

**GLI STRUMENTI DELLA DIAGNOSTICA PER
IMMAGINI DEL TORACE**

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■ LE METODICHE

RX

TC

RM

ANGIOGRAFIA

US

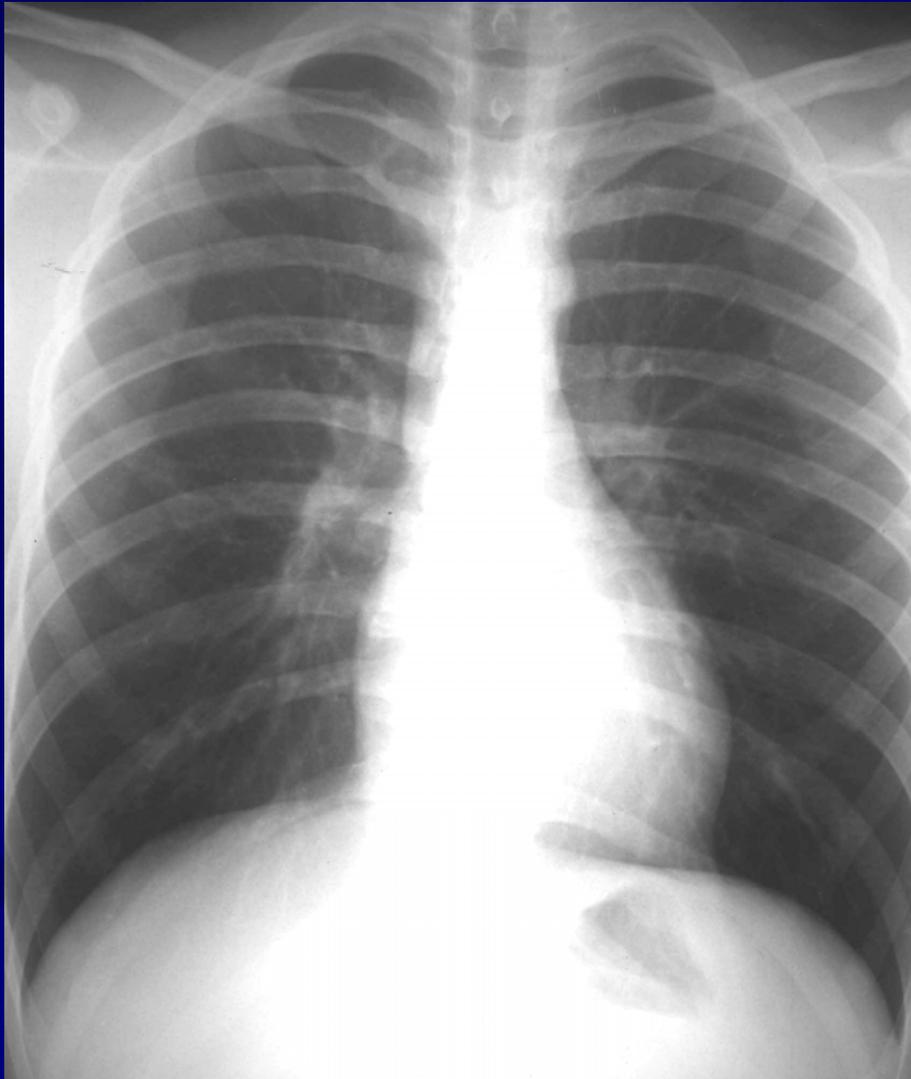
■ ANATOMIA RADIOLOGICA

■ INDICAZIONI CLINICHE

■ SEMEIOTICA RADIOLOGICA

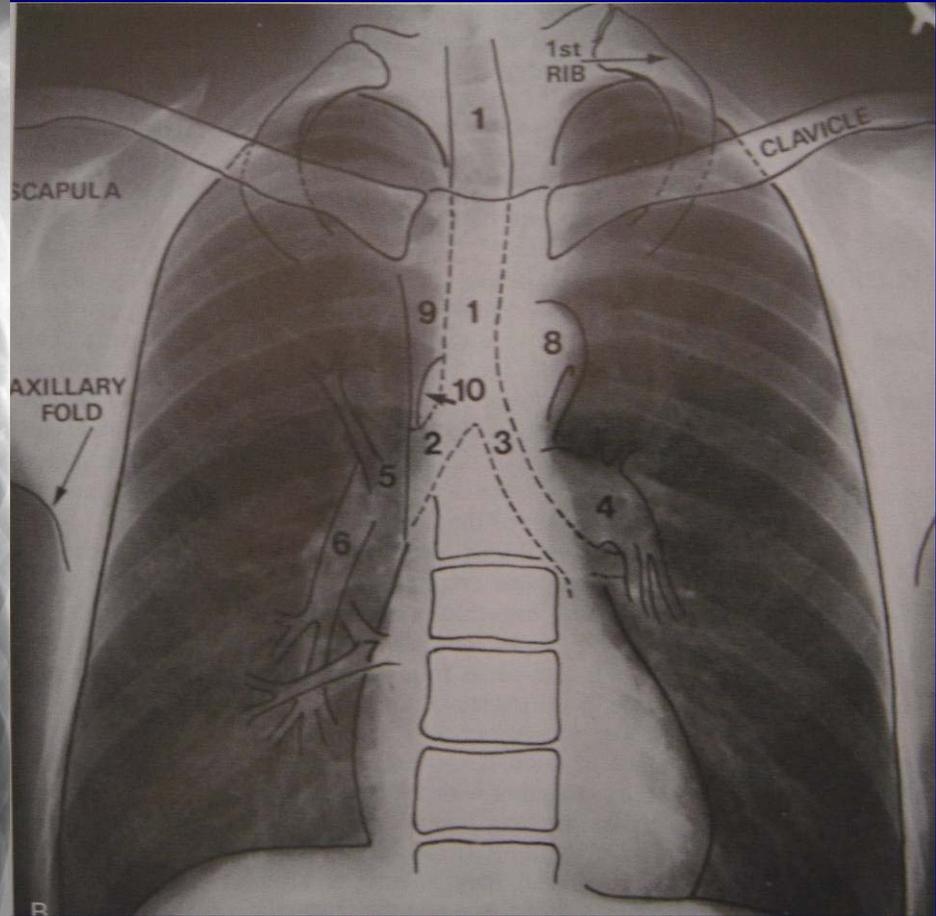
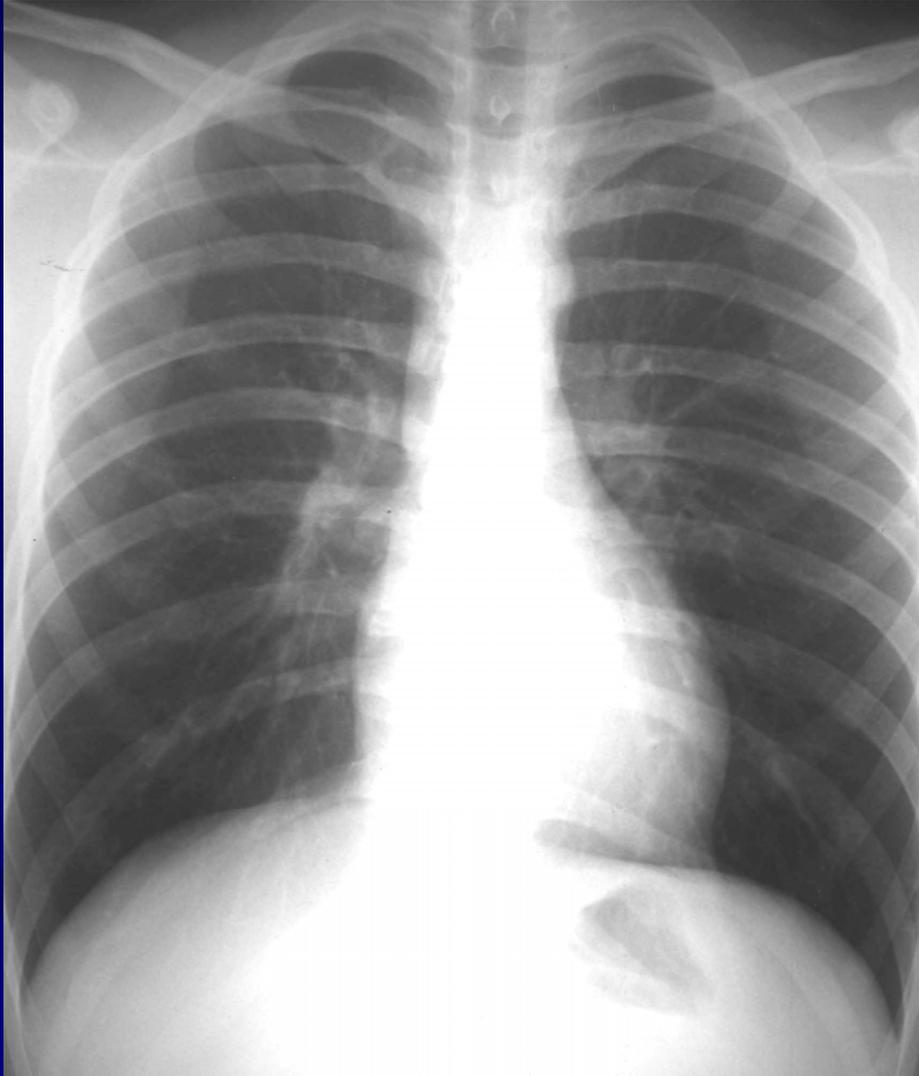
RX normale

2 proiezioni, PA e LL, costa pochi € e poche radiazioni ionizzanti. In stazione eretta e in inspirio profondo,



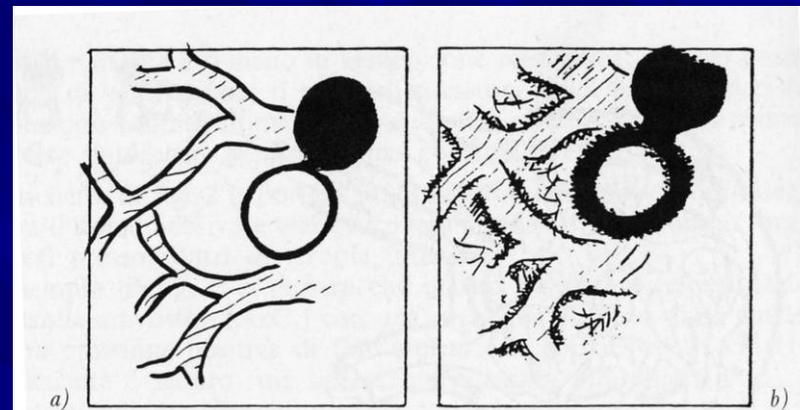
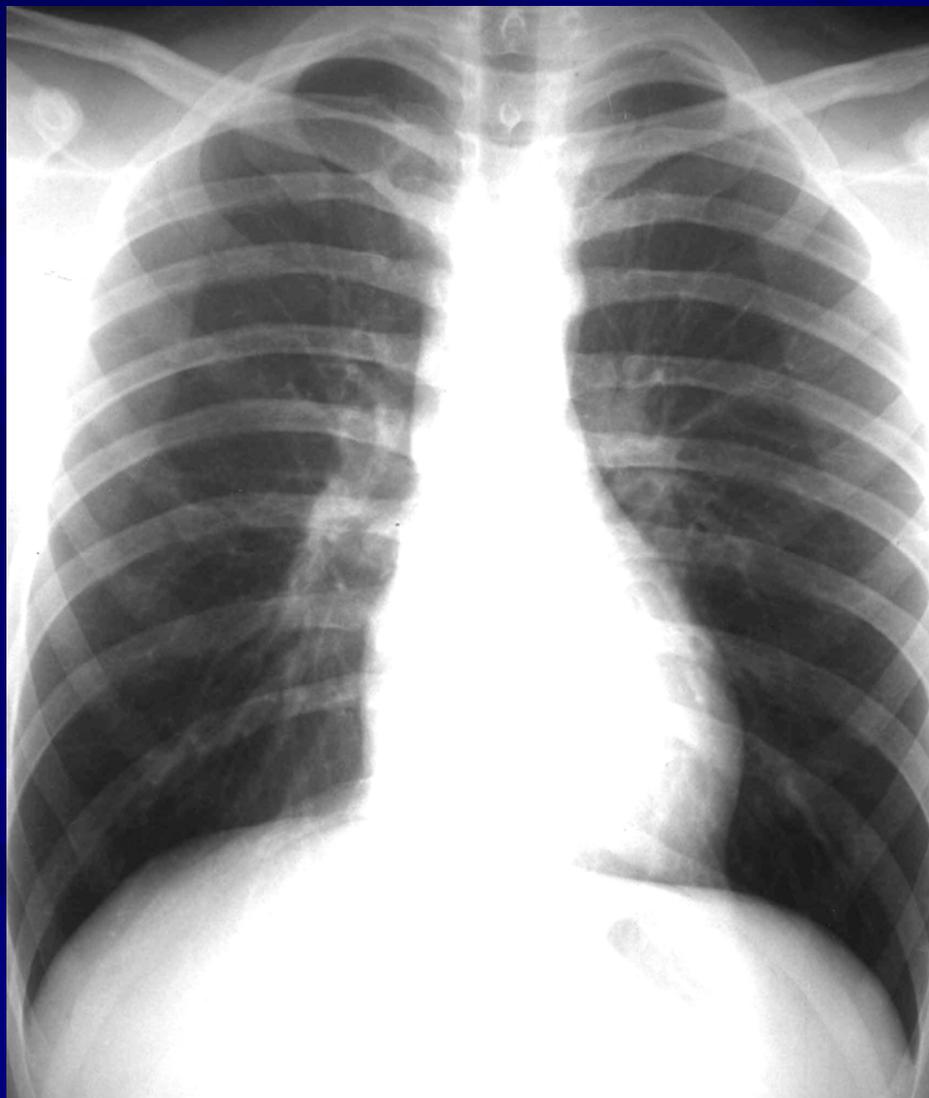
RX normale

Scheletro, mediastino, diaframmi, cuore, aorta (8), v.cava sup (9), trachea (1), bronchi principali (2,3), arterie polmonari (4,5,6), **ARIA NEI POLMONI**, vasi polmonari



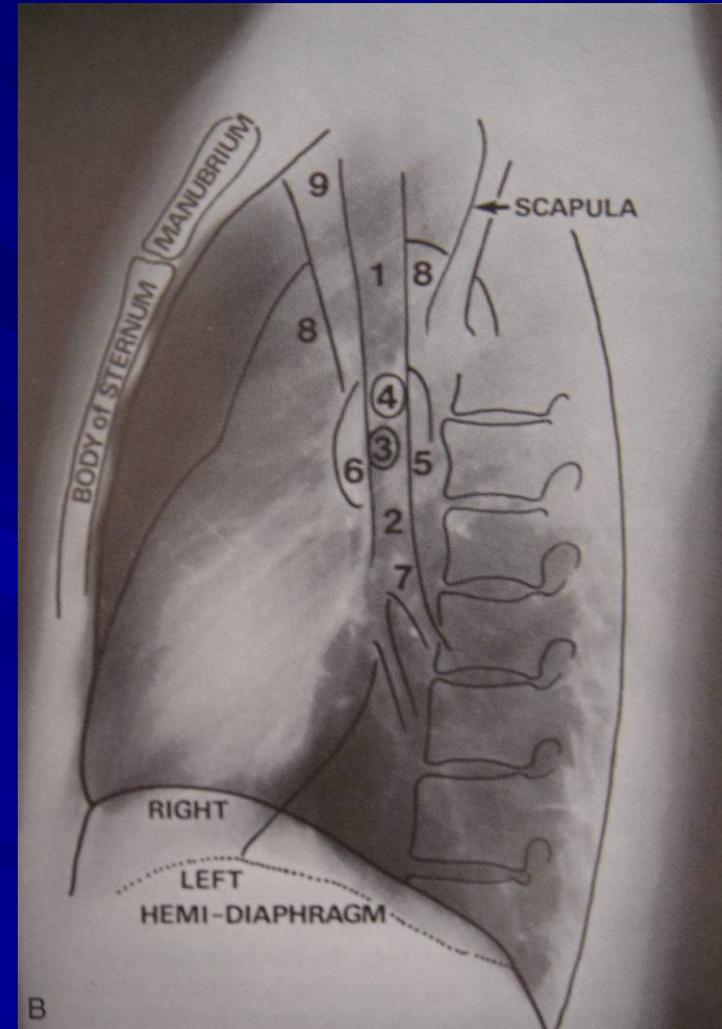
RX normale

Scheletro, mediastino, diaframmi, cuore, aorta (8), v.cava sup (9), trachea (1), bronchi principali (2,3), arterie polmonari (4,5,6,7), **ARIA NEI POLMONI**, vasi polmonari



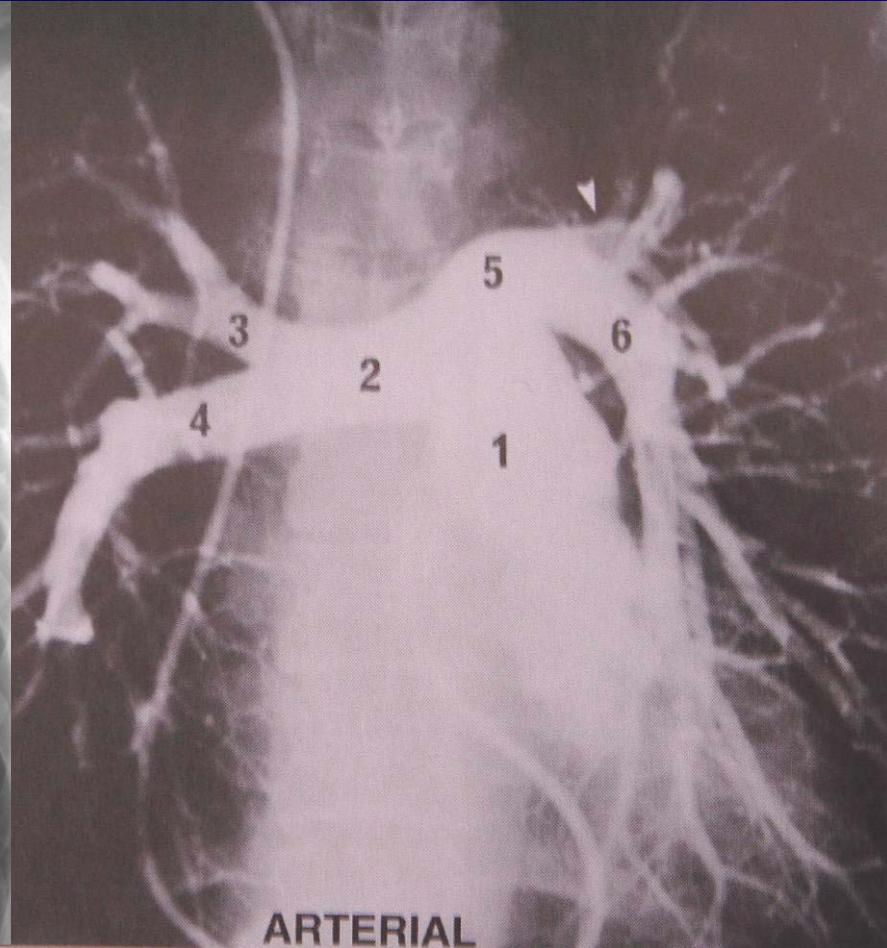
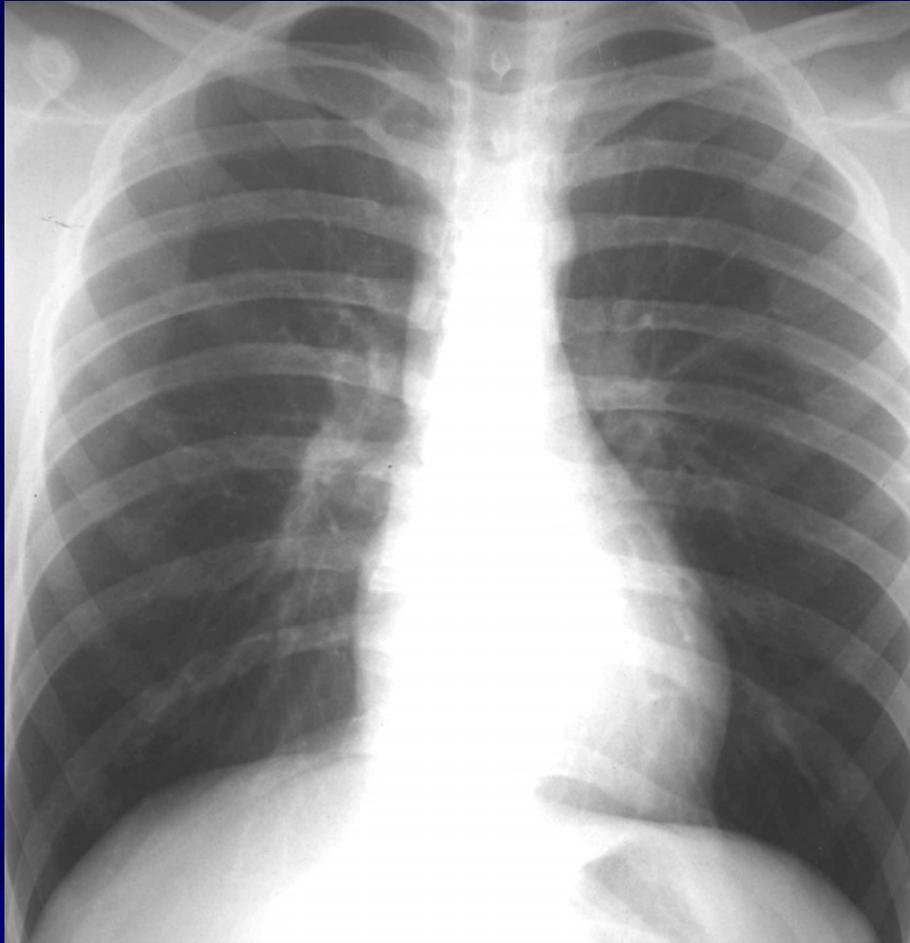
RX normale

