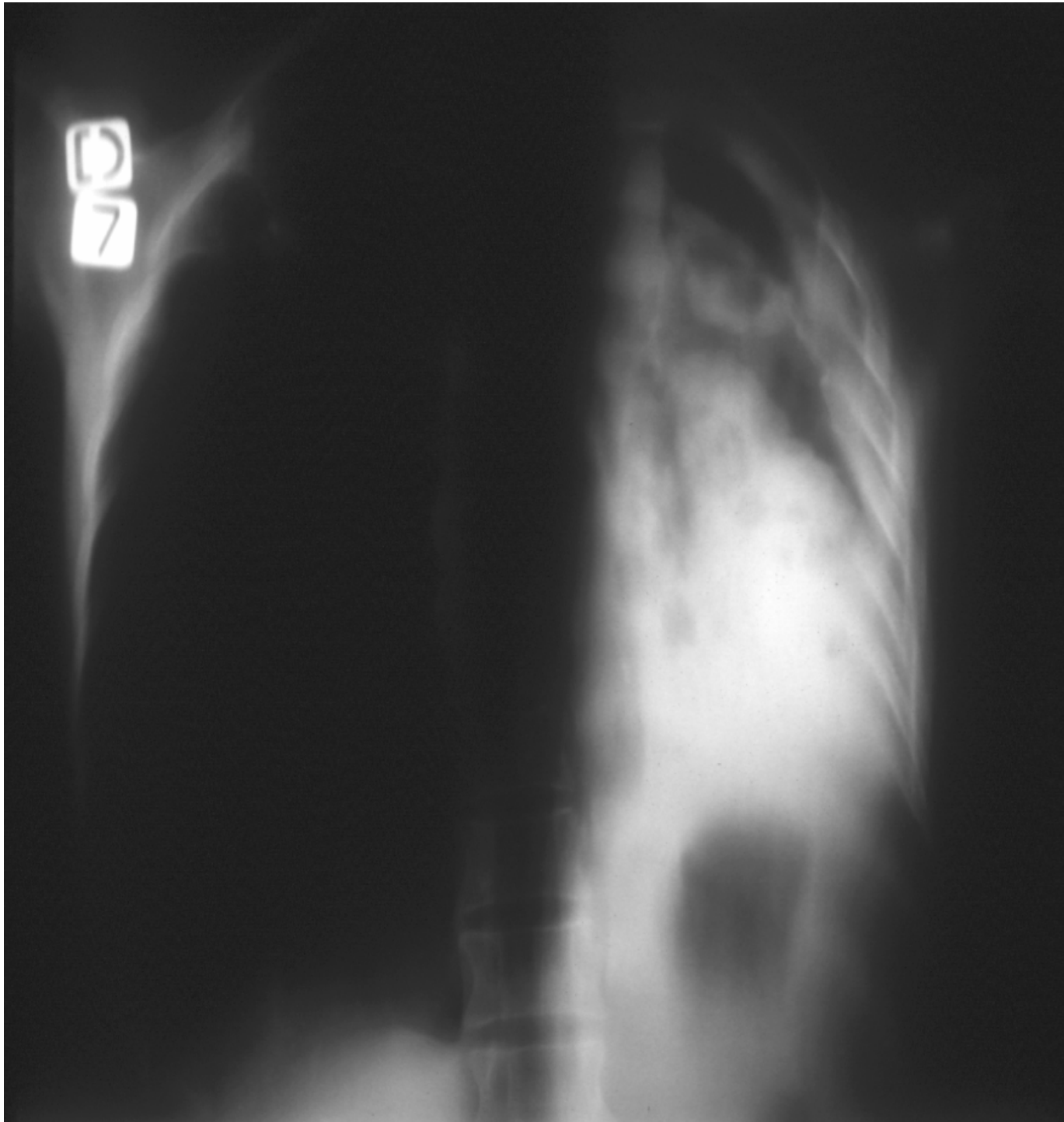
-684



PT 4







« Traditional » Aspergilloma

demographics

	Pulmonary A. (N = 55)	Bronchial A. (N = 6)	Pleural A. (N = 16)
age	48.2	40.2	54.6
weight (%)	86.2	111,8	83.8
VC (%)	77.5	97.5	65.5
FEV1/VC	60.4	78.3	67.8
serodiagnosis	6.3	7.1	2.6

« Traditionnal » Aspergilloma

ideal curative treatment

Standard anatomic resection encompassing

- the megamycetoma
- the underlying diseased part of the lung



segmentectomy, lobectomy, pneumonectomy

Sine qua non :

