



KEMENTERIAN PENDIDIKAN, KEBUDAYAAN RISET DAN TEKNOLOGI
UNIVERSITAS MULAWARMAN
FAKULTAS KEDOKTERAN

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SURAT TUGAS

Nomor: 581/UN17.10/KP.04/2023

Sehubungan dengan kegiatan Workshop How To Interpret Chest X Ray (cara membaca x-ray), maka dengan ini Dekan Fakultas Kedokteran Unmul menugaskan kepada:

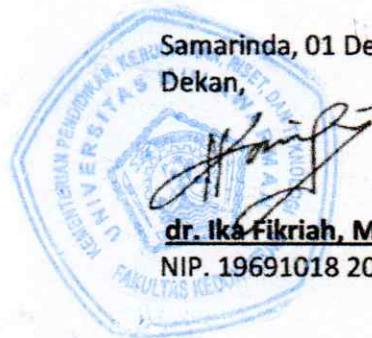
No.	NAMA	NIP / NIDK	JABATAN
1.	dr. Yudanti Riastiti, M.Kes., Sp.Rad.	197505012005012002	Dosen FK
2.	dr. Abdul Mu'ti, S.Ked, M.Kes., Sp.Rad.	197403022005011002	Dosen FK

Untuk mengikuti kegiatan tersebut sebagai Narasumber pada 02 Desember 2023 di Hotel Mercure, Samarinda.

Demikian surat tugas ini dibuat kepada yang bersangkutan untuk dilaksanakan dengan penuh rasa tanggung jawab.

Samarinda, 01 Desember 2023

Dekan,



dr. Ika Fikriah, M.Kes

NIP. 19691018 200212 2 001



FAKULTAS KEDOKTERAN
UNIVERSITAS MULAWARMAN

2001 - 2023

Sertifikat

NO. 3912/UN.17.10/AK/2023

Diberikan Kepada :

dr Abdul Mu'ti, M.Kes., Sp.Rad

ATAS PARTISIPASINYA SEBAGAI :

INSTRUKTUR

"How to Interpret Chest X Ray"

Acara Workshop Nasional Tuberculosis diselenggarakan oleh Prodi Spesialis Pulmonologi dan Kedokteran Respirasi Fakultas Kedokteran Universitas Mulawarman Dalam Rangka Dies Natalis FK Unmul ke- 22

Hotel Mercure Samarinda, Sabtu 2 Desember 2023

SKP IDI No. 242/IDI-WIL-17/A.7/XI/2023 Peserta 2 SKP, Instruktur 1 SKP, Panitia 1 SKP



Dekan

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Ketua Pelaksana

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NIP. 197504302008011008



Workshop Interpretasi Foto Thorax

Abdul Mu'ti, Yudanti Riastiti
FK Universitas Mulawarman
RSUD Abdoel Wahab Sjahranie
Samarinda



Terminologi

- Chest x-ray = CXR
- Foto thorax



Modalities	Pros	Cons
CXR	Low radiation dose Inexpensive Widely available Portable	Limited range of densities Low Sn/Sp
Fluoros	Relative available Real-time	Substantially high radiation dose
US	No radiation Relatively inexpensive Real-time Widely available Portable	Operator dependent Peripheral lesion
CT	Relative available Cross-sectional Wide range of densities High resolution Higher Sn/Sp Fast	High radiation dose Not portable
MRI	No radiation Cross-sectional Higher soft tissue contrast Structural and functional imaging	Expensive Not widely available Not portable MRI safety issues Longer, prone to artifacts Relative low resolution
Nuclear and Hybrid Imaging	High Sn/Sp (hybrid) High Sn, med Sp (nuclear only) Functional + molecular imaging	Low resolution (nuclear) Expensive – very expensive (hybrid) Very limited availability Not portable

First line

Second line



- Prinsip: “*if the x-ray is taken, it must be interpreted*”
- Sebelum interpretasi harus dievaluasi dulu meliputi verifikasi dan validasi
- Interpretasi meliputi: (Reading + Writing)
 - Reading
 - Writing: *radiology report*



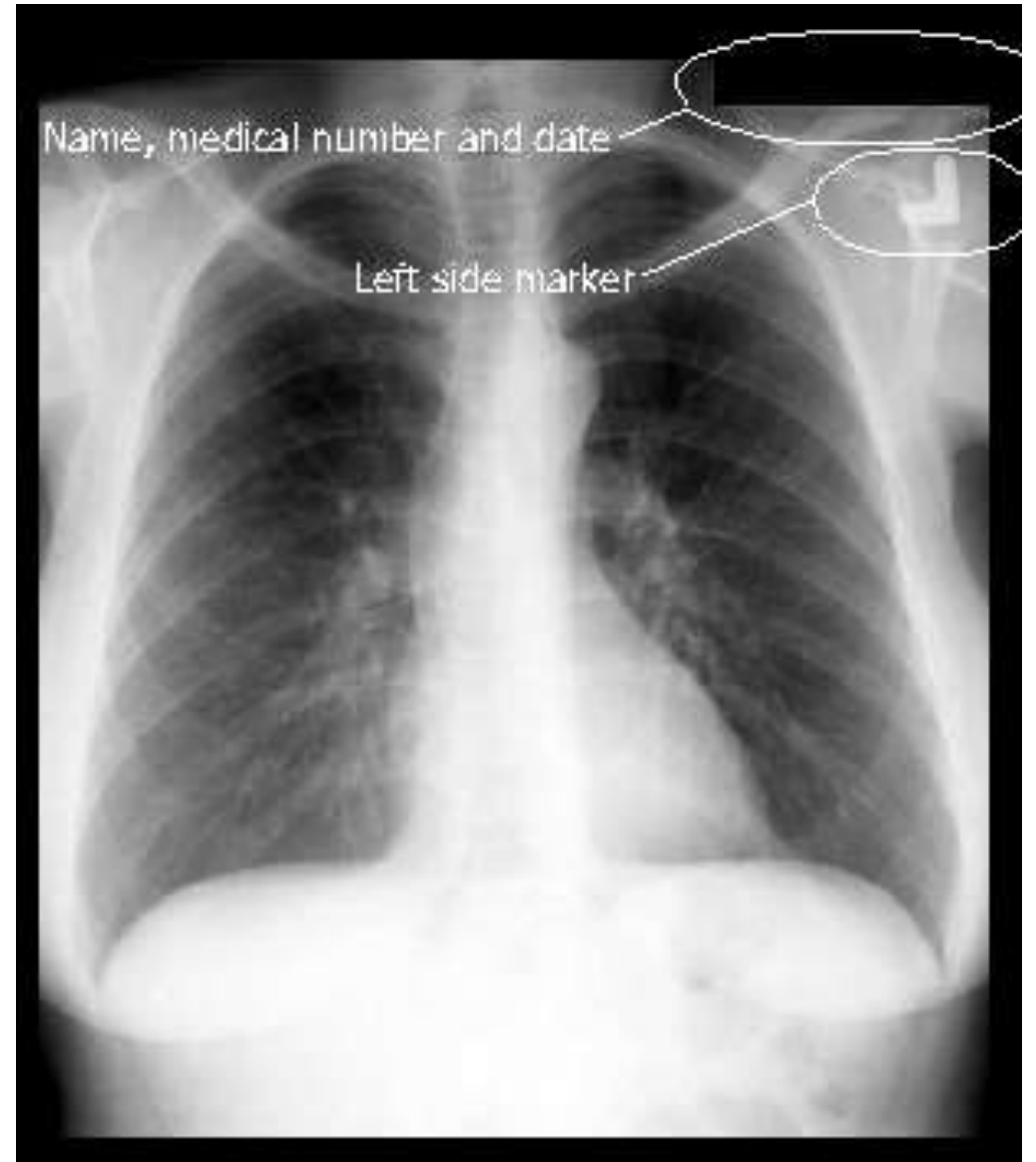
Interpretasi Foto Thorax

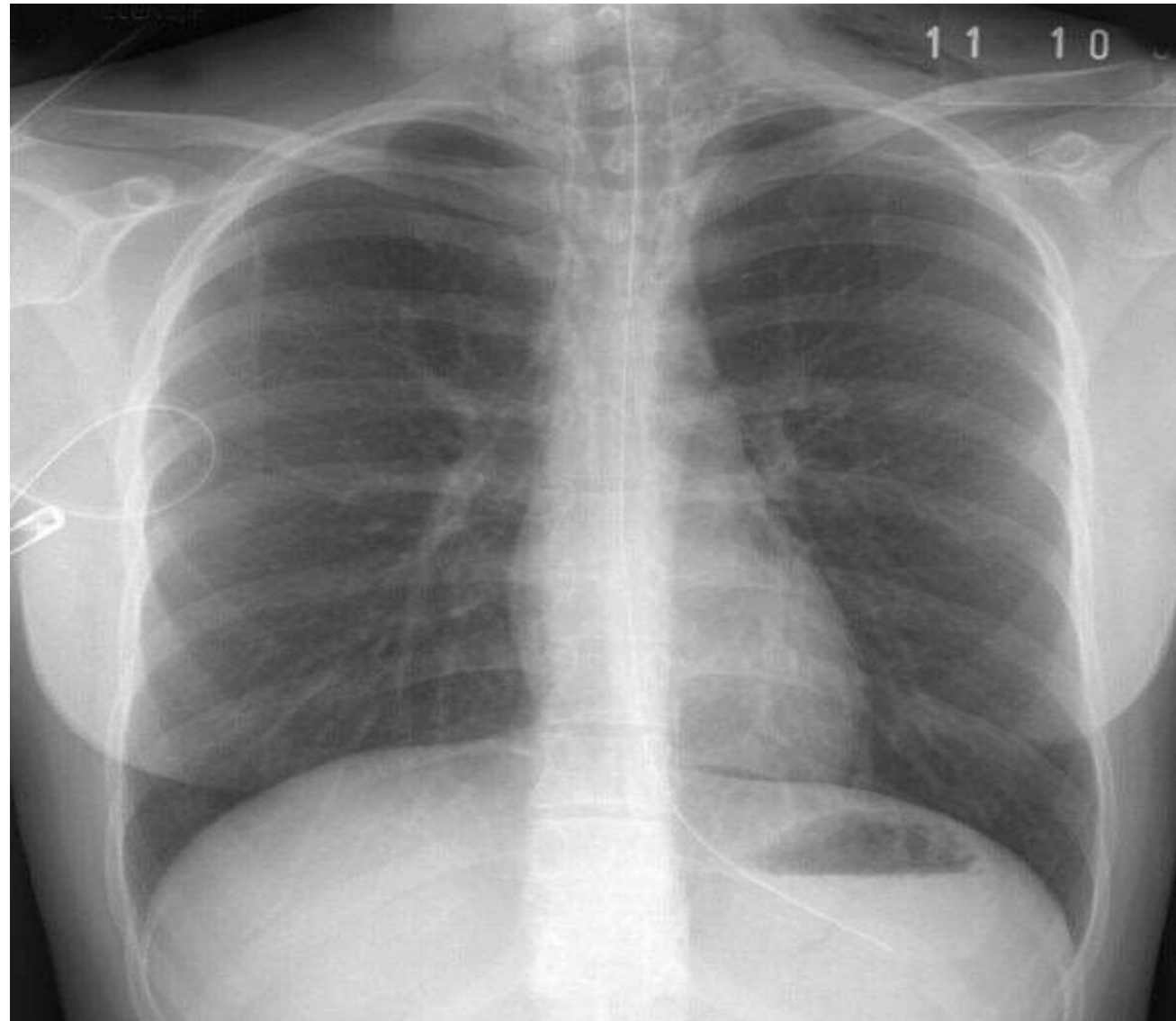
- Verifikasi (konfirmasi melalui data-data pasien disesuaikan dengan surat permintaan pemeriksaan dari klinisi)
- Validasi (konfirmasi melalui **pengujian + data-data pasien** untuk mendapatkan **kecukupan/kelayakan foto untuk di interpretasi**)
- Interpretasi

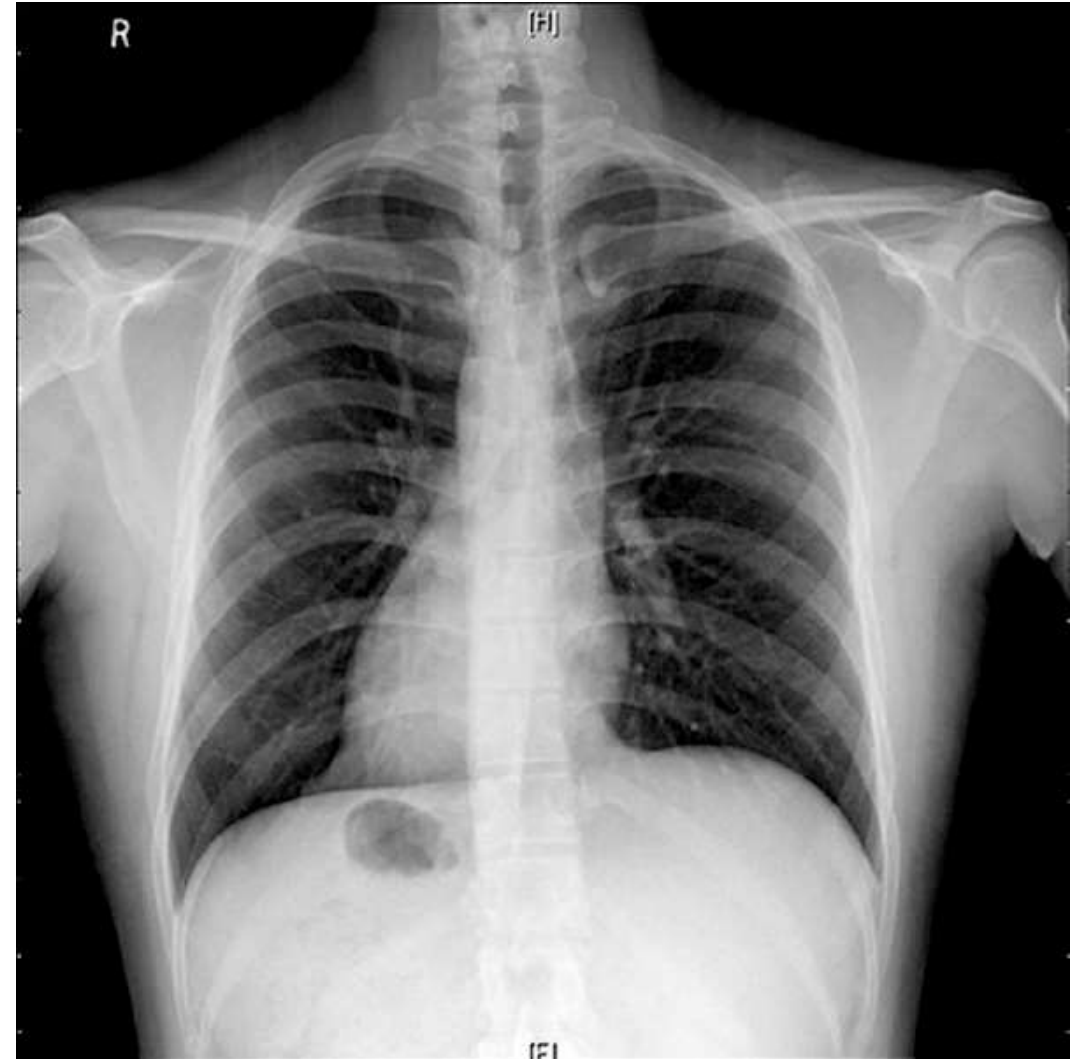


Verifikasi

- Nama, usia
- Tanggal pembuatan foto
- Medical number
- Marker L/R
- Jenis foto: Foto toraks PA atau AP atau Lateral dll







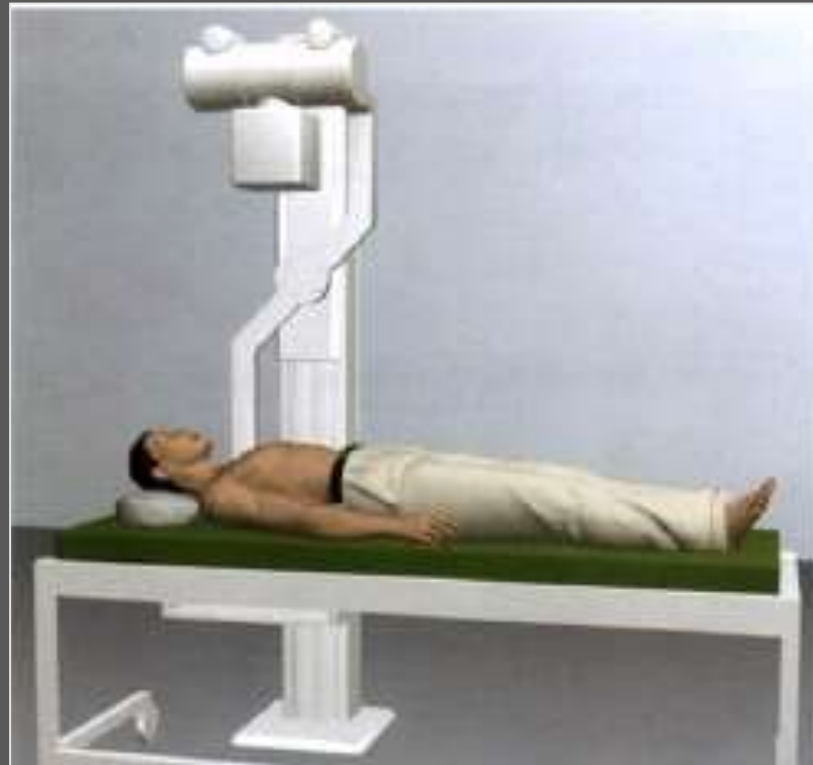
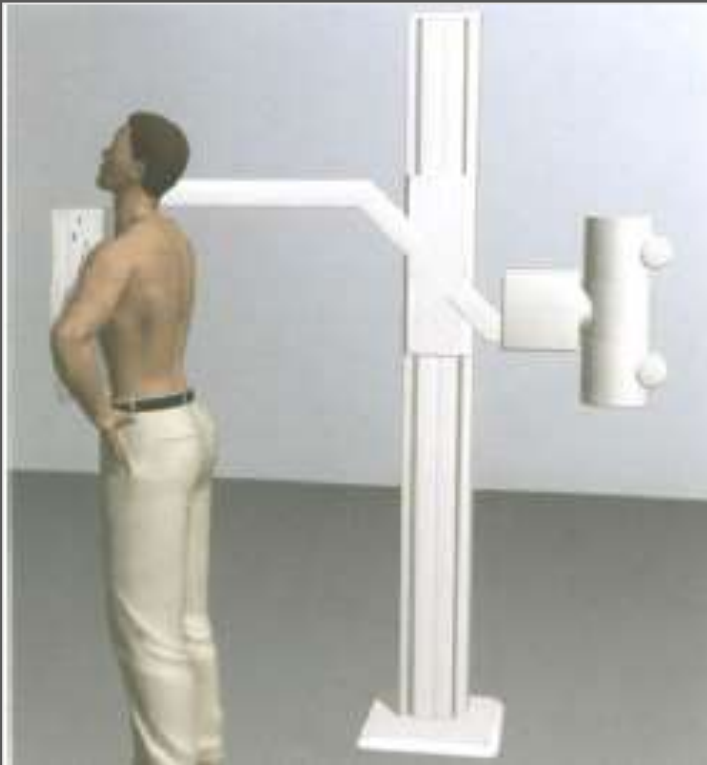


Posisi foto (view, proyeksi)

- Rutin: PA, bila tidak memungkinkan dibuat Foto toraks AP
- Suplemen: pelengkap
 - Lateral
 - Left
 - Right
 - Top lordotik
 - Lateral Dekubitus (R or L)
 - Oblik → Jantung
 - Left
 - Right

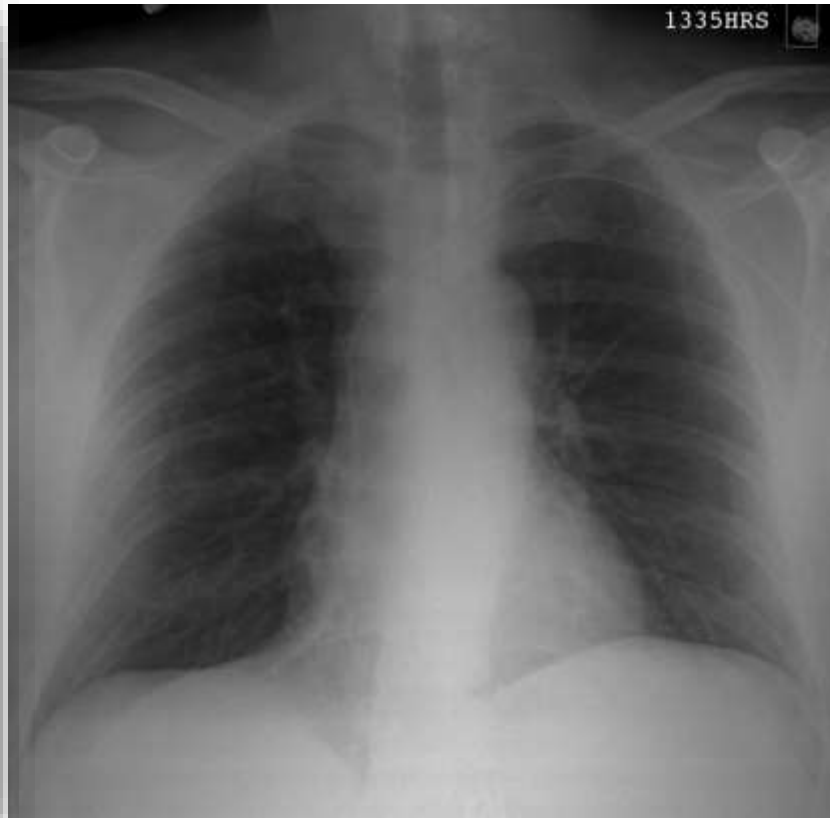
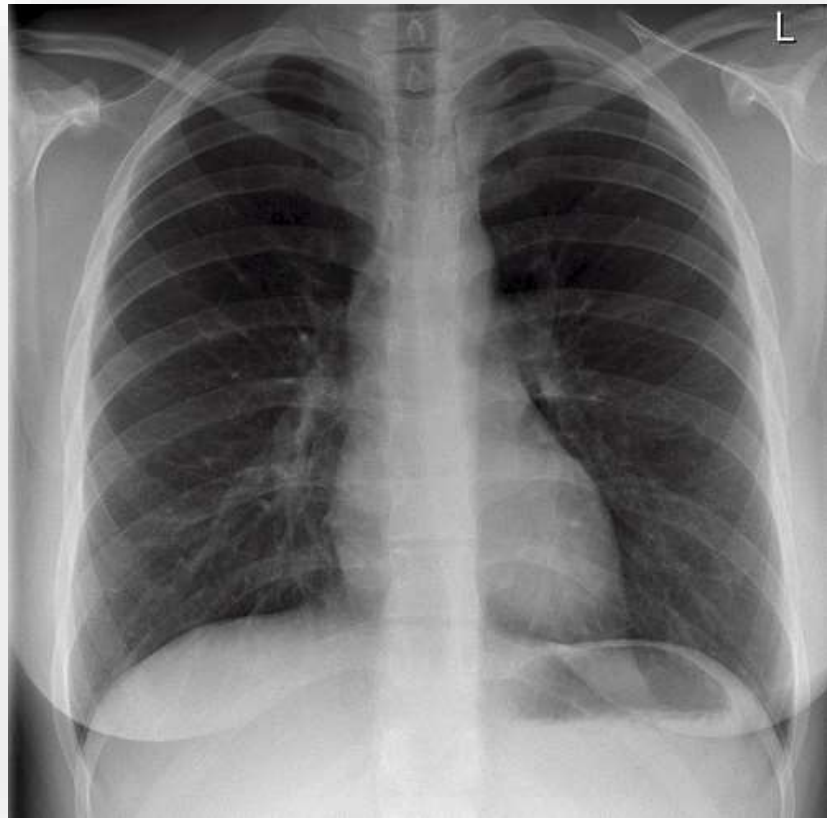


