Surgery for
invasive aspergillosis and aspergilloma

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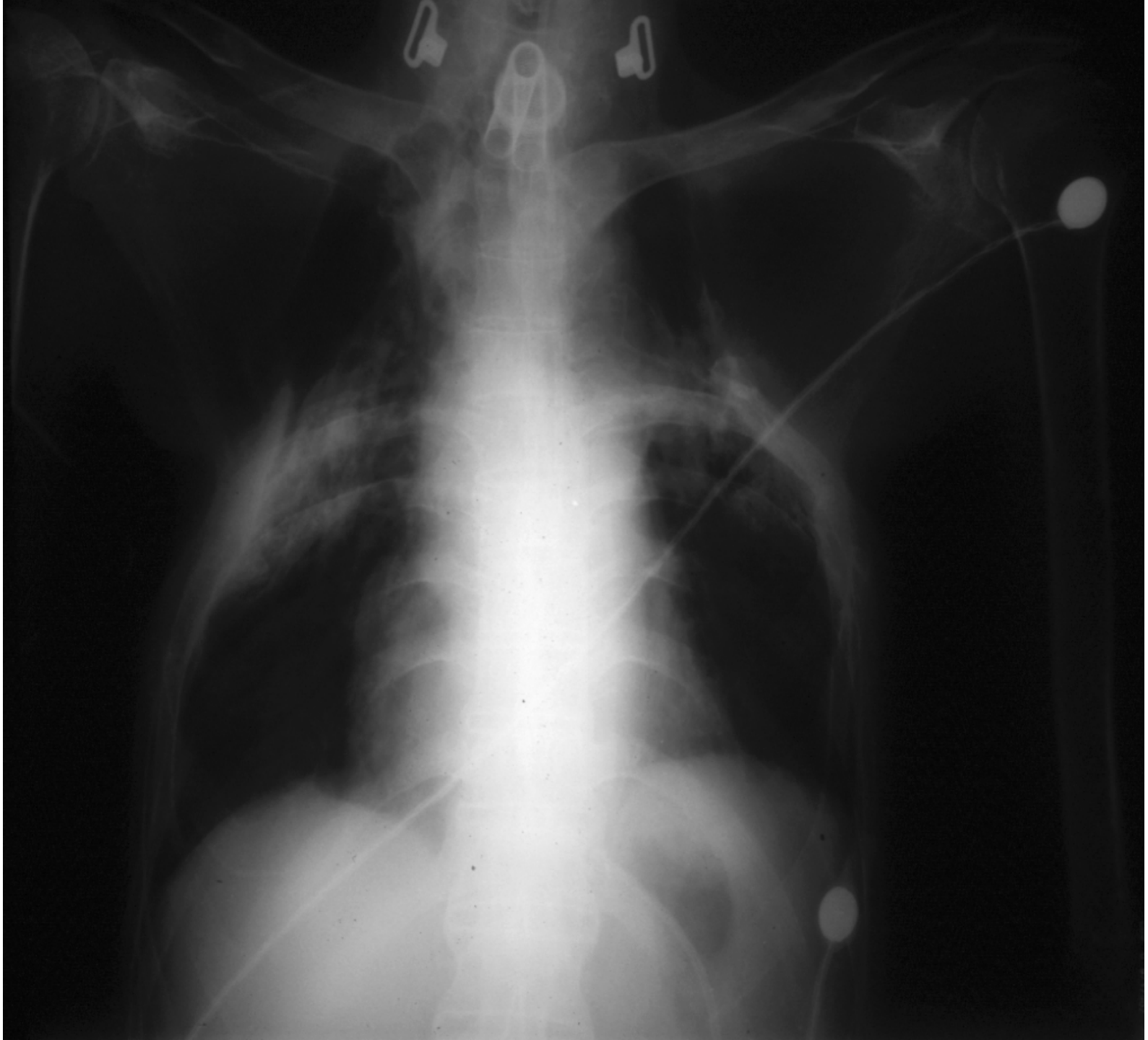
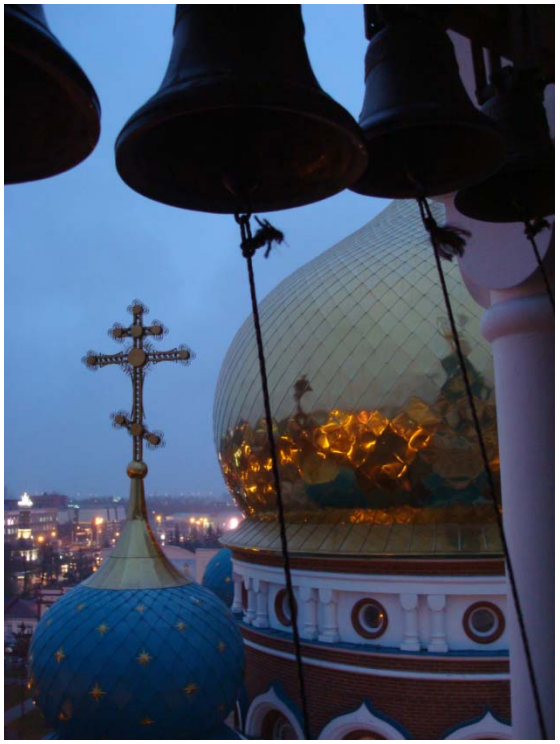


Traditional classification

- Allergic aspergillosis
- Invasive aspergillosis
- Saprophytic aspergillosis

  pulmonary and pleural aspergilloma



→ ***limited place for surgical management !!***

A large spectrum of diseases !

Allergic Aspergillosis

Invasive Aspergillosis

« Aspergilloma »

Bronchitis A.

Semi-invasive A.

Brain A.

Lung A.

Invasive aspergillosis

Natural history of disease

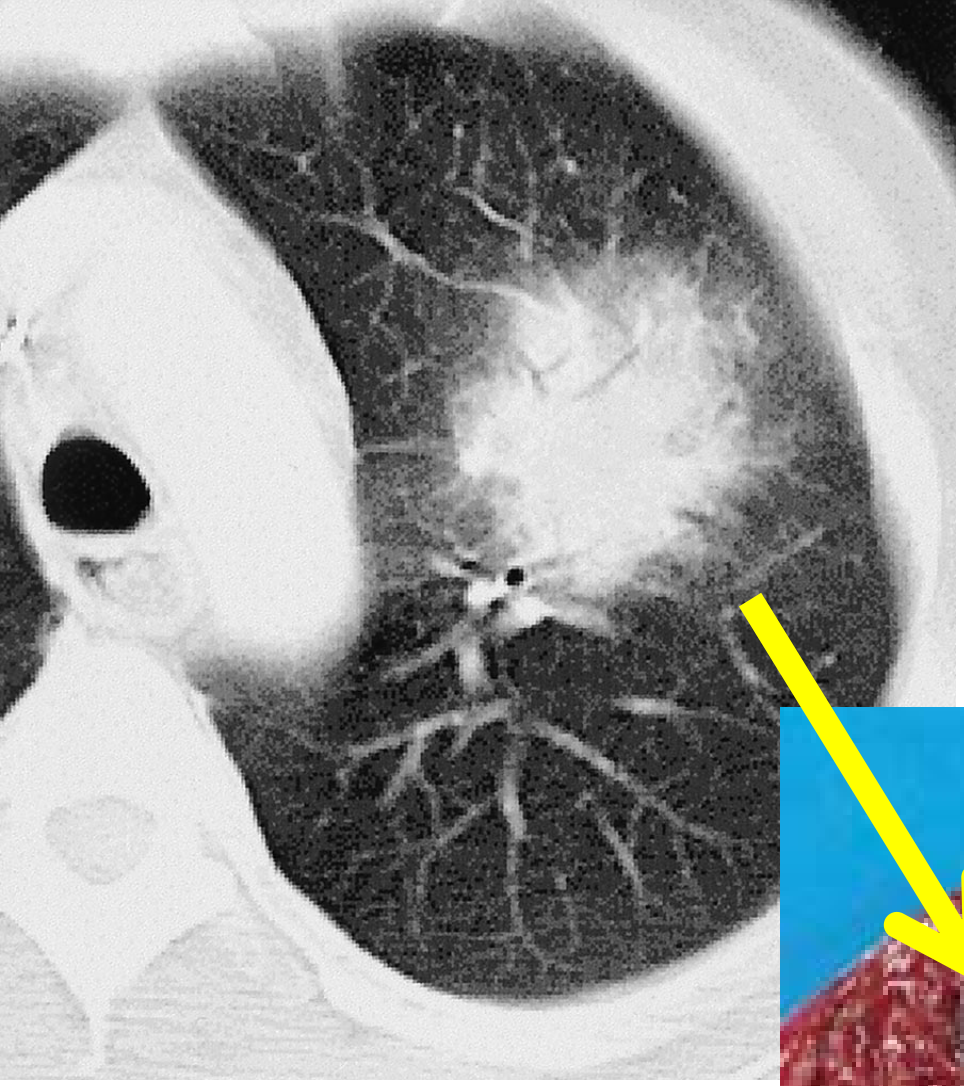
- Infects while immune system is weak
- Infected tissue (lesions) dies when immune system recovers