Scheletro, diaframmi, cuore, colonna dorsale, aorta asc (8), trachea (1),

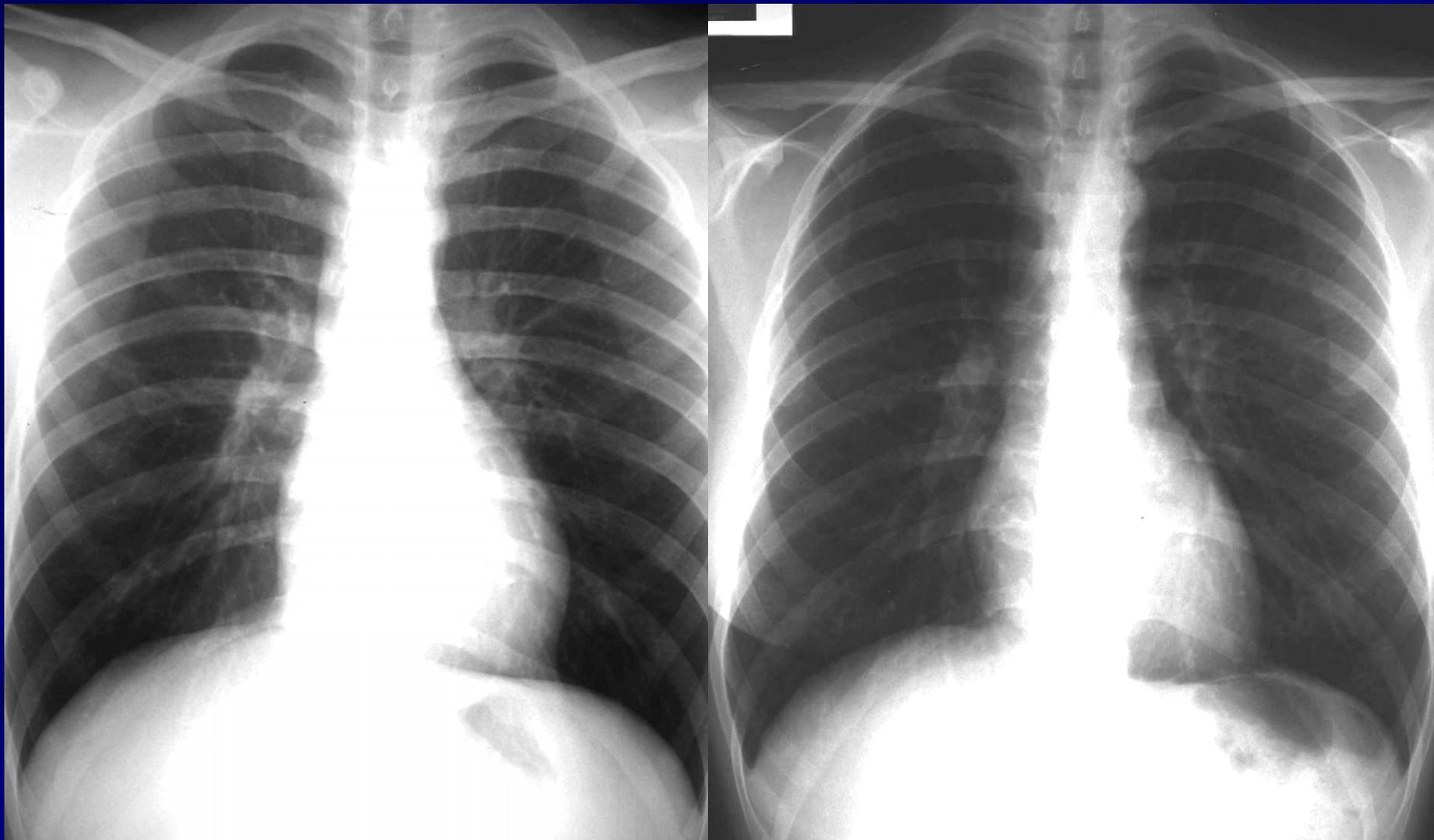


RX normale

ili polmonari

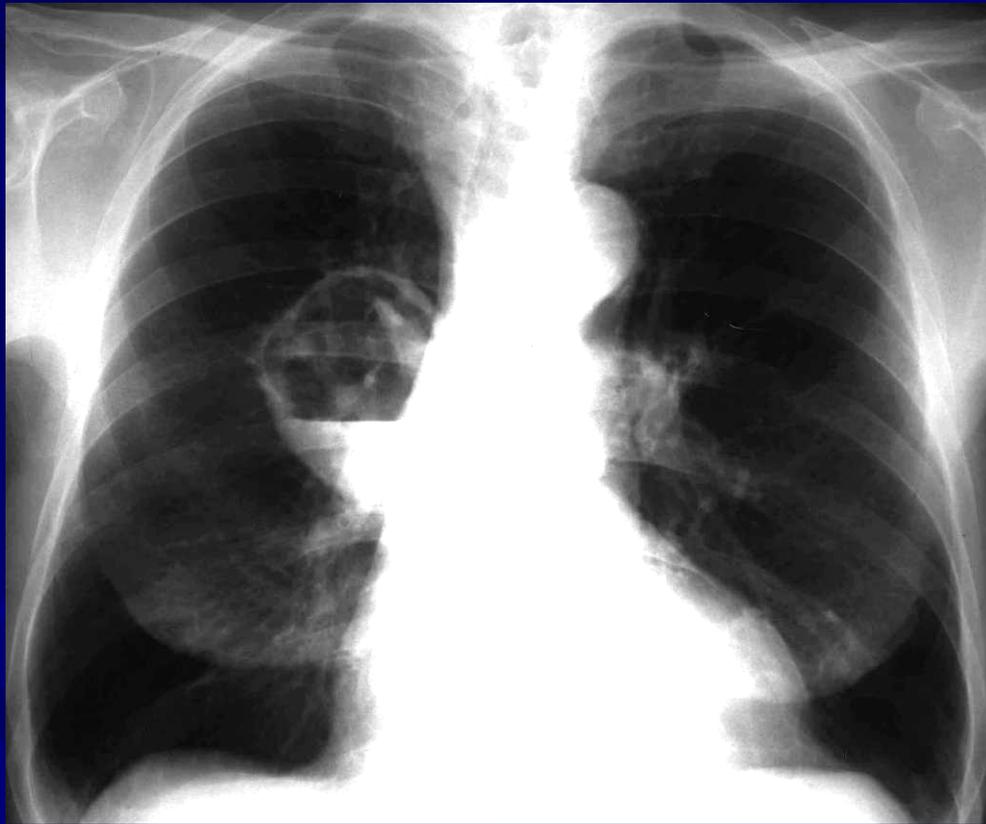


RX normale



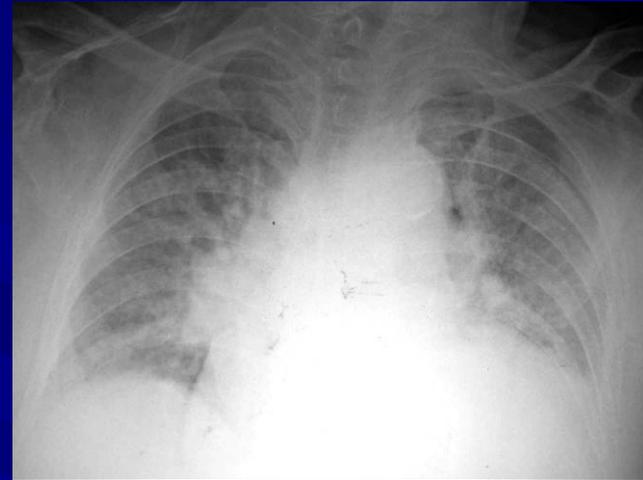
RX le informazioni

■ Polmoni, lo spazio aereo, interstizio



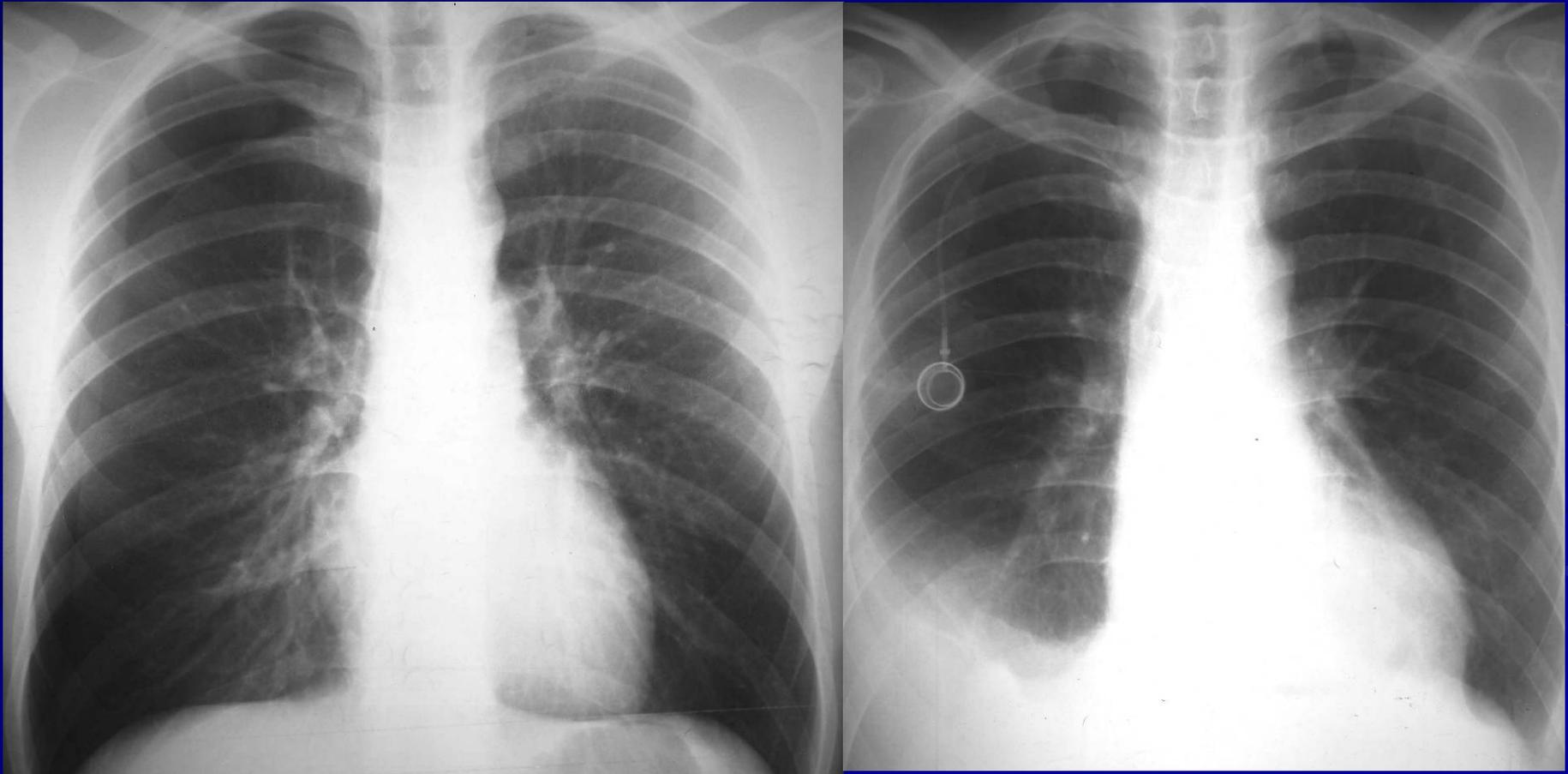
RX le informazioni

- Polmoni, lo spazio aereo, interstizio



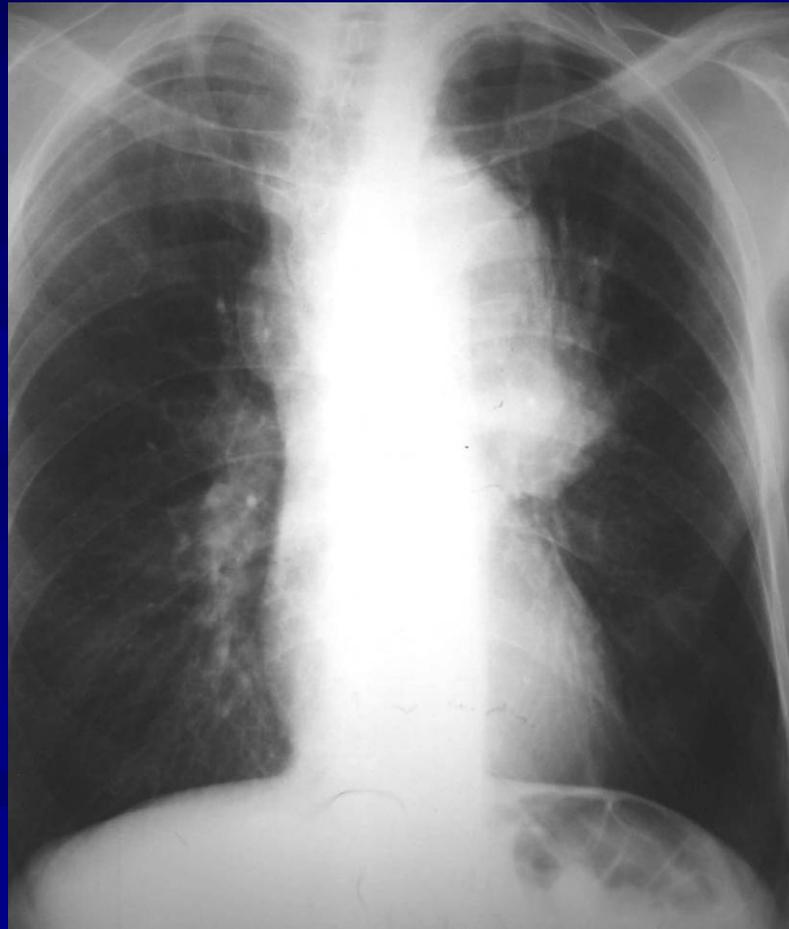
RX le informazioni

■ Lo spazio pleurico



RX le informazioni

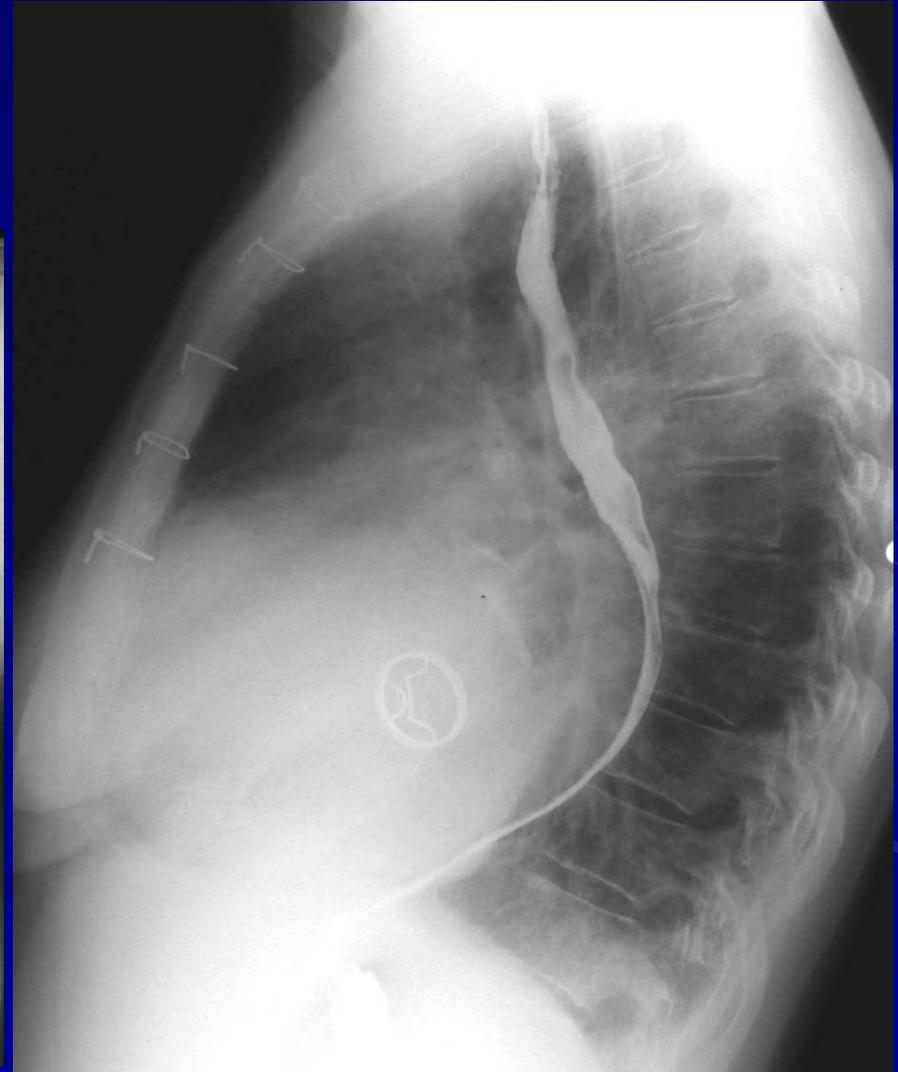
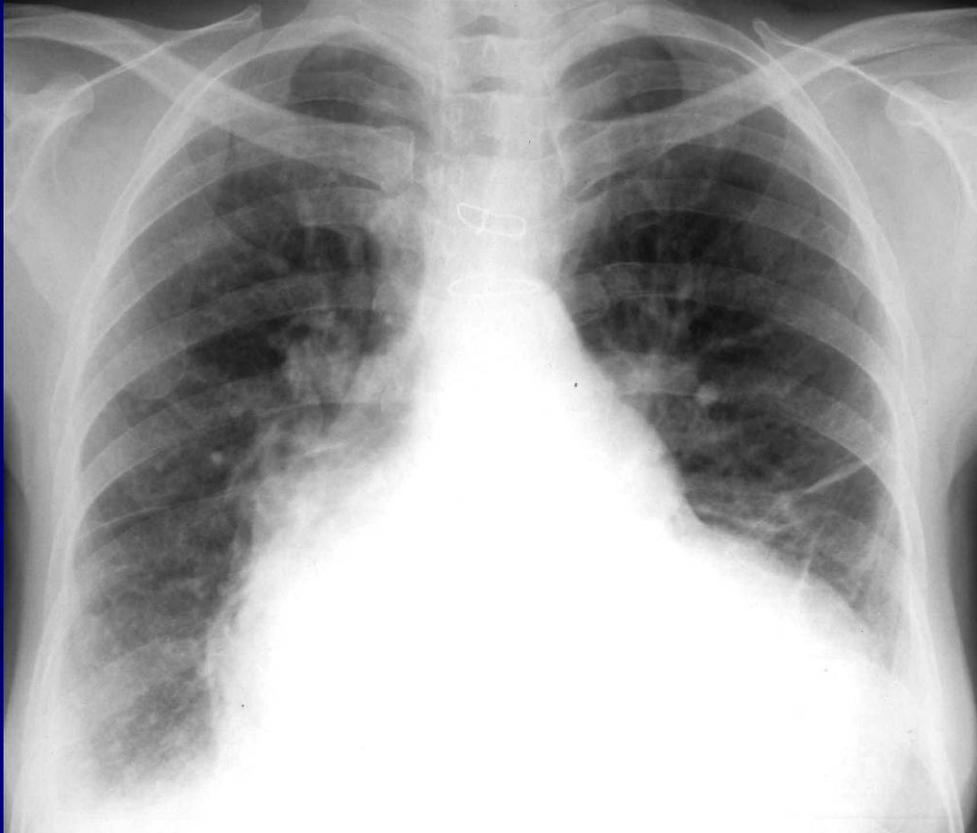
- mediastino, masse, aneurismi,



RX

le informazioni

- cuore, insufficienza, CMD, valvulopatie, vasi polmonari



RX torace

referto parte descrittiva
conclusioni

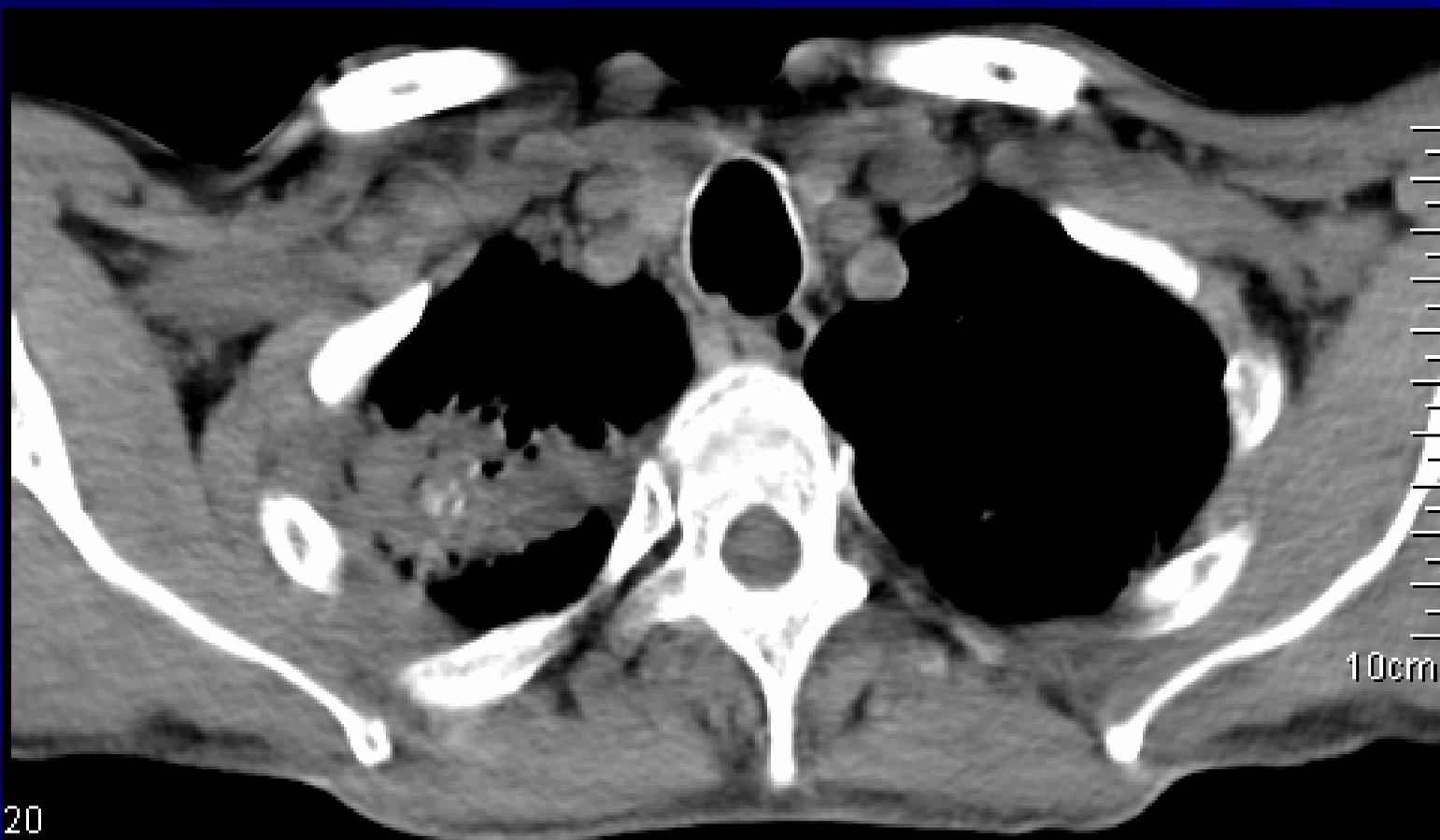
- Conformazione toracica
- Riscontri pleurici, riscontri del parenchima
- Come sono i vasi polmonari, per cabro e per distribuzione
- Se il mediastino è deformato
- Se il cuore è deformato per le cavità di destra o di sinistra