Posisi foto (view, proyeksi)



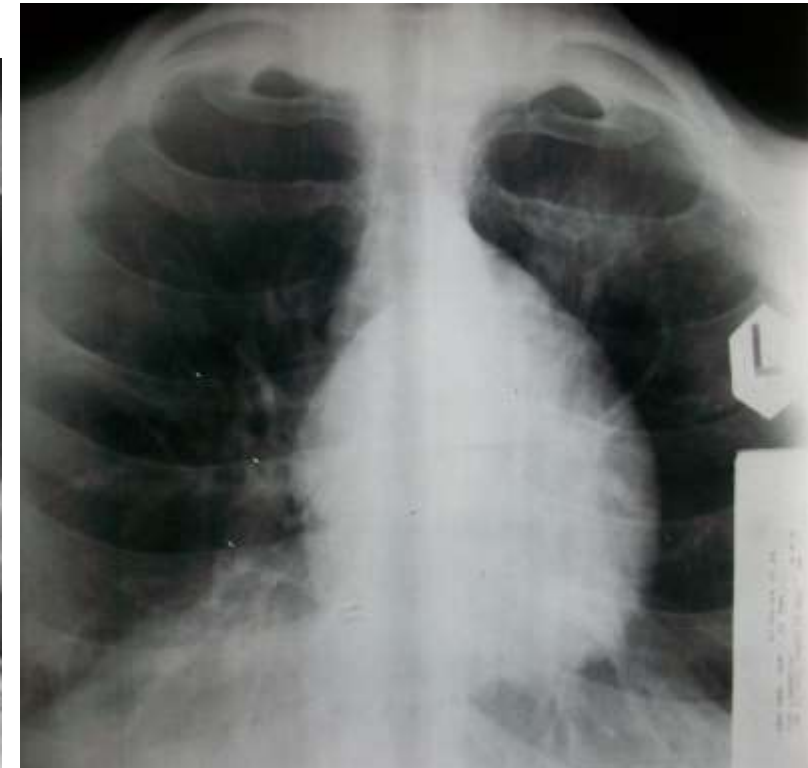
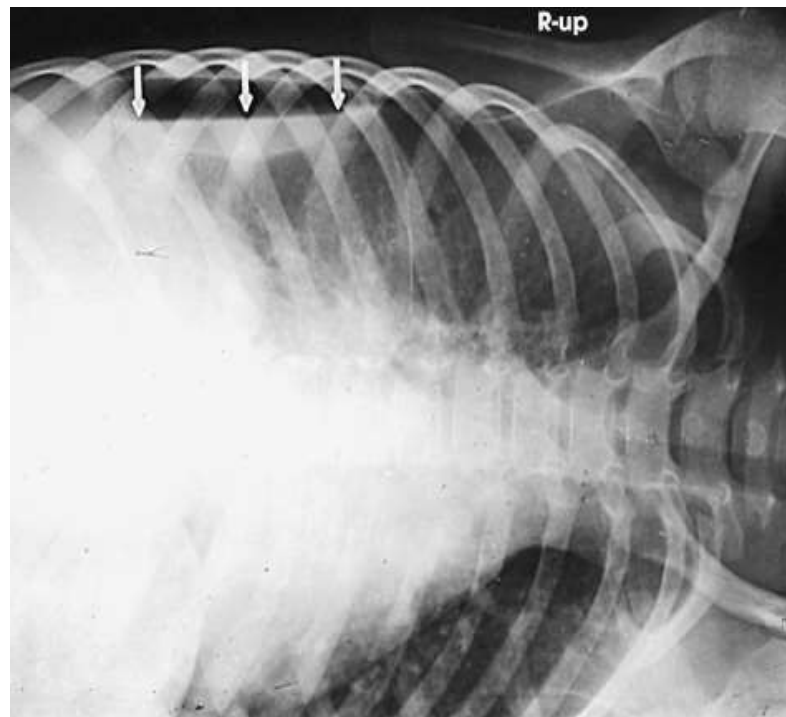
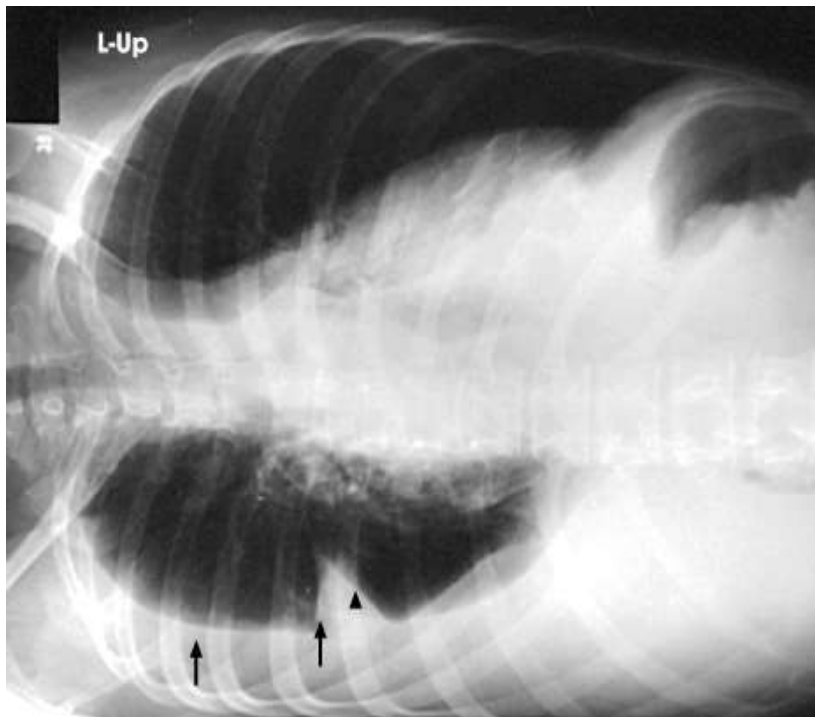


Posisi foto (view, proyeksi)





Posisi foto (view, proyeksi)





Posisi foto (view, proyeksi)

Errect radiographs are preferred :

- The relative size of pulmonary vessels in the upper & lower zone can be used to **assess pulmonary venous pressure**
- Detect **air-fluid level**
- Detect **pleural pathology** (Ptx, pl effusion)

Based on:

- Record
- Gastric air bubble (**errect : fundal, supine : antral**)

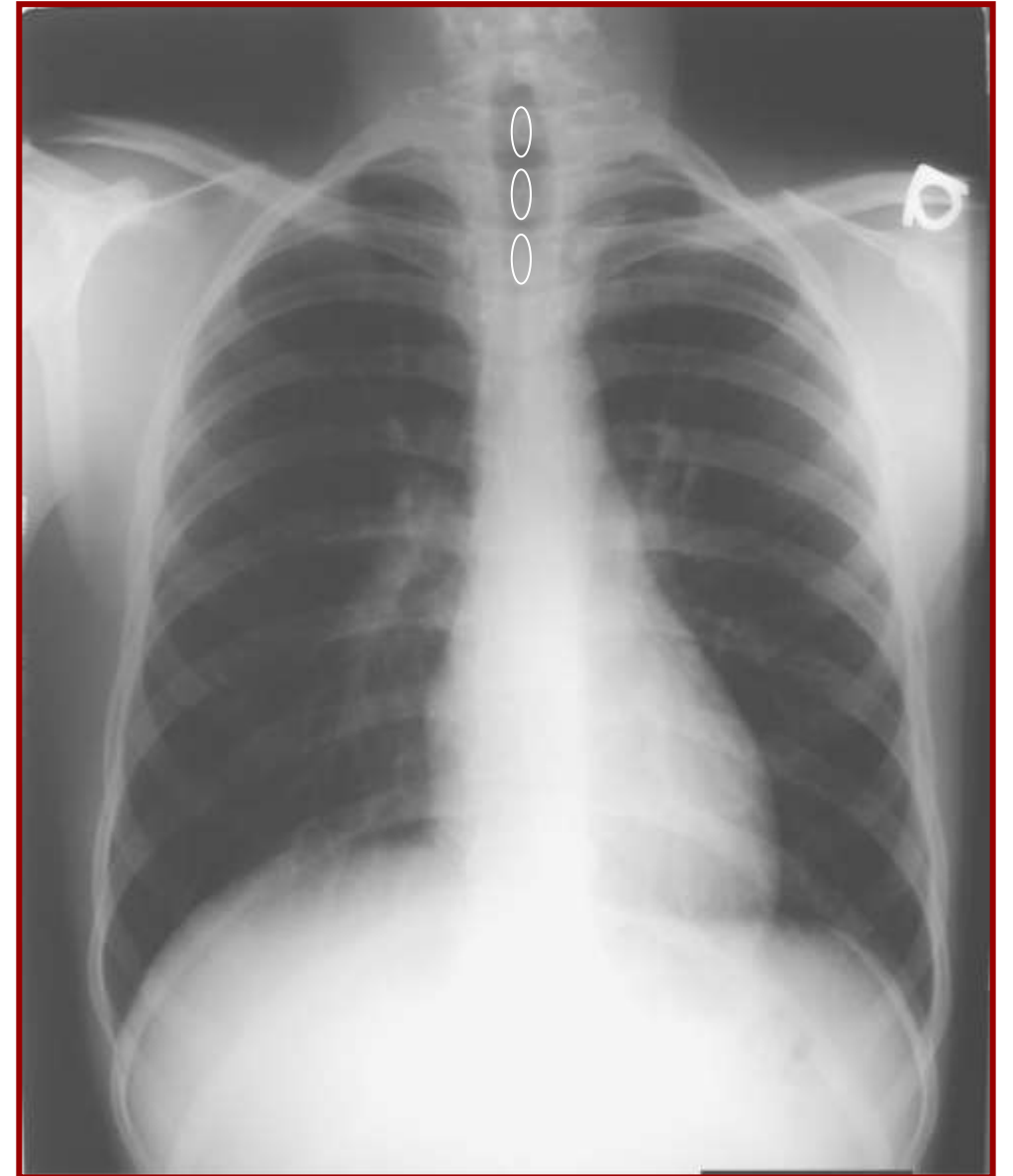


Validasi

- Penetrasi
- Inspirasi
- Magnifikasi
- Rotasi
- Angulasi

Penetrasi

- Penetrasi → KV (tegangan)/MAS
 - Bila KV cukup, maka corpus VT IV makin ke bawah makin tidak jelas → kontras
 - MAS (kuat arus) memengaruhi jumlah sinar X yang dikeluarkan → densitas.

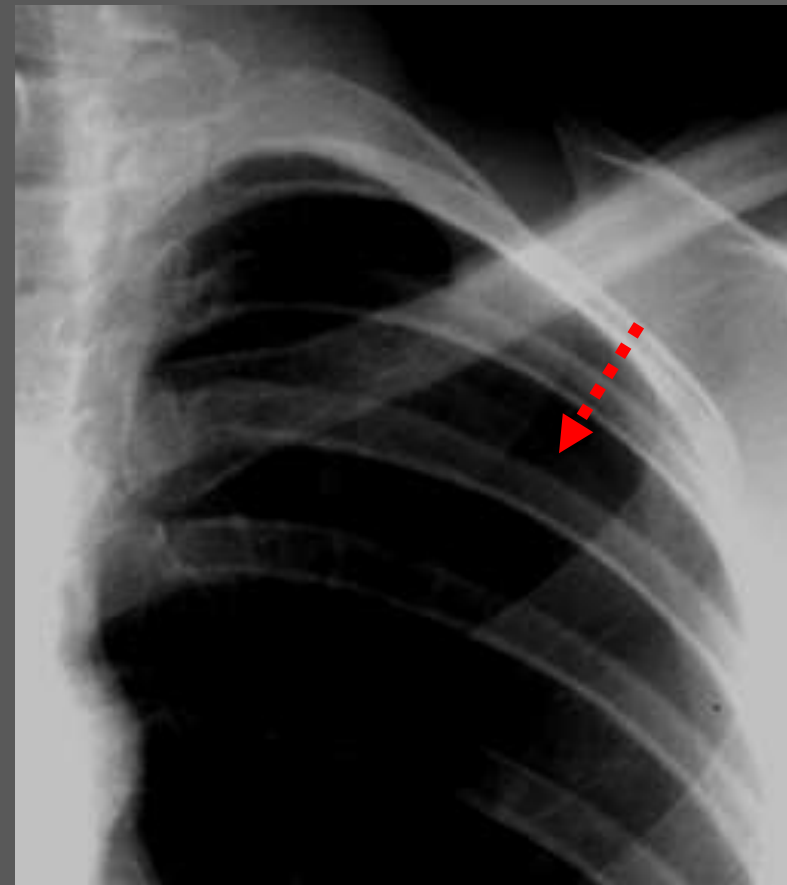




Good-Penetration



Over-Penetration



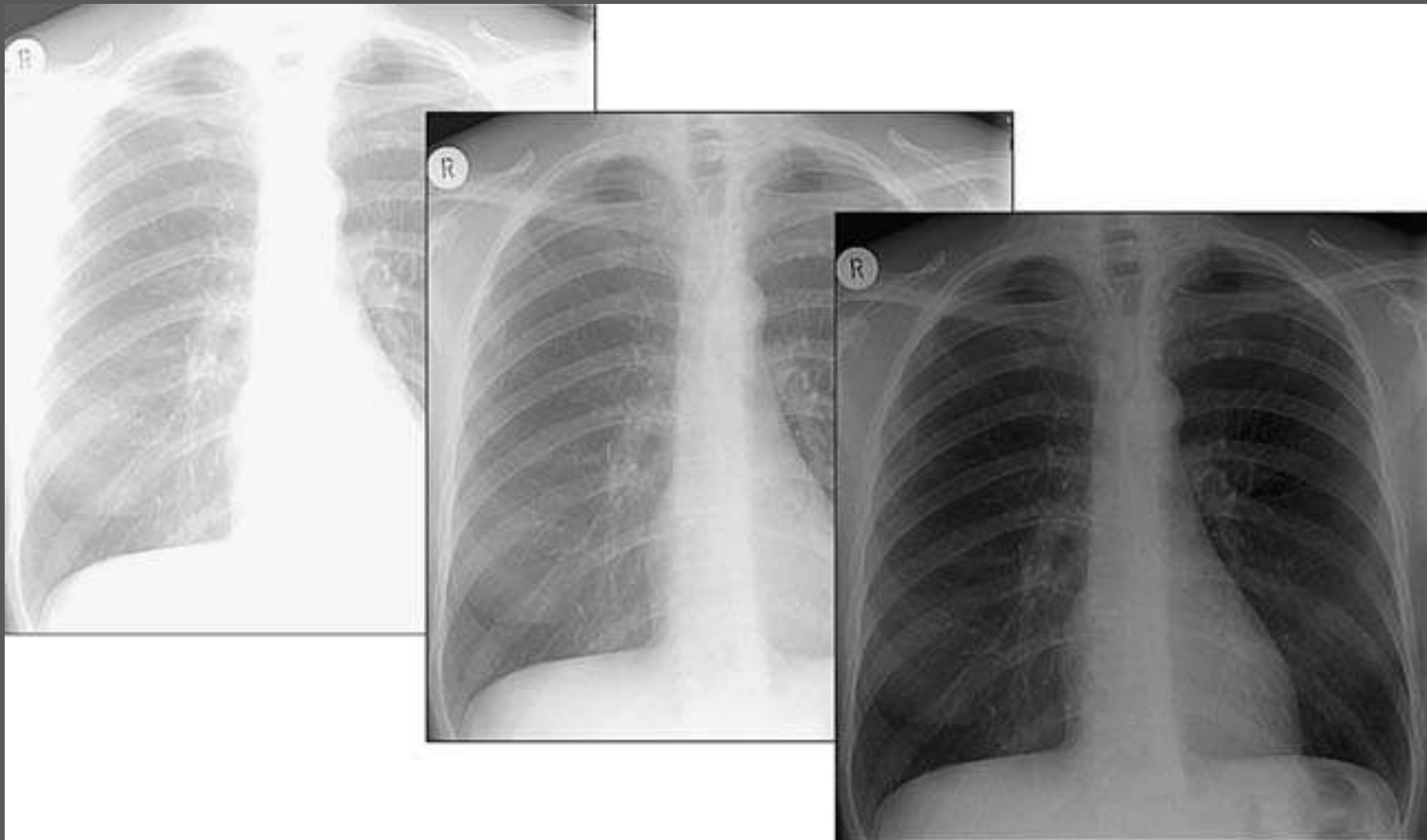


Under penetration vs over penetration





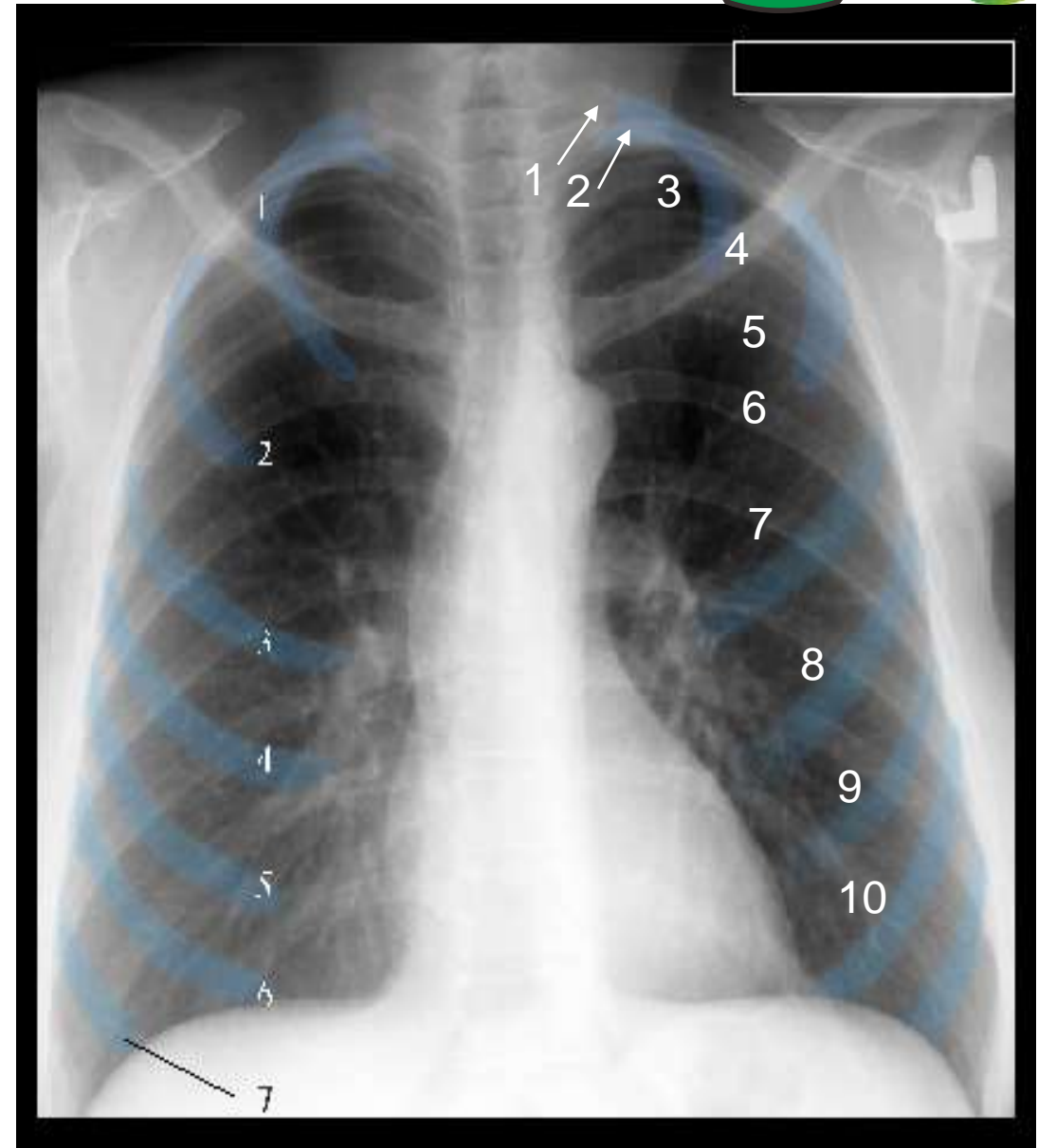
Kualitas exposure sinar X-ray: Cukup atau Berlebih atau Kurang