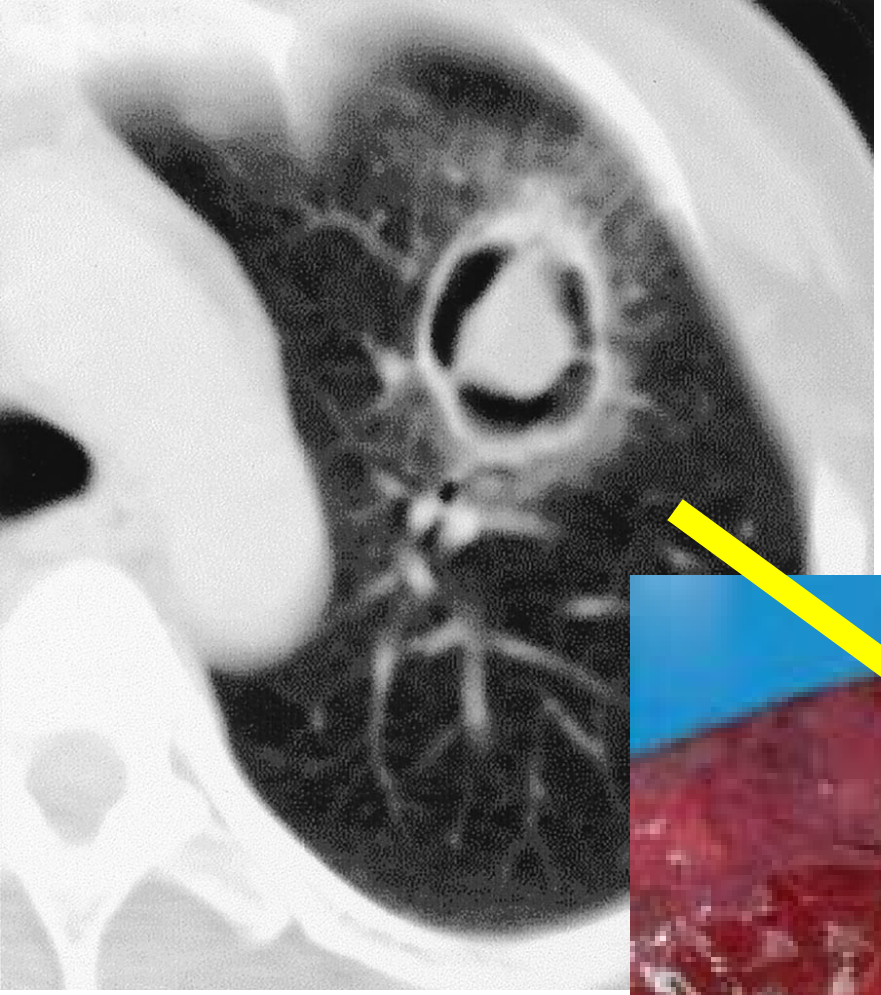
  Risk of fatal lung bleed when close to major blood vessels

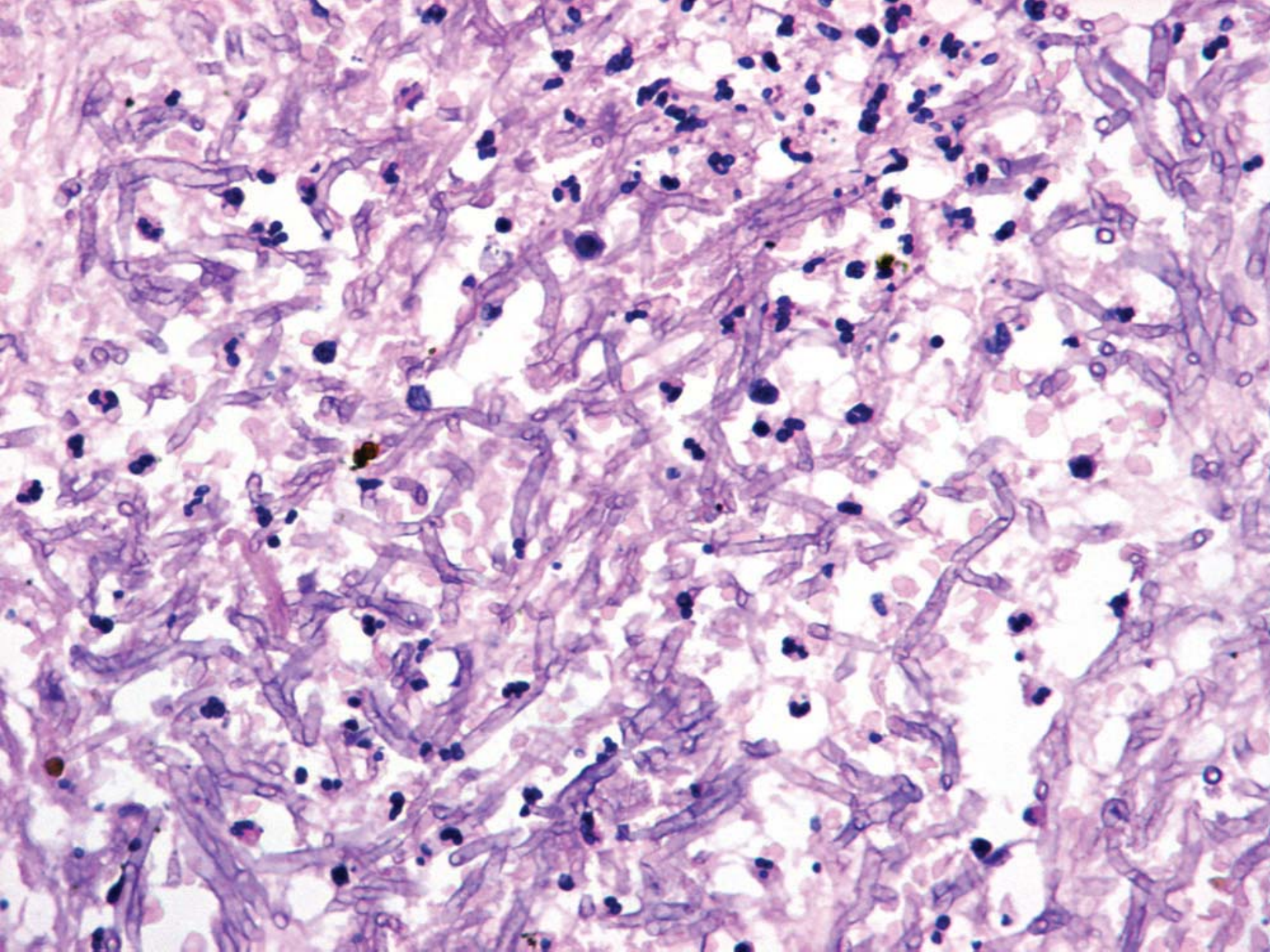
- Regression with anti-fungal drugs
- Small areas (foci) with dead tissue & fungal hyphae may stay