RX torace

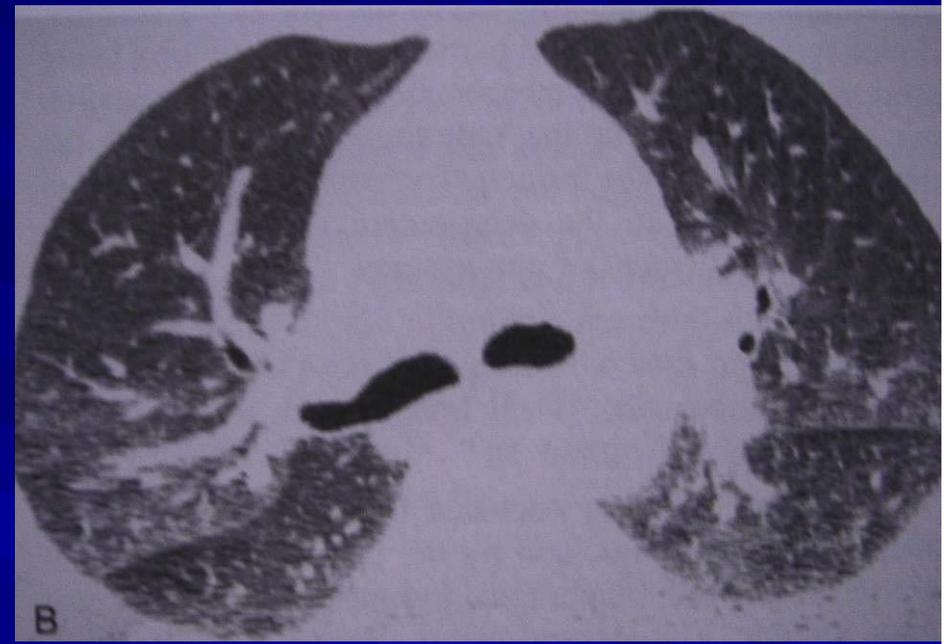
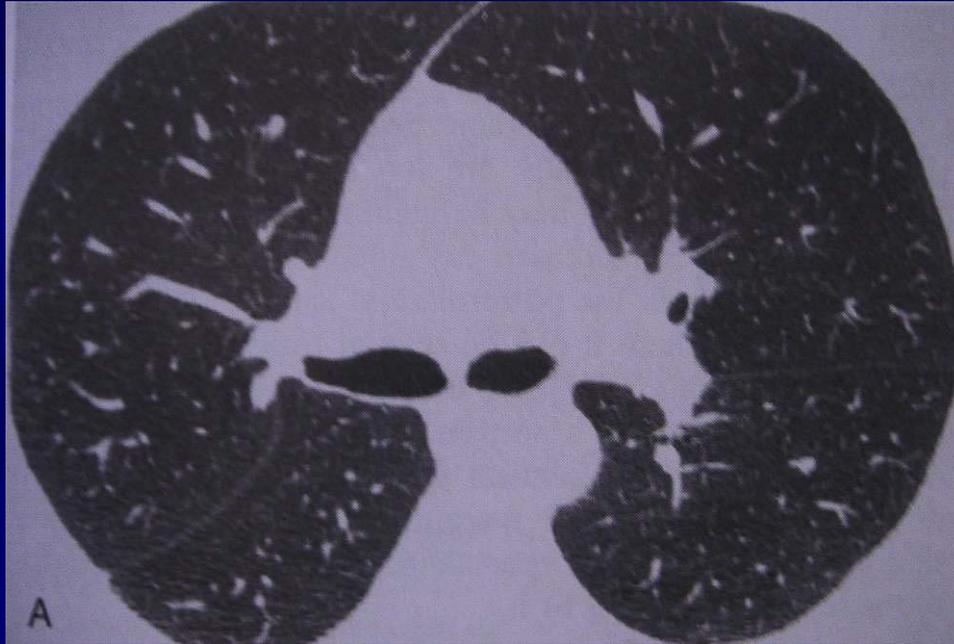
indicazioni

- Dispnea
- Dolore toracico (pleurico, retrosternale, respiratorio, non scheletrico)
- Emottisi
- Obiettività respiratoria positiva
- Stati febbrili con ↑
- Tosse persistente
- Sindrome cavale superiore
- Follow-up chirurgici ed oncologici
- Sospetta cardiopatia congenita
- Traumi

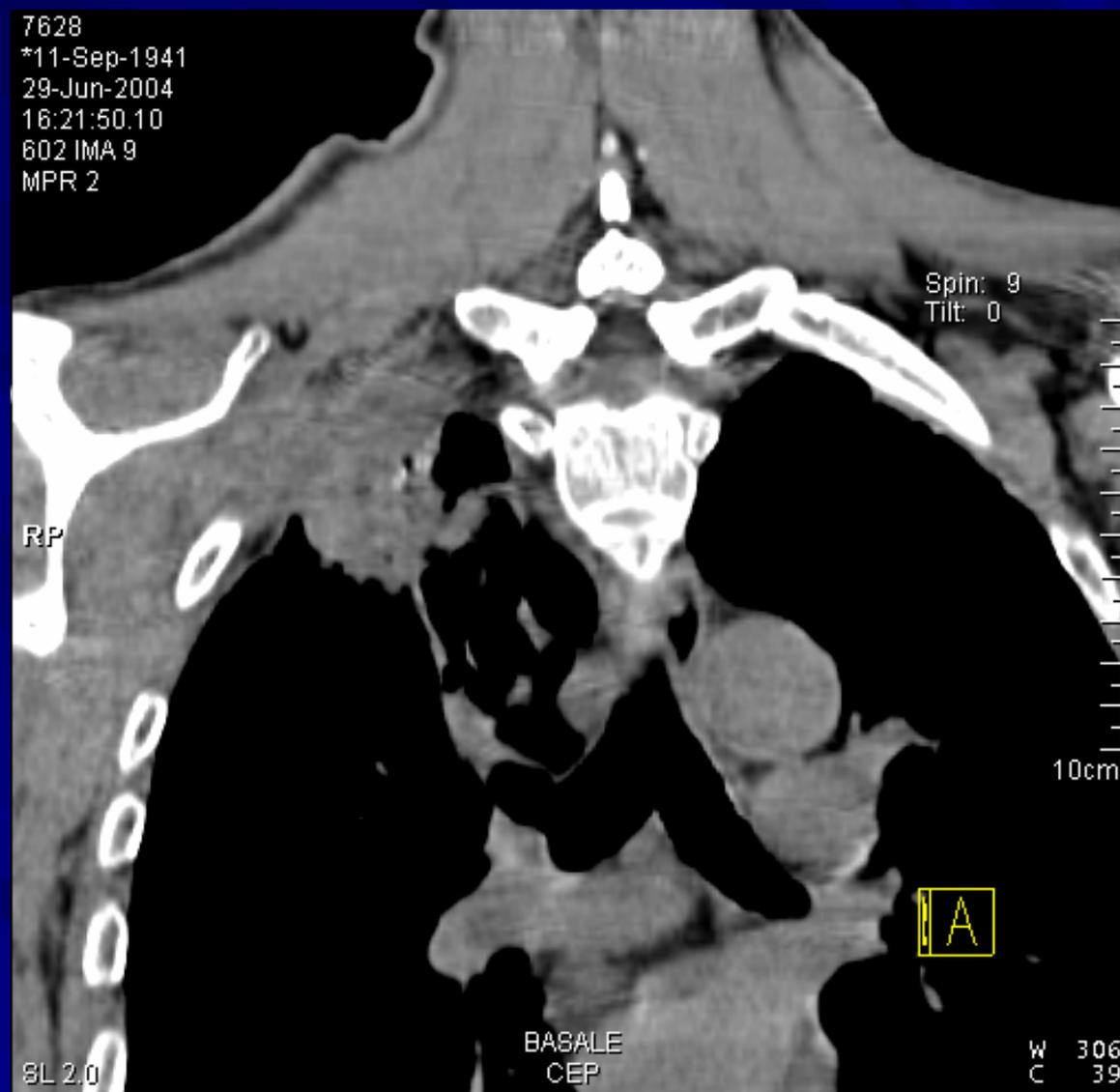
TC - i tessuti molli



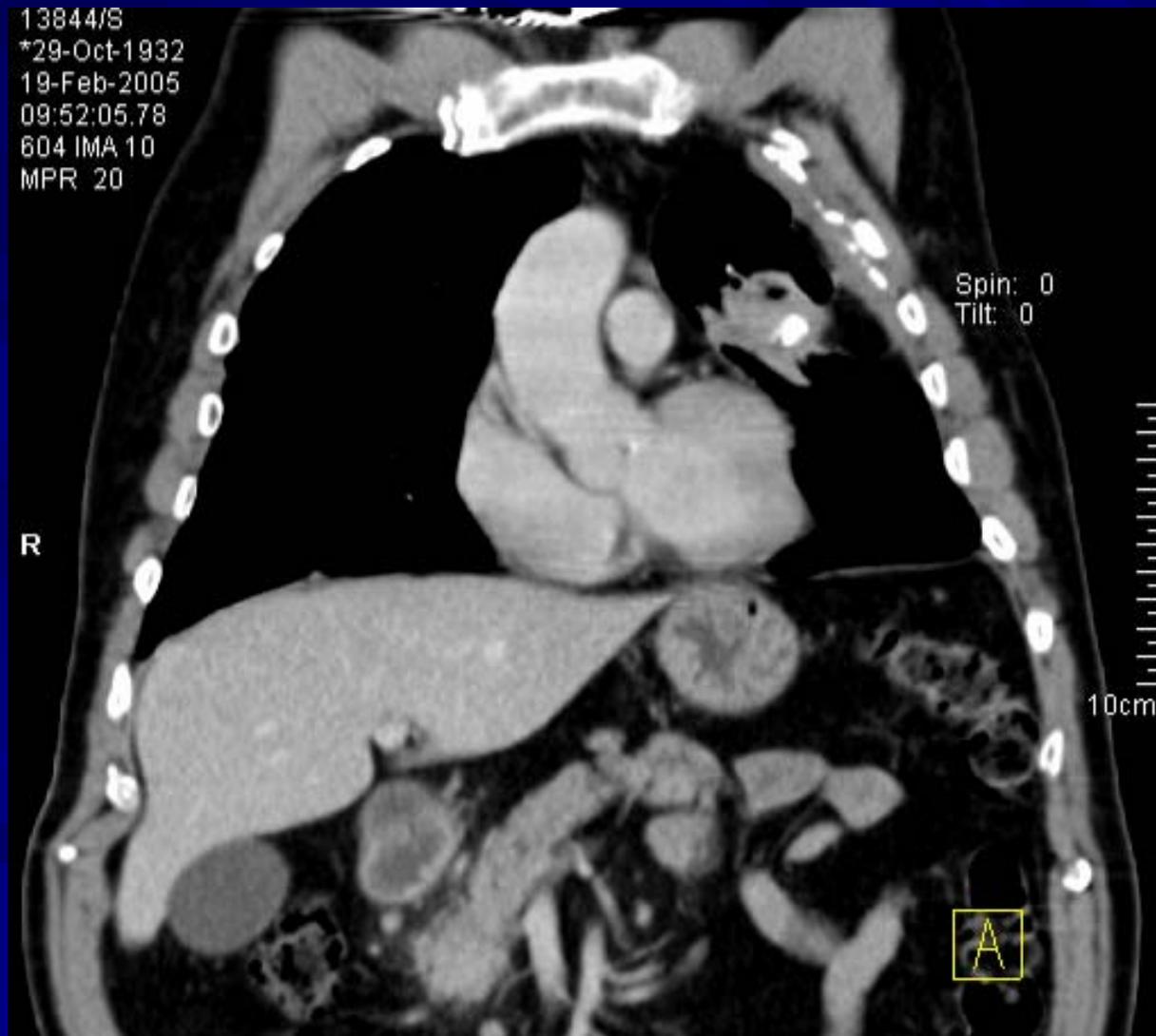
TC - il polmone



TC - i tessuti molli

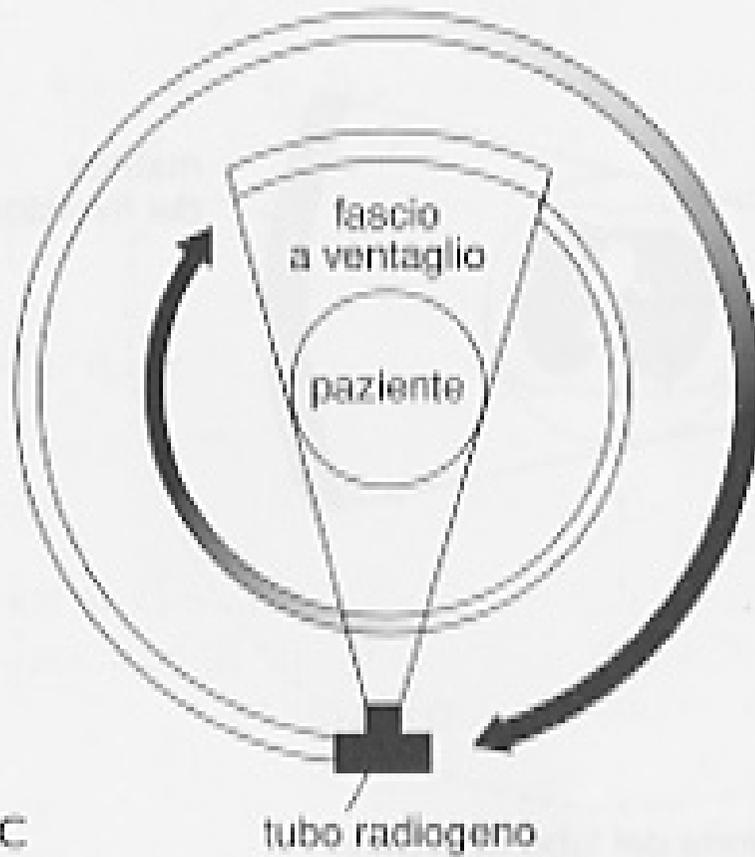


TC - i tessuti molli; il cuore, i grossi vasi, la parete toracica



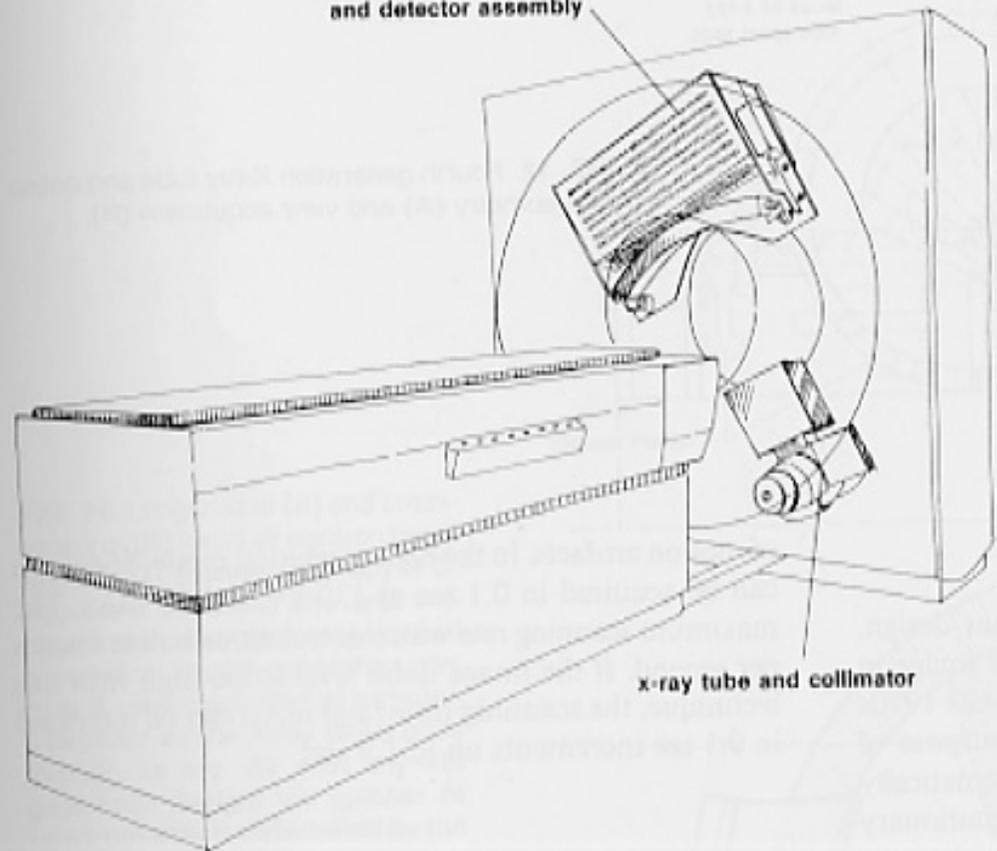
TC tradizionale 1975

matrice di rivelatori (mobile)

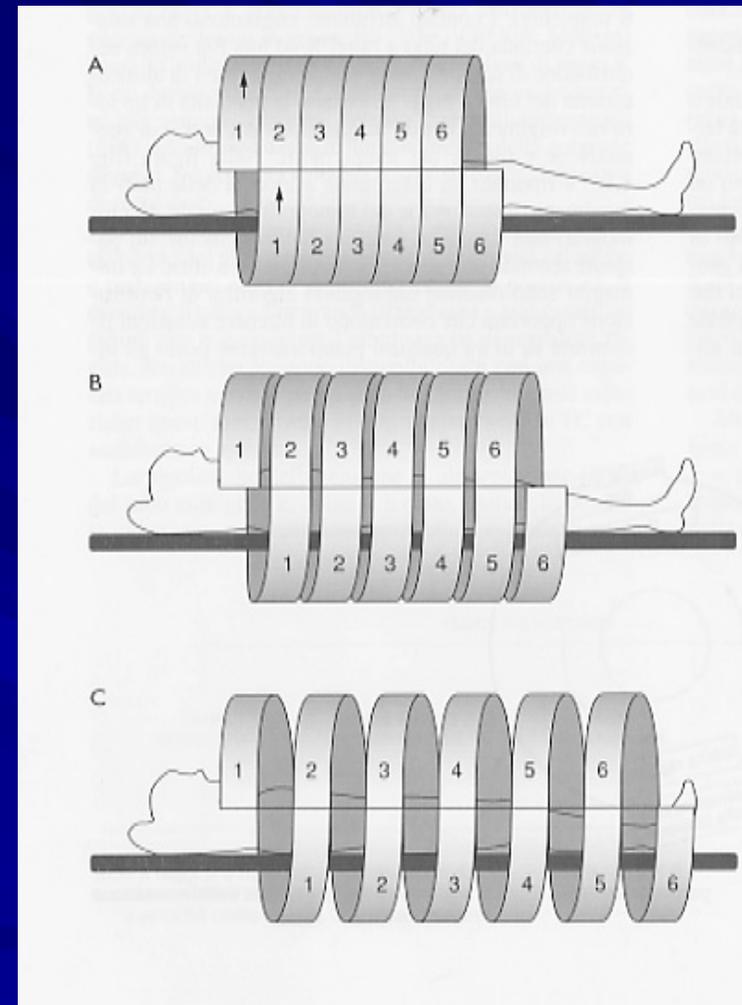
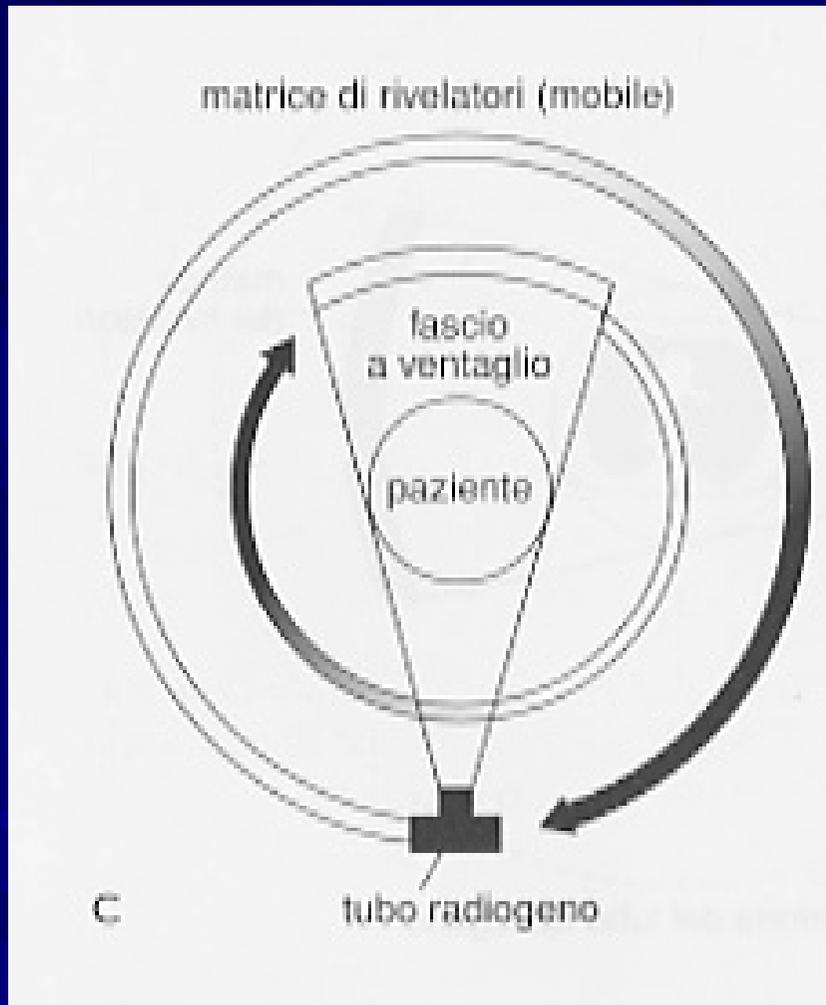