Inspirasi

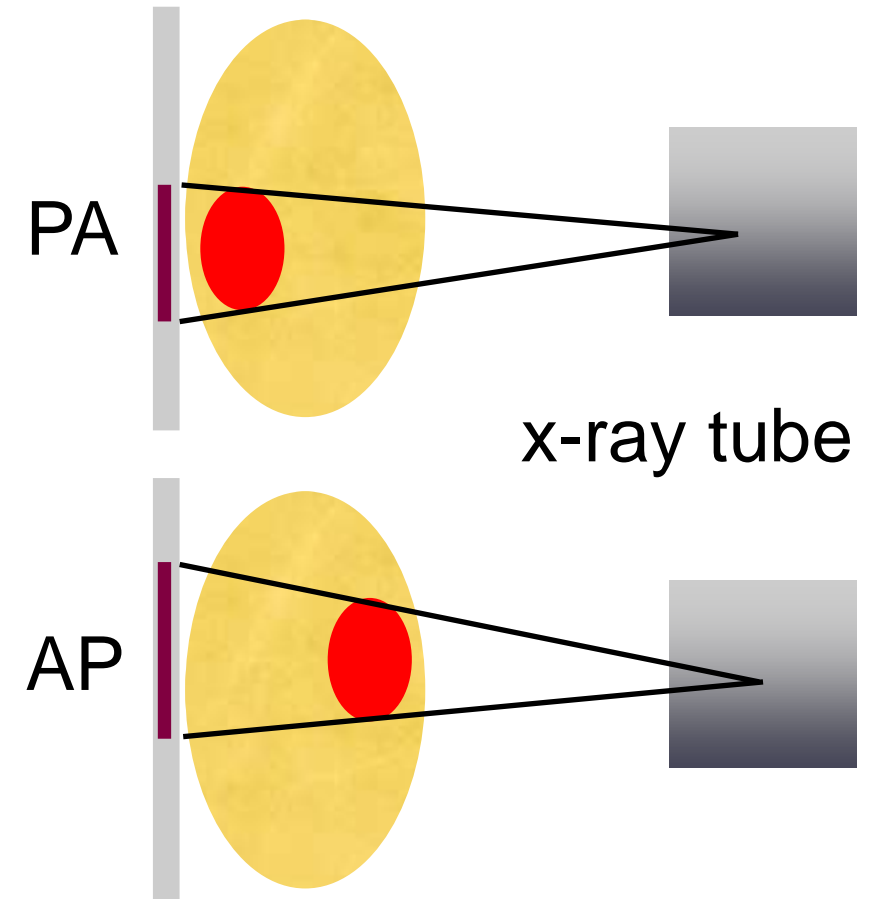
- Level inspirasi → optimal
 - Midpoint diafragma pada costa 5-6 anterior atau costa 9-10 posterior





Magnifikasi

- Posisi PA → jantung mendekati ukuran yang sebenarnya
- *SID (source image receptor distance)* = Jarak antara *x-ray tube* dan reseptor/film lebih pendek pada posisi AP (40 inchi) dibandingkan dengan posisi PA (72 inchi)





**AP
versus
PA**



PA erect

AP portable film makes the heart look larger than it does...



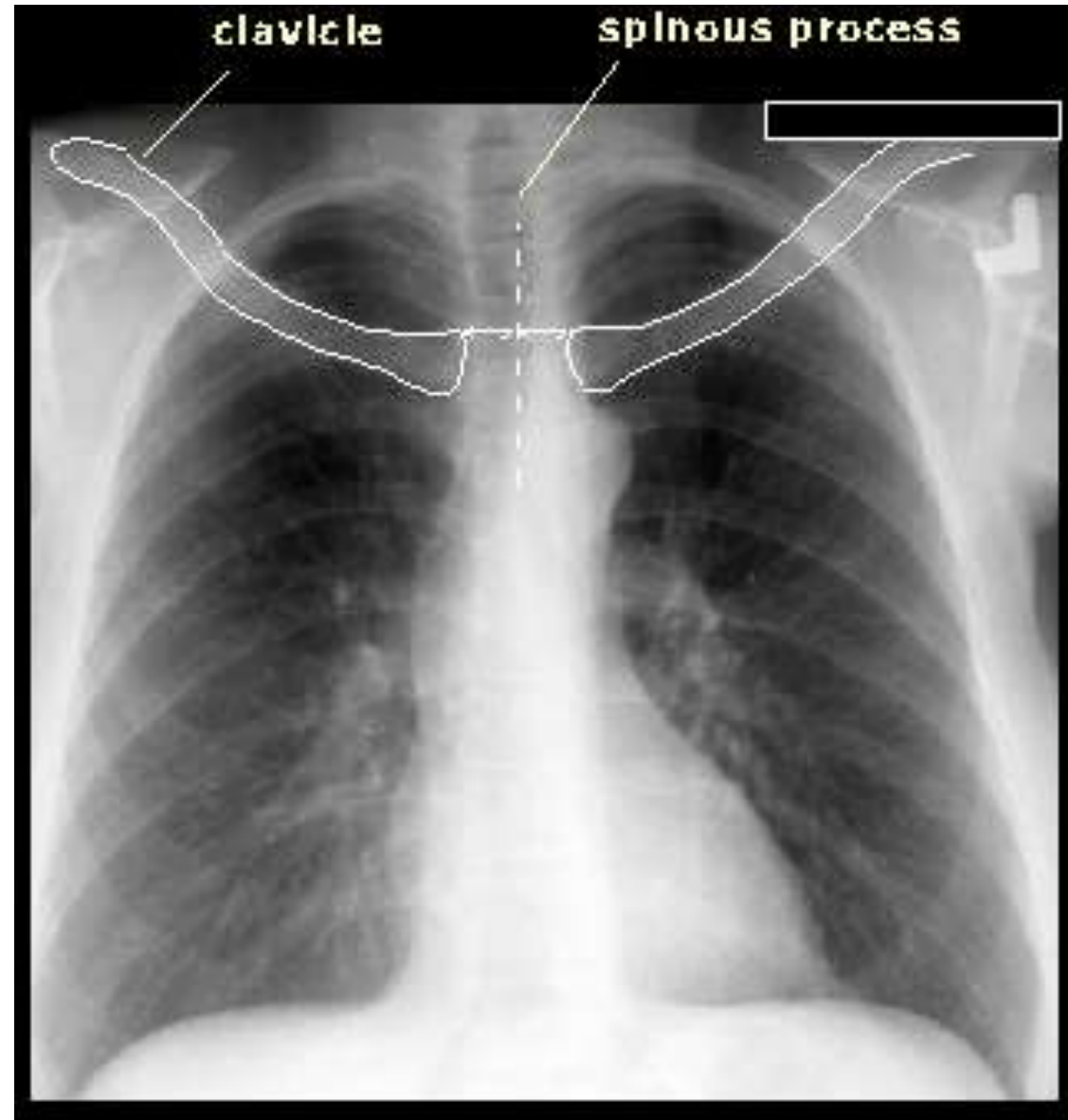
AP erect

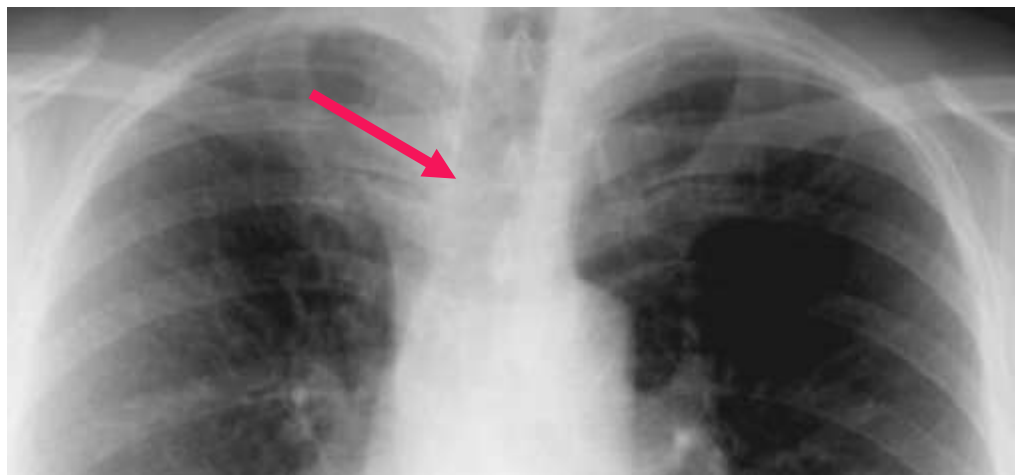
On this PA film done on the same patient an hour later



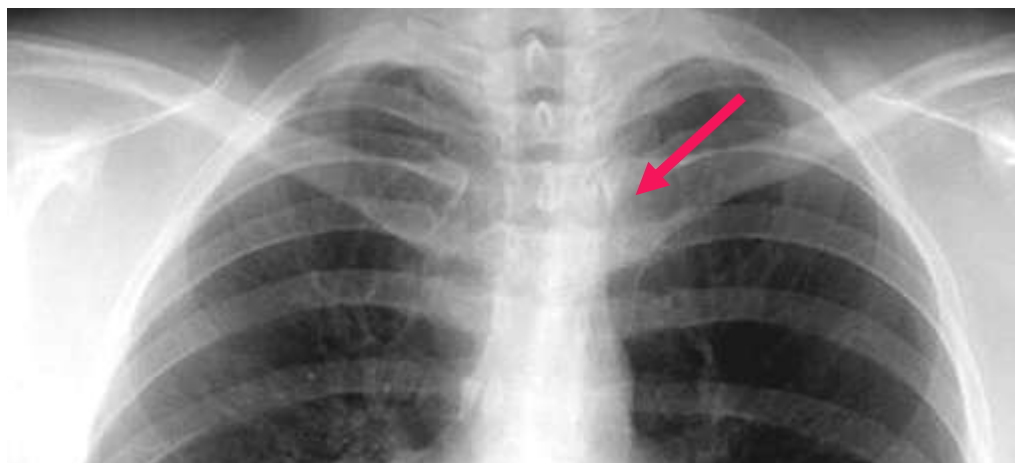
Rotasi

- Posisi yang diharapkan → *simetris*





If spinous process appears closer to the right clavicle (red arrow), the patient is rotated toward their own left side ☐



If spinous process appears closer to the left clavicle (red arrow), the patient is rotated toward their own right side ☐

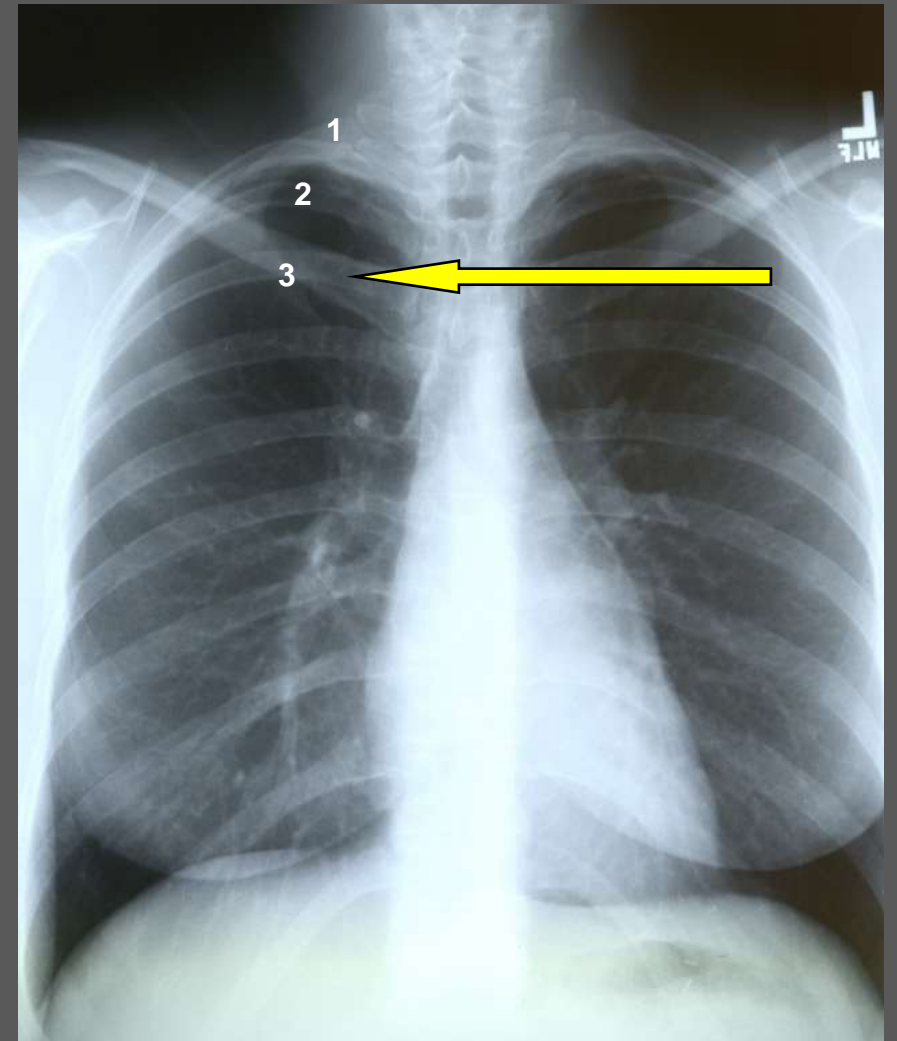
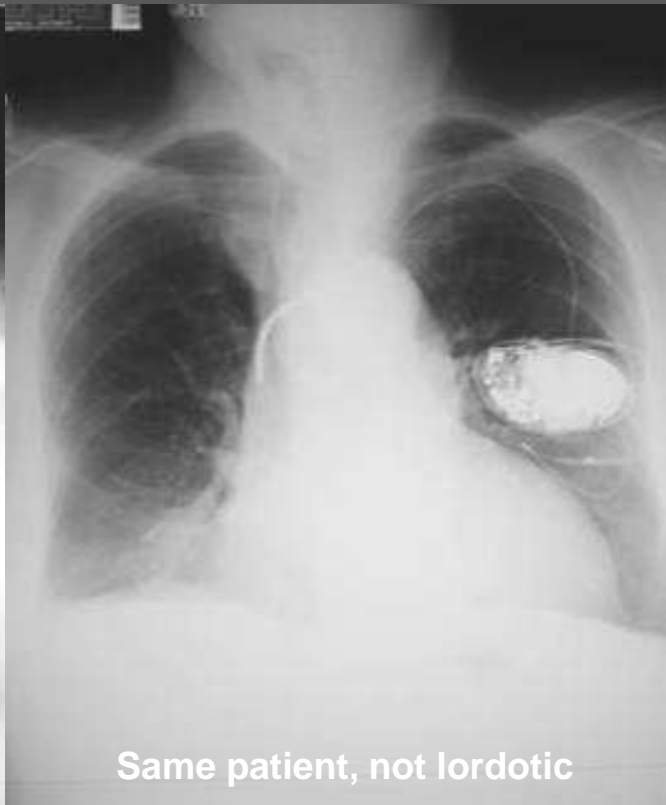
Pitfall Due to Marked Rotation



Severe rotation may make the pulmonary arteries appear larger on the side farther from the film



Angulasi



A film which is apical lordotic (beam is angled up toward head) will have an unusually shaped heart and the sharp border of the left hemidiaphragm will be absent



Interpretasi

Deskripsi:

- Trakea (di tengah/terdorong/tertarik)
- Jantung (membesar/tidak membesar/bentuk/posisi)
- Sinuses dan diafragma kanan/kiri (normal/tumpul/tertutup perselubungan)
- Pulmo:
 - Hili (normal/kasar/melebar)
 - Corakan bronkovaskuler (normal/bertambah/berkurang)
 - Tidak tampak (bercak lunak (infiltrat)/keras (fibrotik)/perselubungan/nodul/massa)
- Skeletal dan soft tissue

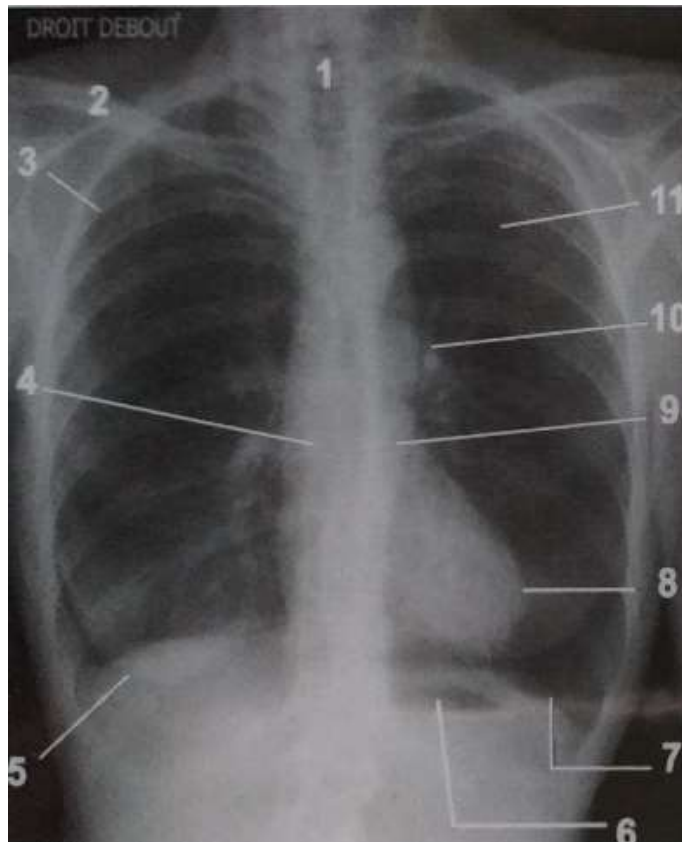
Kesan (impresi):

-

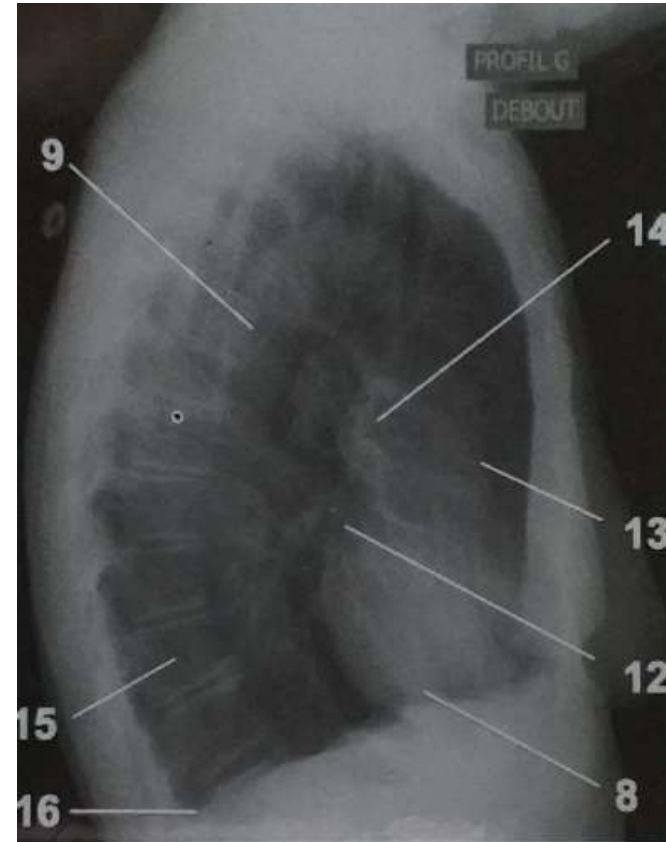


Radioanatomomi Foto Thorax

Proyeksi AP



Proyeksi Lateral



1. Trakea

2. Os Klavikula

3. Kosta IV Posterior

4. Bronkus Utama Kanan

5. Bayangan Payudara Kanan

6. Udara dalam Lambung

7. Hemidiafragma Kiri

8. Ventrikel Kiri

9. Aorta descendens

10. . A. Pulmonalis Kiri

11. Lobulus Paru Kiri Atas

12. Atrium Kiri

13. Ventrikel Kanan

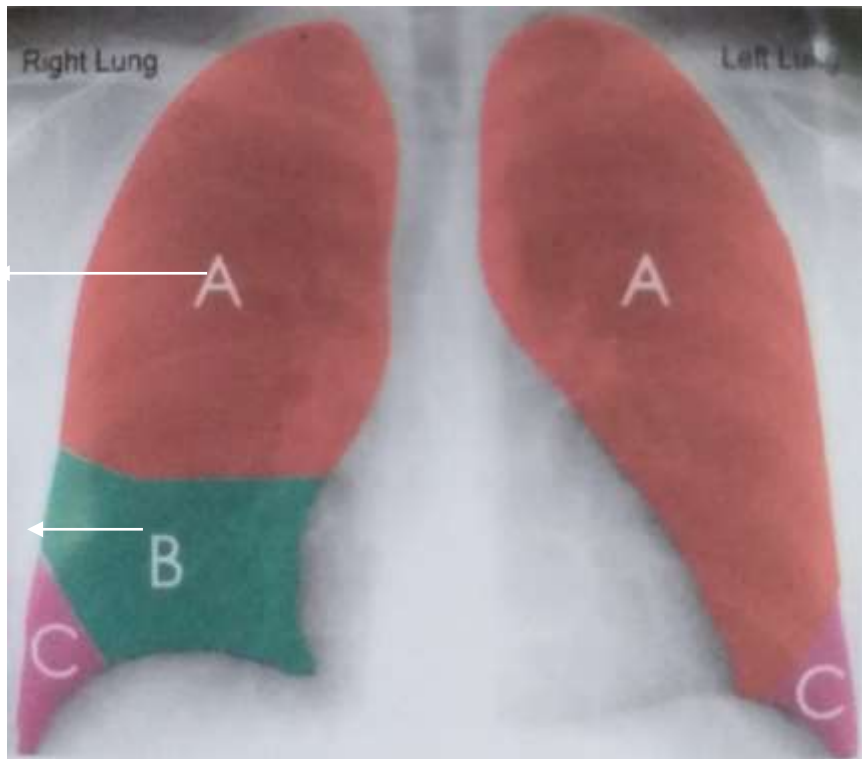
14. A. Pulmonalis Kanan, V. Pulmonalis Kanan