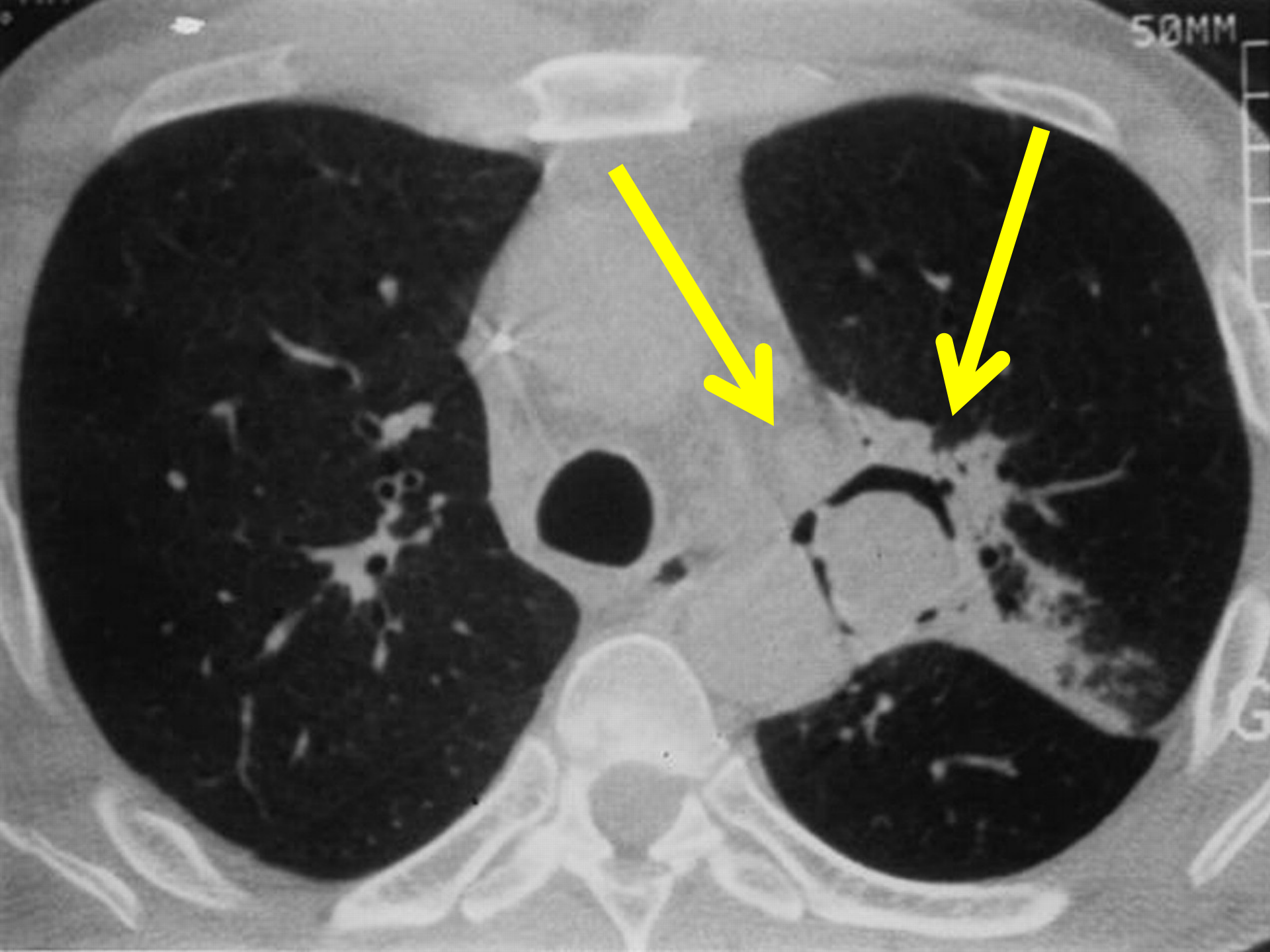
  Risk of reinfection

  Risk of bone marrow graft ! ! !





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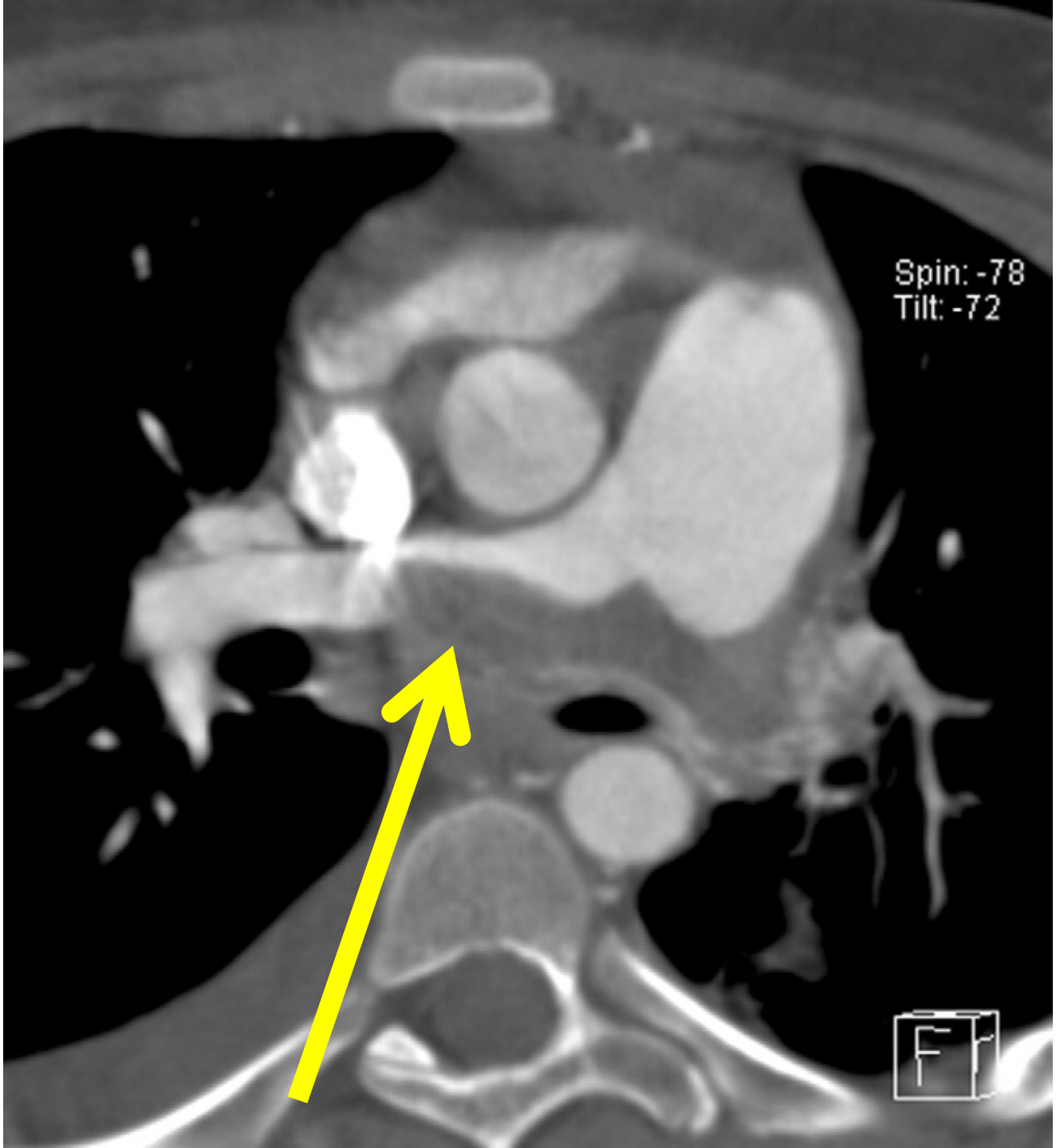
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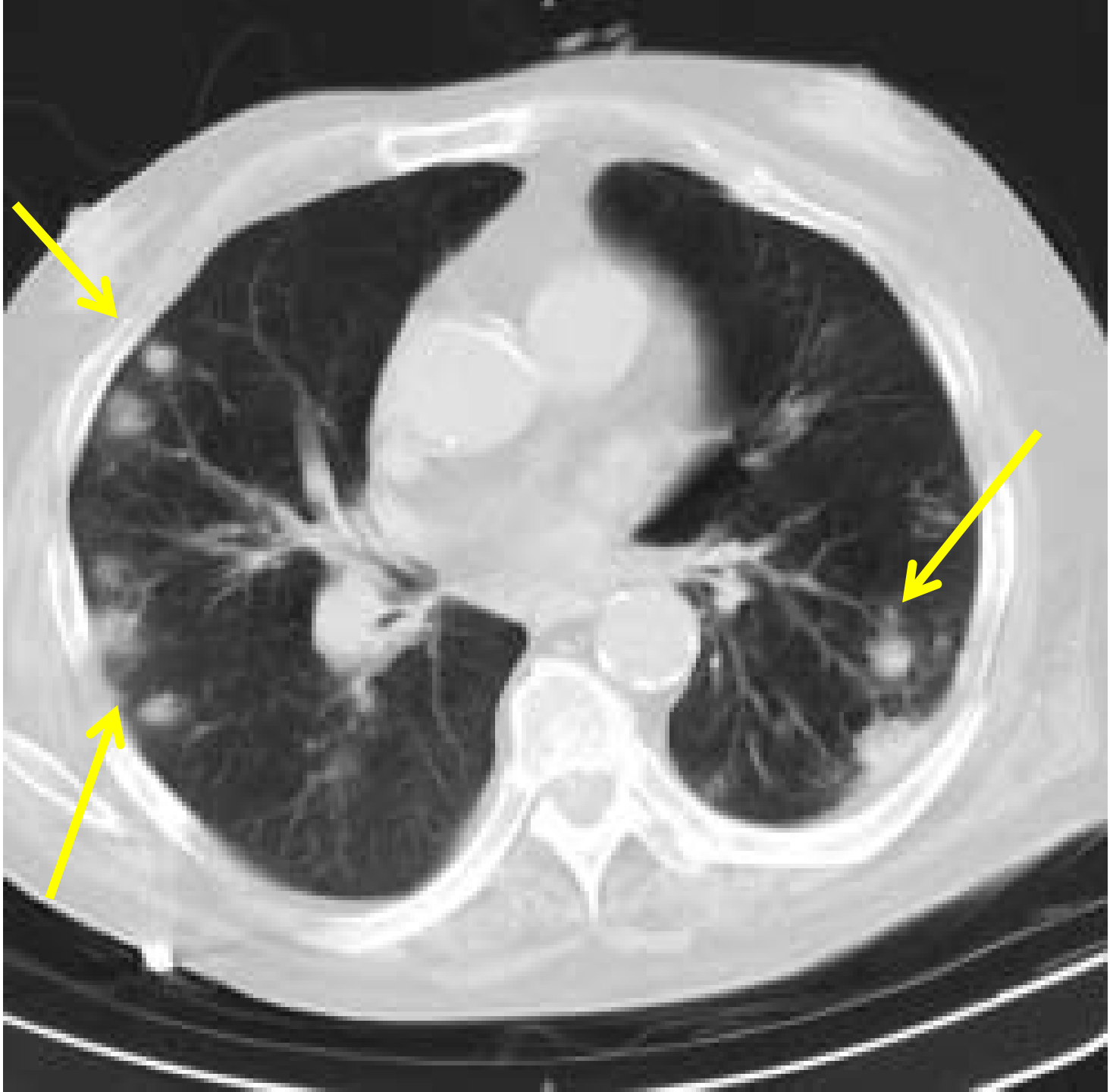