C

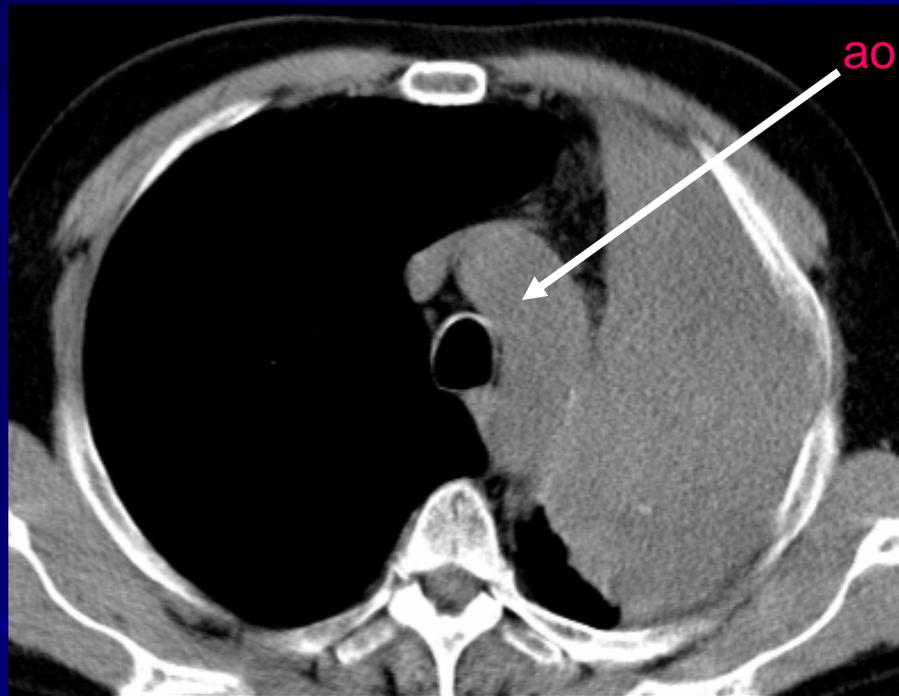
data acquisition
and detector assembly



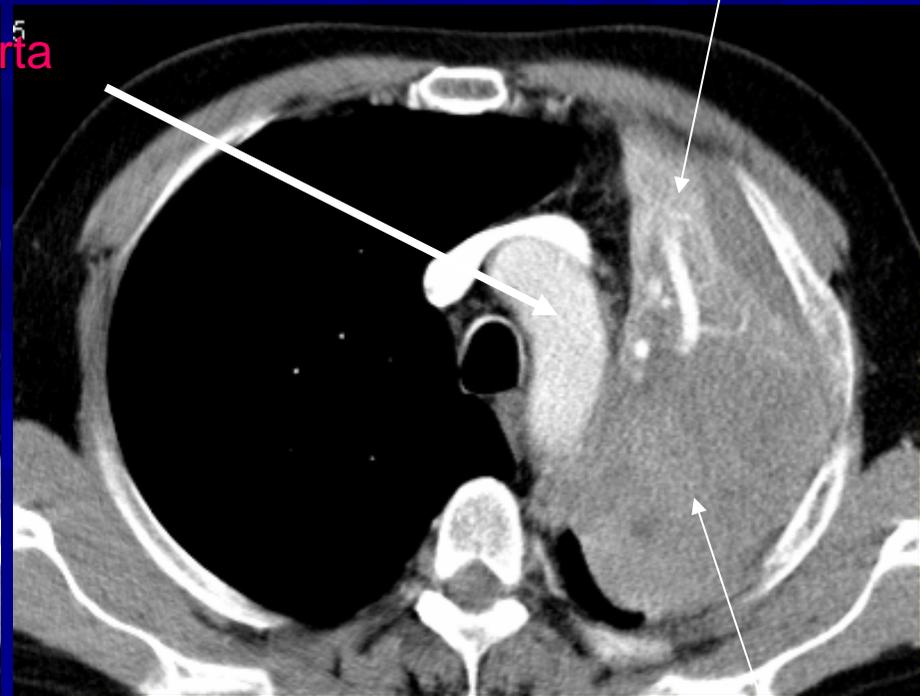
TC SPIRALE



Mdc per le masse



Senza mdc ev



Con mdc ev

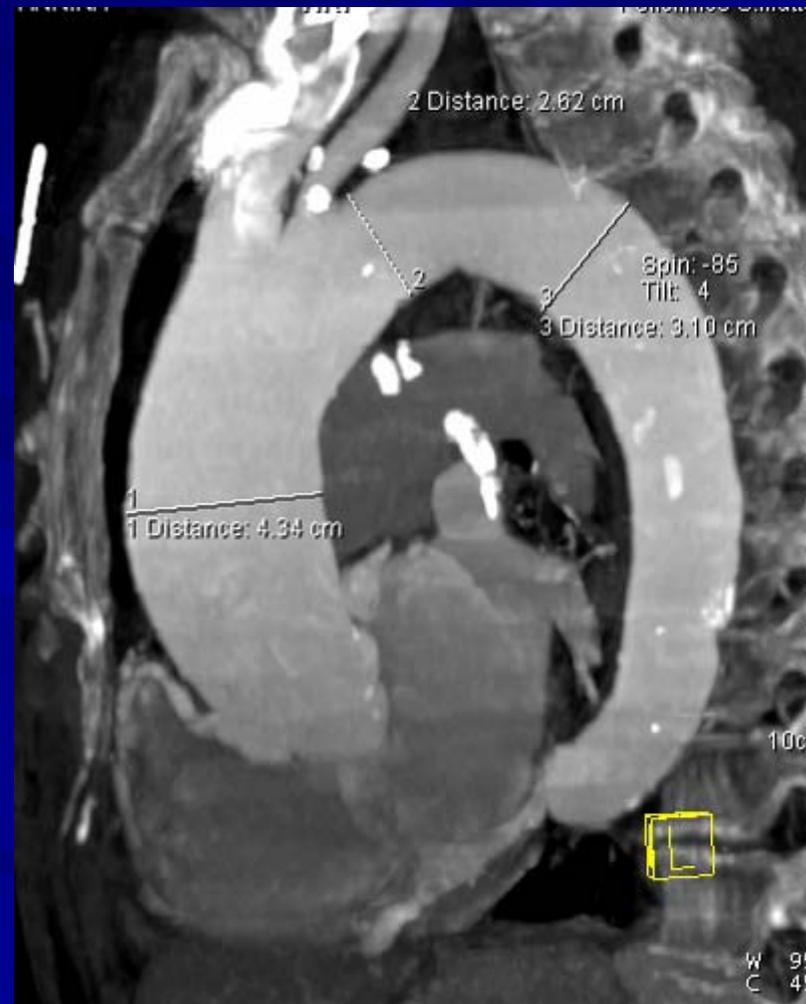
tumore

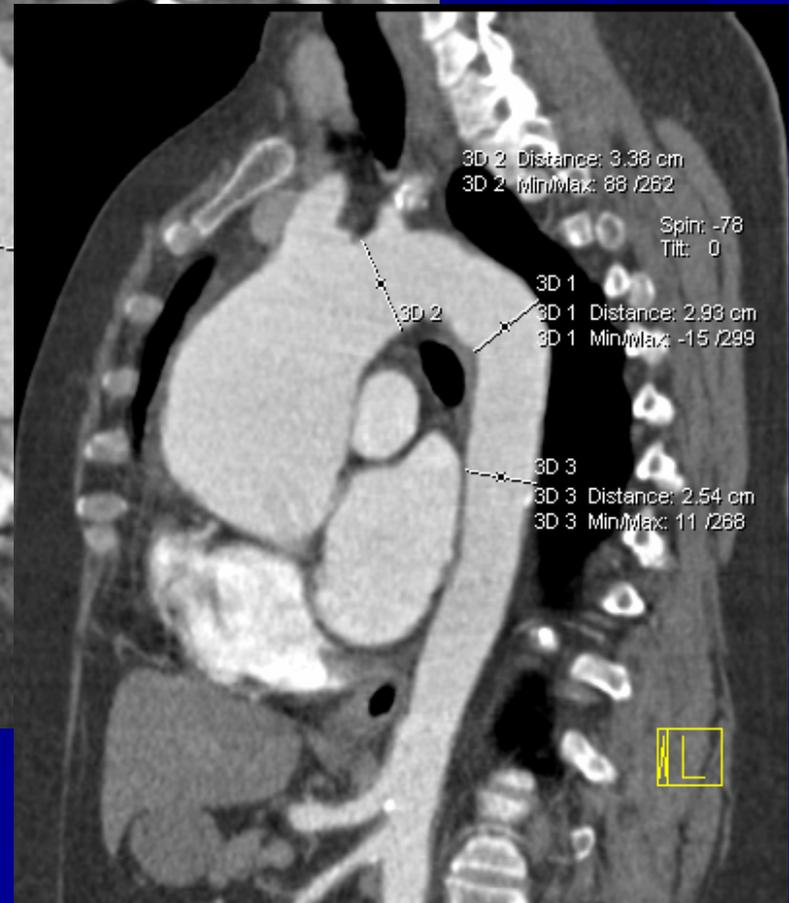
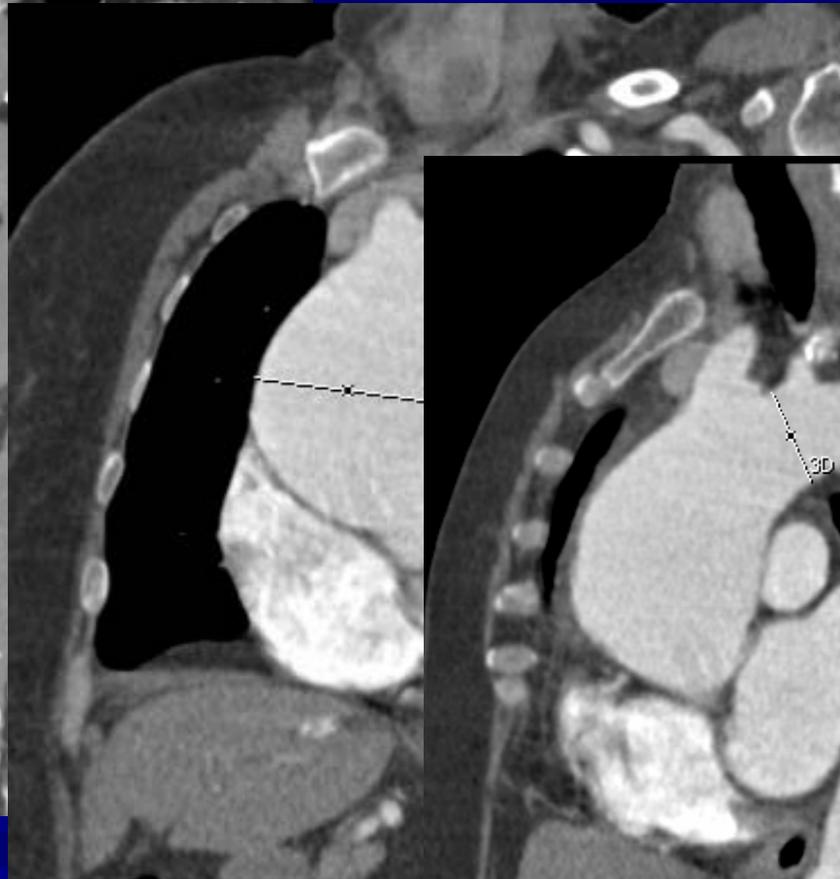
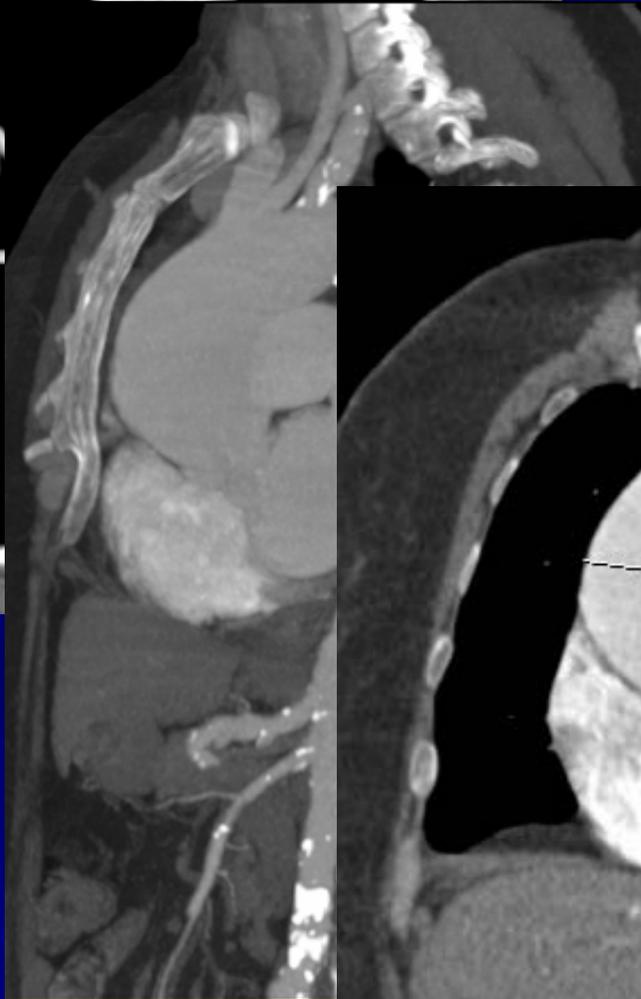
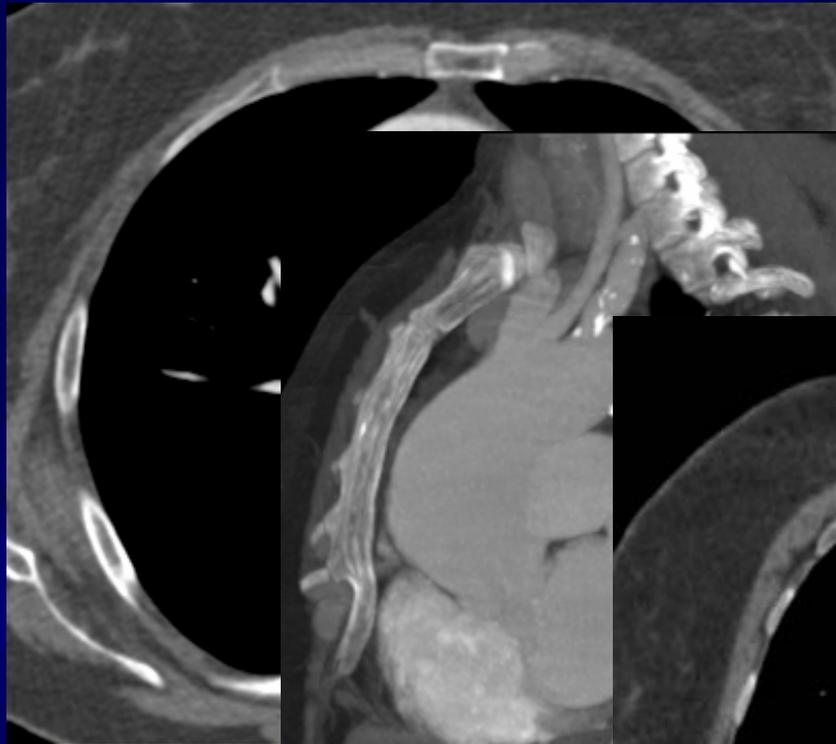
atelettasia

TC - i tessuti molli

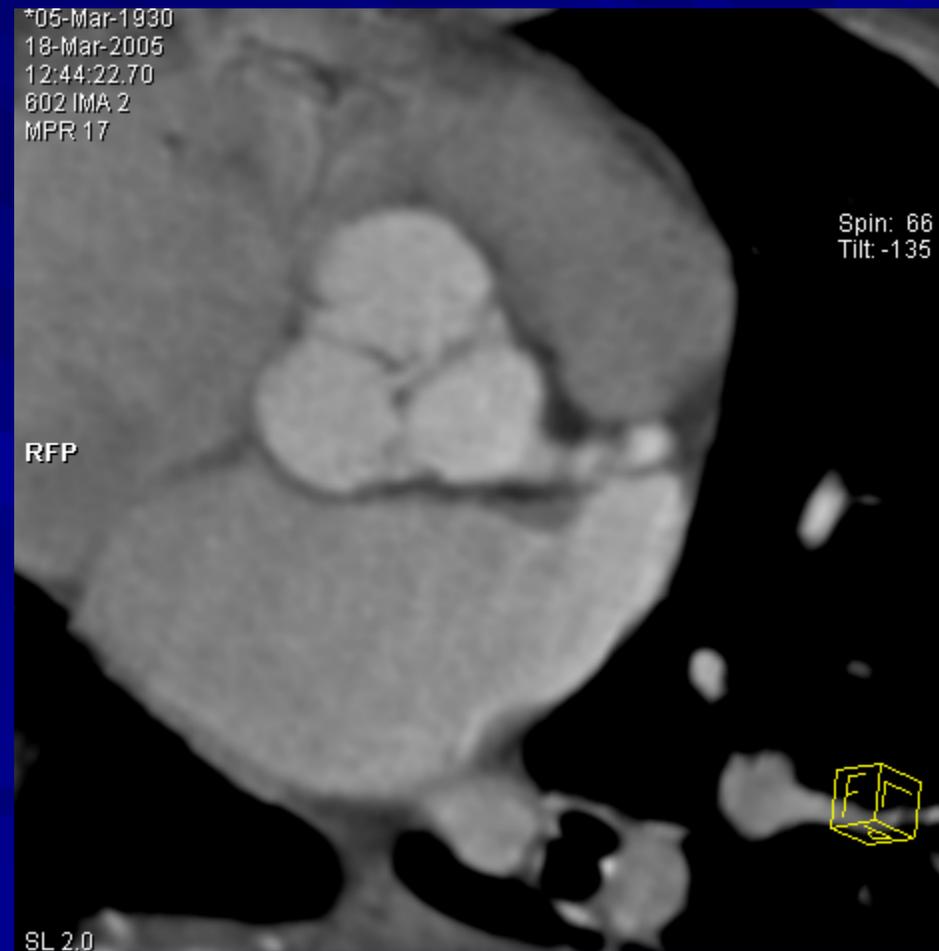
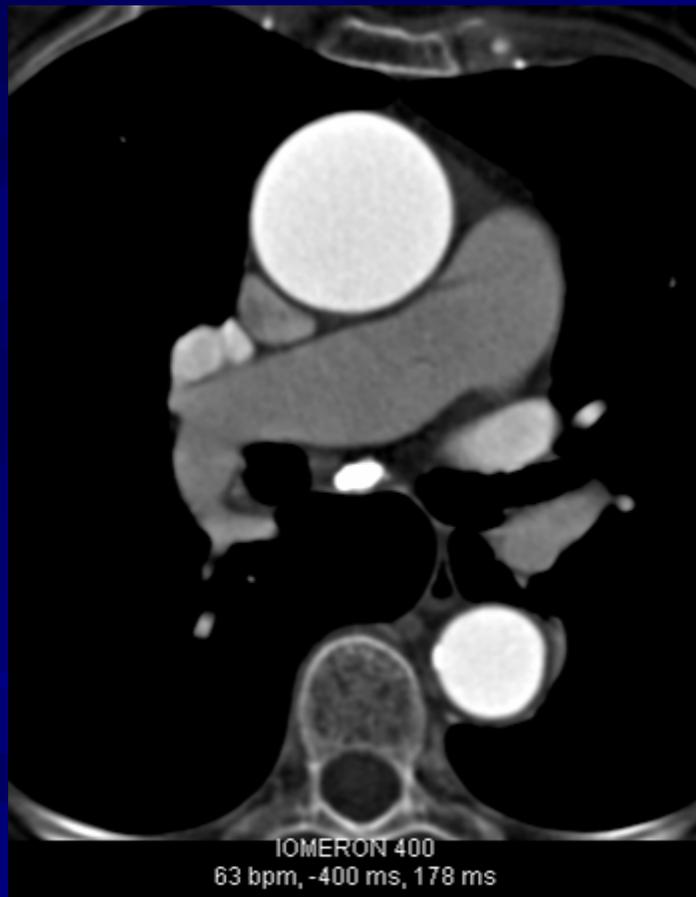


aorta





Aorta e valvola aortica

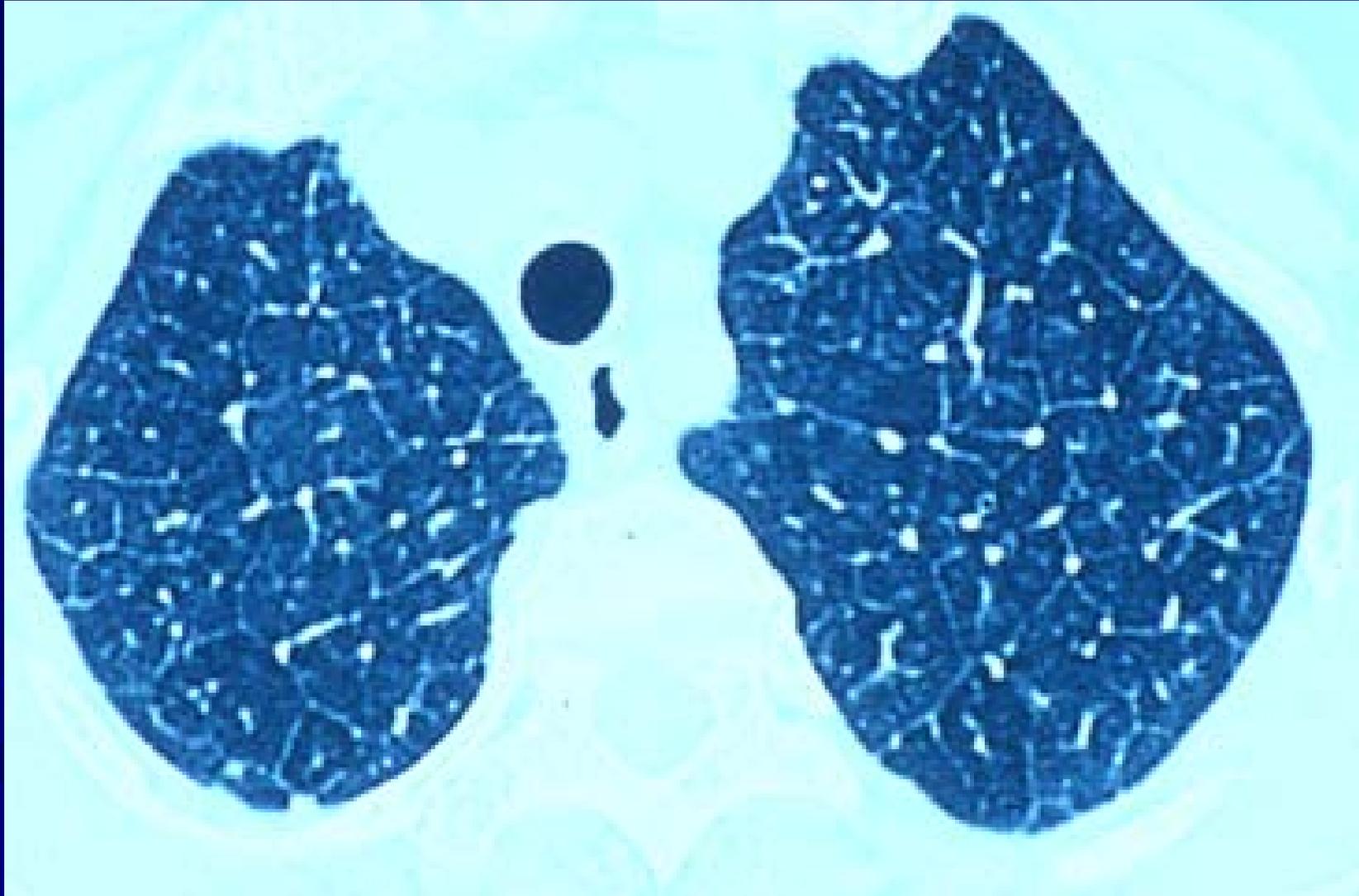


Mdc endovenoso radio-opaco

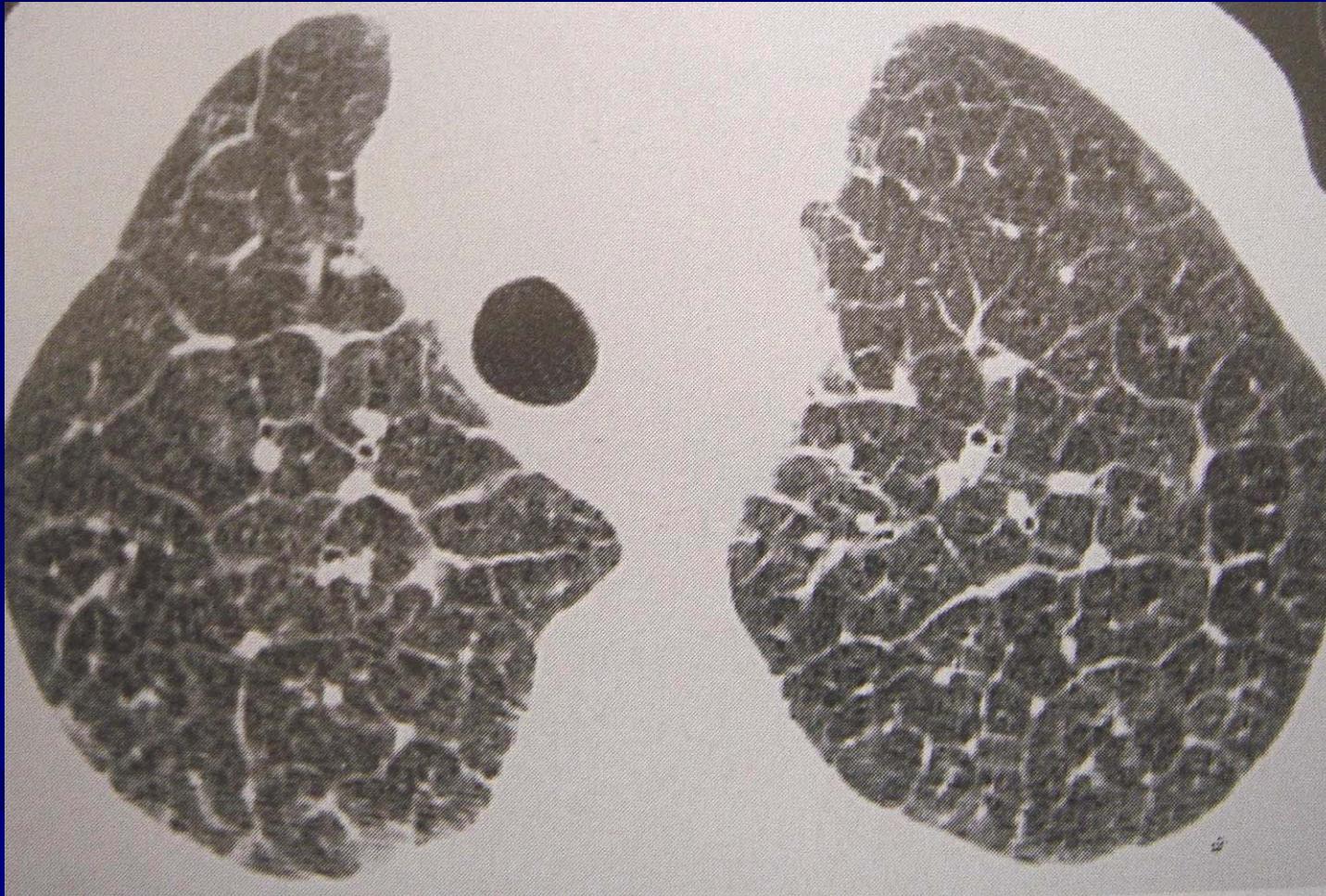
- Iodato, idrosolubile, eliminazione renale
- Visualizza meglio i vasi, differenzia diversi tessuti