15. Corpus Vertebra

16. Sudut Costofrenicus Posterior



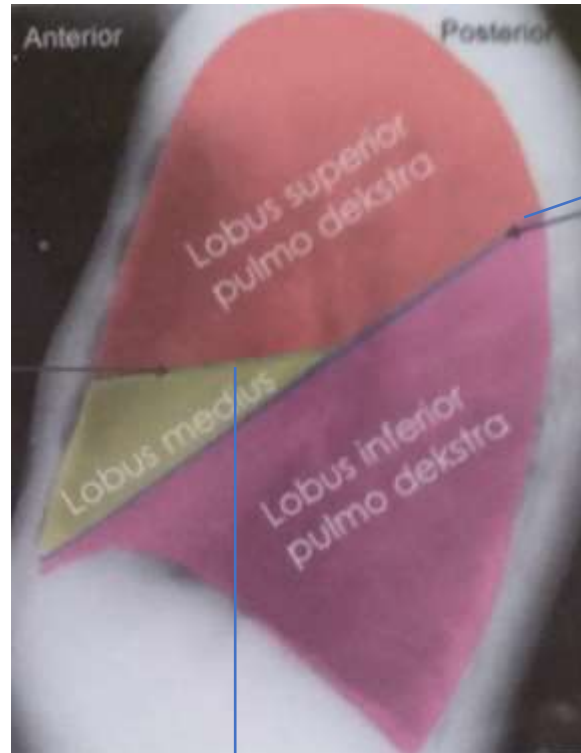
Radioanatomi



Lobus Superior

Lobus Media

Lobus Inferior



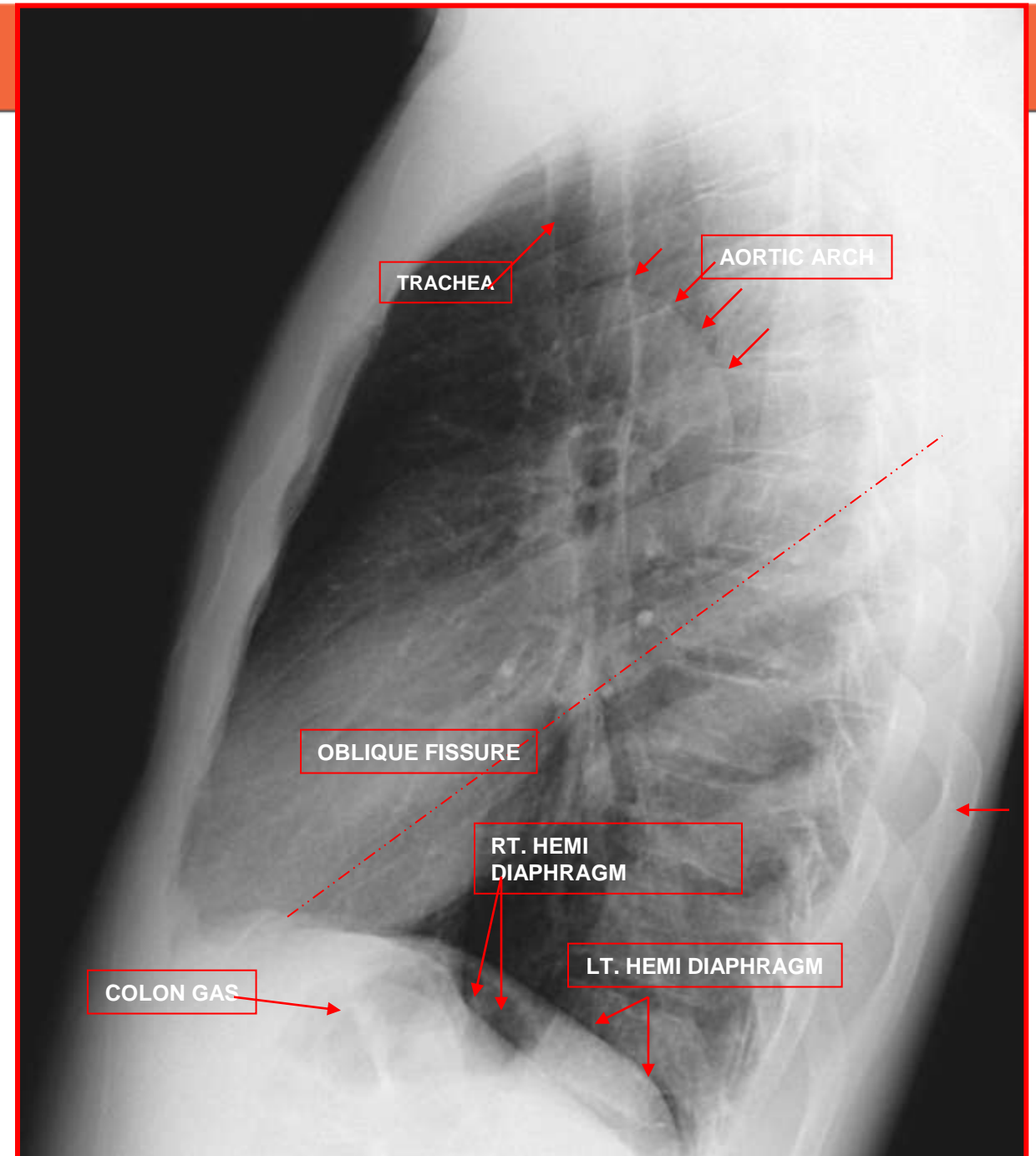
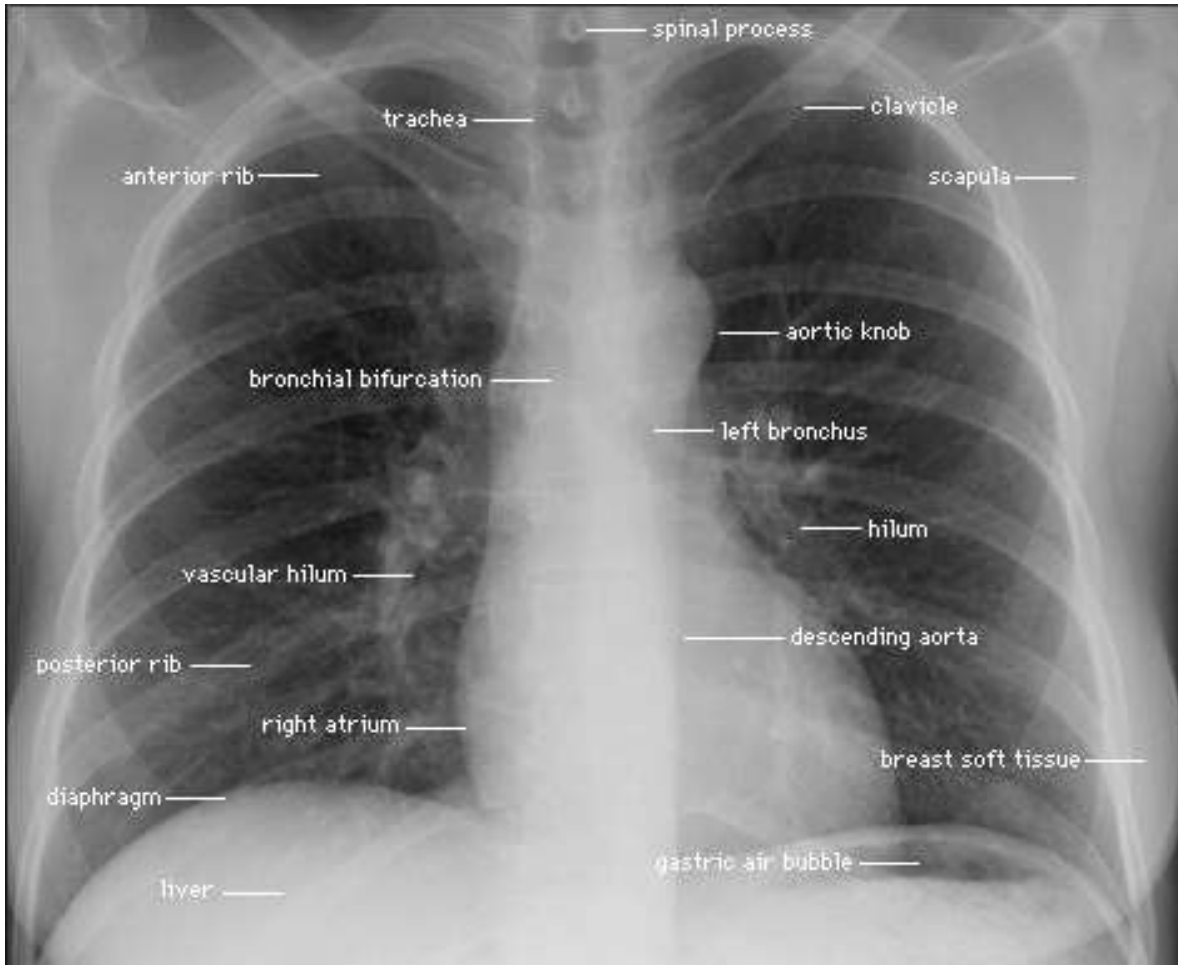
Fisura Mayor

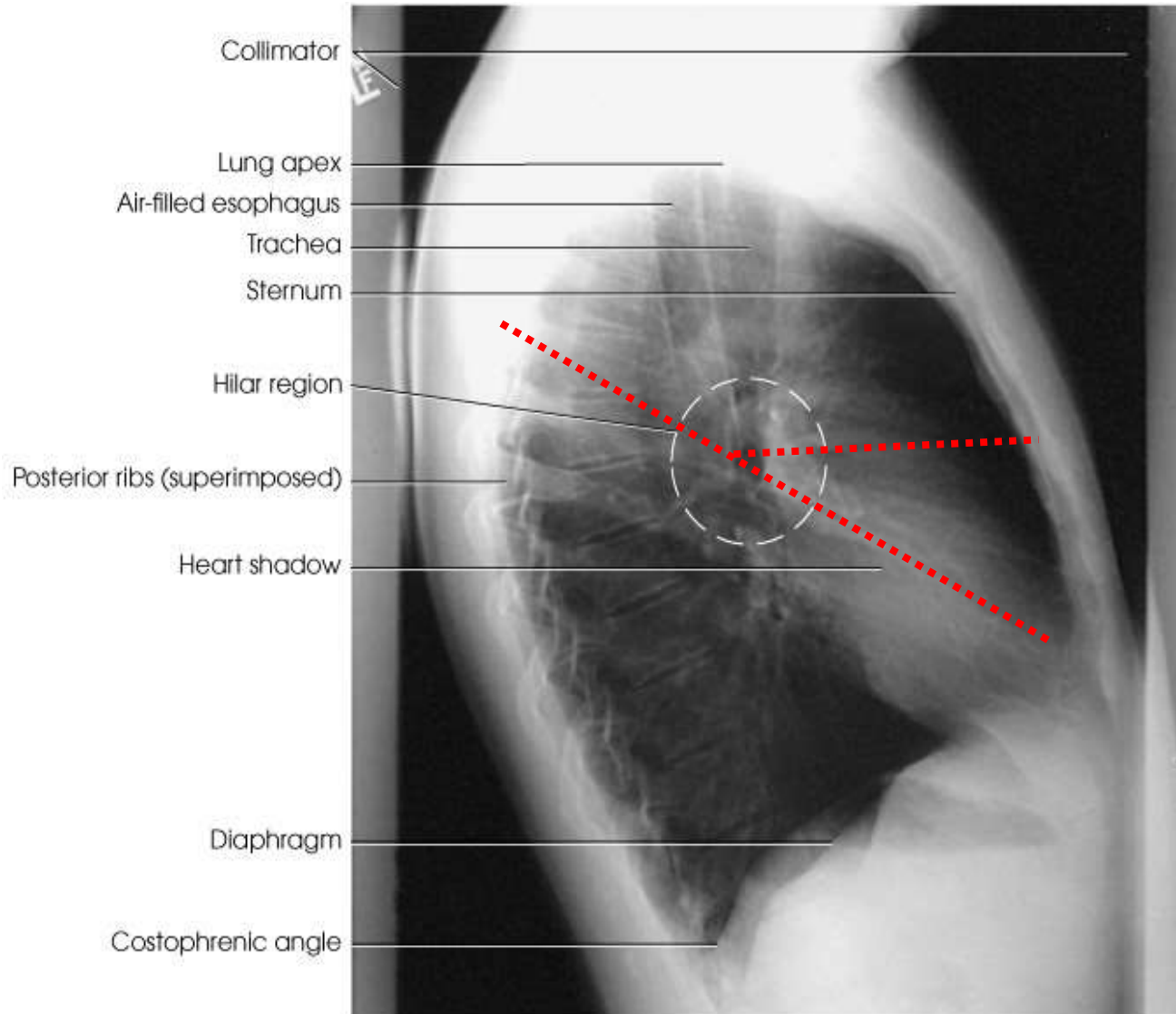
Fisura Horizontalis





Radioanatomomi Foto Thorax

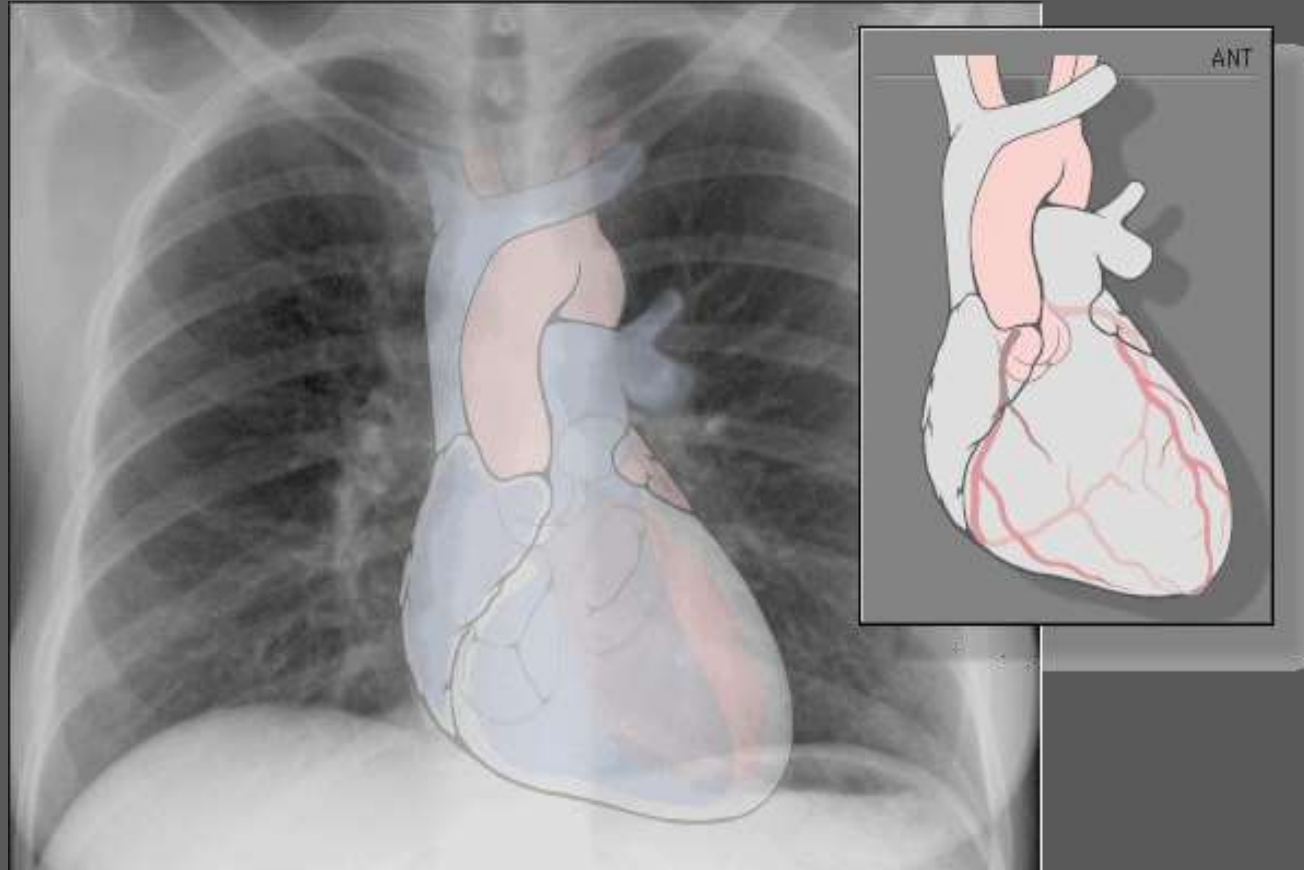




Radioanatomomi Foto Thorax

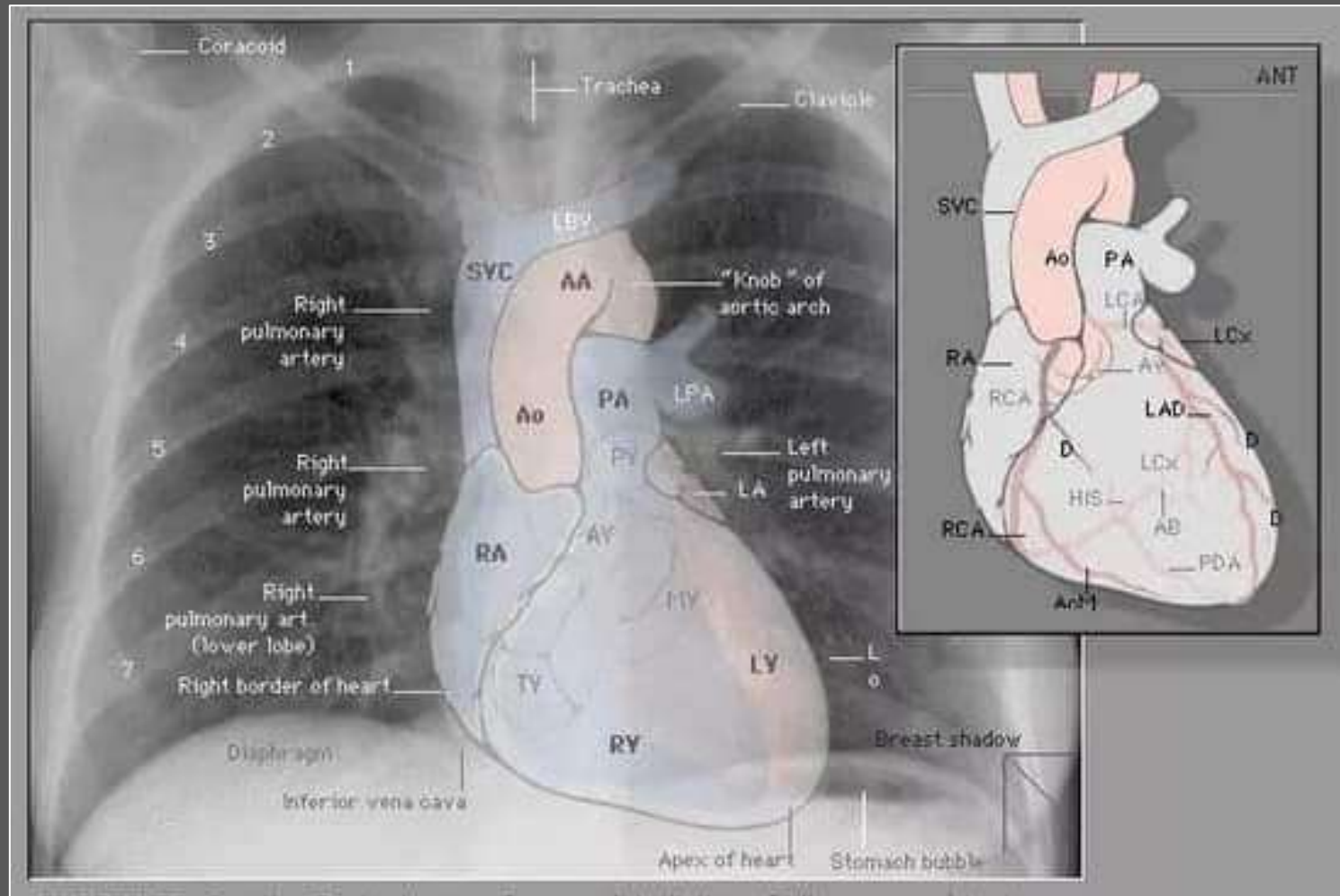


Radioanatomomi Foto Thorax





Radioanatomomi Foto Thorax





Interpretasi

Deskripsi:

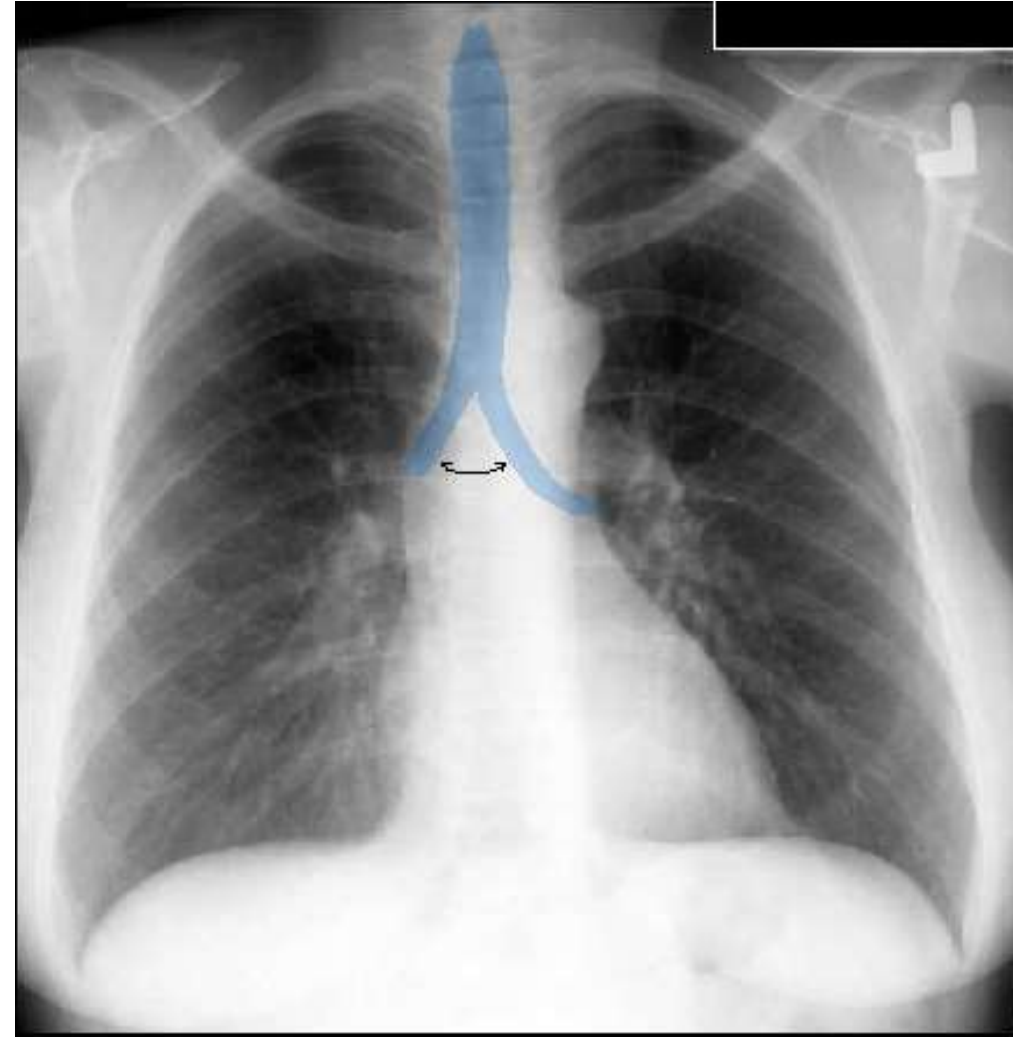
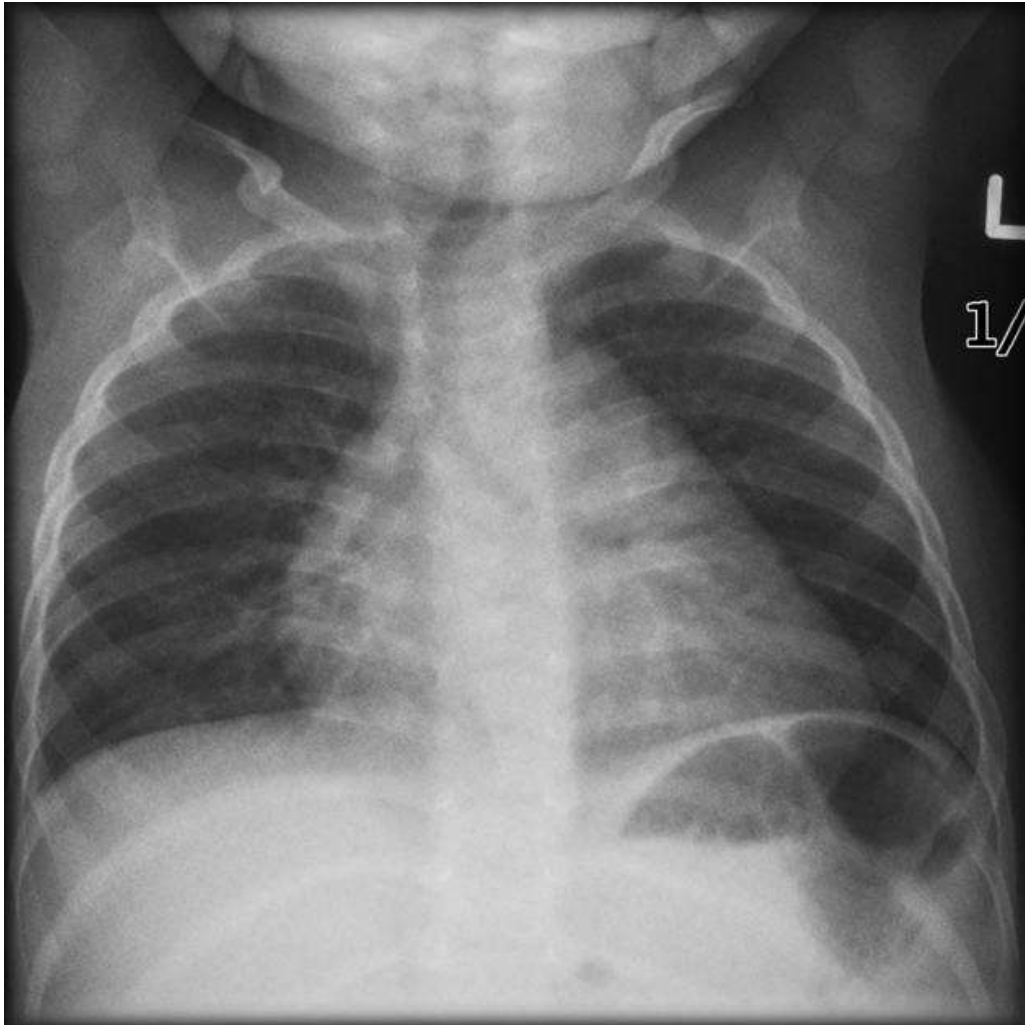
- Trakea (di tengah/terdorong/tertarik)
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- Sinuses dan diafragma kanan/kiri (normal/tumpul/tertutup perselubungan)
- Pulmo:
 - Hili (normal/kasar/melebar)
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 - Tidak tampak (bercak lunak (infiltrat)/keras (fibrotik)/perselubungan/nodul/massa)
- Skeletal dan soft tissue

Kesan (impresi):

-

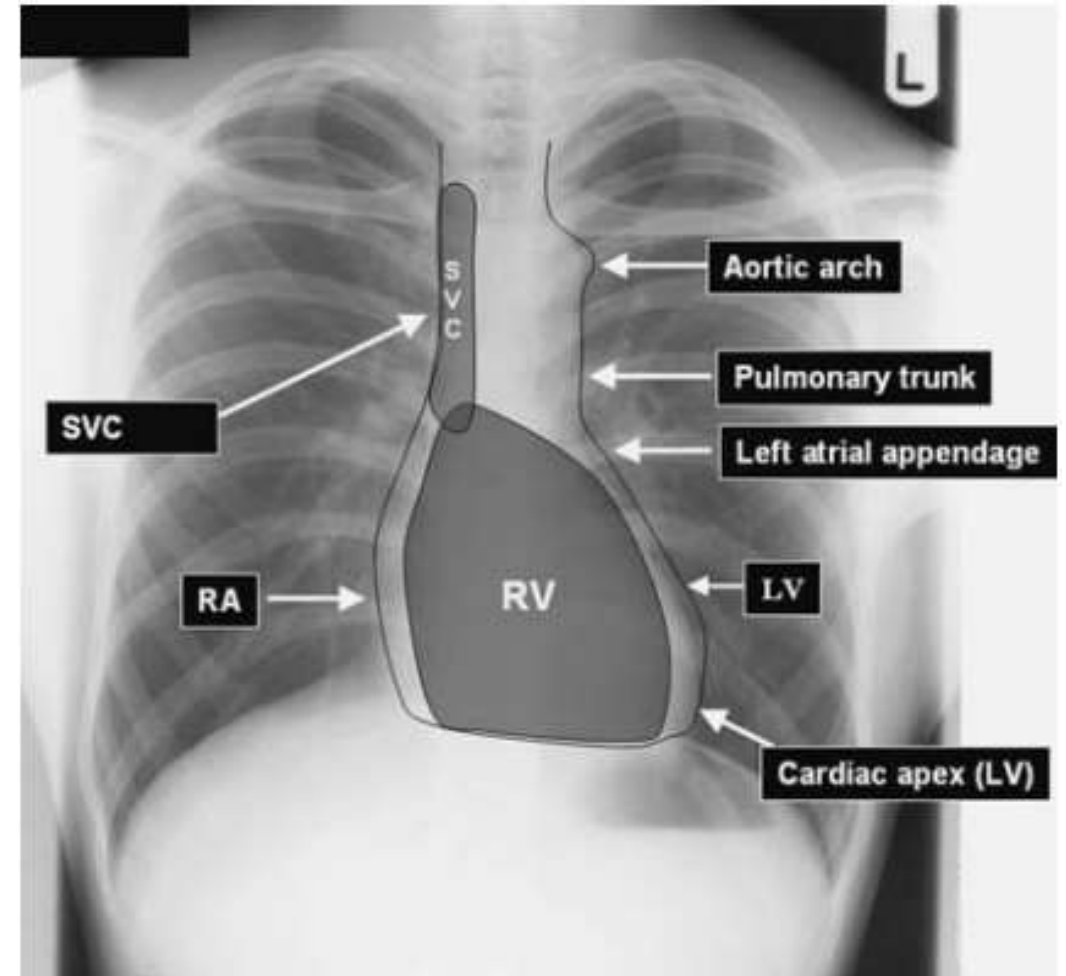
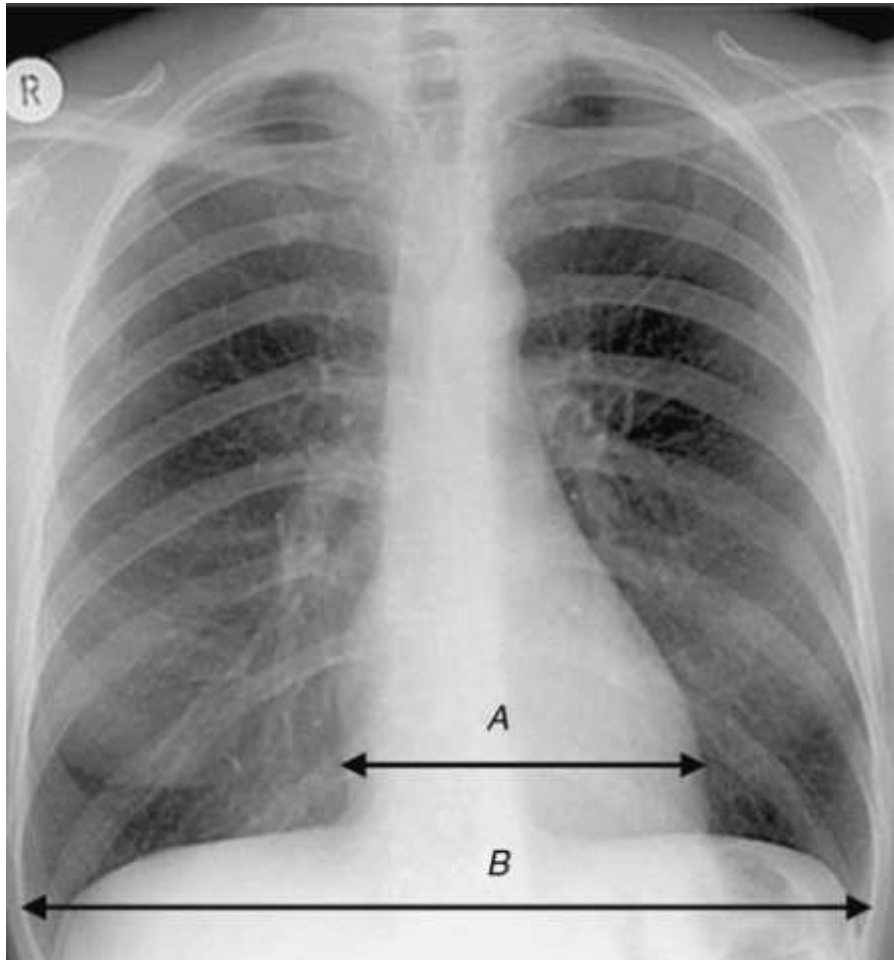


Trachea





Jantung



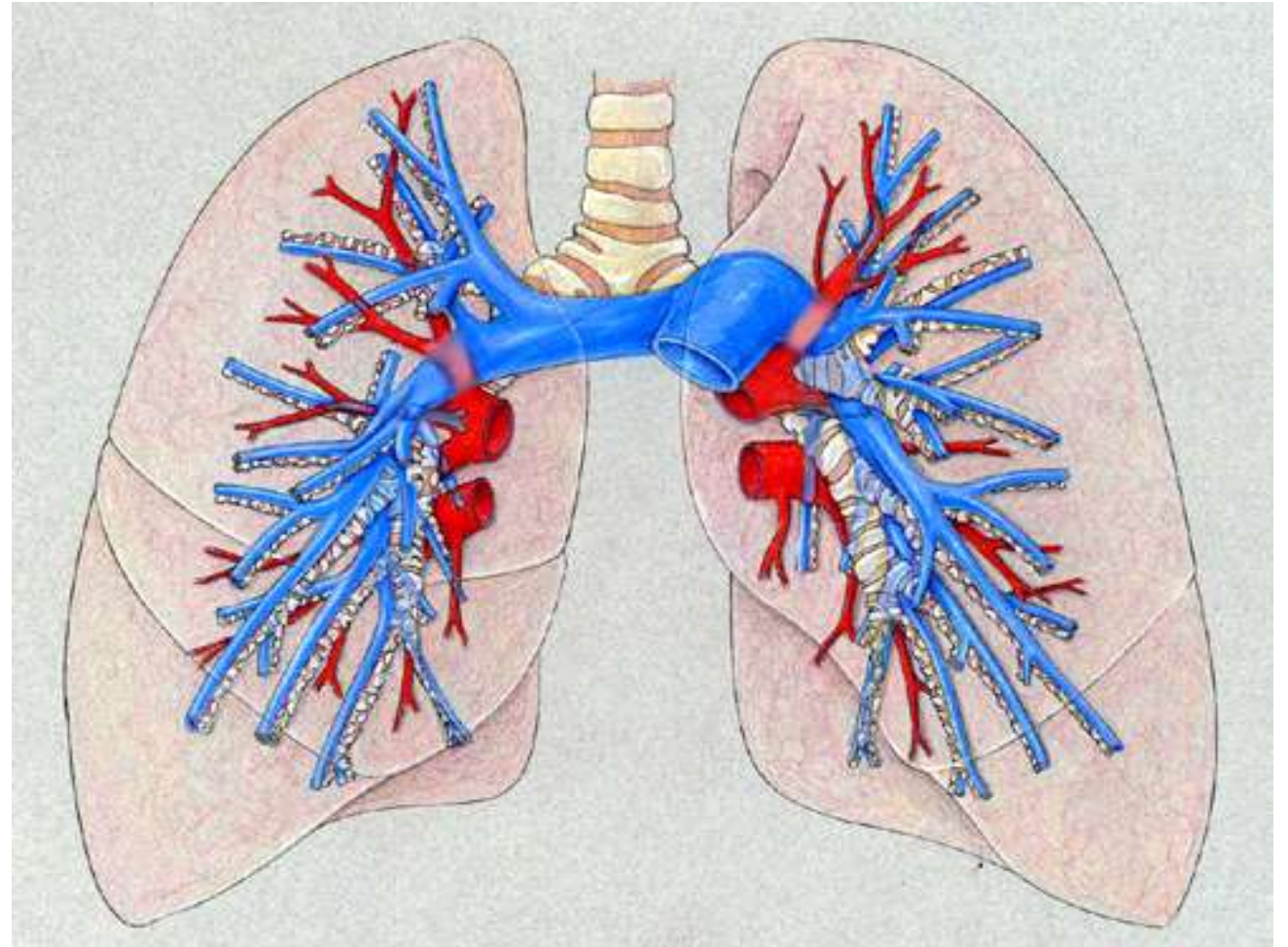
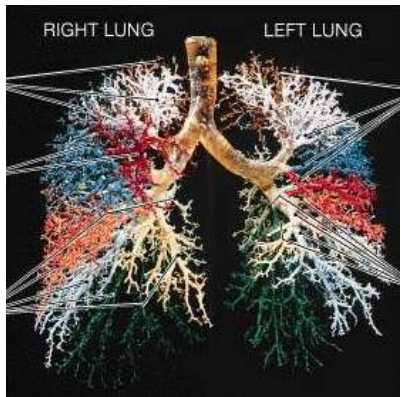
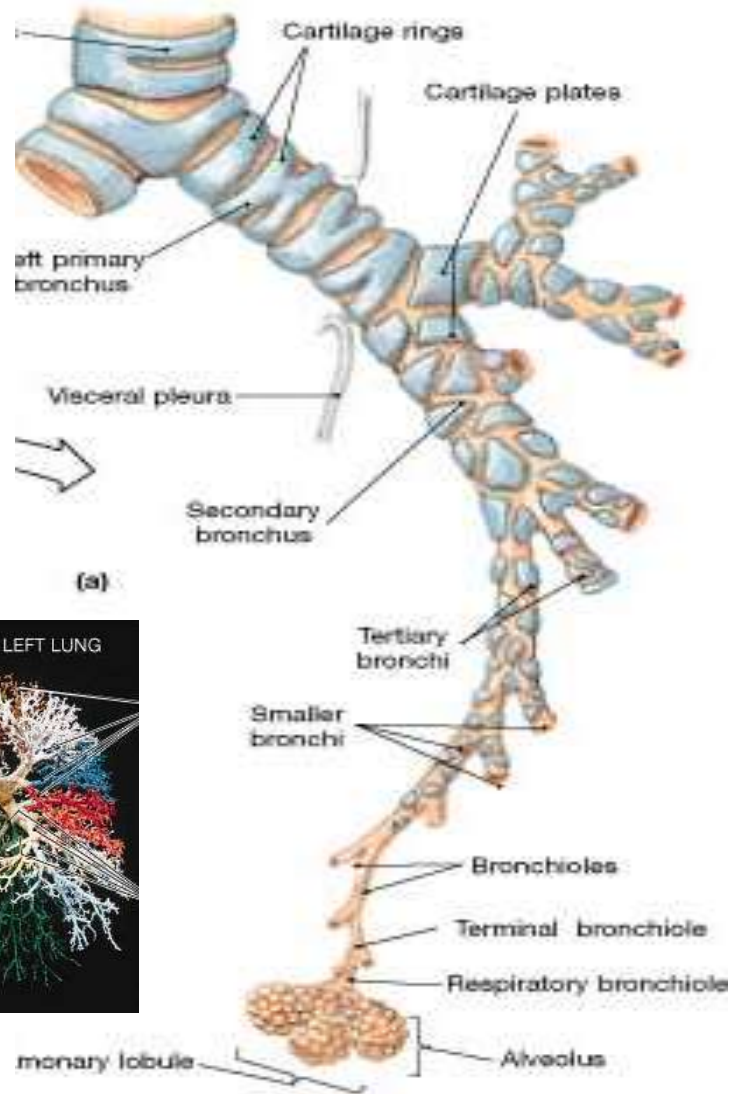