Invasive Aspergillosis

Prevention of lung bleeding

- Early detection of the halo sign
- Monitoring CT scan/48 hours if lesions close to large blood vessels
- Disappearing of perivascular fat rim preceeds disruption
- **Resection is limited to the most dangerous lesion !**

Initial report from Dijon, F:

- ***8 patients 1988-94***
- ***No deaths during surgery.***
- ***2 progressed ; death at 1 and 3 months***

Several short reports in adults and children

→ *Post operative death rate < 10 %*

May be less frequent because more potent drugs

Bernard et al, Ann Thorac Surg 1997;64:1441-7

Invasive Aspergillosis

Eradicate infected tissue to reduce risk of reinfection

Following complete recovery of bone marrow

Following medical treatment during ???

Limited removal of all infected areas (lesions)

Subsequent bone marrow graft is a viable option*

Massard et al, Ann Thorac Surg 1993;55:563-4

Lupinetti et al, J Thorac Cardiovasc Surg 1992;104:684-7

Invasive Aspergillosis

To remove damaged tissue: 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
total	*65*	*7*

Invasive Aspergillosis

To remove damaged tissue: risk for recurrence

	N patients	Recurrences	Site
Baron	12	1	Spine/brain
Bernard	7	0	
Robinson	16	1	Diffuse
Lupinetti	6	3	Spine/brain/lung
Wong	12	0	
total	***53***	***5***	

Main cause of death : recurrent leukaemia (not fungus)!

Invasive Aspergillosis

Minor operative complication rate

- Young patients
- No underlying lung disease
  - normal compliance
  - minimal pleural adhesions (lung damage)
  - normal respiratory function (prior to bone marrow graft !)
- Limited resections +++

Traditional aspergilloma

« Traditional » Aspergilloma

classification

- Simple Aspergilloma

  thin-walled cavitation
  healthy kidneys
  no symptoms
  normal lung function

- Complex Aspergilloma

  thick-walled cavitation
  scarred kidneys
  lung damage
  annoying symptoms
  disabled lung function
  poor general health

Belcher & Plummer, Br J Dis Chest 1960 ; 54:335-41
Daly et al, J Thorac Cardiovasc Surg 1986;92:981-8

« Traditional » Aspergilloma

demographics

	Complex A. (N = 55)	Simple A. (N = 6)	Pleural A. (N = 16)
age	48	40	55
weight (%)	86	112	83
Lung capacity (VC %)	77	97	65
Useful lung capacity (FEV/VC)	60	78	67

Massard et al, Ann Thorac Surg 1992;54:1159-64

« Traditional » Aspergilloma

ideal curative treatment

Standard anatomic resection encompassing

- the fungal ball
- the underlying diseased part of the lung

→ *removal of small part of lung (segmentectomy),*

a lobe (lobectomy) or whole lung (pneumonectomy)

Requirement for surgery: adequate lung function

Warning: High risk of whole lung being removed !!!

« Traditional » Aspergilloma

fears and questions

- Technical challenge for the surgeon
- Substantial risk of death in some cases
- High risk of post-operative disease

When to operate ?

On a routine basis for prevention of significant bleeding ?
Select only patients with symptoms ?