- **Controindicazioni:** - insufficienza renale
 - allergie
 - gammapatia monoclonale

TCAR - il polmone

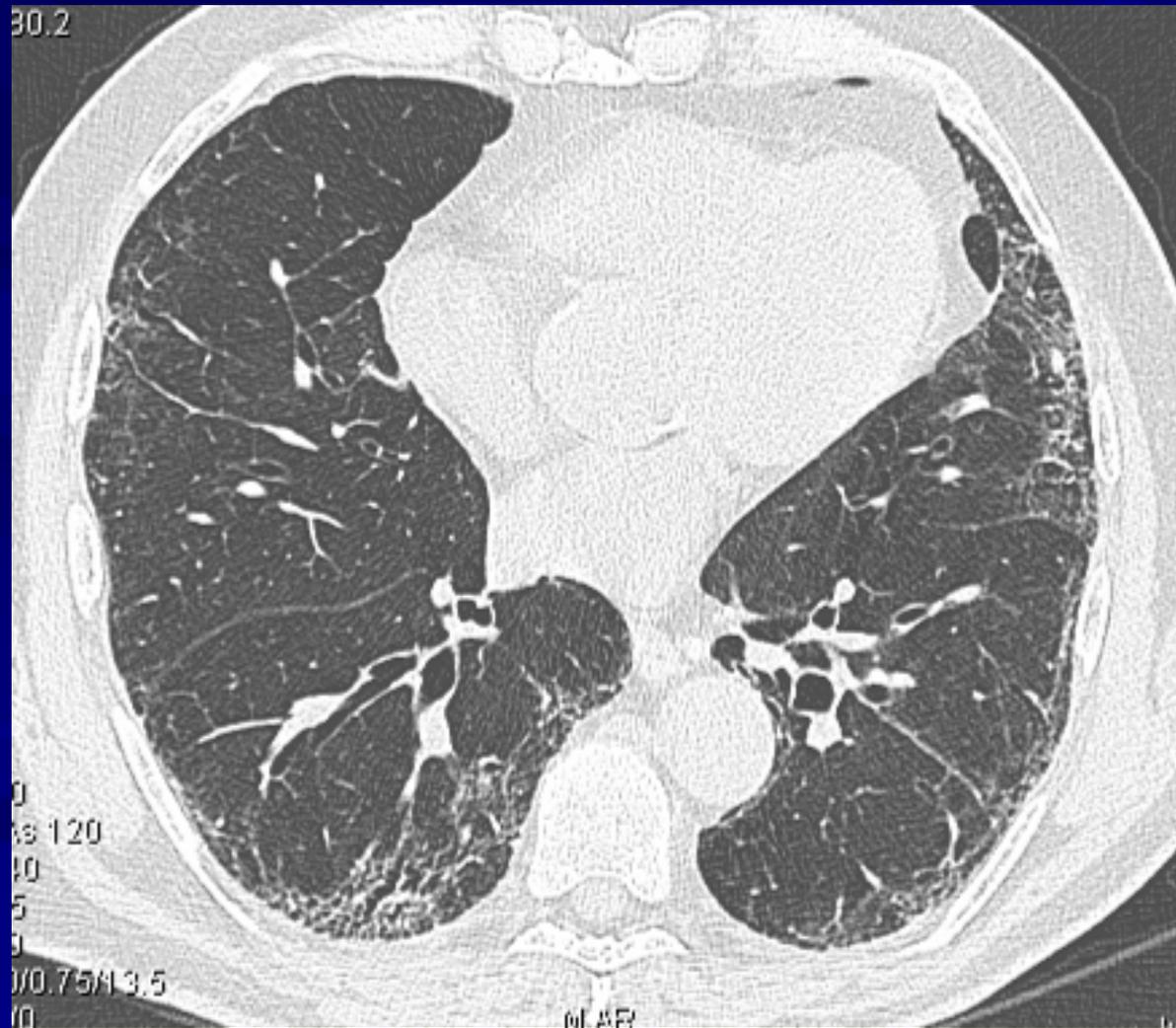


TCAR - il polmone



TC - il polmone

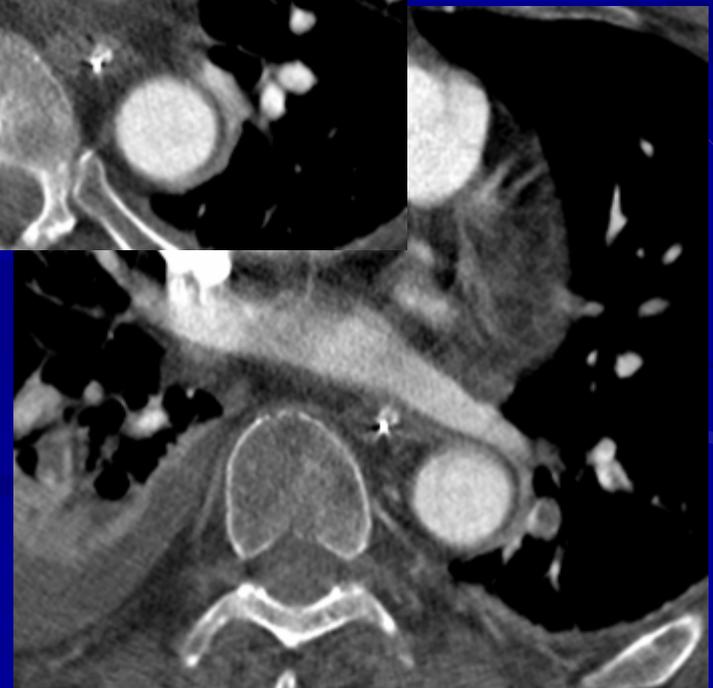




TC - i vasi

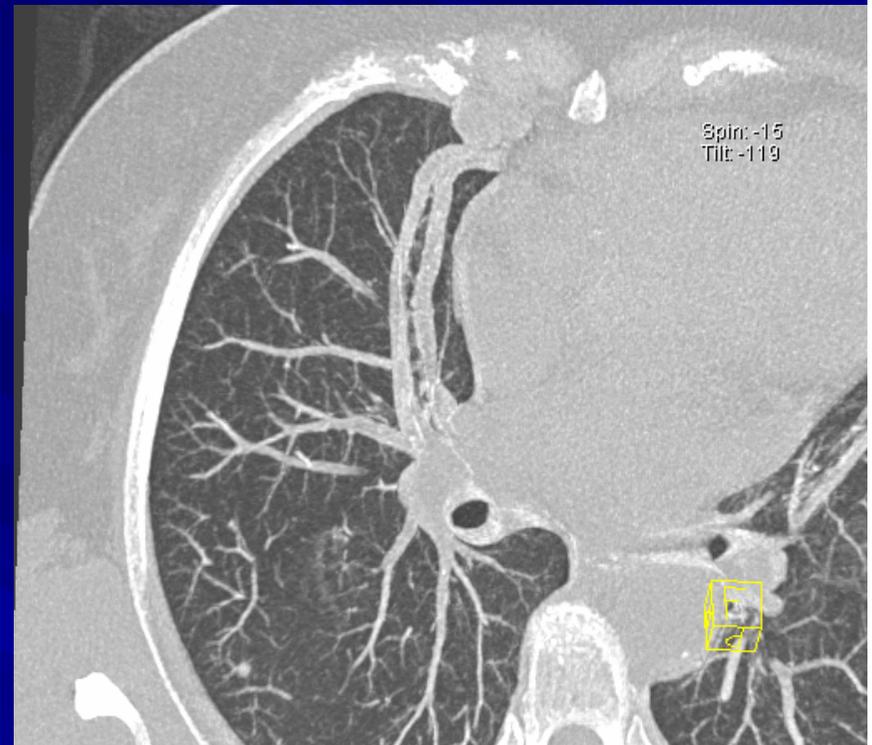
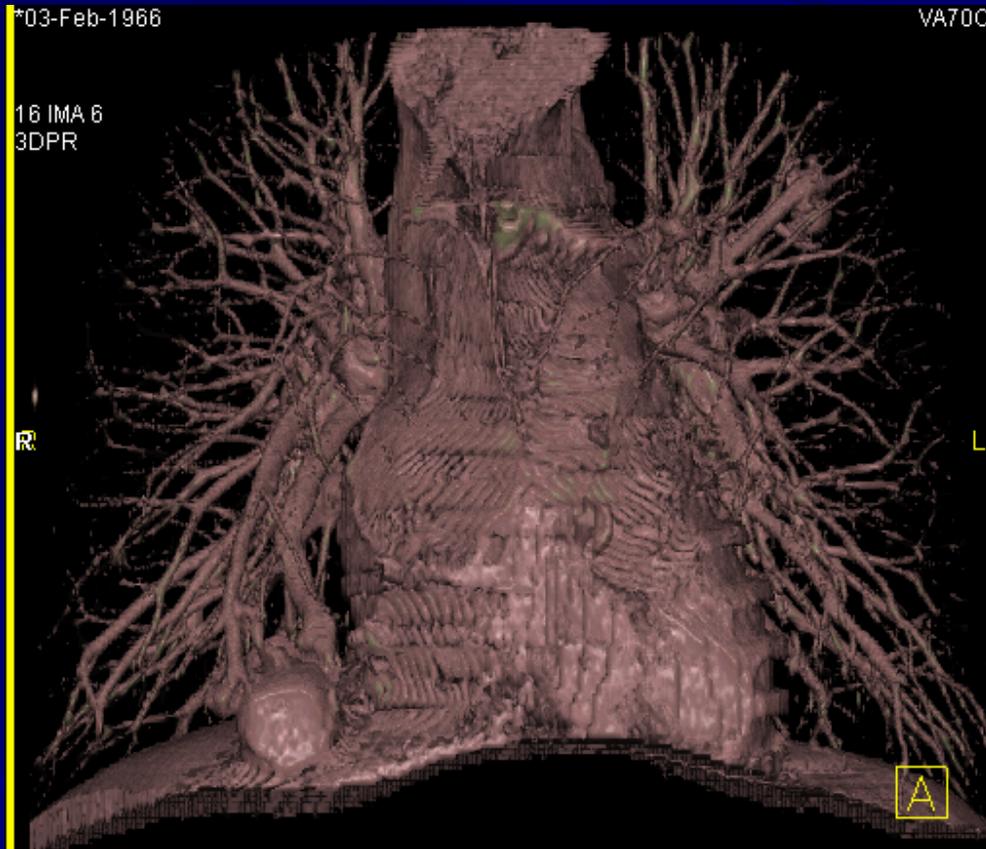


Le malattie delle arterie polmonari

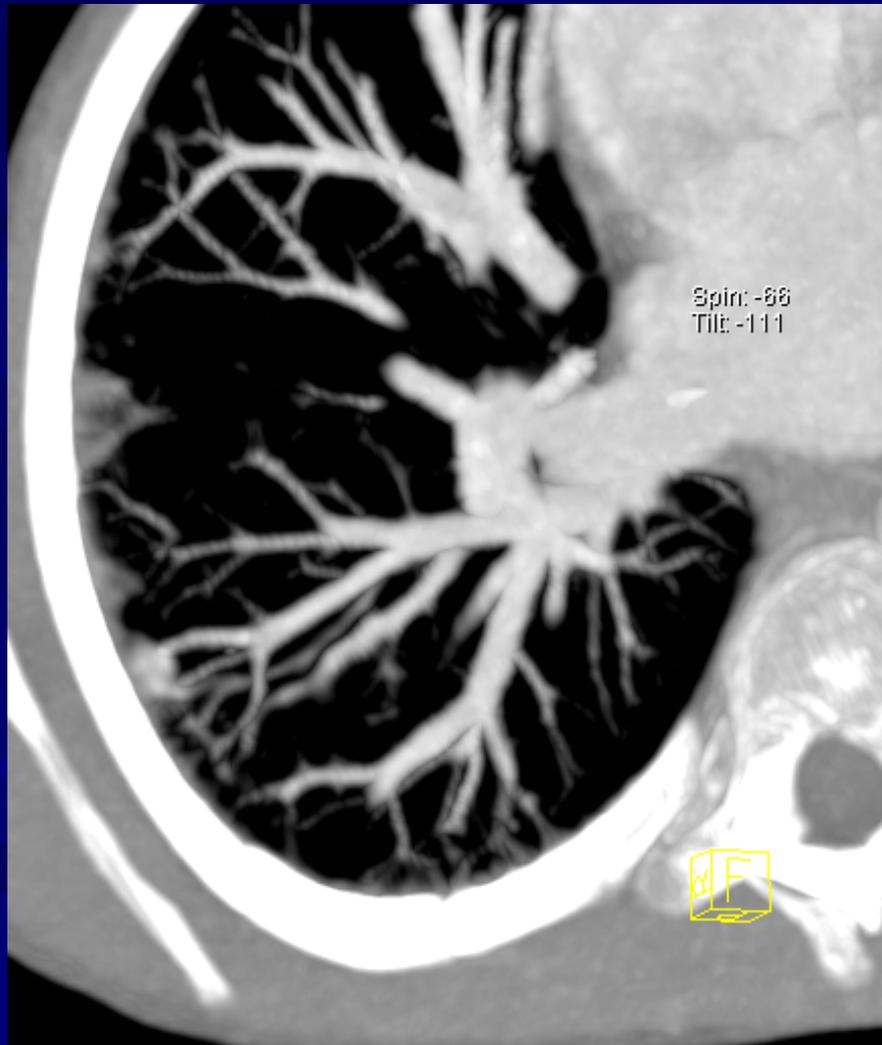


Embolia polmonare acuta

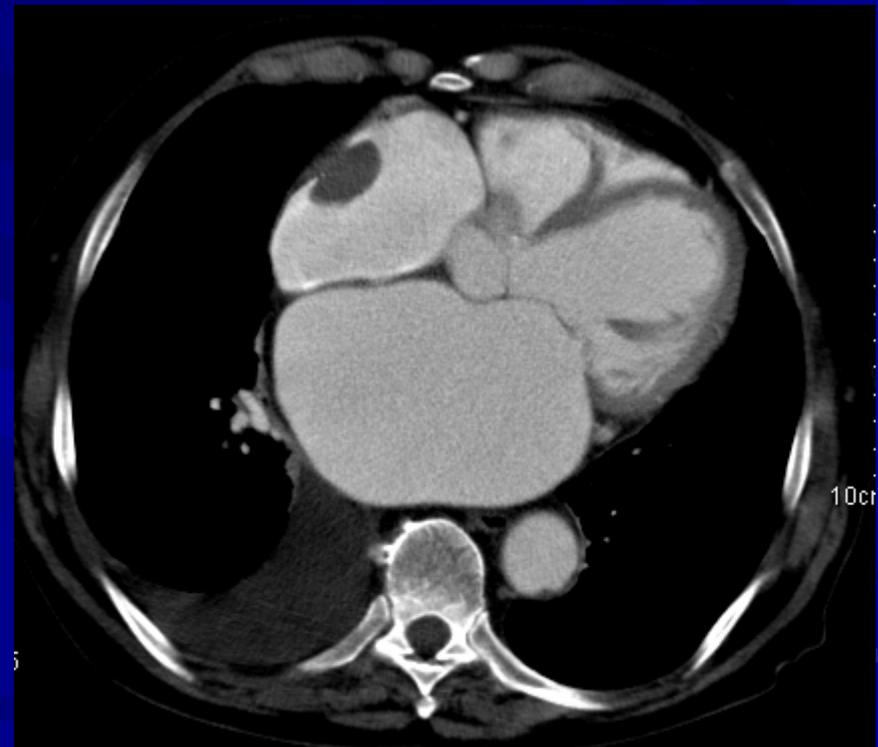
TC – fistole aterovenose



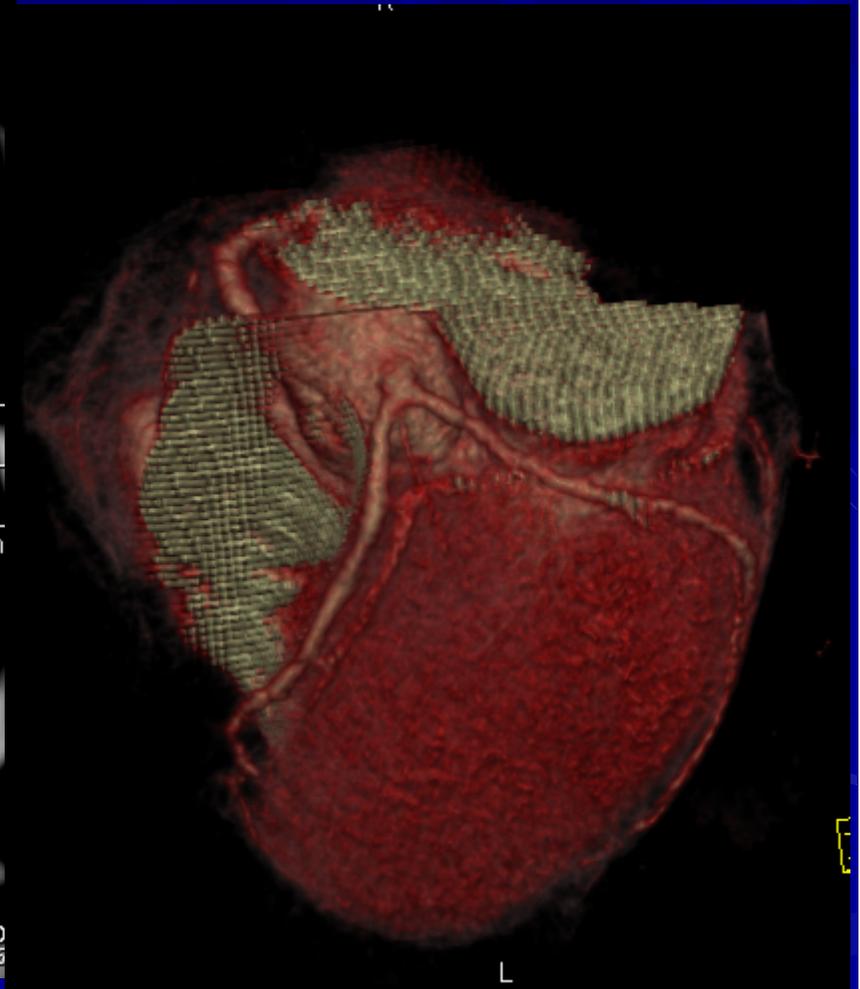
TC - i vasi



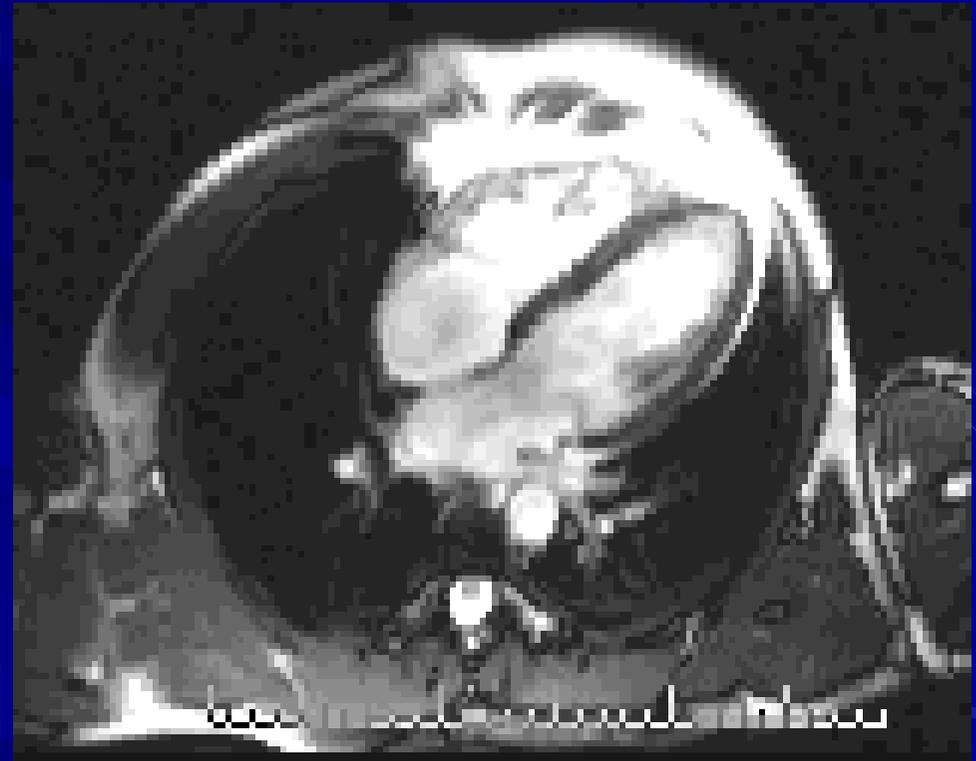
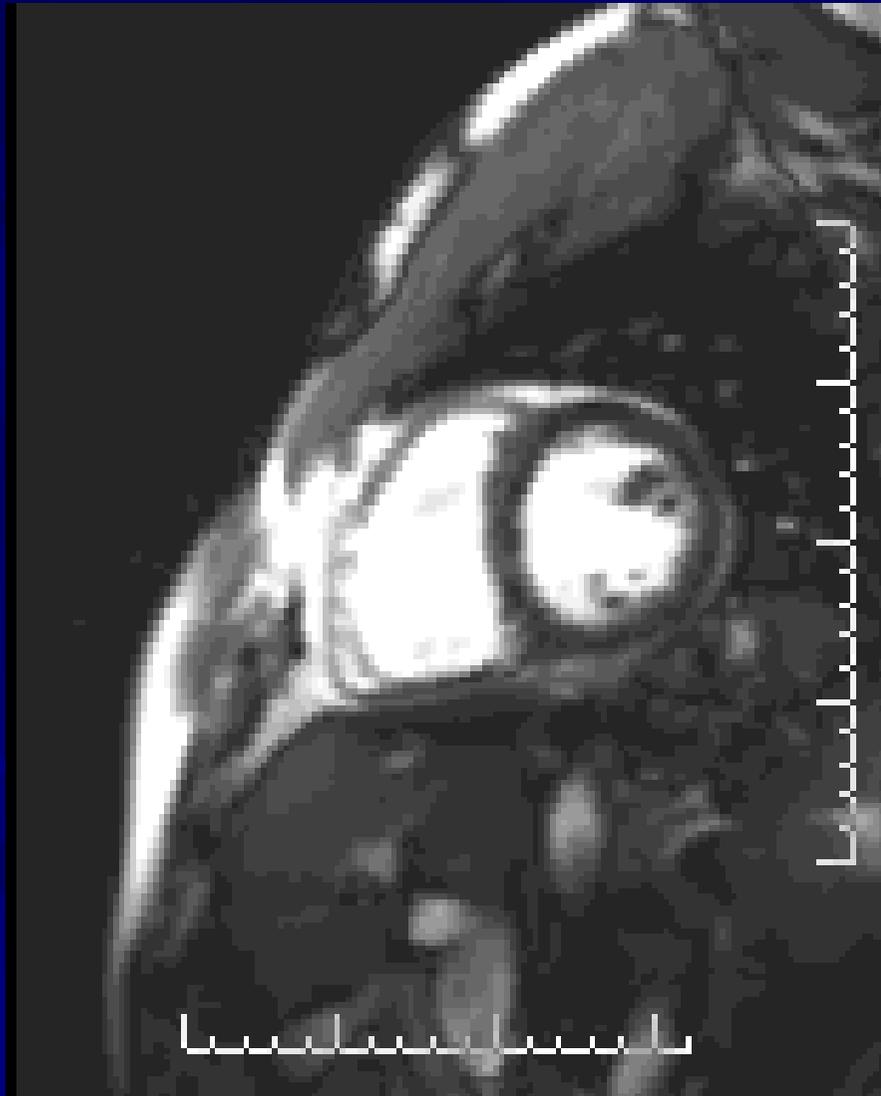
cuore



coronarie



RM - il cuore



US - il versamento pleurico



GLOSSARIO

- TAC – TC CT
- TC basale
- Angio TC Angio CT
- Fasi contrastografiche
- Densità
- Contrast enhancement
- Collimazione
- Immagini multiplanari (MPR) : coronali, sagittali, oblique, curve