Parenkim paru





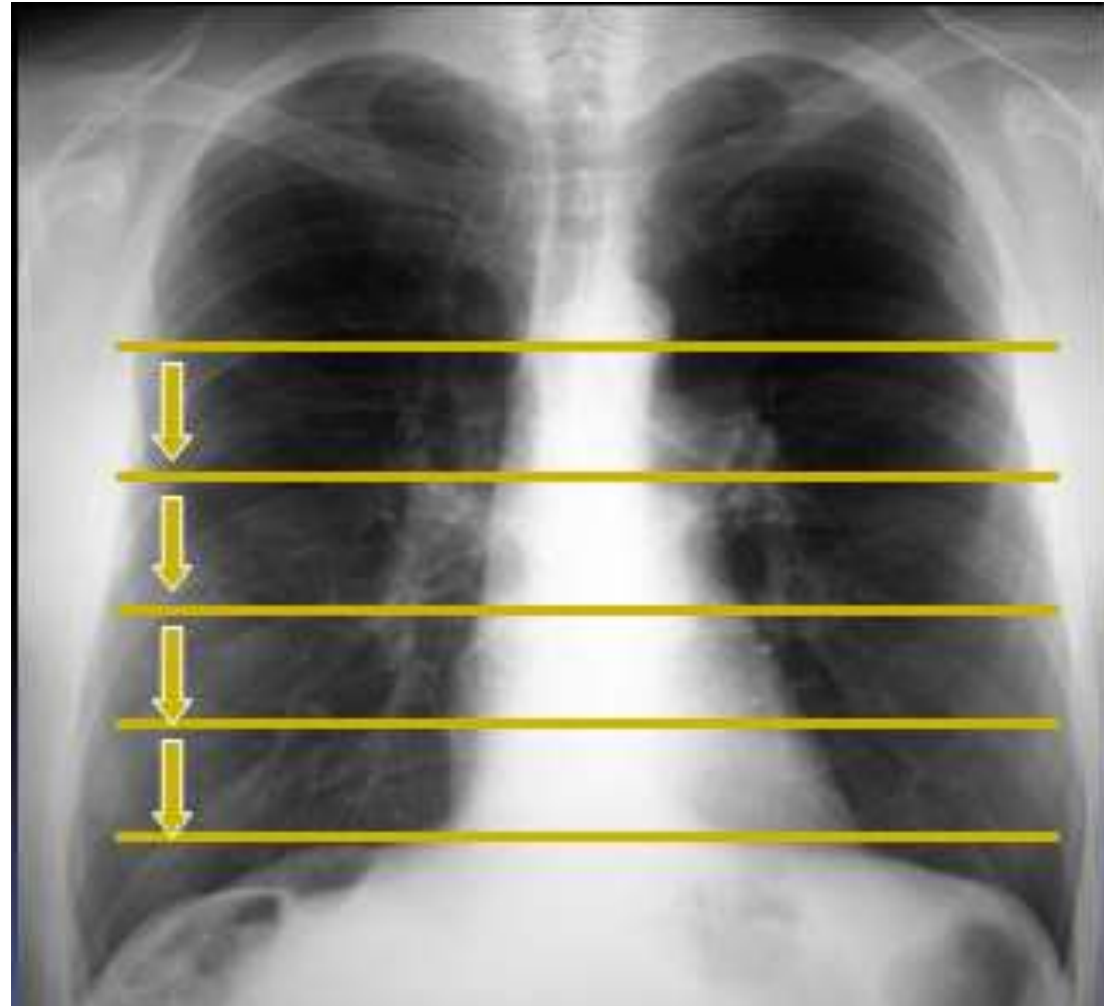
Parenkim paru





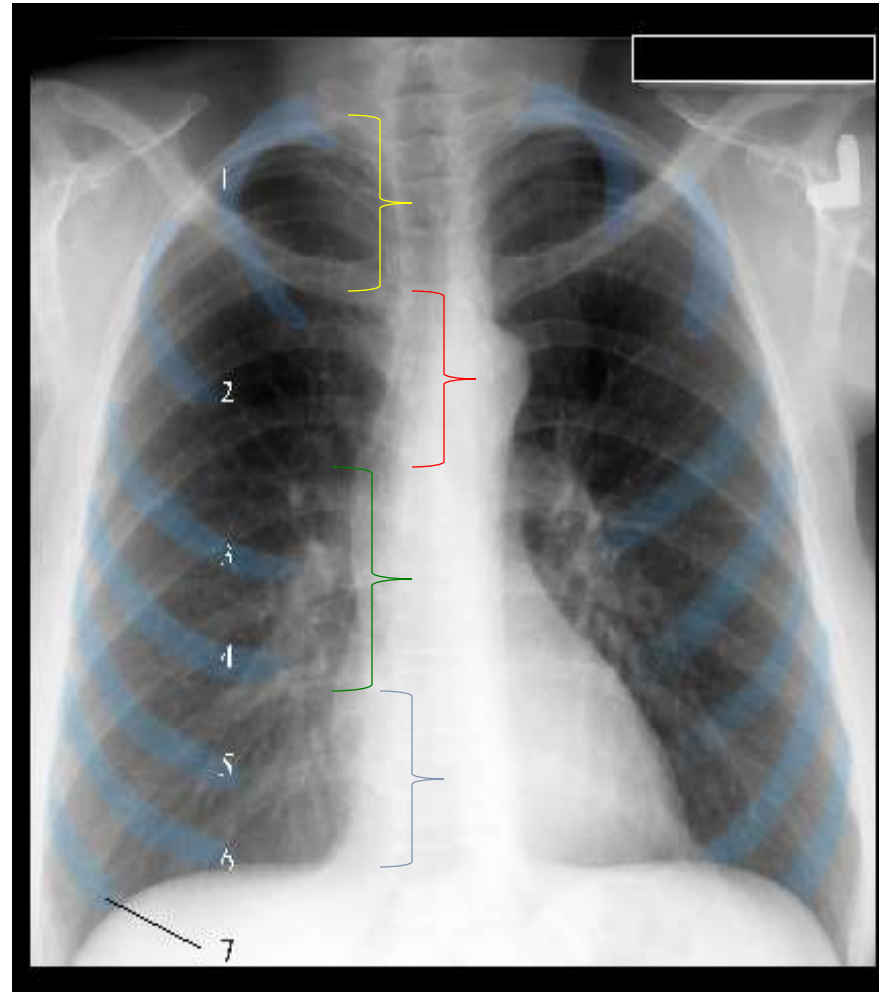
Read the lung parenchyma
« **from top to bottom and
from left to right** ».

- Volume
- Radiodensity
- vascularisation



Lapang paru (lung zones)

- Apeks → puncak paru - klavikula
- Lapang atas → klavikula sampai kosta II depan
- Lapang tengah → kosta II-IV
- Lapang bawah → kosta IV sampai diafragma





Right Lung

The right lung has 3 lobes and two fissures

Lobes

Right Upper Lobe (RUL)

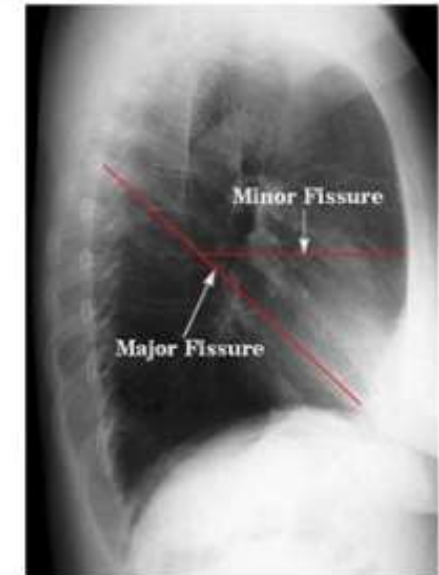
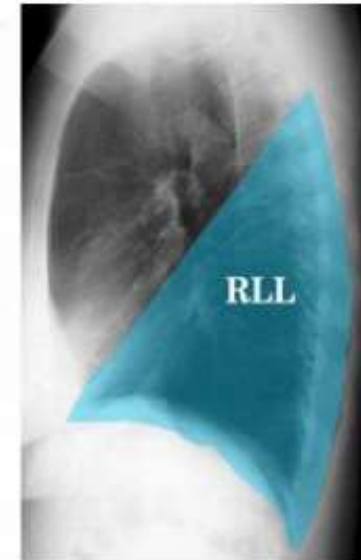
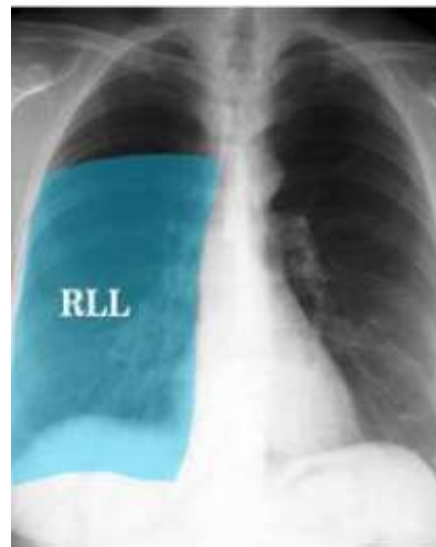
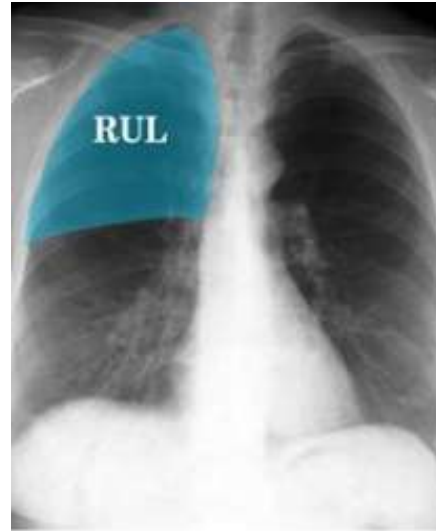
Right Middle Lobe (RML)

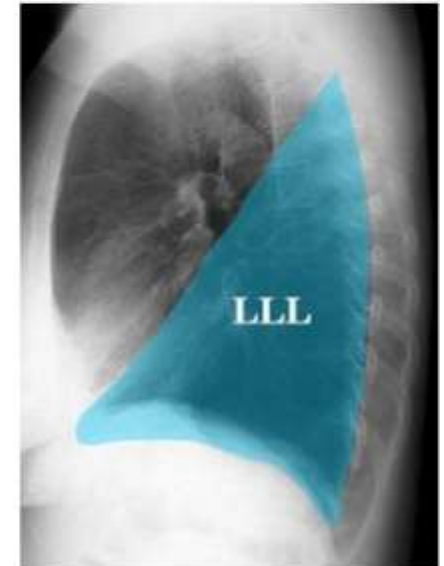
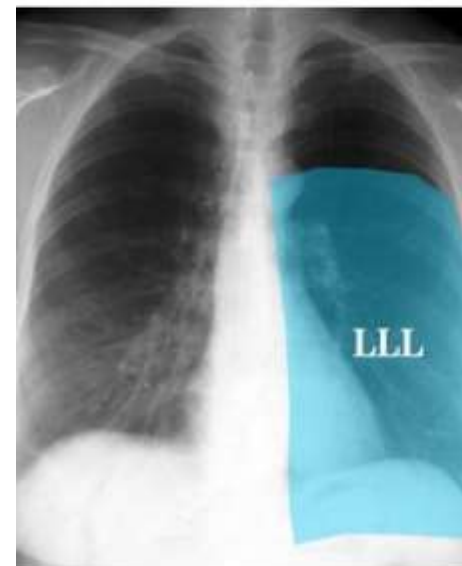
Right Lower Lobe (RLL)

Fissures

Major Fissure (aka oblique fissure)

minor fissure (horizontal fissure)





The left Lung is Comprised of two lobes which are divided by one fissure

Lobes

Left Upper Lobe (LUL)

Left Lower Lobe (LLL)

Fissures

Major Fissure

Hilus

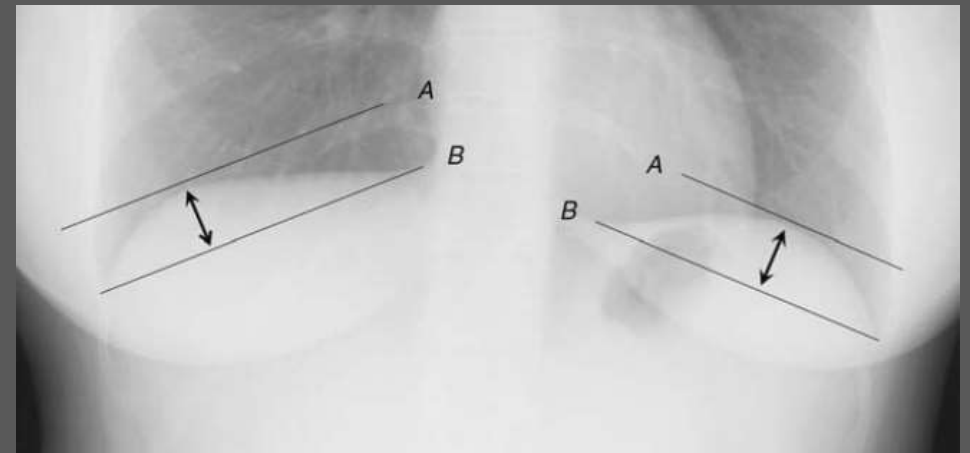
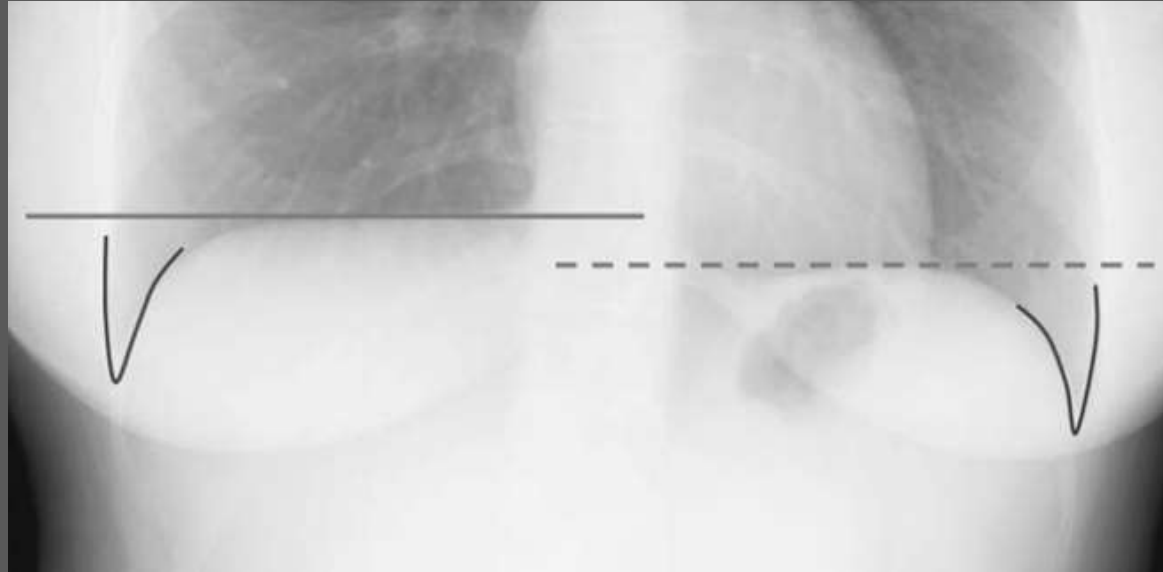
- Tempat keluar masuknya *pembuluh darah (a/v), bronkus, limfa*
- Berukuran $\pm 1,5$ cm
- Pada foto toraks “diwakili” a. pulmonalis





DIAFRAGMA

- Diafragma kanan lebih tinggi dari kiri
- Perbedaannya 2.5 cm → lebih dari 3 cm berarti abnormal
- Lihat: *Free air, gastric bubble, pleural effusions*



Assess for diaphragmatic flattening. The distance between A and B should be at least 1.5 cm.



Skeletal

- Clavicula
- Scapula
- Costa anterior/posterior
- Vertebra thoracal 4

Soft tissue

- Supraclavicular
- Axilla
- Chest wall lateral



Lesi

- **Pembercakan (patchy)**
 - Bercak/noda keras/fibrotik
 - Infiltrat/Bercak lunak
- **Perselubungan:**
 - **Konsolidasi (fluffy/cloudlike/hazy)**
 - **Perselubungan opak (atelektasis)**
- **Massa**
 - *Ukuran > 3 cm*
- **Nodul**
 - Halus/Milier: < 0,5
 - Kecil: 0,5-2 cm
 - Besar: 2-3 cm
- **Bentuk lesi**
(kalau bentuknya nodul harus diukur)
 - Jumlah
(yang dapat dihitung)
 - Distribusi
 - Lokasi



Lesi

Intrathoracal

Extrathoracal

Intrapulmonal

Ekstrapulmonal

Intrapulmonal

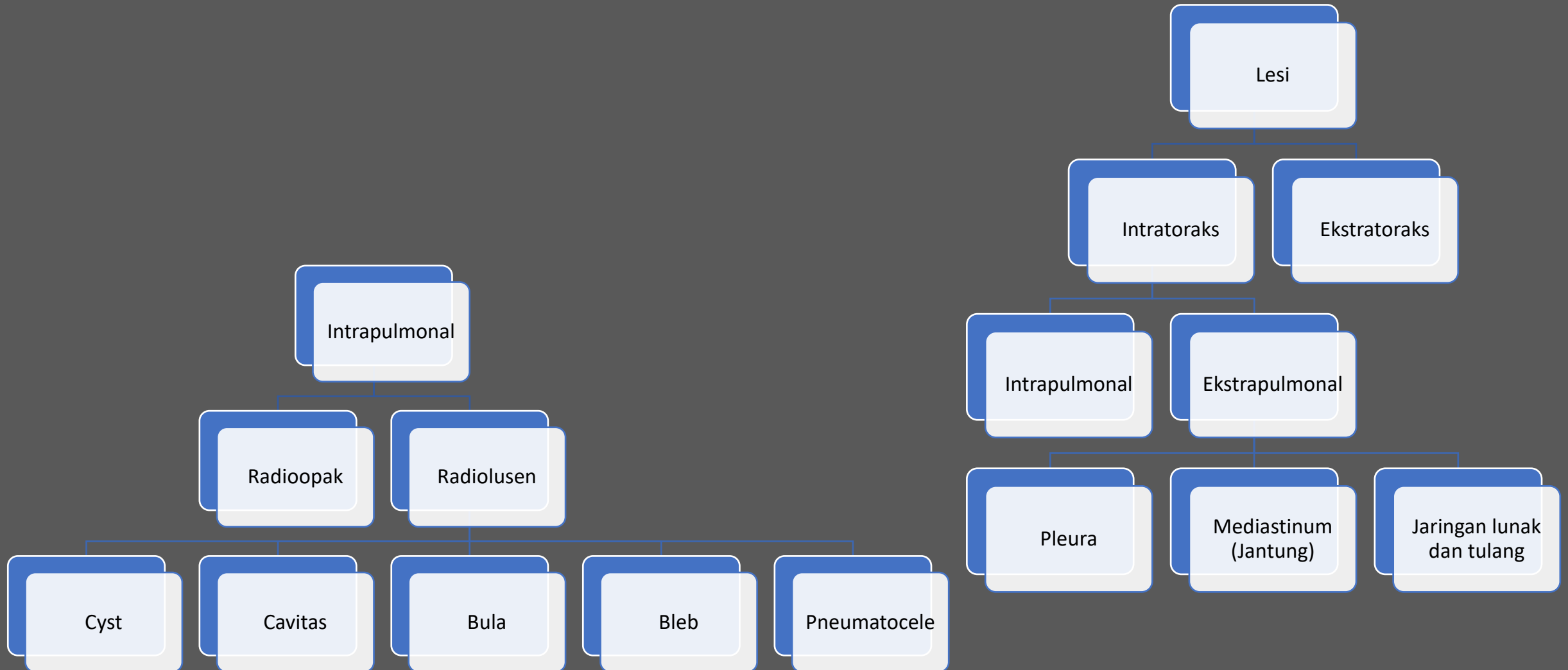
Radiopak

Radiolusen

Infiltrat

Konsolidasi

Nodul





*Thank
you*



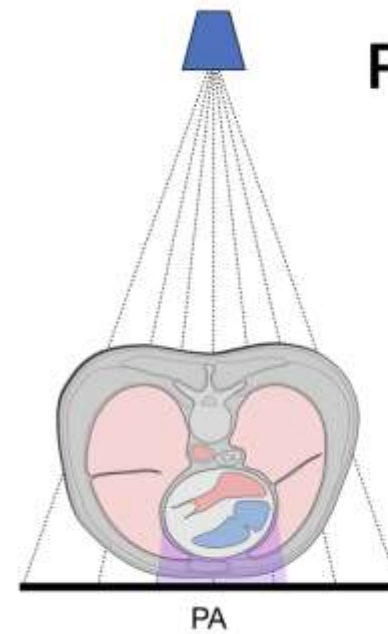




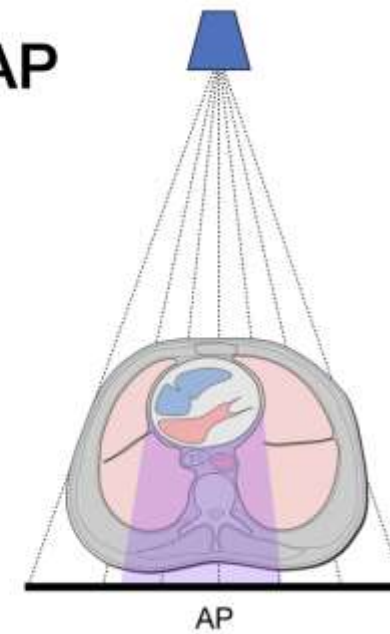


- Caption: Comparing the posterior-anterior and anterior-posterior radiographic techniques. Observe magnification of the heart (pink area)

Illustration of



PA vs AP



ch

PA vs AP

- Caption: Normal technique produces a PA erect chest radiograph with less magnification of the heart and the scapulae away from the lung fields.
- Illustration credit: Radiopaedia



PA erect



AP erect

- Caption: Normal PA and erect AP and the erect technique, but with a degree of widening of the mediastinum
- Illustration credit: Anon

Erect vs supine



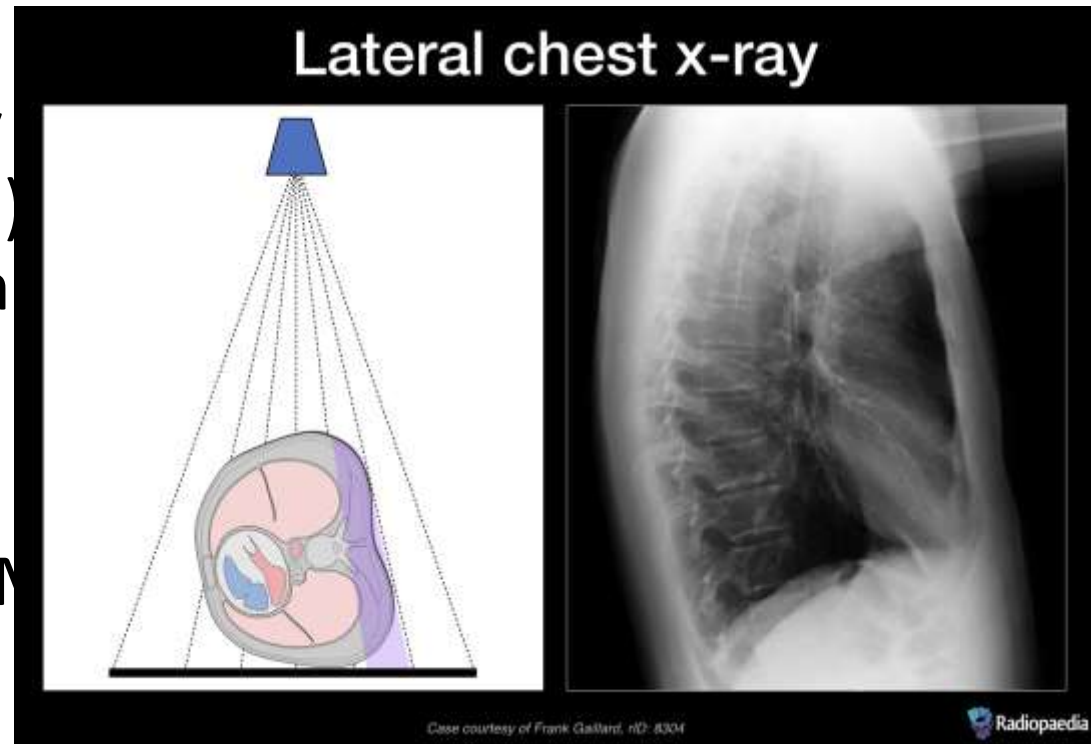
PA erect



Supine



- Caption: Lateral chest x-ray right anterior oblique (RAO) posterior ribs by aligning the shading).
- Illustration credit: Andrew M



right

Inspiration vs expiration

- Caption: Normal inspiration shows how the heart increases in size and becomes more dome-shaped and crowded during expiration. This is an advantage when assessing the pleural space.
- Illustration credit: A