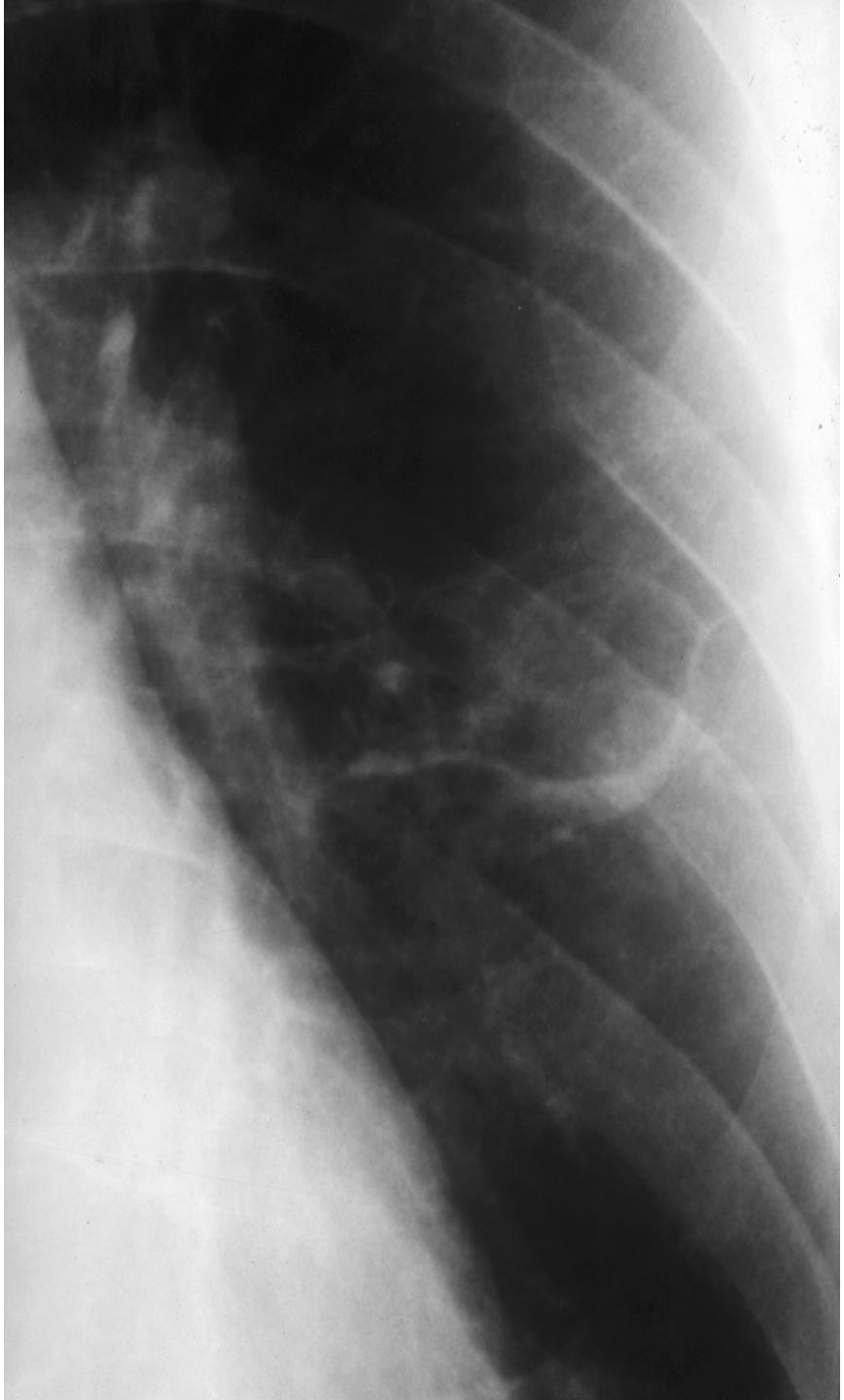
«Simple» aspergilloma

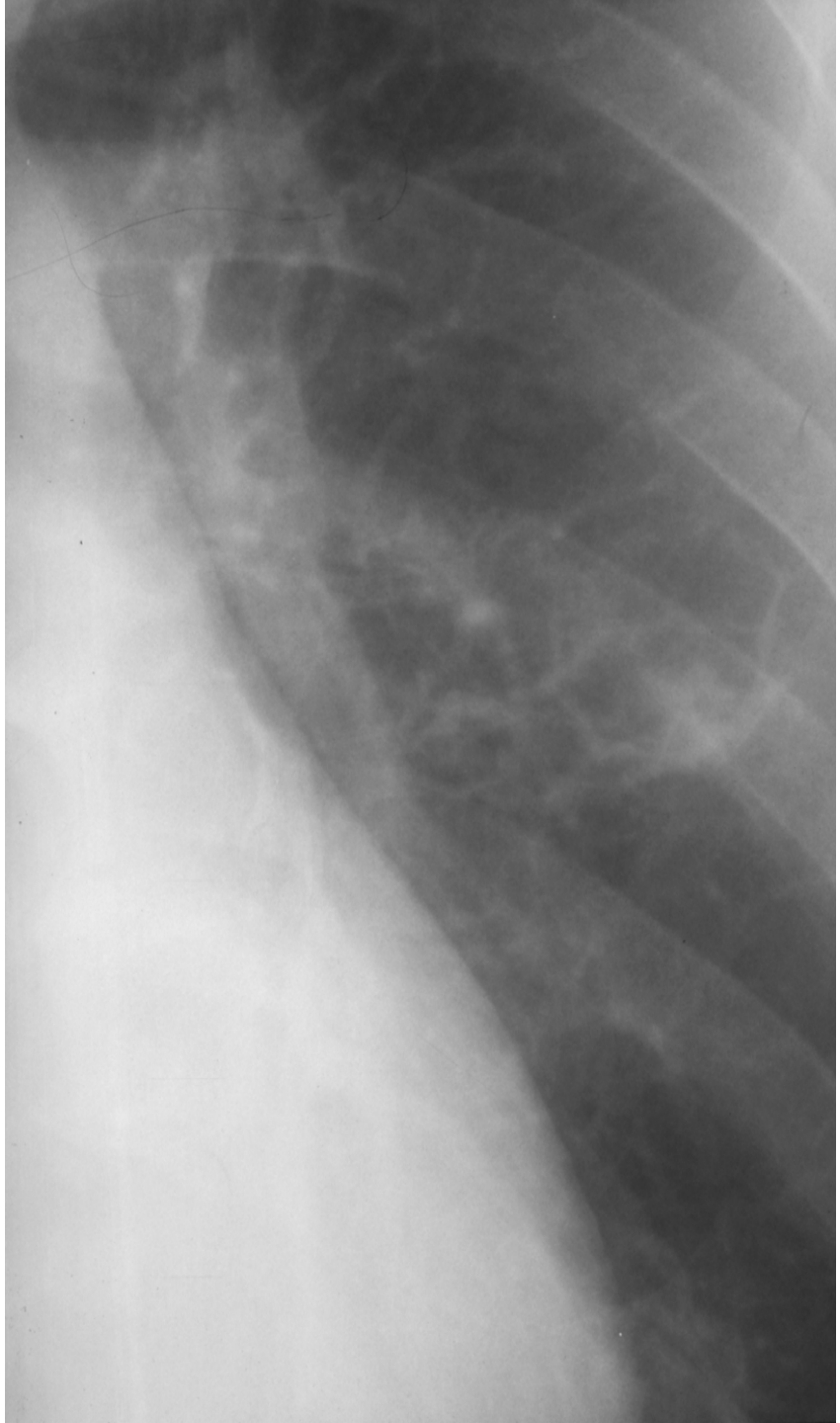
- Small limited lesion
- Usually no symptoms