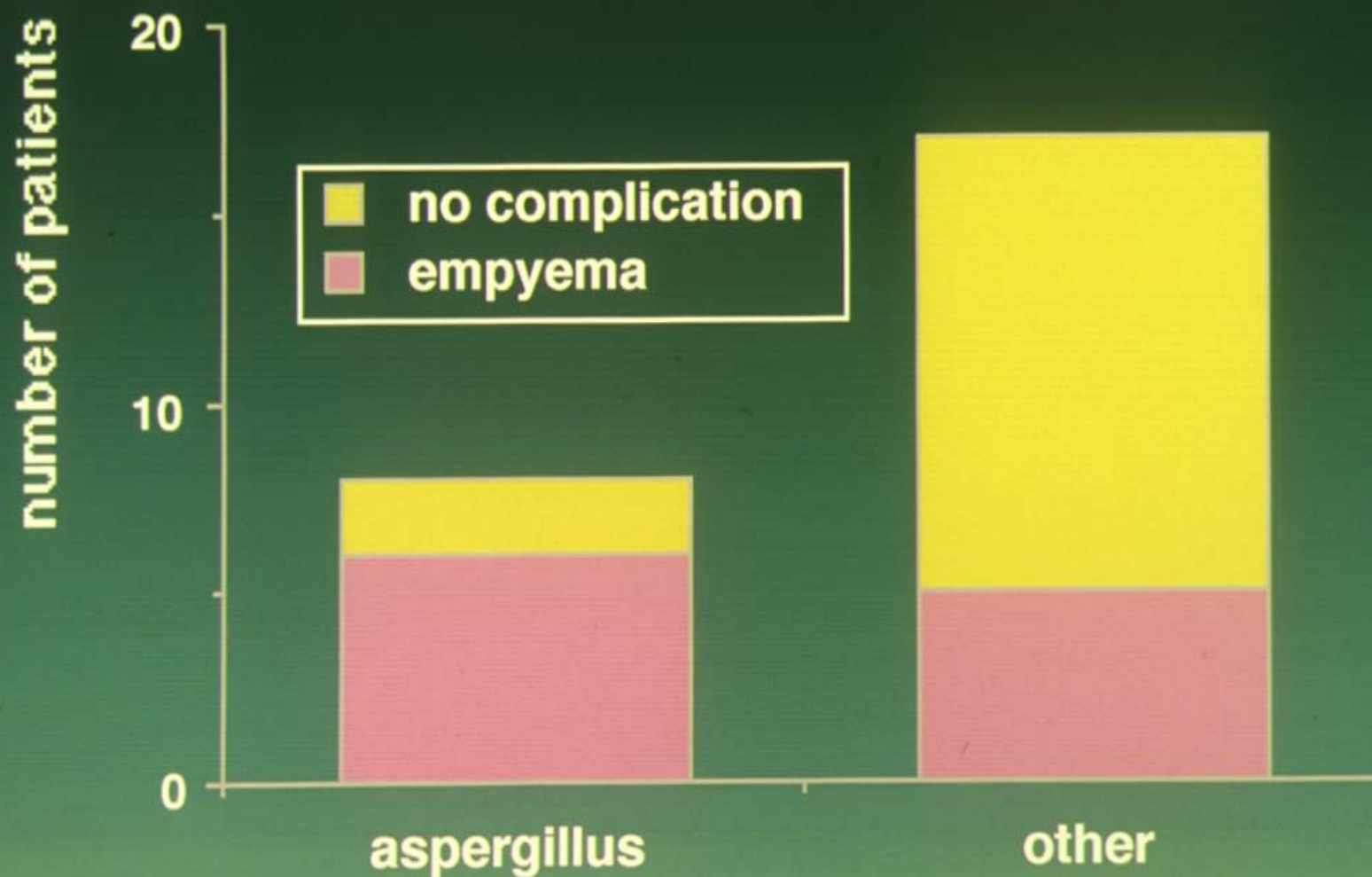
adequate lung function

Caveat :