Inspiration



Expiration

Case courtesy of Dr Balint Botz, ID: 55560



Chest x-ray review: ABCDE

Last revised by [Hector Lopez-Cardona](#) on 14 Nov 2023

[Edit article](#)

Citation, DOI, disclosures and article data

Chest x-ray review is a key competency for medical students, junior doctors and other allied health professionals. Using A, B, C, D, E is a helpful and systematic method for [chest x-ray review](#):

- A: airways
- B: breathing (the lungs and pleural spaces)
- C: circulation (cardiomediastinal contour)
- D: disability (bones - especially fractures)
- E: everything else, e.g. pneumoperitoneum

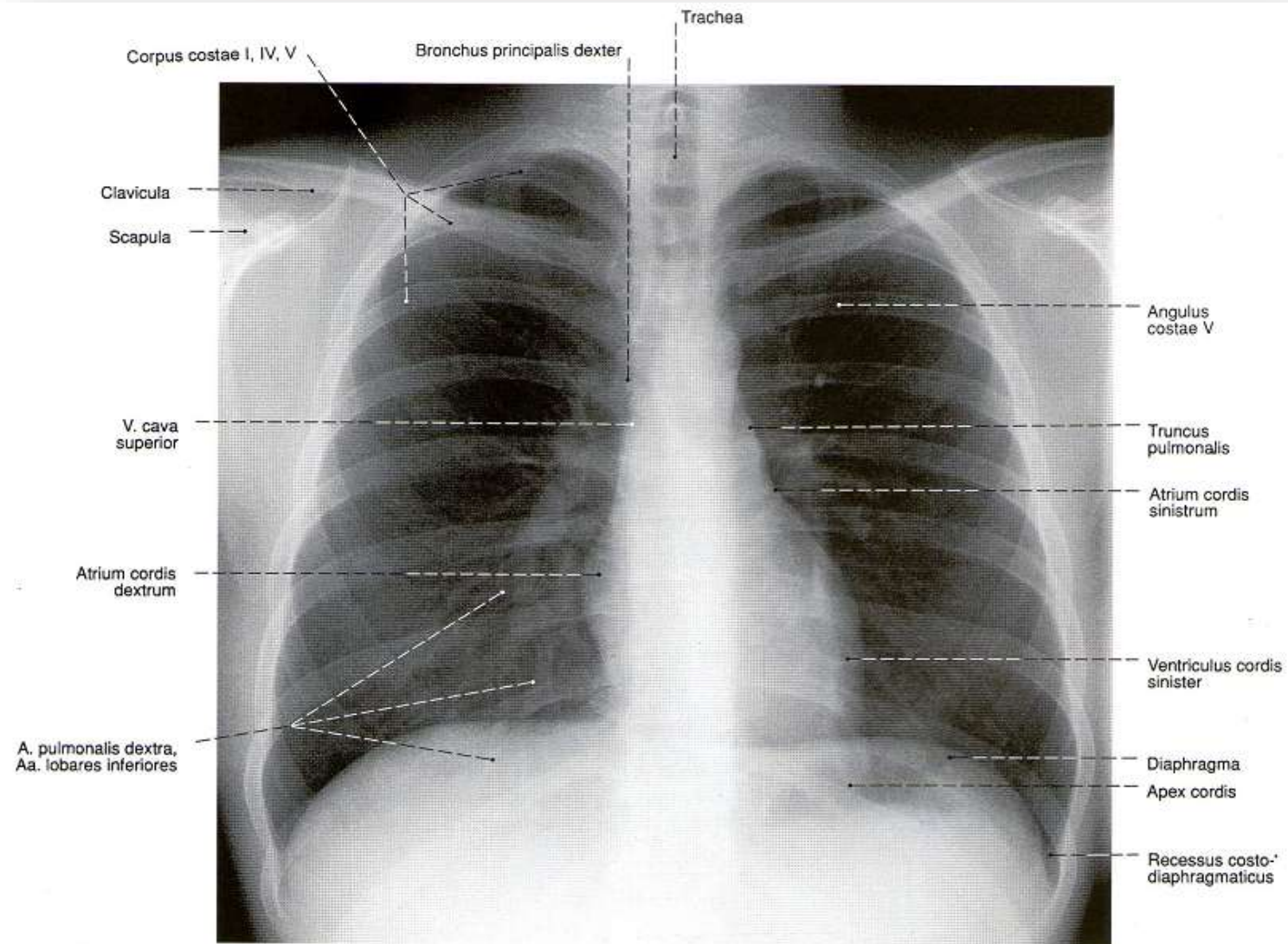
Summary

Airways

Start at the top in the midline and review the airways.

- trace down the trachea to the carina
 - is it straight and midline?
 - is there any narrowing?
- trace down both main bronchi
 - is the carina wide (more than 100 degrees)?

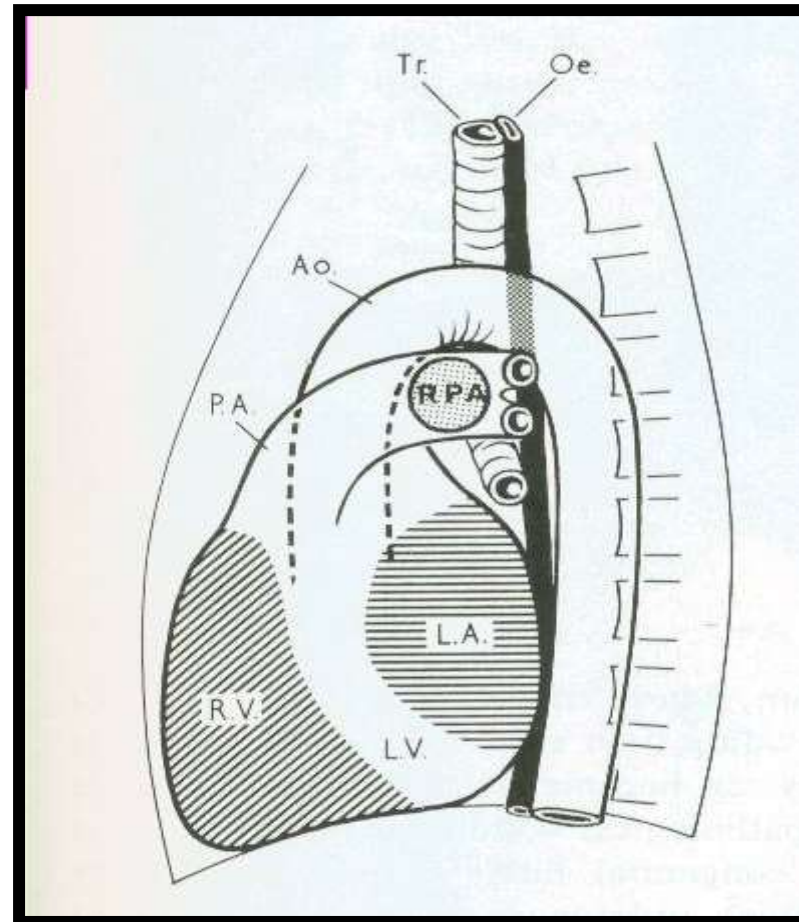
RONTGEN THORAX PROYEKSI PA



PROYEKSI PA

- Batas kanan jantung dibentuk oleh:
 - Aorta ascenden (di bagian atas)
 - Atrium kanan (di bagian bawah)
 - Kadang tepat dibawah atrium kanan bisa tampak sedikit bayangan dari tepi kanan vena cava inferior.
- Batas kiri jantung dibentuk oleh:
 - Arcus aortae (di bagian atas) disebut aortic knob/aortic knuckle.
 - Appendage atrium kiri (auricula atrium) ada diantara aortic knob dan ventrikel kiri.
 - Tepat dibawah aortic knob diatas apppendage atrium kiri, samar-samar ada bayangan truncus pulmonalis & arteri pulmoner kiri.
- Ventrikel kiri (di bagian bawah)
 - Bayangan apeks jantung disini adalah bayangan apeks dari ventrikel kiri.

RONTGEN THORAX PROYEKSI LATERAL



PROYEKSI LATERAL KIRI

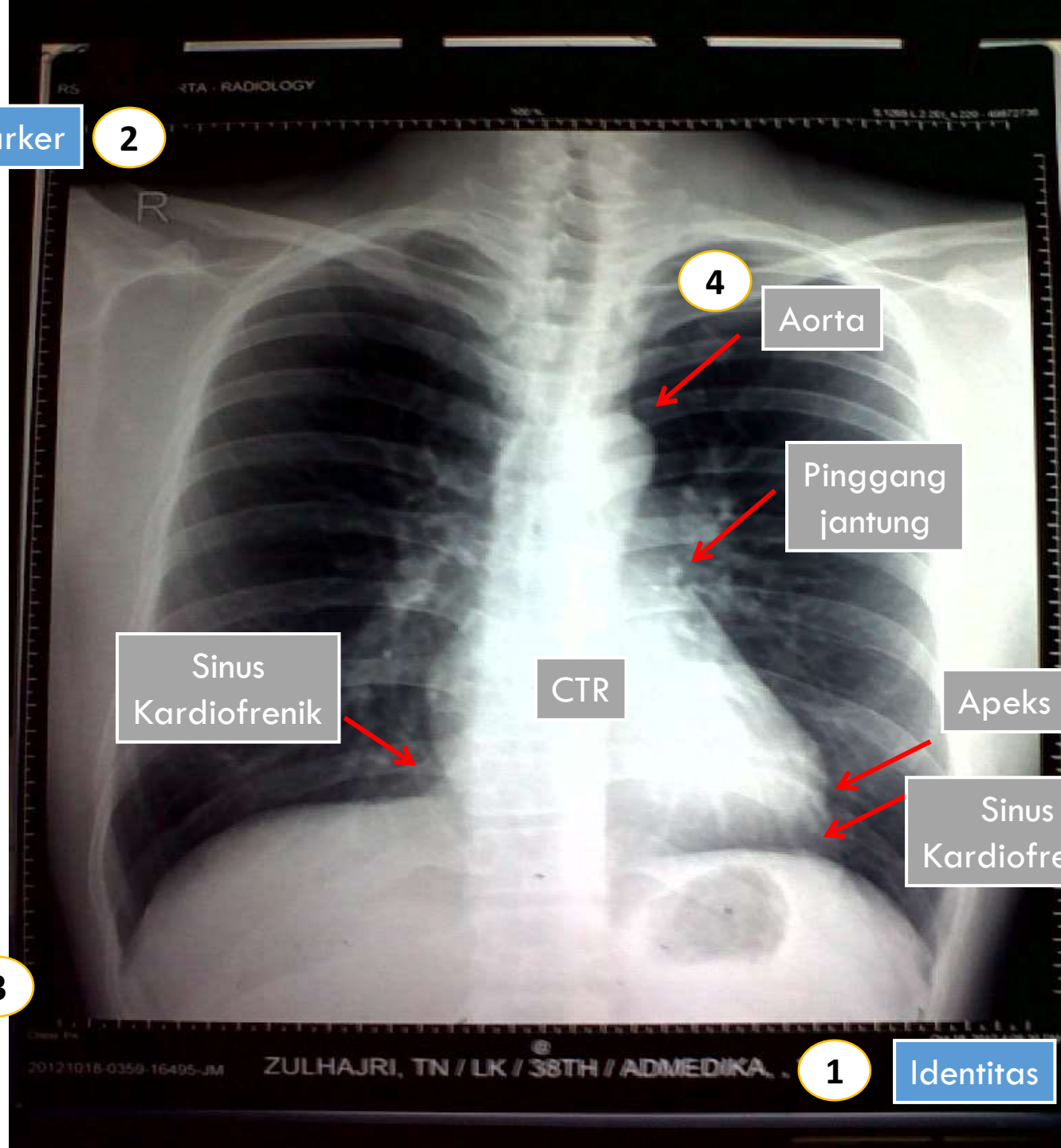
- Batas anterior jantung dibentuk oleh:
 - Aorta ascenden (di bagian atas)
 - Dibawahnya ada appendage atrium kanan, adalah satu-satunya bagian atrium kanan yang tampak di anterior pada proyeksi lateral.
 - Trunkus pulmonalis bagian proksimal, diantara aorta ascenden dengan dinding depan ventrikel kanan.
 - Ventrikel kanan (di bagian bawah, di belakang sternum)
 - Normalnya, ventrikel kanan mengisi $1/3$ bagian bawah retrosternal space, yang juga $1/3$ tinggi sternum. Retrosternal space di atasnya menunjukkan densitas hitam.

PROYEKSI LATERAL KIRI

- Batas posterior jantung dibentuk oleh:
 - Atrium kiri (di bagian atas, menempel setinggi $1/3$ bagian tengah esophagus)
 - Ventrikel kiri (setinggi $1/3$ bawah esophagus)
 - Bayangan vena cava inferior membatasi bayangan jantung paling belakang.
 - Di bagian bawah, sedikit diatas bayangan vena cava inferior, tampak sedikit bagian dari atrium kanan.

Marker

2



Jenis Foto dan Posisi

3

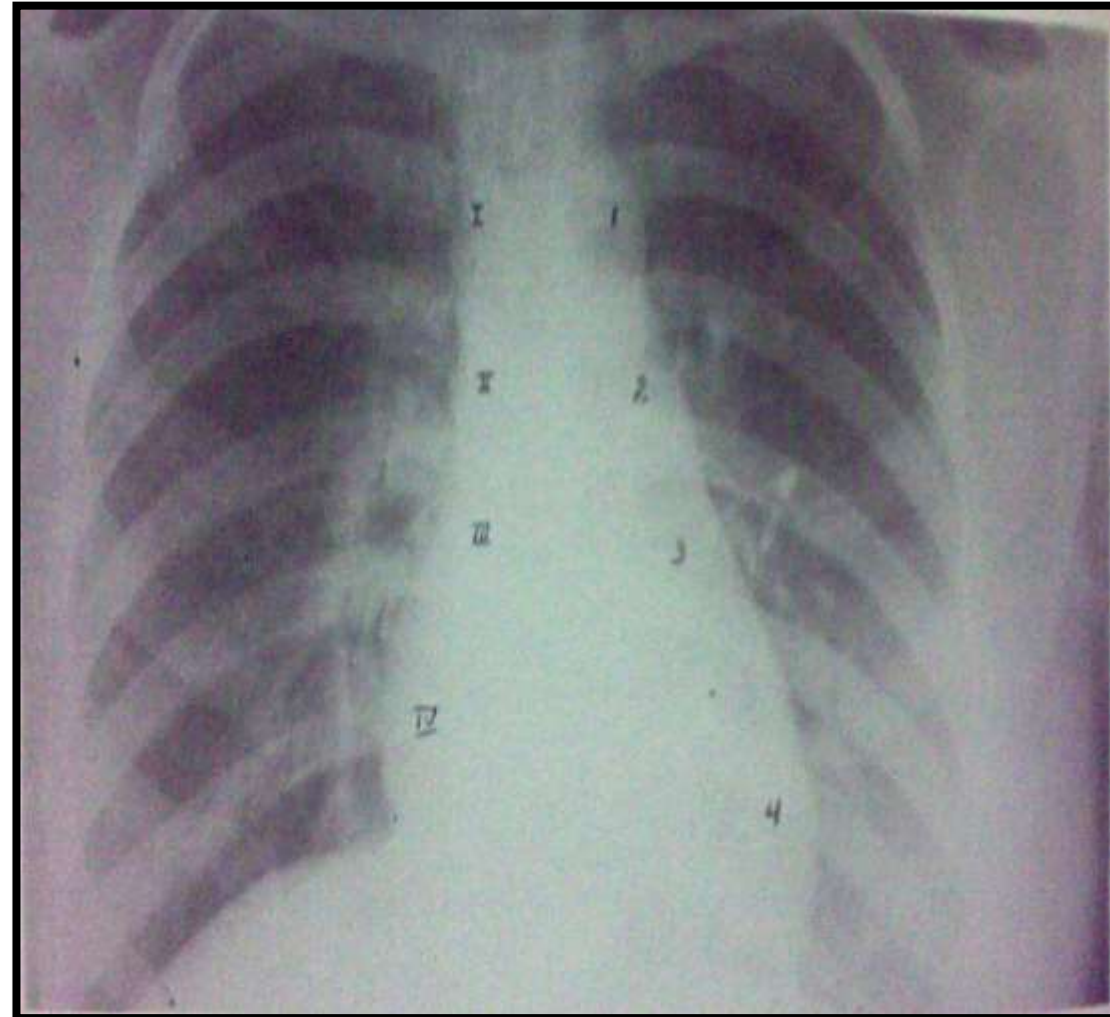
Identitas

1

BATAS DINDING JANTUNG

FOTO THORAX POSISI PA

- Batas Kanan Jantung
 - Tonjolan I
 - Vena cava superior
 - Tonjolan II
 - Aorta
 - Tonjolan III
 - Vena azygos
 - Tojolan IV
 - Atrium kanan
- Batas Kiri Jantung
 - Tonjolan 1
 - arcus aorta
 - Tonjolan 2
 - Arteri Pulmonalis
 - Tonjolan 3
 - Aurikel atium kiri
 - Tojolan 4
 - Ventrikel kiri



URUTAN EXPERTISE JANTUNG

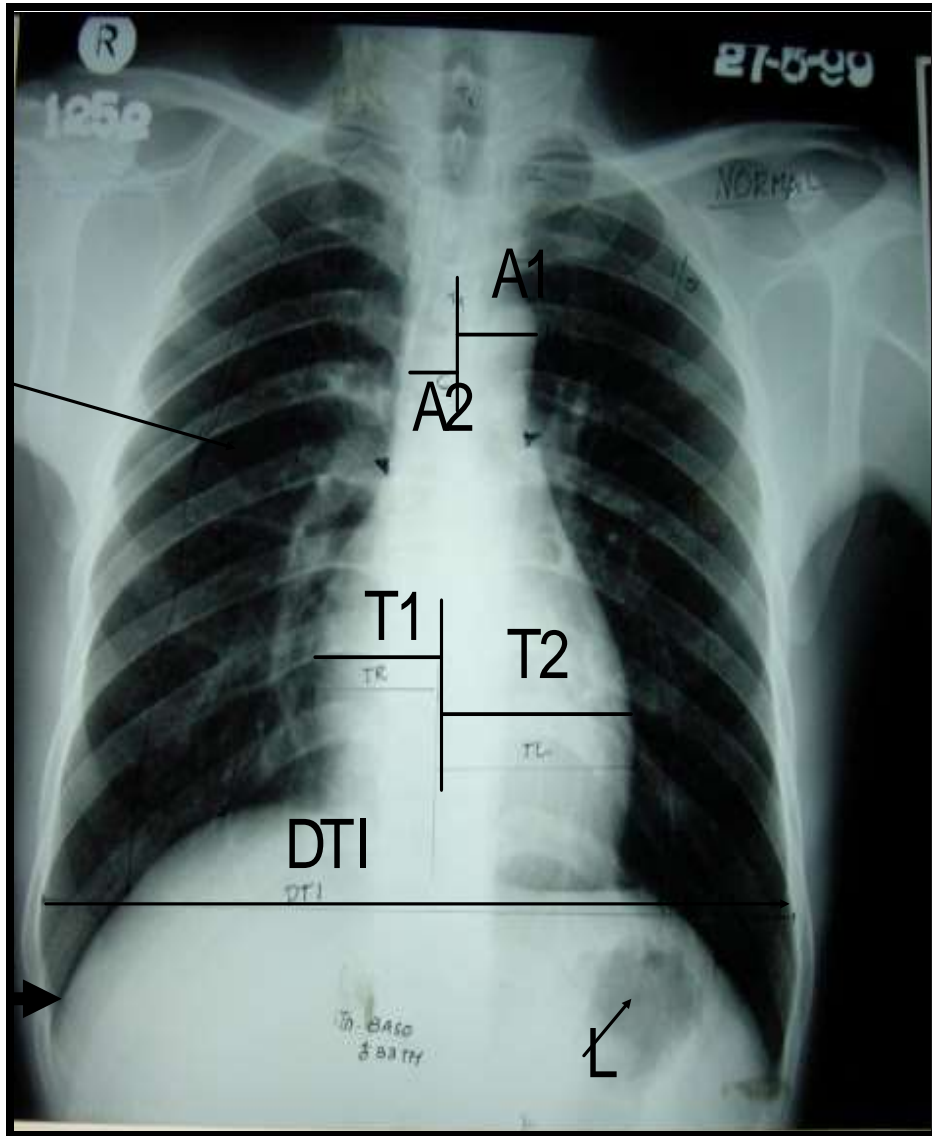
- CTR (Membesar)
- Apeks (Tertanam, Terangkat)
- Pinggang Jantung (N, Mendatar)
- Aorta (Elongasi, Dilatasi, Kalsifikasi)
- Sinus Kardiofrenik (Tajam, Tumpul)