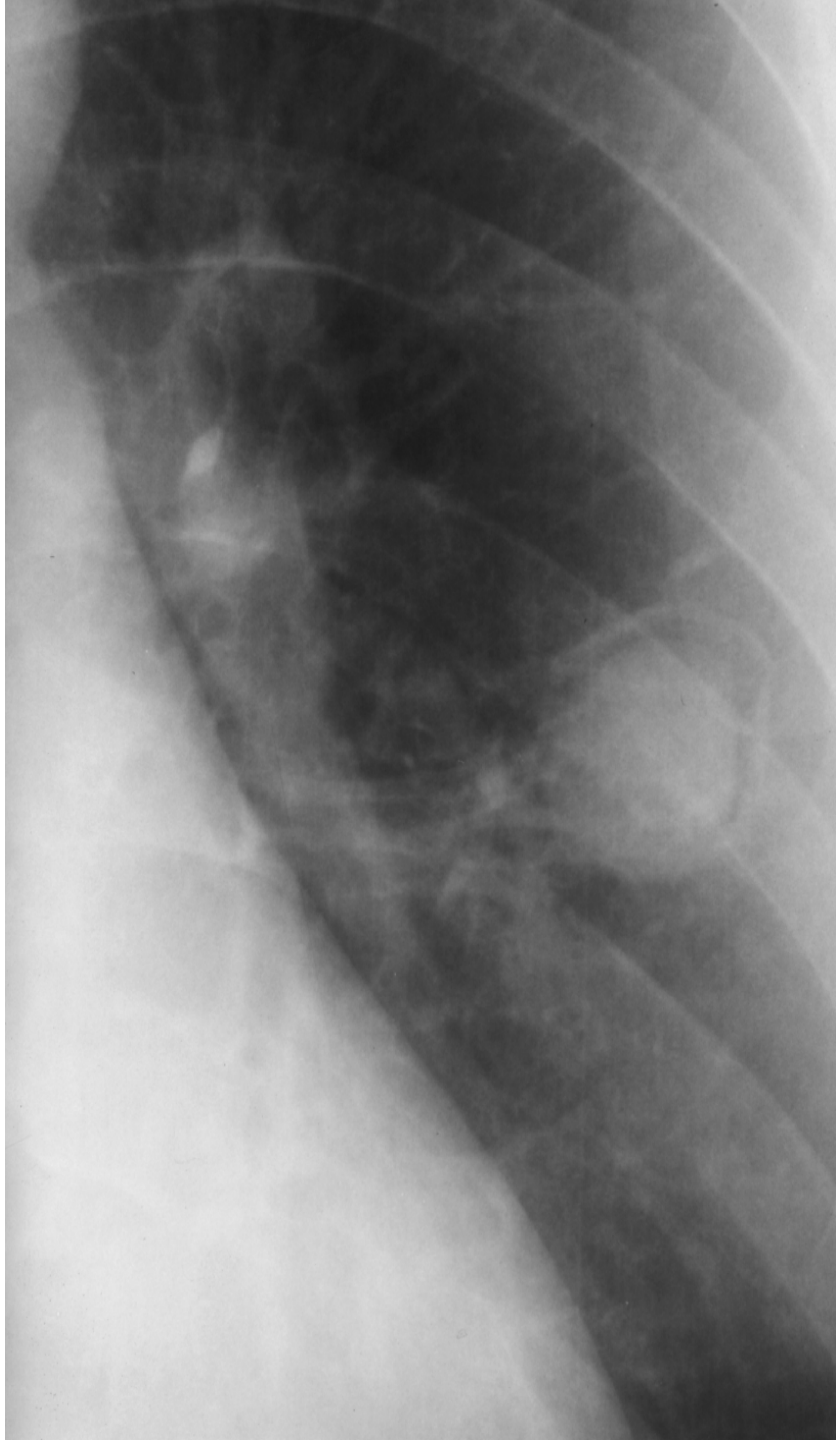
Natural history unknown

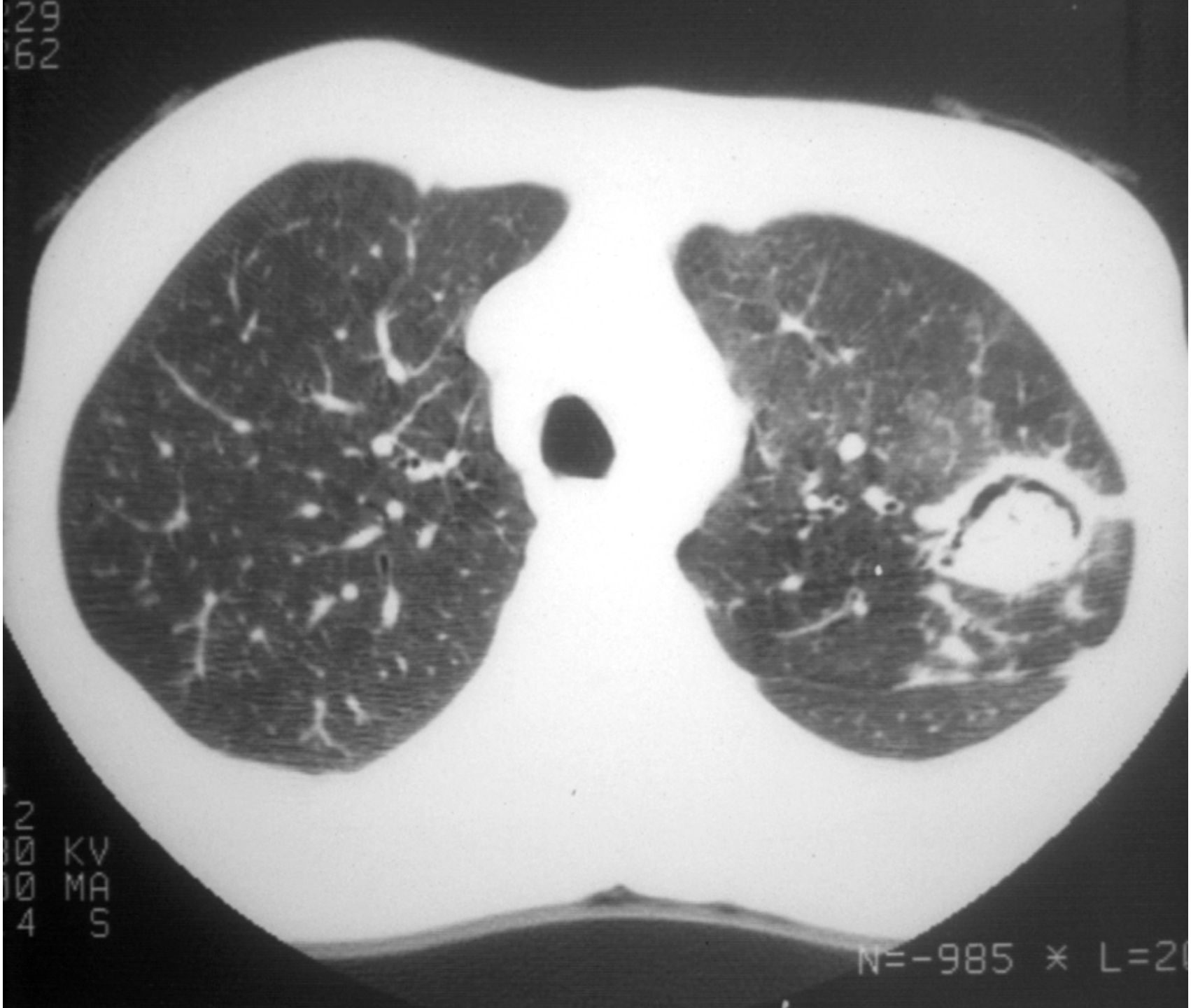
- growth ?
- risk for coughing up of blood (hemoptysis)?
- risk for invasive aspergillosis if immunosuppressed ?

But known, low operative risk !!