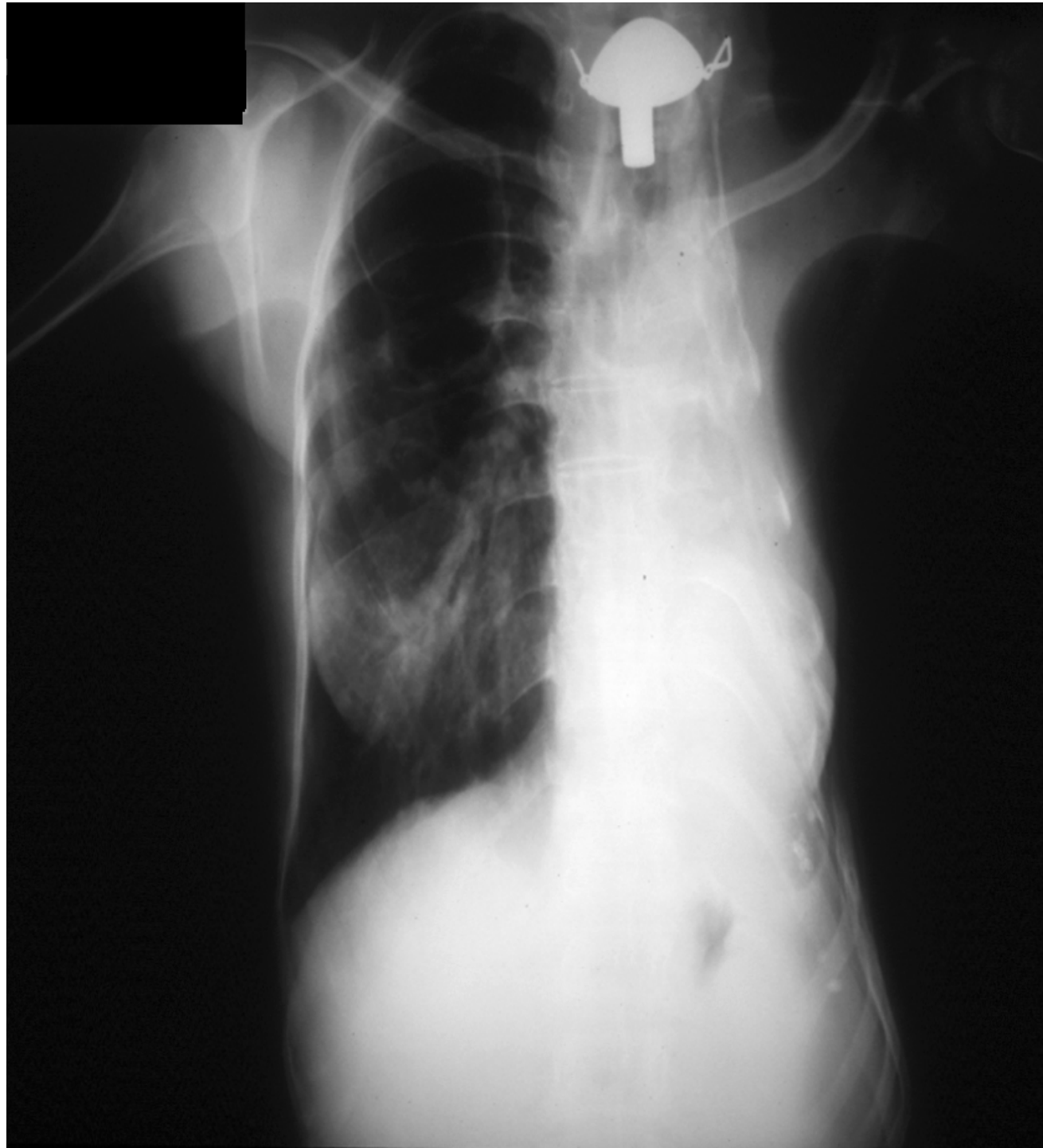
High risk of pneumonectomy !!!

pneumonectomy for chronic infection

empyema & b-p fistula : influence of aspergillus infection



$\chi^2 = 4.588 ; p < 0.05$



« Traditional » Aspergilloma

intra-operative tricks

- Avoid to open cavitation : extrapleural dissection
- Act against pleural oozing : Aprotinine
packing (hot saline or H₂O₂)
- Prevent tearing of larger vessels : tape origins at once
- Poor immediate reexpansion : pneumoperitoneum
phrenic nerve crush ?

Differ thoracoplasty as a second stage !

« Traditionnal » Aspergilloma

alternatives to resection (1)

- **Embolisation of bronchial arteries**
may ascertain hemostasis in acute conditions
- **intracavitary injection of antifungals**
risk for bronchial flooding
cavitation persists
- **Cavernostomy**
may be only option in high risk patients
cavitation persists

« Traditionnal » Aspergilloma

alternatives to resection (2)

mycetomectomy + thoracoplasty

- complete one-stage curative treatment
 - removes the fungus ball
 - obliterates the underlying cavitation
- substantial surgical risk