INDICAZIONI

Sintomi polmonari o cardiovascolari

Follow up di malattie toraciche diagnosticate

Valutazione preoperatoria

Monitoraggio in pz con device toracici o che sono stati sottoposti a chirurgia cardiaca, toracica

**ELEMENTI DI DIAGNOSTICA PER IMMAGINI.
POLMONITE E TB**

Polmoniti acquisite in comunità - definizione

- **polmonite acquisita in comunità**
 - **soggetti altrimenti sani**
 - **soggetti non ricoverati affetti da malattie**
 - **soggetti in ambienti di cura o riposo**
- **modalità di infezione:**
 - **da persona a persona**
trasmissione aerea di virus
e batteri su goccioline di
vapore



PAC

Spettro di microorganismi Persone sane < 65 anni

- *Streptococcus pneumoniae*
- *Mycoplasma pn. (US, Europa)*
- *Chlamydia pn. (US, Europa)*
- *Haemophilus influenzae*
- **Virus**

PAC

*Stretto di microorganismi
Comorbidità e / o > 65 aa*

- *Streptococcus pneumoniae*
- **anaerobi orali**
- **batteri Gram-negativi**
- **Staphylococcus aureus**
- *Legionella*

POLMONITI NOSOCOMIALI

Definizione

- infezioni delle basse vie aeree non presenti ne in incubazione al ricovero
- polmonite da ventilazione assistita (VAP)
sono PN in pazienti ventilati meccanicamente , non presenti ne in sviluppo al momento della intubazione



DIAGNOSING PNEUMONIA

The bugs - Summary

Community-acquired pneumonia

- 90% of CAP caused by atypical & typical bacteria
- 10% by viruses and Tb
- NO FUNGI, NO PROTOZOA

Nosocomial pneumonia

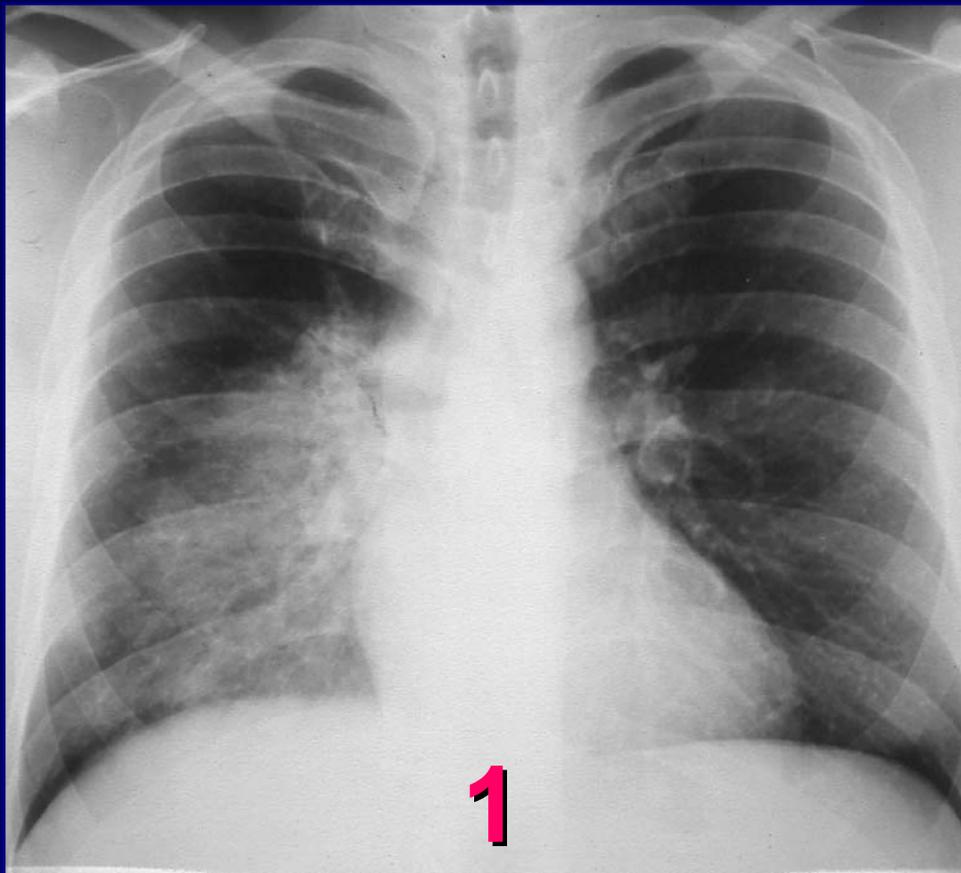
- 90% of NP caused by gram⁺ & gram⁻ bacteria
- 10% by viruses
- NO FUNGI, NO PROTOZOA

Pneumonia in the immuno-compromized host

- All sorts of bugs (depending on i.c. factor)

IMAGING NELLE PAC & PN

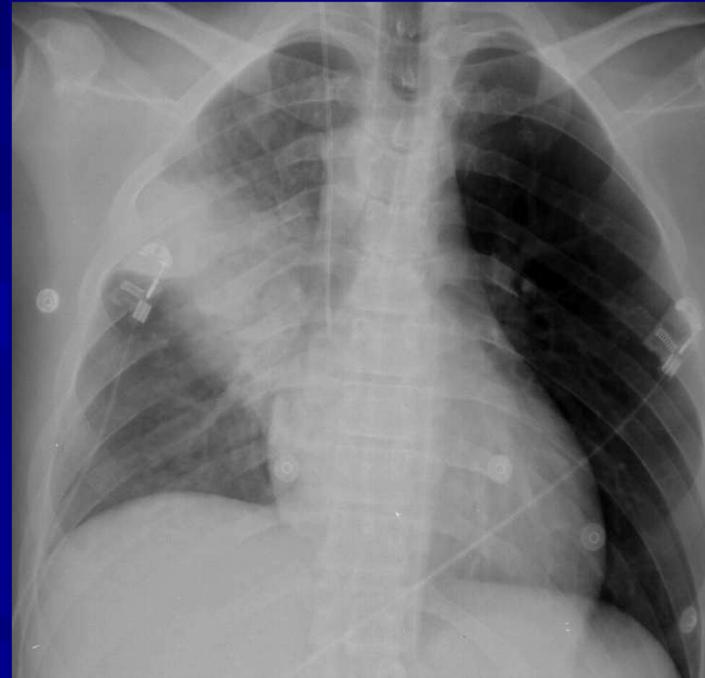
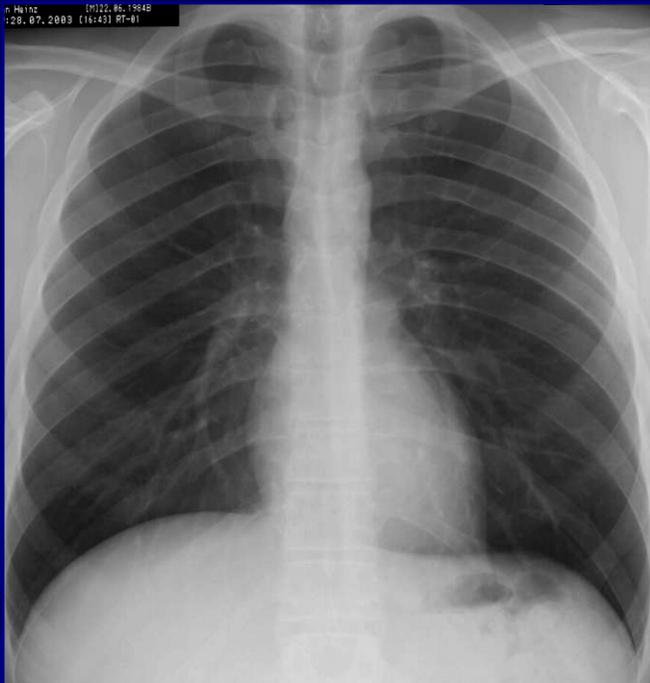
- **IDENTIFICAZIONE DELLA POLMONITE**
- **SEGNI RADIOLOGICI E CRITERI DI D.D.**
- **FOLLOW-UP**



Due paz. con febbre, leucocitosi e innalzamento degli indici di flogosi

Identificazione della polmonite

12 ore di intervallo tra la presentazione dei sintomi e la manifestazione dell'infiltrato



Spencer H, Pathology of the lung 1995

Potenziale ritardo nella manifestazione della polmonite nei soggetti anziani, in quelli con neutrofili poco funzionanti (diabete, alcolismo), o con **neutropenia**

Paz diabetico,
febbre,
leucocitosi,
CPR elevati

Sviluppo incompleto di
polmonite da *E. coli*



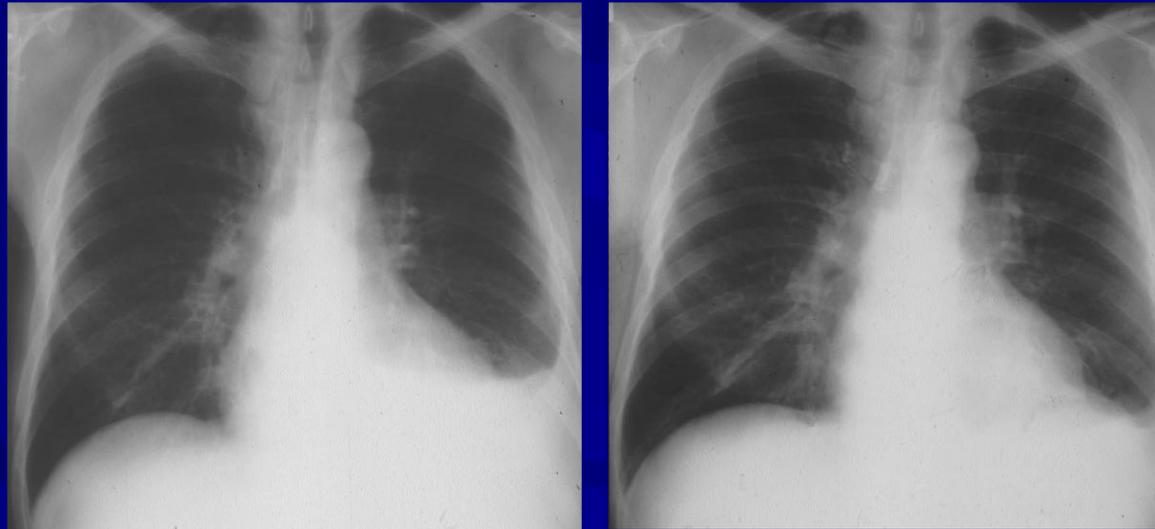
Zornoza J et al, ARJ 1976

Hall FM, Simon M, AJR 1987

Identificazione della polmonite

Problemi

- **Incompleto sviluppo dell'infiltrato**
- **Versamento pleurico**
- **Malattie polmonari pre-coesistenti (PN)**



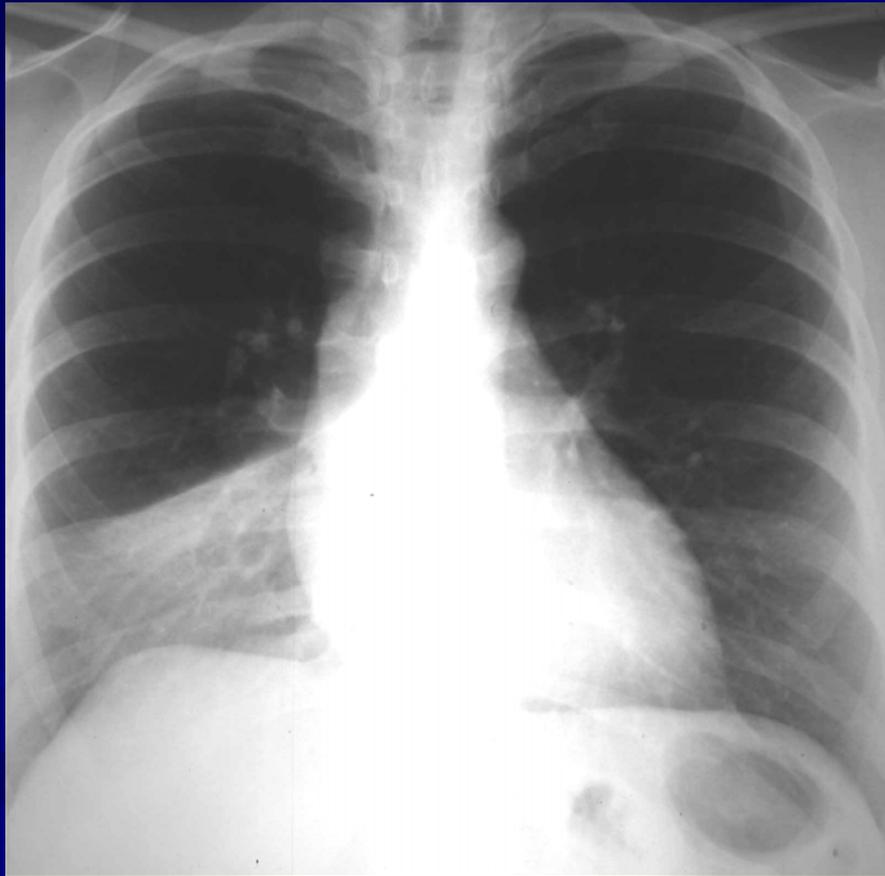
Versamento pleurico maschera polmonite da *Staph.aureus*

IMAGING NELLE PAC & PN

- IDENTIFICAZIONE DELLA POLMONITE
- PATTERNS E CRITERI DI D.D.
- FOLLOW-UP

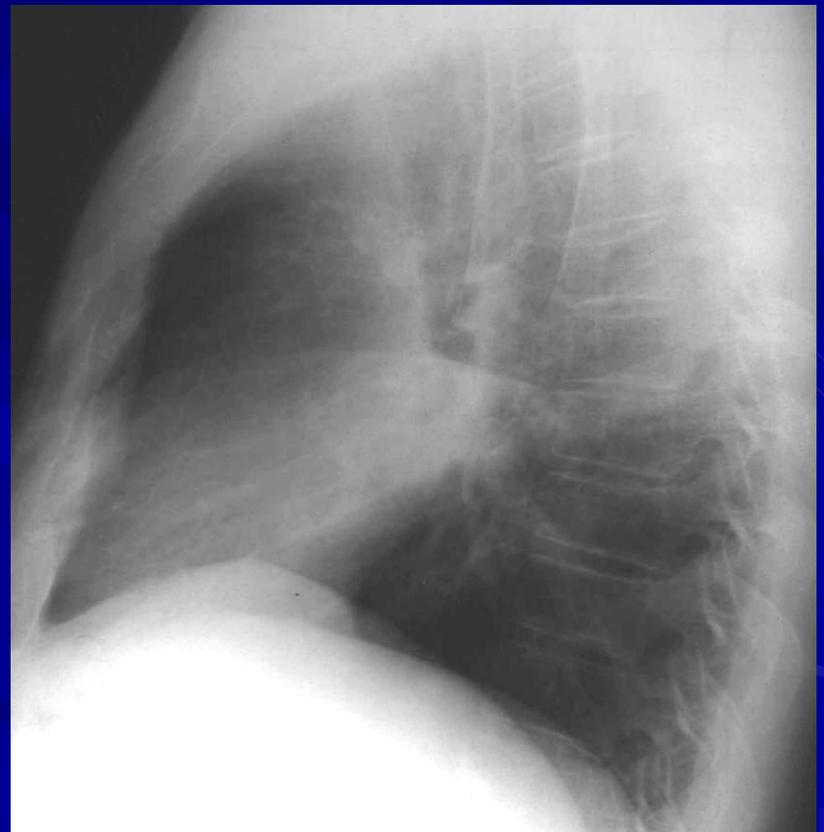
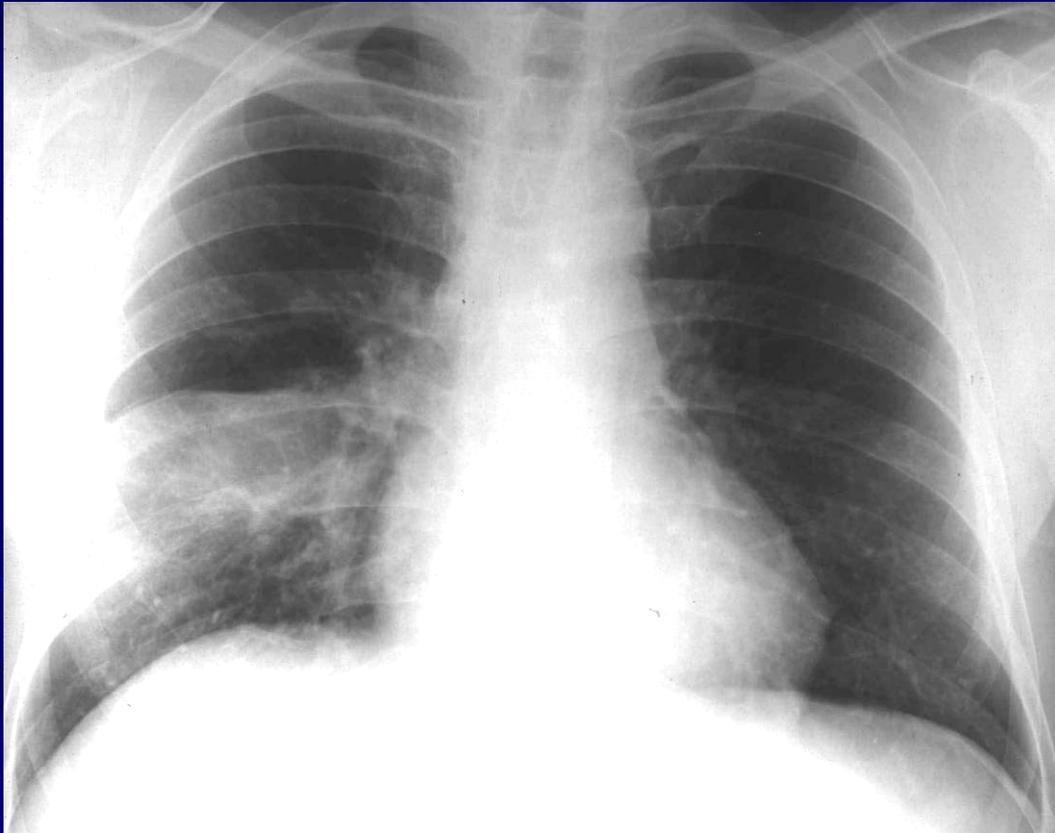
Paziente febbrile

■ Polmonite del LID

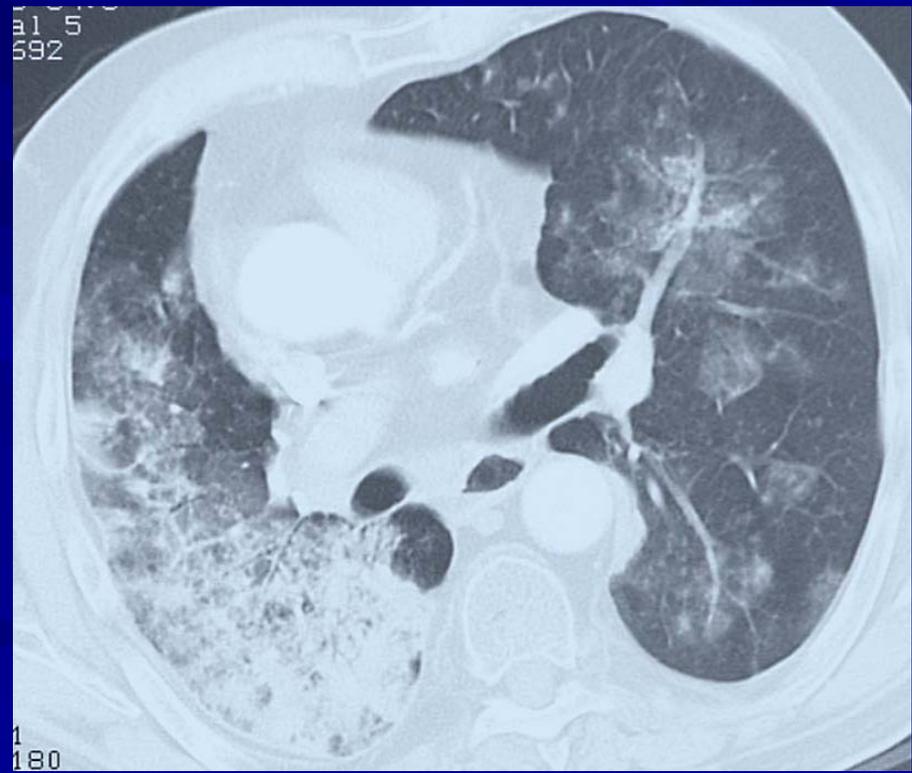
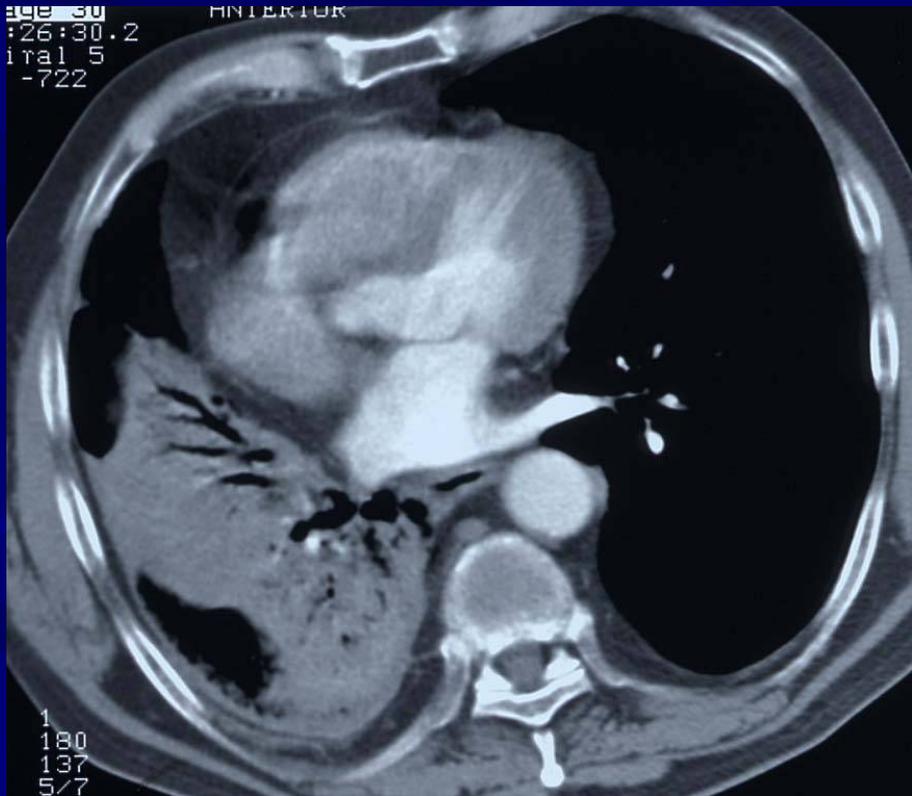