29
62
2
0 KV
0 MA
4 S
N=-985 * L=2

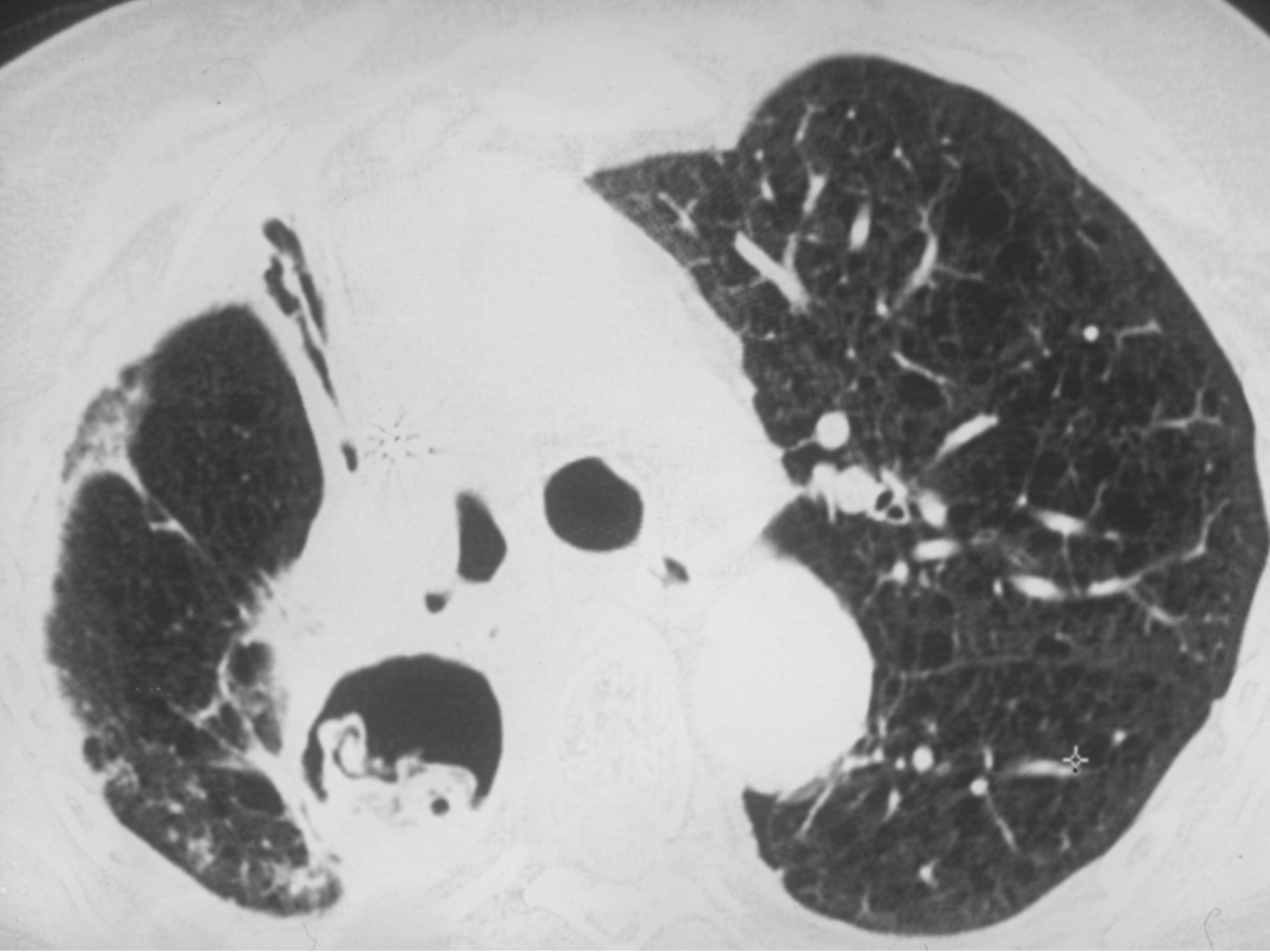
« Complex » aspergilloma

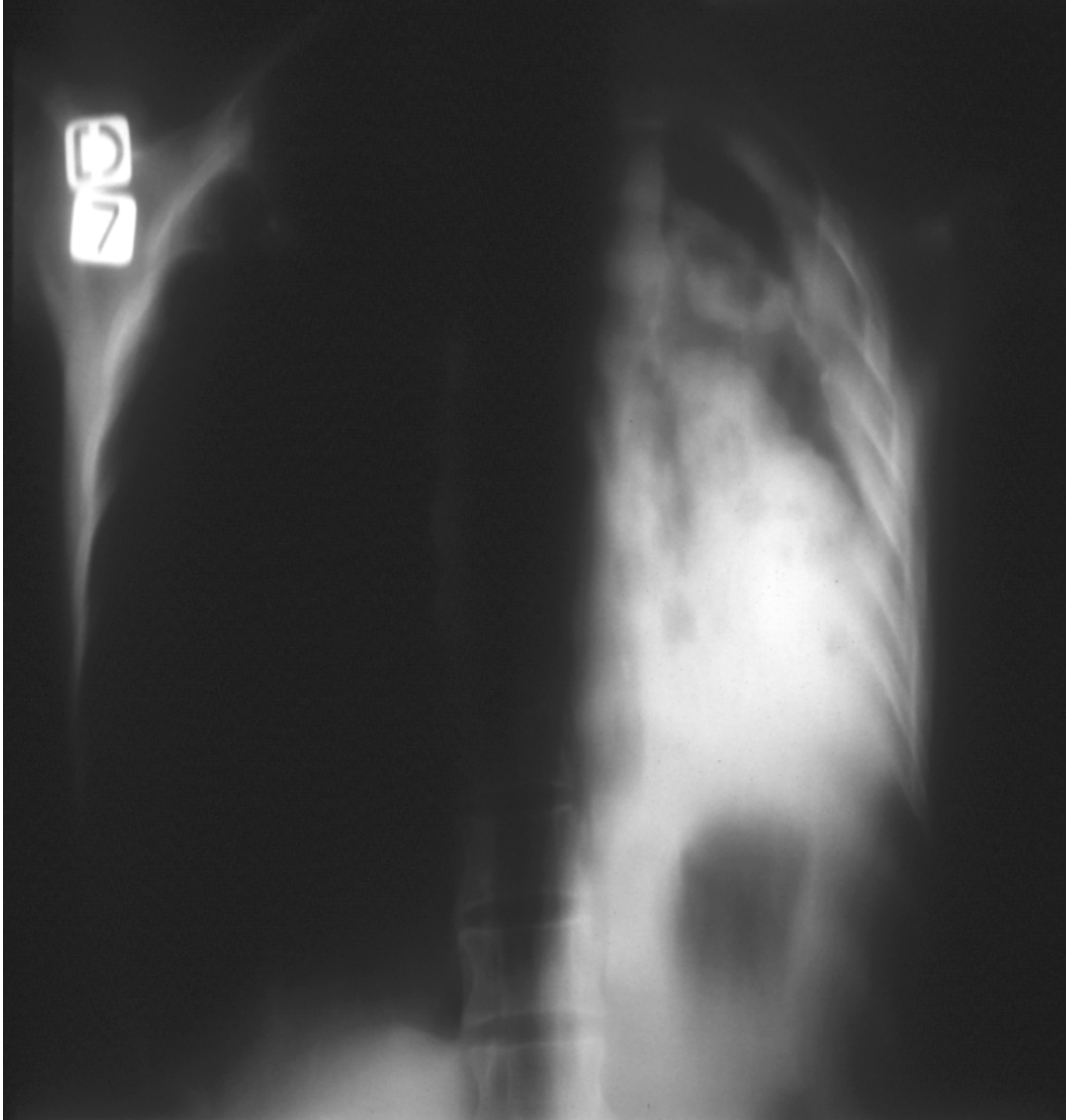
- Larger lesion
- Diseased underlying lung (TB ++)
- Poor respiratory function
- Poor nutrition
- Heavy symptoms (lung bleeding (hemoptysis) ++)

Increased operative risk

Increased spontaneous risk


-684

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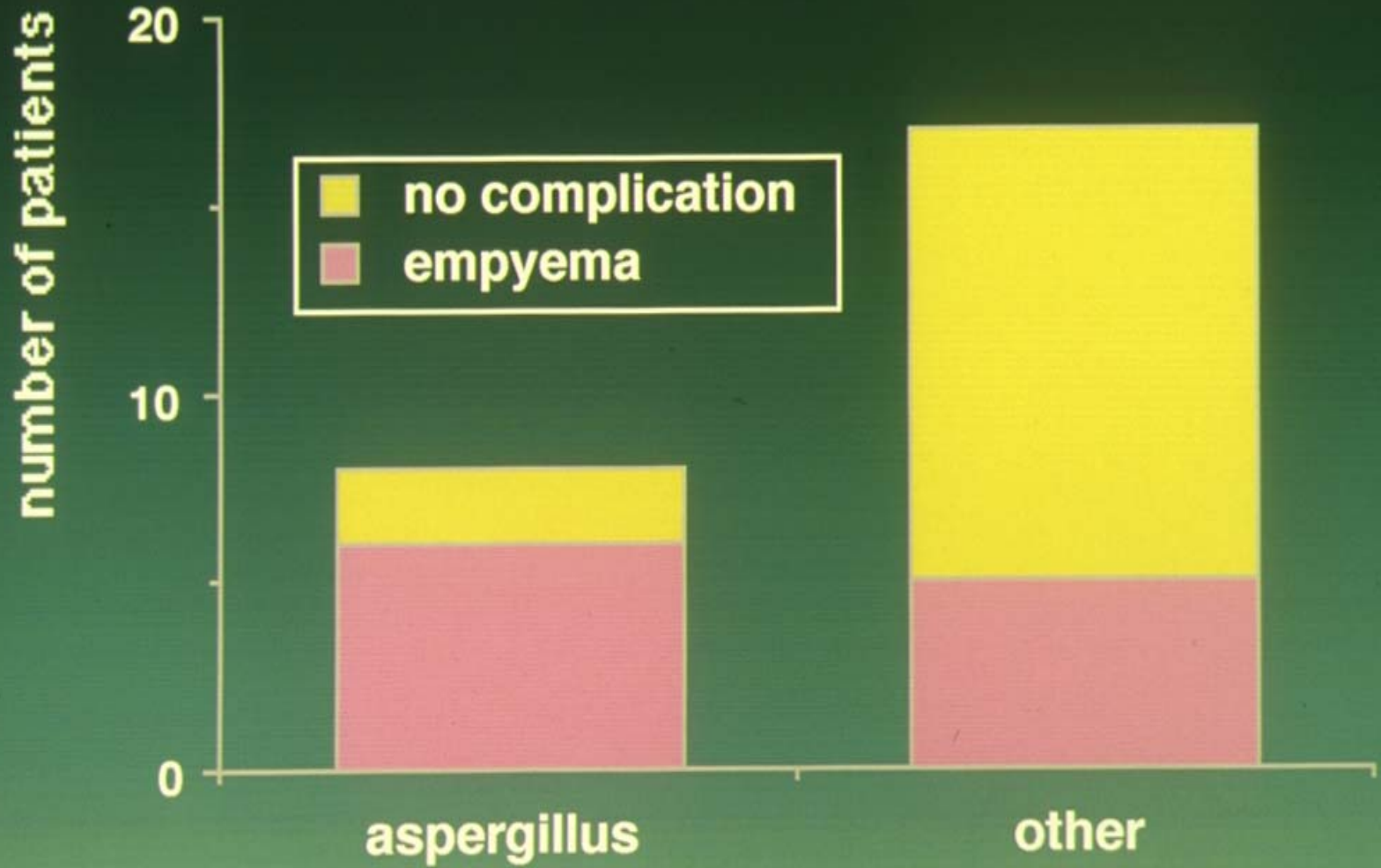
Complex aspergilloma

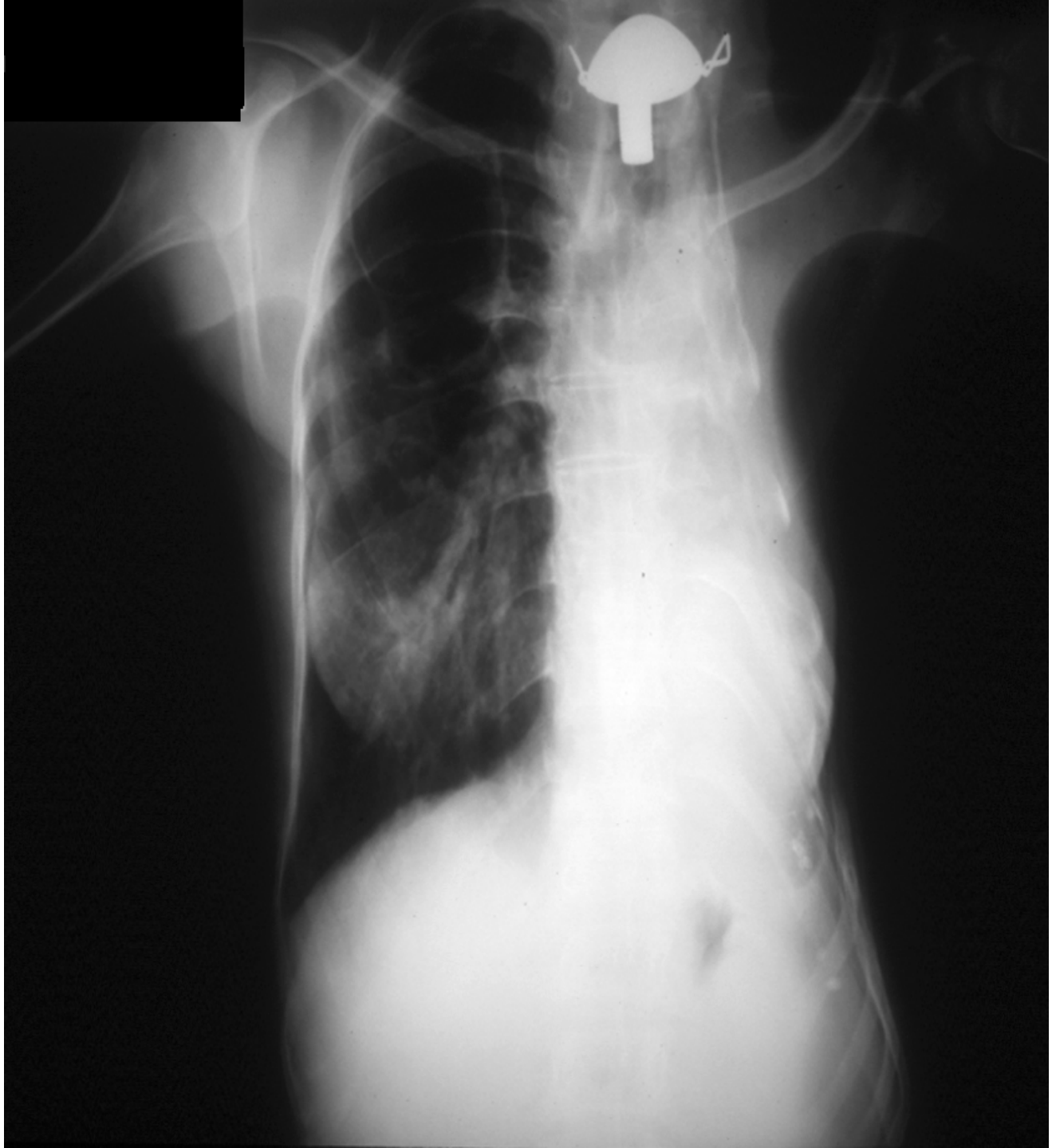
Which surgery ?