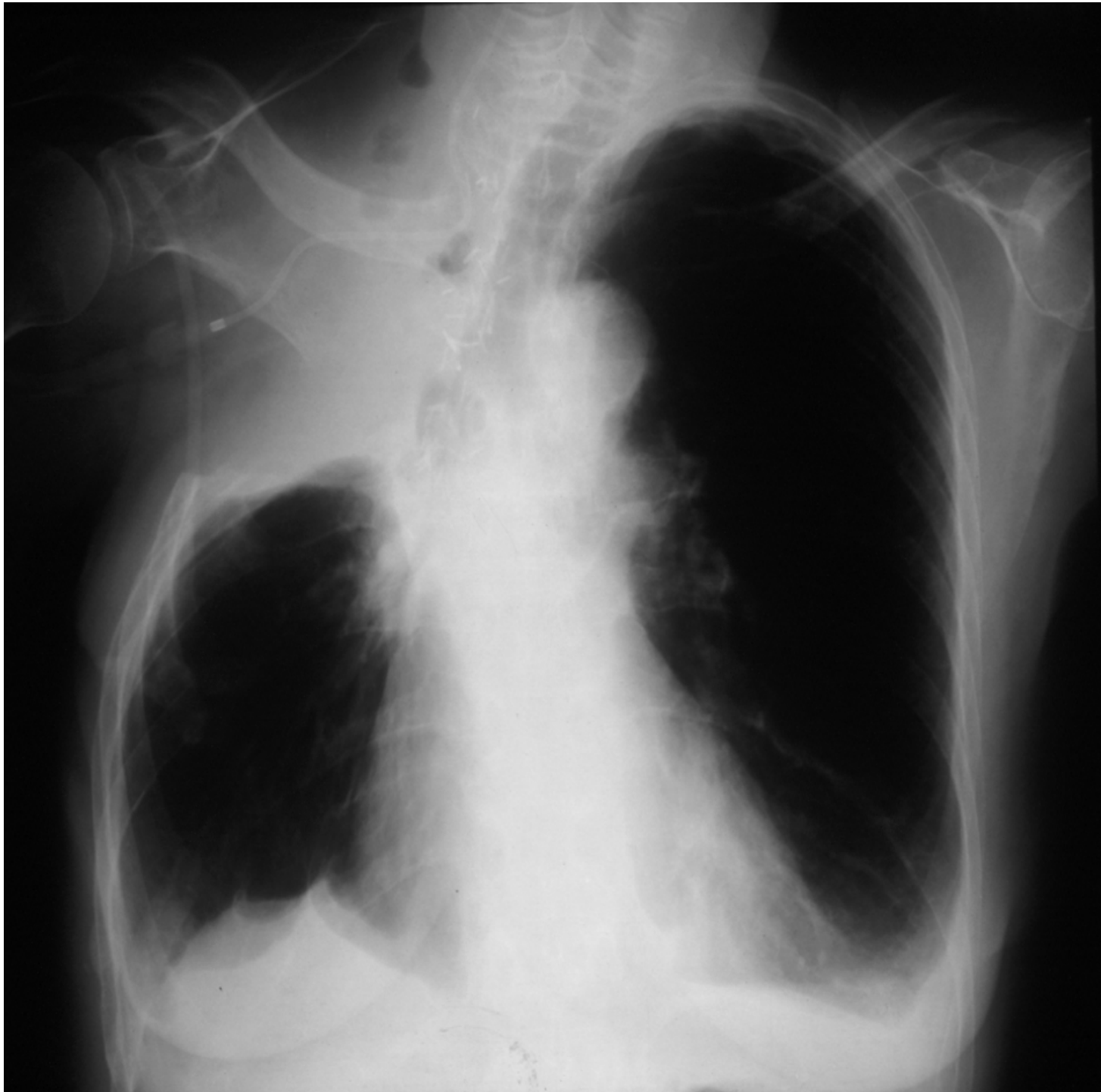
Ideal indication : **Asp. complicating radiation pneumonitis following lobectomy**

What about myoplasty ?

Poor nutritional status

Need for generous exposure





Traditional Aspergilloma

comparative operative mortality

Author	N	simple A.	complex A.
Battaglioni	15	0	18.1
Daly	53	4.7	34.3
Stamatis	29	0	11.7
Shirakusa	24	0	0
Massard	63	0	10
Chatzimichalis	12	0	0
Regnard	87	0	6.2

« Traditional » Aspergilloma

recent demographic changes

	1974-91	1992-97
Age	49	46
tuberculosis (%)	57.4	16.6
Complex Asp. (%)	80	41.6

« Traditionnal » Aspergilloma

recent changes with respect to complications (%)

	1974-91	1992-97
<i>immediate thoracoplasty</i>	20	8.3
bleeding	44.1	8.3
pleural space	47	16.6
hosp > 30 d	32.3	8.3



Conclusions

surgical management for thoracic aspergillosis

- Broad spectrum of indications despite contemporary antifungal therapy
- requires well-trained thoracic surgeon
- « Real surgery » !



Is there any place for minimally invasive surgery ??