Paziente febbrile

■ Polmonite del LM



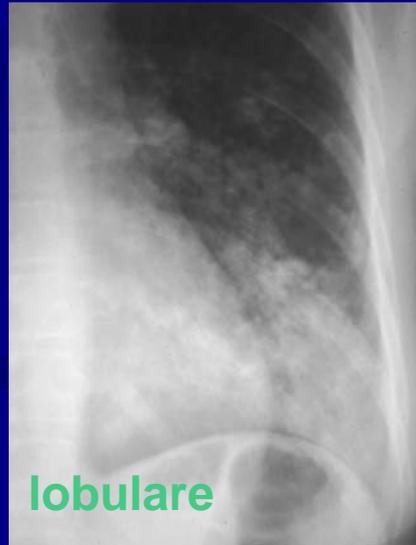
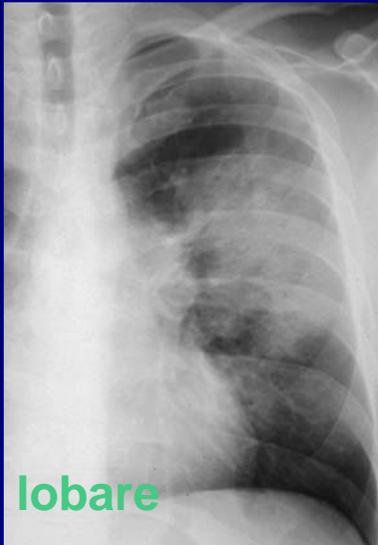
■ Se il paz è asintomatico: d.d, con neoplasie (TC)



PAC & PN

Patterns radiologici ed imaging

- malattia acuta degli spazi aerei
 - Polmonite **lobare**: infiltrato segmentale / lobare
 - Polmonite **lobulare** : opacità alveolari e a chiazze
- malattia diffusa bilaterale interstiziale / m.miste



PAC:

Importanza della valutazione batteriologica e radiologica iniziale noninvasiva

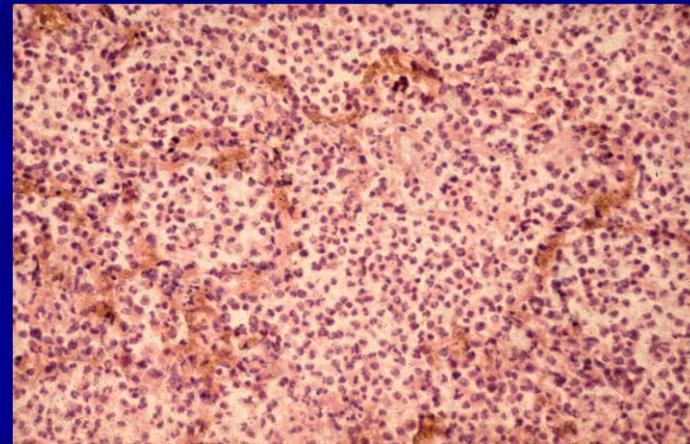
Levy M et al, Chest 1987

- **Opacità alveolari associate a P. batteriche in 90 %**
- **Opacità non alveolari associate a batteri atipici e virus**
- **Pattern radiografici superiori a test non-invasive nella identificazione di gruppi di microorganismi**

LOBAR PNEUMONIA

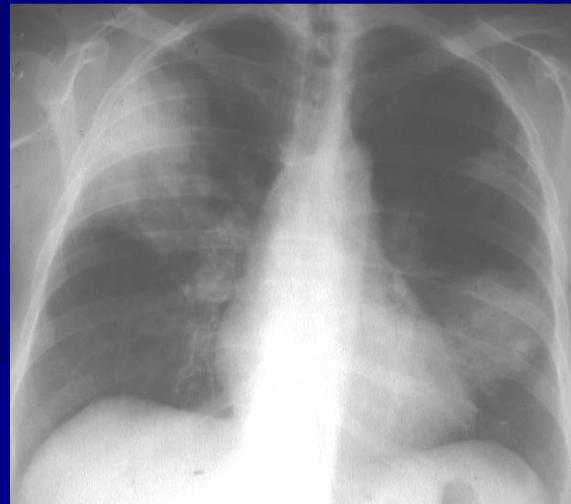
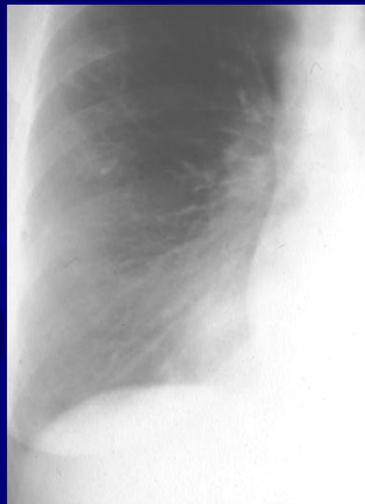
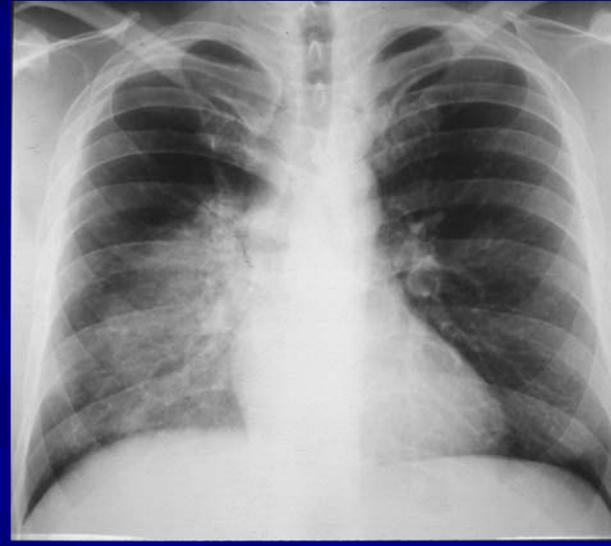
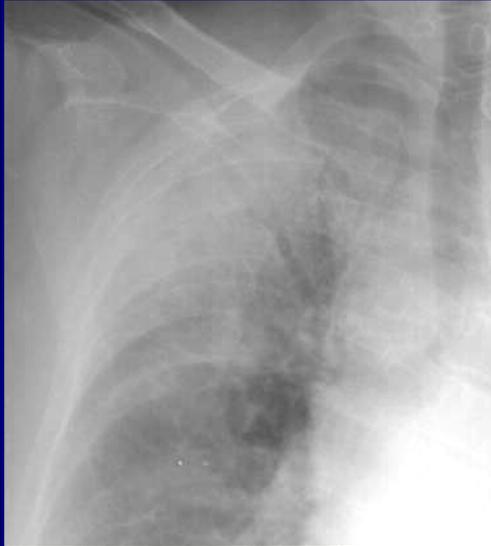
Pathogenesis, Histopathology and Microbiology

- **Damage to the terminal airspace (alveoli)**
- **Outpouring of edema into alveoli**
- **Rapid spread of fluid through terminal airways and pores of Kohn**
- **Invasion of macrophages, erythro/leukocytes**
- **Fibrin accumulation**
- **Caused by gram+, gram-, and atypical bacteria**



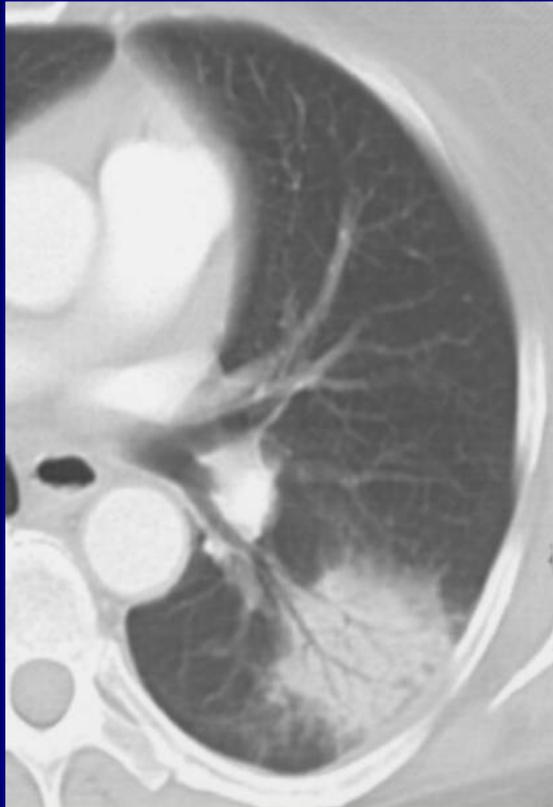
Polmoniti acute degli spazi aerei

Patterns radiografici

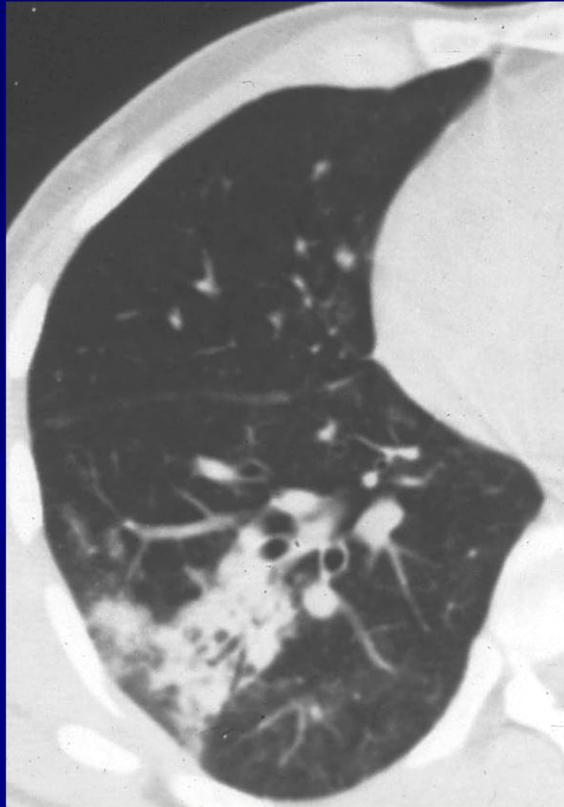


Polmoniti acute degli spazi aerei

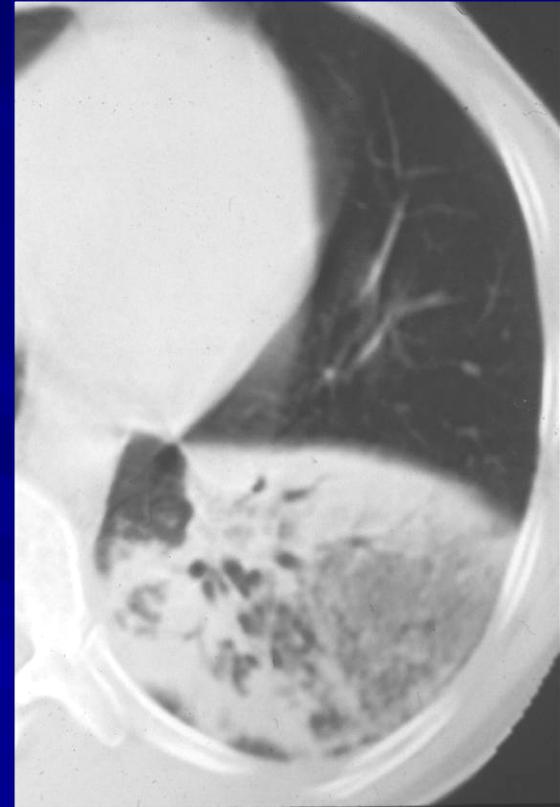
Patterns TC



*rotonda, non-segm.
alone*



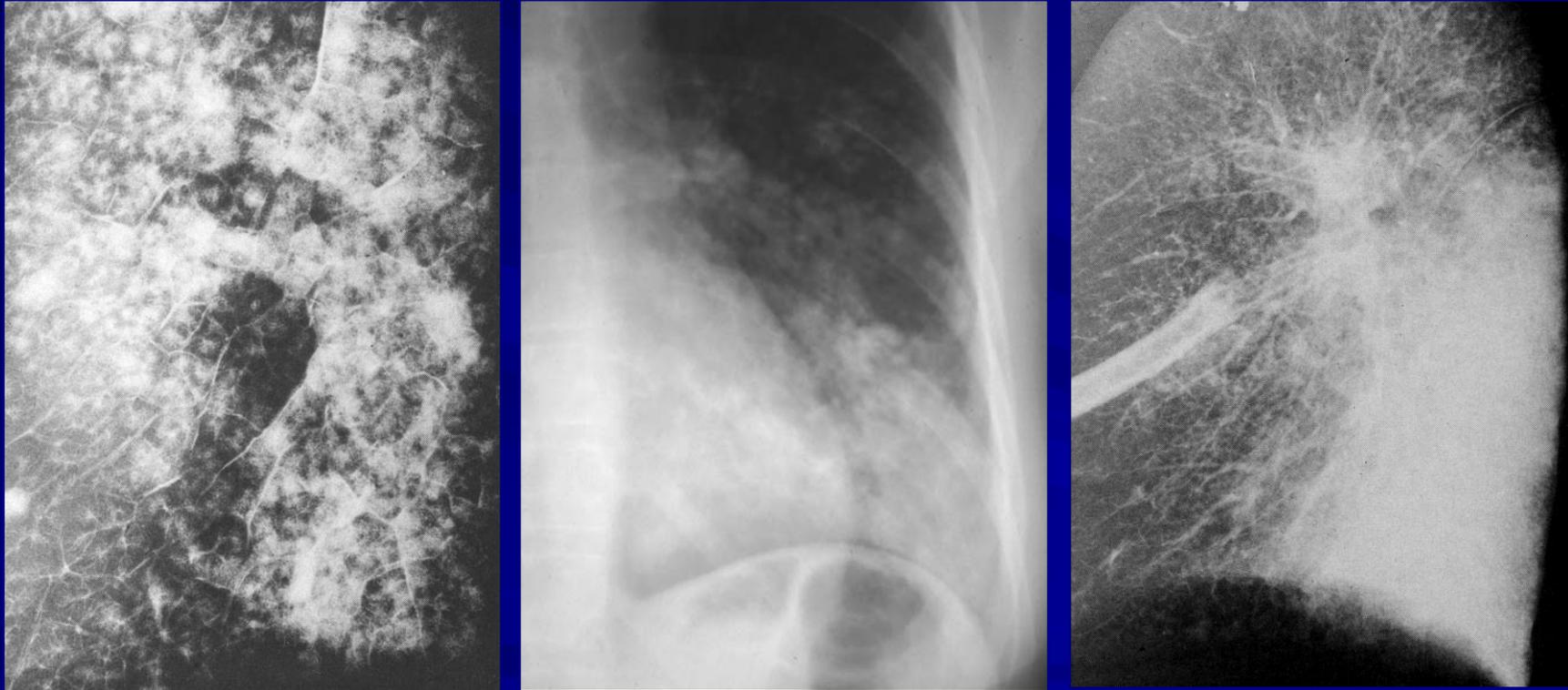
Segmentale



Lobare

Polmonite lobulare

- Danno a bronchioli respiratori e terminali evolventi in bronchite e bronchiolite necrotizzante
- Aggregati infiammatori nel parenchima adiacente



Polmonite lobulare da *Staphylococcus aureus*

Polmonite lobulare

Microbiologia

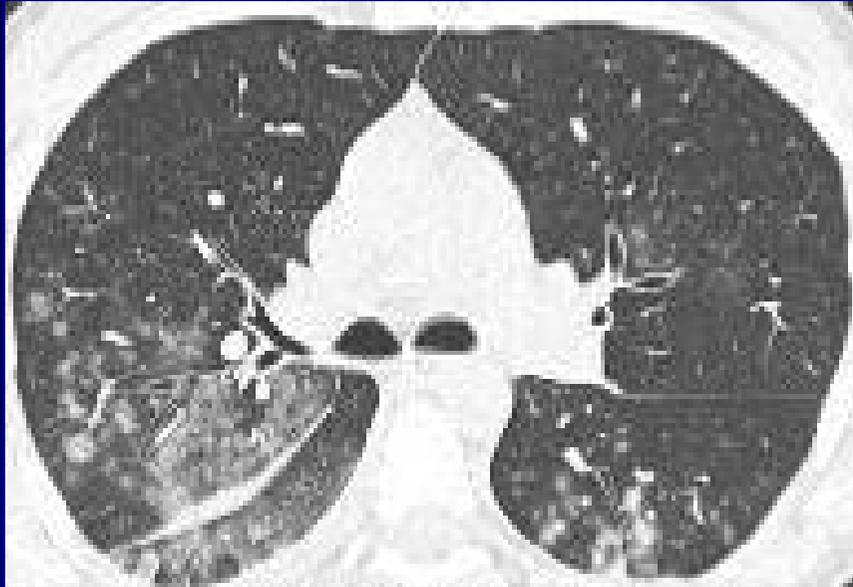
- Batteri: *Staphylococcus aureus*
Mycoplasma p., *Pseudomonas ae.*
Mycobact. tuberculosis
- Virus: *Influenza virus*, *Varicella zoster-virus*
- Protozoi: *Pneumocystis c.* (immunodepressi.)

„Pensare alle polmoniti lobulari come ad infezioni delle vie aeree che si sviluppano poi in polmoniti

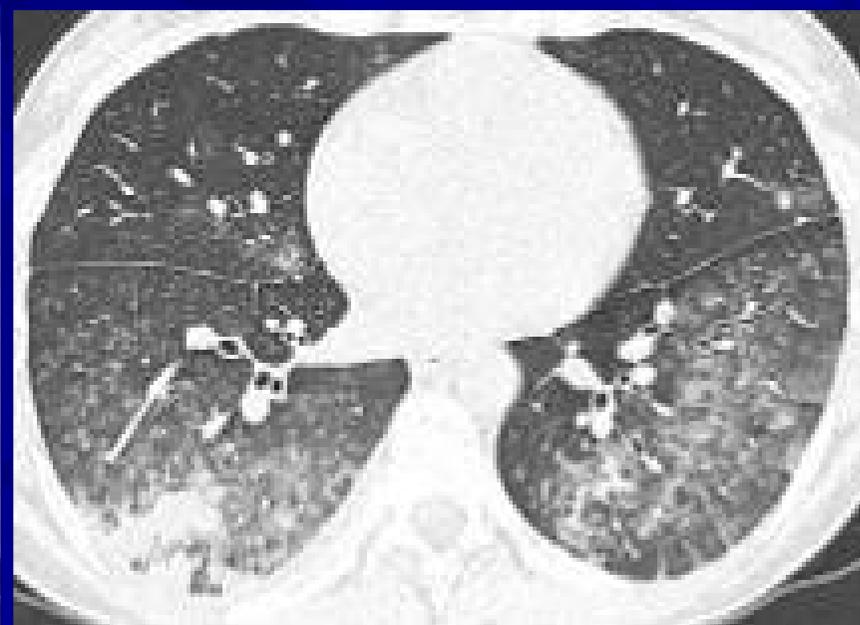
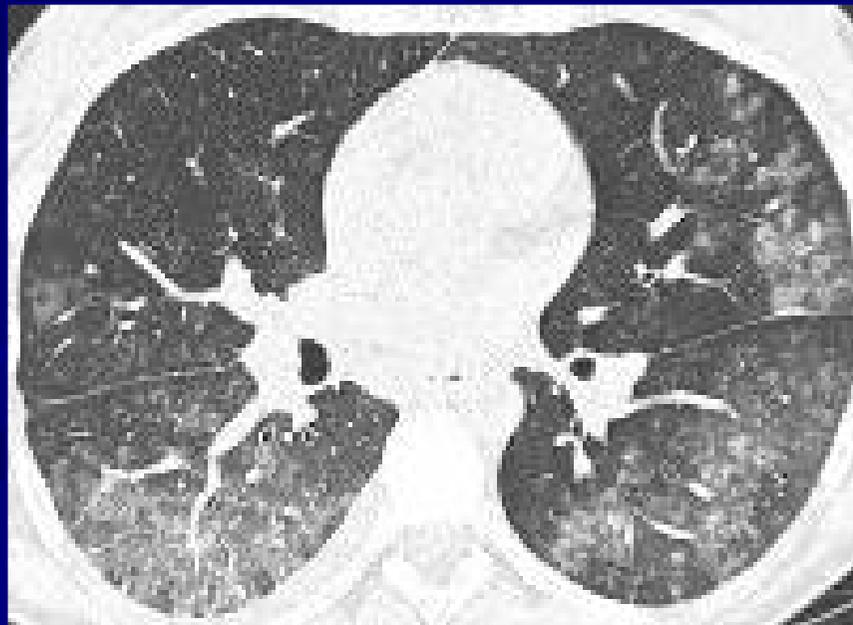
LOBULAR PNEUMONIA

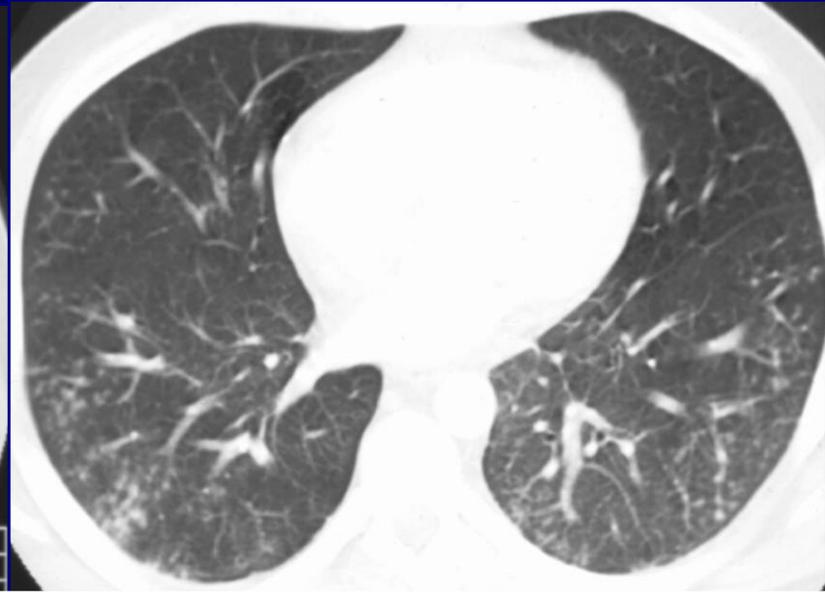
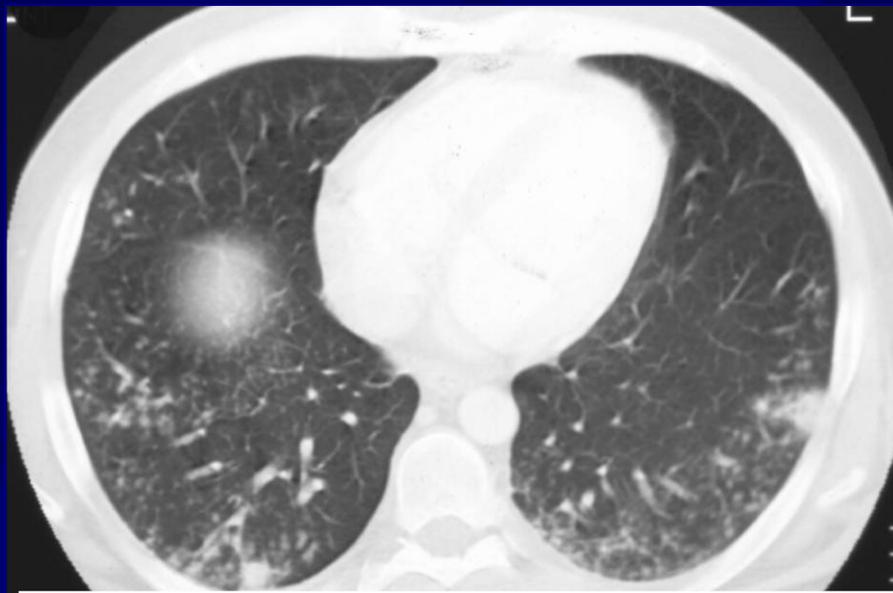
Imaging Findings