- Ideally resection limited to lobectomy
  - technical difficulties
    - Adhesions
    - Lung damage (Perihilar fibrosis)
  - post-operative complications
    - bleeding
    - Poor expansion of the remaining lung
    - Pneumonia
- Lung removal is high risk surgery

empyema & b-p fistula : influence of aspergillus infection



$\chi 2 = 4.588 ; p < 0.05$



« Traditional » Aspergilloma

alternatives to removal (1)

- Embolisation of bronchial arteries
  - may stop bleeding (hemoptysis) in acute conditions
- Injection of antifungals into lung cavity
  - risk of lung flooding
  - cavitation persists ….
- Drain the cavity (cavernostomy)
  - may be only option in high risk patients
  - cavitation persists ….

« Traditional » Aspergilloma

alternatives to resection (2)

Removal of fungal ball (mycetomectomy)

+ volume reduction of diseased area (thoracoplasty)

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

Ideal indication : **Aspergillosis complicating treatment for lung cancer**

What about use of muscle to repair tissue defect (myoplasty) ?

Poor nutritional status
Need for generous exposure

Traditional Aspergilloma

comparative risk of death from operation

Author	N	simple A.	complex A.
Battaglini	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

Chatzimichalis et al, Ann Thorac Surg 1998;65:927-9

« Traditional » Aspergilloma

recent changes with respect to complications (%)

	1974-91	1992-97
Immediate thoracoplasty	*20*	*8.3*
Bleeding	44.1	8.3
Pleural space	47	16.6
Hosp > 30 d	32.3	8.3

Chatzimichalis et al, Ann Thorac Surg 1998;65:927-9

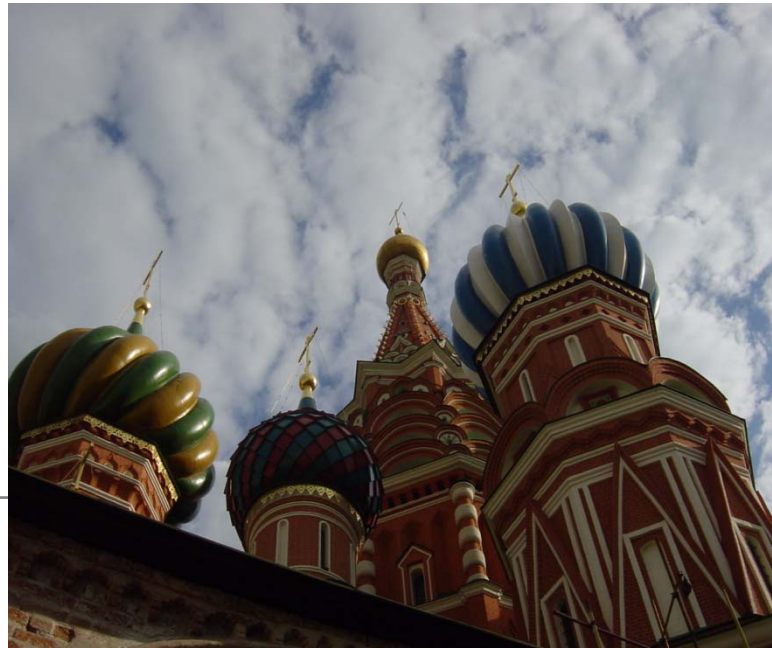
Parietal

aspergillosis

Parietal Aspergillosis

exceptional condition !

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

Kramer et al, Am Rev Respir Dis 1991;144:552-6

Pleural aspergillosis

(Infection of the fluid filled space around the lungs)

Pleural Aspergillosis

Pathophysiology

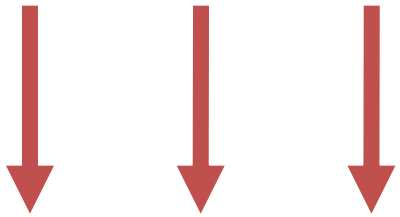
- **<u>Early pleural asp</u>**
  - >intraoperative seeding
  - + failing re-expansion of lungs
- **<u>Late pleural asp</u>**
  - > broncho-pleural fistula
  - + residual pleural space

healing = obliteration of residual space

Pleural Aspergillosis

Guide-lines for management

- Pneumoperitoneum (air in abdomen), antifungals
  - seldom sufficient …..
- Decortication (peeling of abnormal inelastic lung covering)
  - applies only to patients without lung tissue loss !
- Myoplasty (use of muscle to repair)
  - debatable :
    - previous thoracotomy (chest surgery)/
    - size of pleural space /
    - nutritional status.
- Open chest drainage (thoracostomy)
  - reduces symptoms ...



Thoracoplasty

= tailor chest cavity to fit the lung !!!

Pleural A. : results with thoracoplasty

- Patients : n = 14

  - 5 early A. - 9 late A.

- 1 post-operative death (late A.)
- complications :

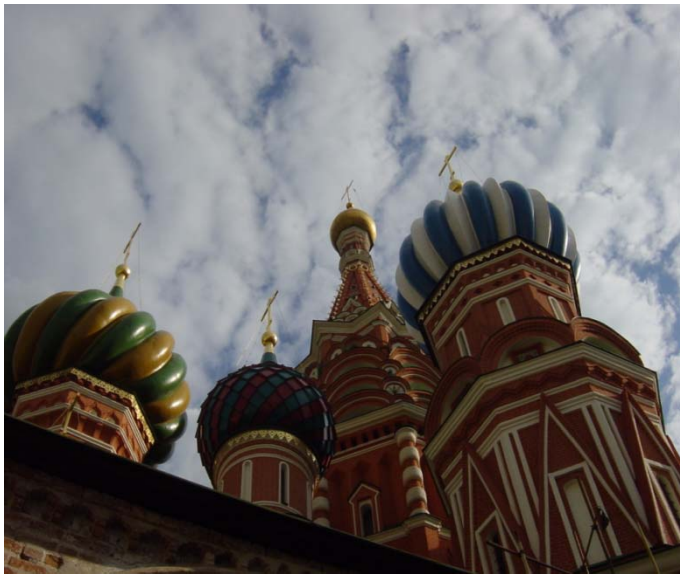
– bleeding :	9	(64 %)
– space problems :	6	(43 %)
– re-operation :	4	(28 %)
– hospital stay > 30d :	9	(64 %)

In medium term, antibodies turned negative in 12 patients !

Importance of adjuvant treatments

Preoperative & post-operative

- Nutrition
  - enteral : feeding tube or gastrostomy
  - intravenous
- Optimization of anti-infectious treatment
- Chest physiotherapy
- Exercise training
- Psychologic support
- Social support



Conclusions

surgical management for thoracic aspergillosis

- Broad spectrum of indications despite contemporary antifungals
- Requires well-trained & experienced thoracic surgeon
- High risk for complications in patients with symptoms
- Risk and benefit need to be weighted carefully