- **Patchy densities, air-space nodules**
- **Centrilobular, lobular consolidation (CT)**
- **Areas of groundglass attenuation in lobular distribution**
(*CT, typical in Mycoplasma pn.*)
- **Segmental infiltrates**
- **Cavitation common in later phase consolidation**
- **More than 50% of *Staph.aureus* pneumonias bilateral**
- **All of above may coexist in complex pattern**

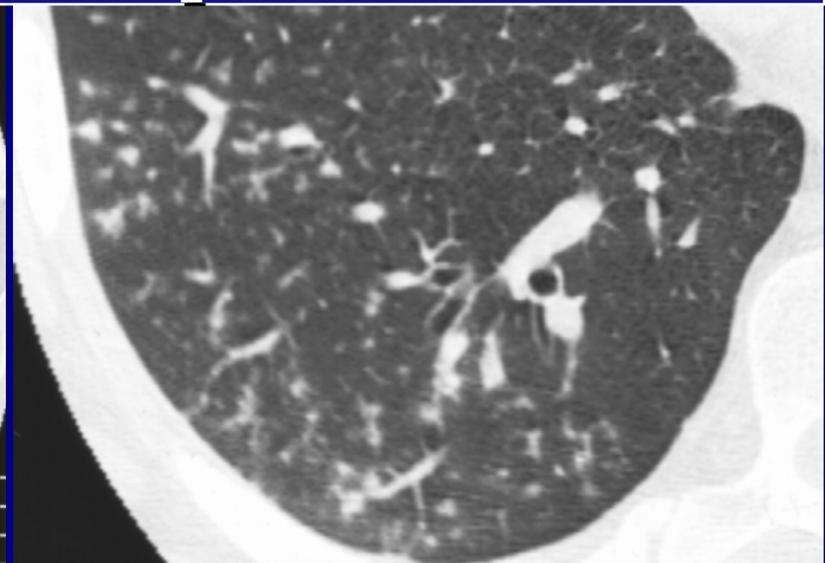


*Mycoplasma
pneumonia
(broncopulmonite)*





Bronchiolite da Mycoplasma pn. – Tree in bud

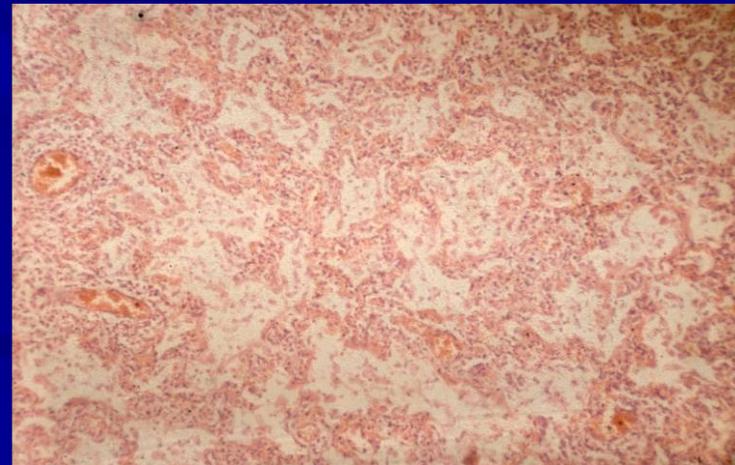


POLMONITE INTERSTIZIALE

Patogenesis, istopathologia and Microbiologia

- danno primario dell'interstizio
- agenti microbici (soprattutto virus) portano ad allargamento dei setti alveolari , lesioni capillari ed edema interstiziale

- Bacteri: *Mycoplasma pn.*,
Mycobacterium tb.
- Virus: *Influenza virus*,
VZV, CMV
- Protozoi: *Pneumocystis c.*

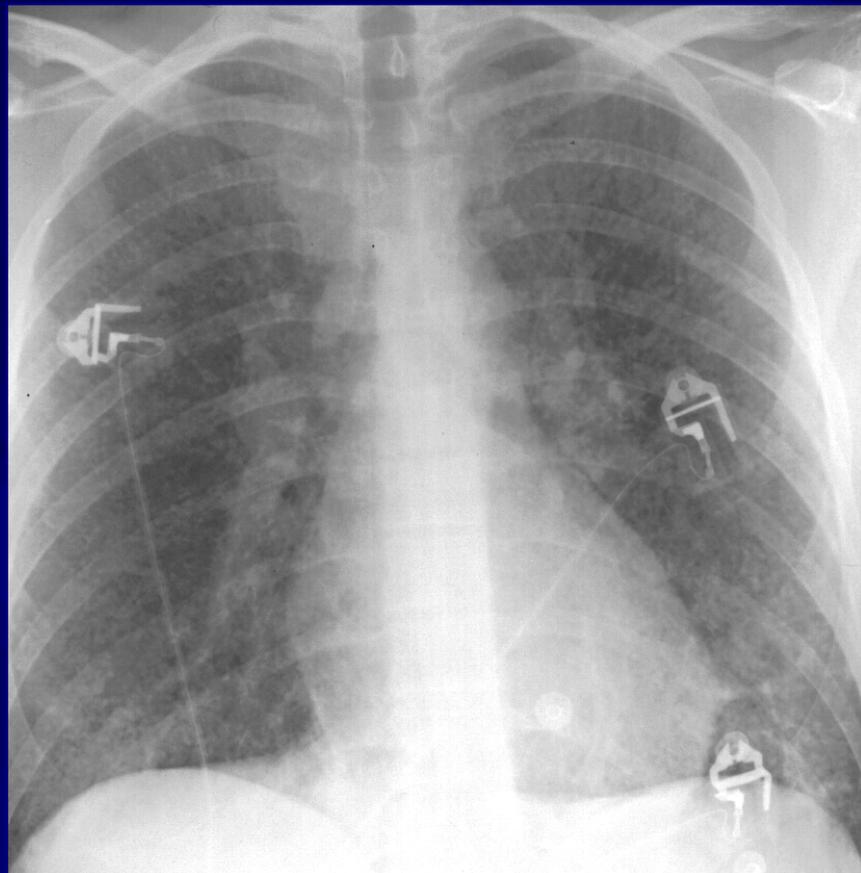


POLMONITE INTERSTIZIALE DIFFUSA

Patterns radiografici

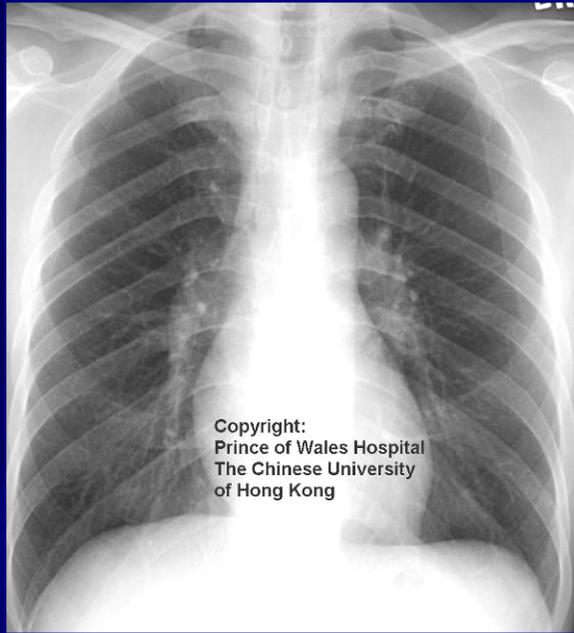
- **diffusa e bilaterale**
- **micronoduli ed ispessimenti settali (CT)**
- **opacità centrolobulari e lobulari (CT)**
- **vetro smerigliato (CT)**
- **Consolidazioni**
- **tutti i segni possono coesistere in pattern complesso**



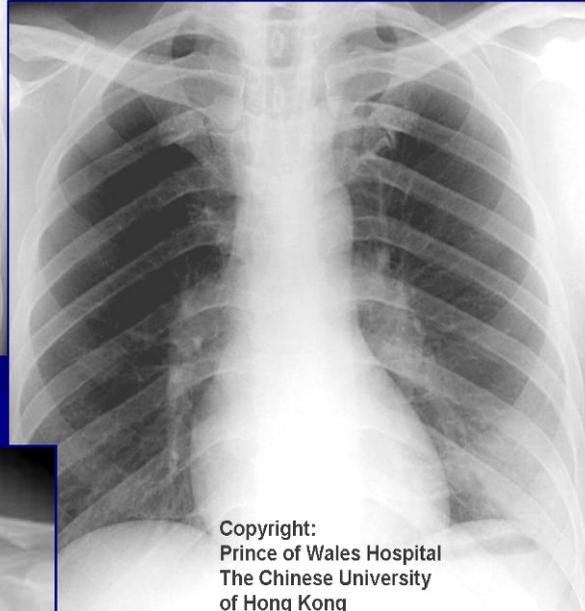


**Danno polmonare bilaterale
da bronchiolite
acuta virale**

SARS



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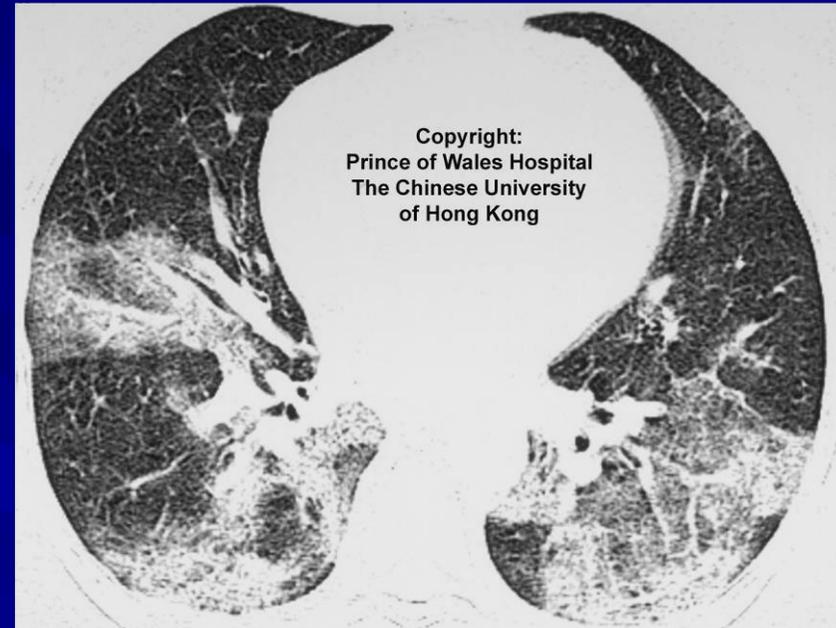
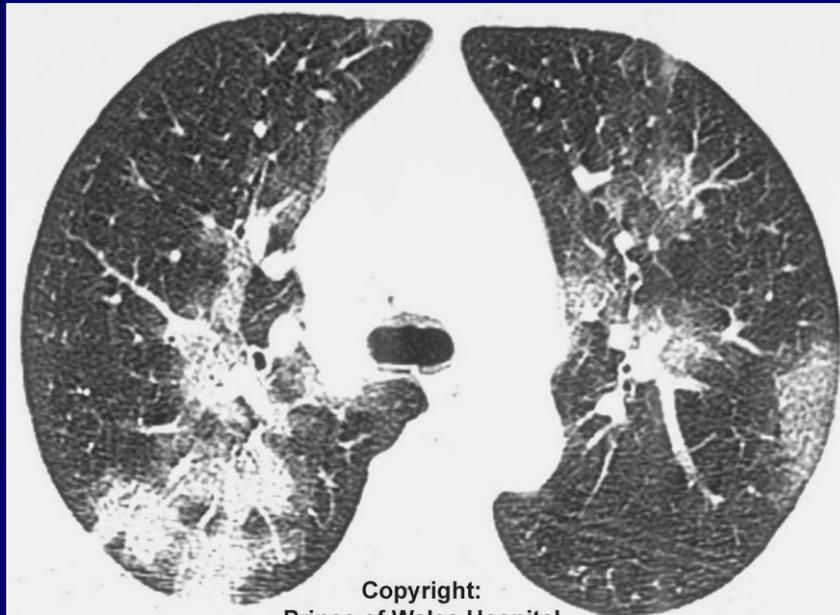


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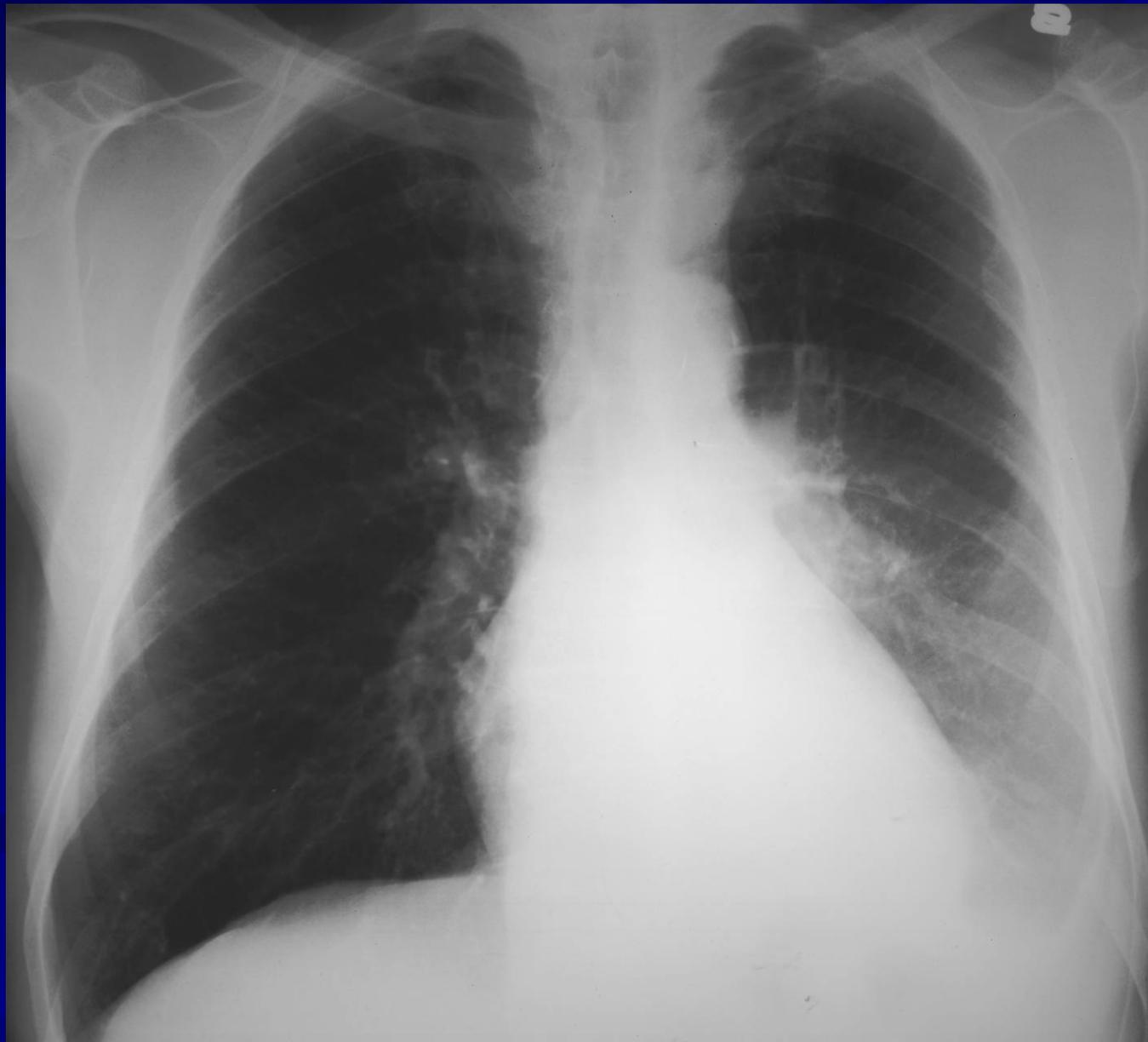
SARS



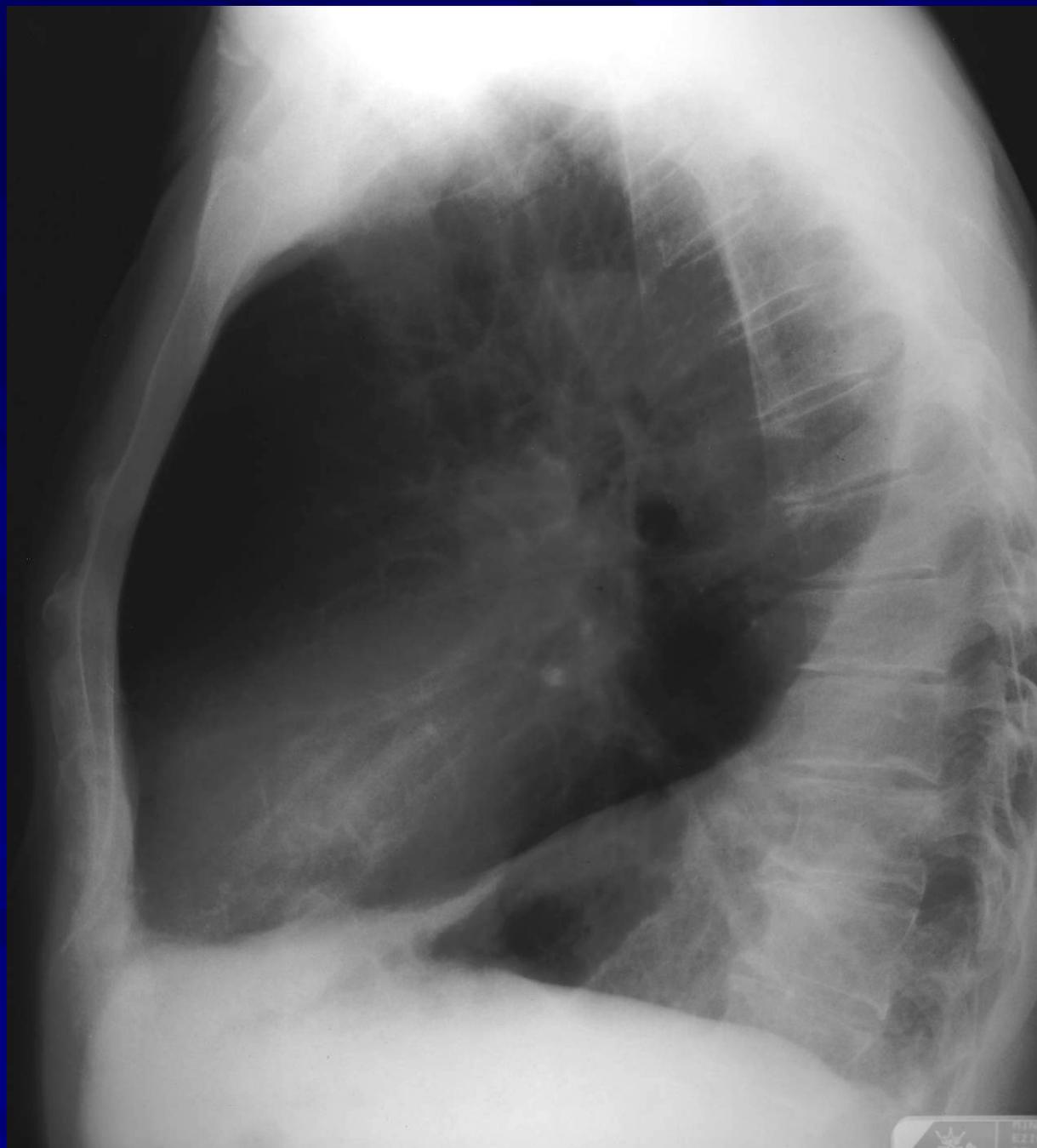
„Hongkong will take your breath away...“

The Hong Kong Tourism Board 2002

Maschio, anni 65, fumatore, tosse da più mesi. Recente espettorato ematico



Maschio, anni 65, fumatore, tosse da più mesi. Recente espettorato ematico



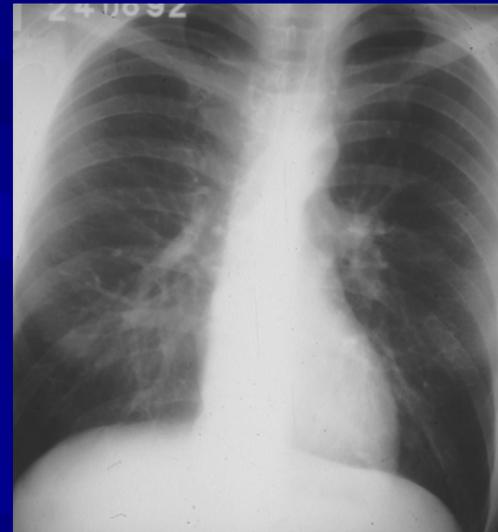
IMAGING NELLE PAC & PN

- IDENTIFICAZIONE DELLA POLMONITE
- PATTERNS E CRITERI DI D.D.
- FOLLOW-UP

PAC

Risoluzione degli infiltrati polmonari

- Polmoniti batteriche si risolvono in 10 - 14 gg, comunque la completa scomparsa può richiedere 4-6 mesi
- Polmoniti virali si risolvono da una settimana a vari mesi



Risoluzione degli infiltrati **entro tre settimane**

DIAGNOSTICA DELLE POLMONITI

Quando usare la TC

in pazienti con

- patterns morfologici sospetti**
- discordanza tra RX e segni clinico-laboratoristici**
- unusuale combinazione tra segni rx e clinici**
- infiltrati persistenti**
- inusuali recidive**

DIAGNOSTICA DELLE POLMONITI

I sei comandamenti

- Familiarizzarsi con gli aspetti e la storia clinica
- Considerare gli aspetti radiologici
- Integrare i dati clinici con gli aspetti radiologici
- Pensare alla d.d. di condizioni non infettive
- Attenzione al follow-up
- Nei dubbi **TC**

CONCLUSION

- **The radiologist plays an important role in the identification, classification and follow-up of pts with pneumonia**
- **The radiologist may serve as an interdisciplinary guide to ensure a high-quality patient management**
- **A solid knowledge of the radiographic features of pneumonia and a fundamental understanding of the epidemiologic, histopathologic, pathophysiologic and clinical features of pulm. infections are necessary**