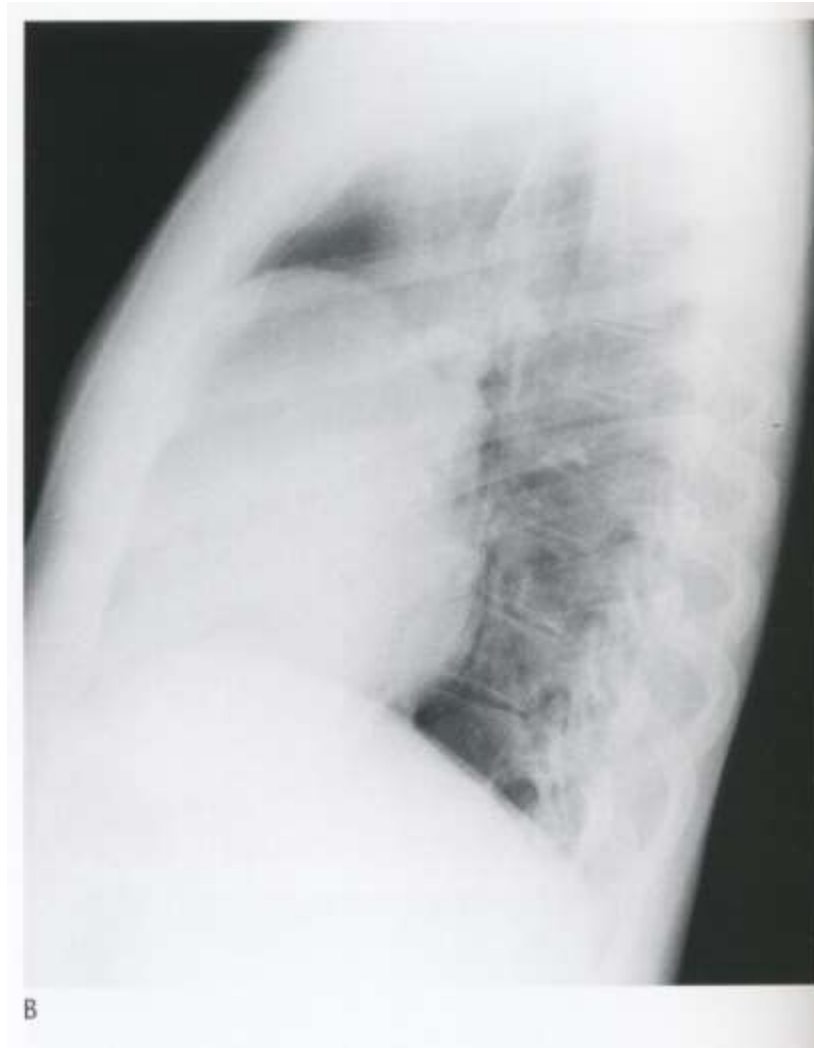
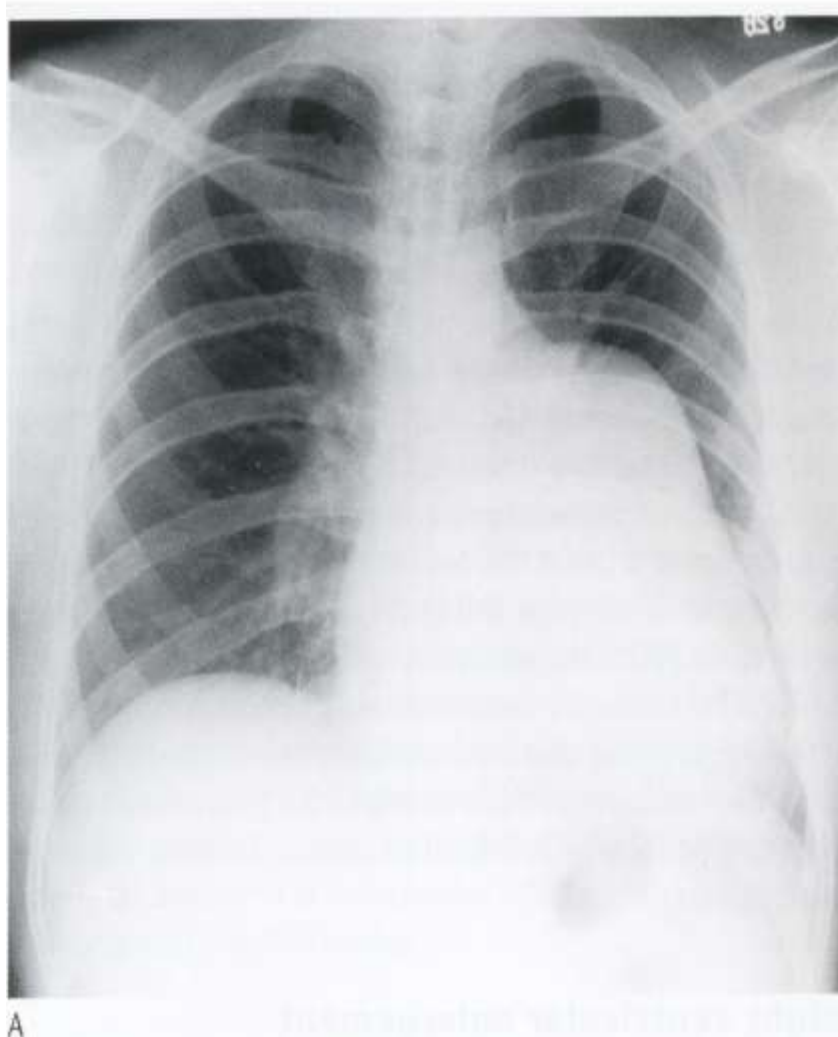
Kesan : Cor tidak membesar

Tanda radiologis pembesaran bagian jantung

- **Pembesaran Atrium Kanan (RAE)**
 - diameter transversa kanan jantung (T1) dibagi dengan diameter hemithorax kanan lebih dari $\frac{1}{3}$
- **Pembesaran Atrium Kiri (LAE)**
 - Double contour (kontur ganda)
 - Aurikel kiri menonjol
 - Main Bronchus kiri terangkat

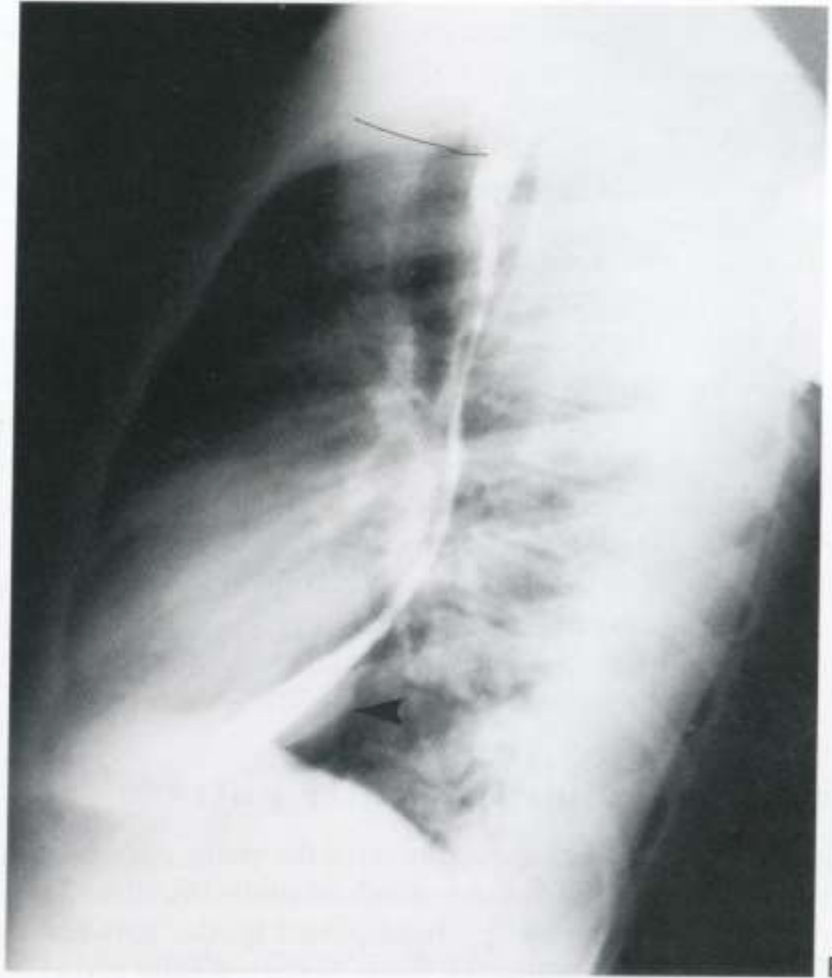
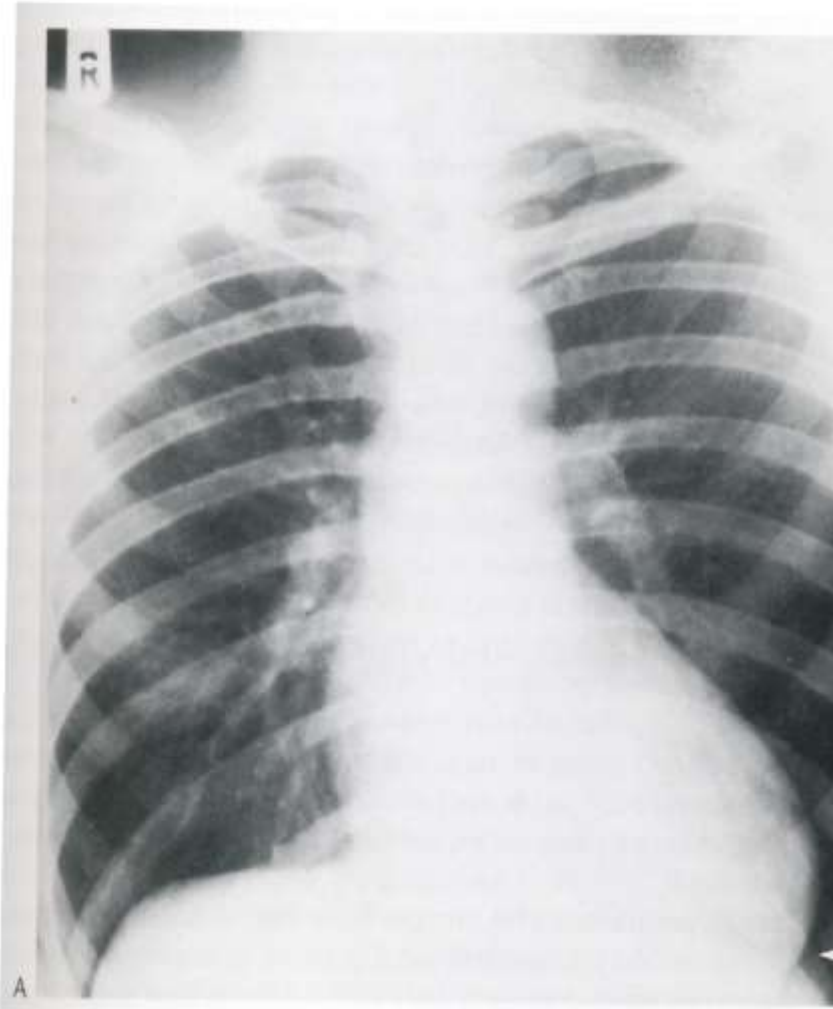
- **Pembesaran Ventrikel kanan (RVH)**
 - Jantung melebar ke kiri dengan apex yang terangkat
 - Retrosternal Clear space menyempit
- **Pembesaran Ventrikel kiri (LVH)**
 - Jantung melebar kekiri dengan apex yang tertanam
 - Retrocardial Clear Space menyempit





Pembesaran ventrikel kanan (RVH)

- A. Pembesaran terlihat penonjolan di bagian kiri antara kontur ventrikel kiri dan pulmonary outflow tract
- B. Retrosternal clear space menyempit



Pembesaran ventrikel kiri (LVH)

- A. Jantung melebar ke kiri dengan apex tertanam
- B. Jantung melebar ke posterior menyebabkan retrocardiac clear space menyempit

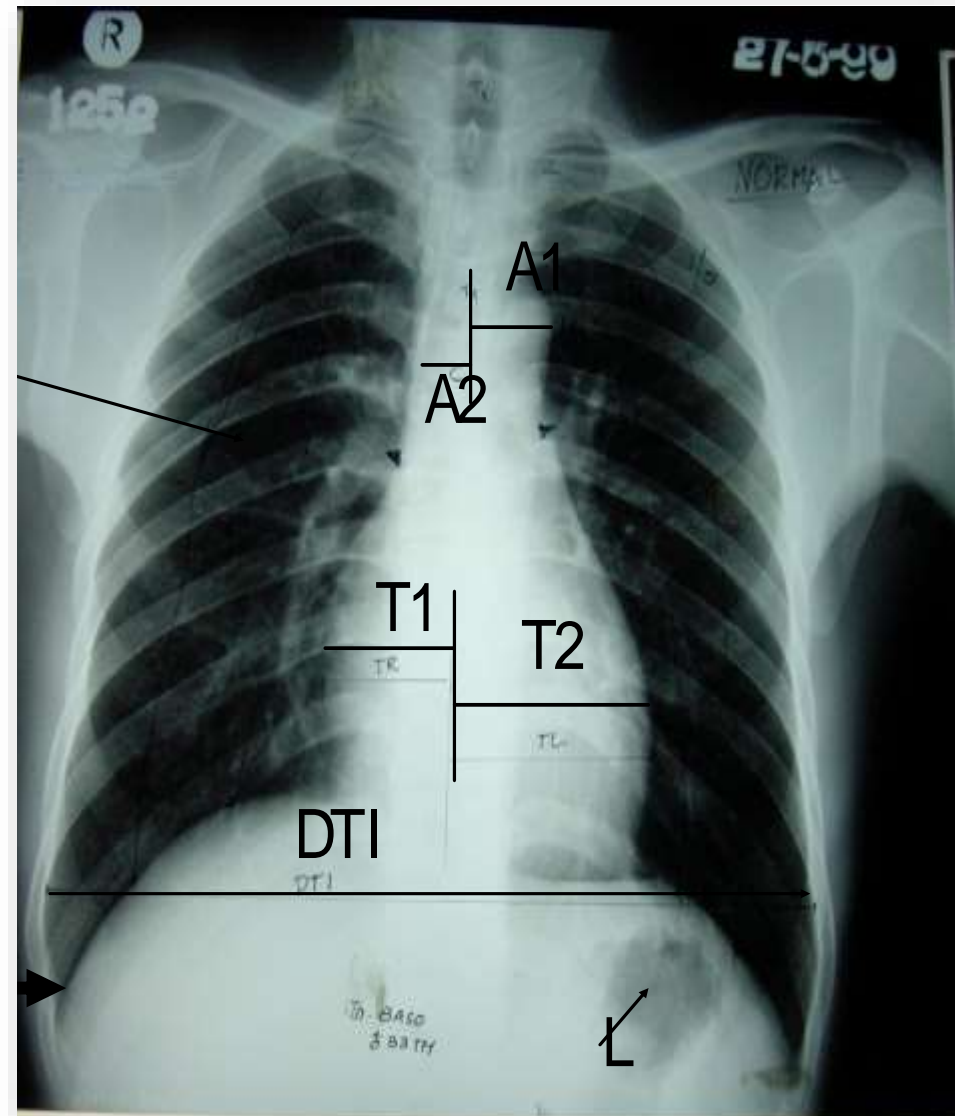
PENGUKURAN JANTUNG (*CARDIO-THORACIS RATIO* = **CTR)**

$$\bullet \text{ CTR} = \frac{T1 + T2}{DTI} = \pm 50 \%$$

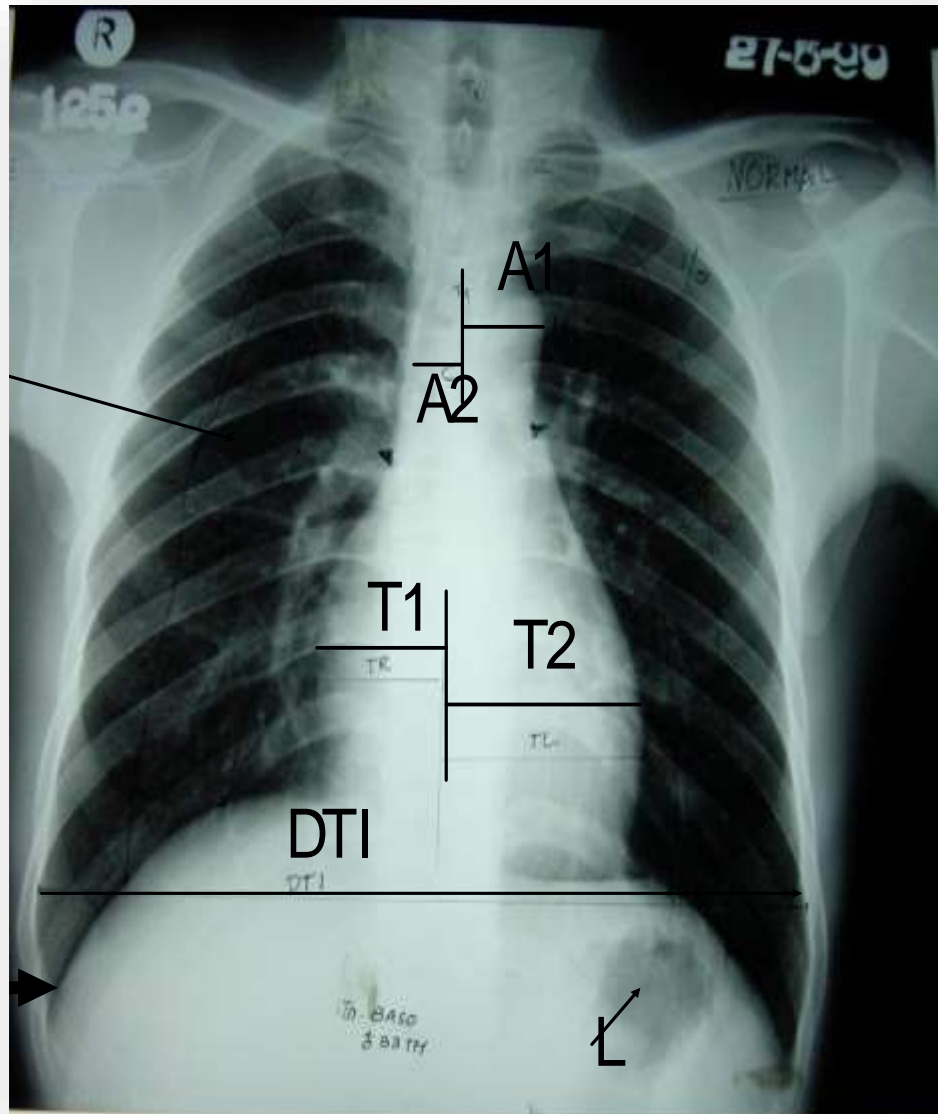
• Normal = 48-50 %

• Anak-anak 60 %

• Ukuran Jantung → dinyatakan dengan cardiac Index = diameter transversa jantung dibagi dengan diameter thorax bagian dalam



GAMBARAN NORMAL



CTR

Aorta

Apakah melebar / tidak

Ukuran normal aorta 3-4 cm

Aneurisma aorta > 4 cm

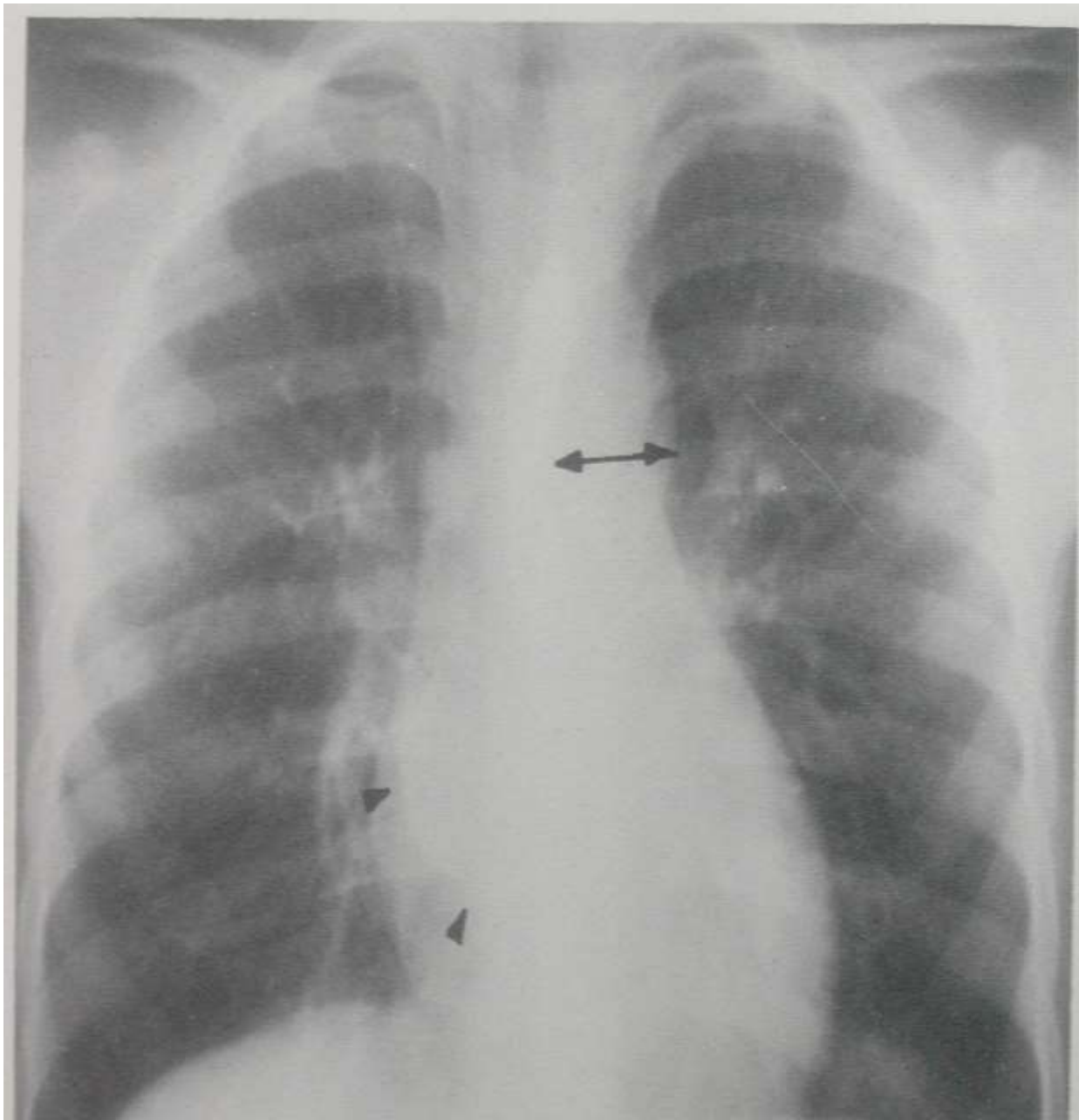
Jarak antara arcus aorta dengan ujung medial clavikula > 1 cm

Elongatio aorta

Kalsifikasi aorta : bayangan radio opaque sejajar permukaan aorta.

- Kelainan Aorta
 - Aorta elongasi
 - Aorta dilatasi







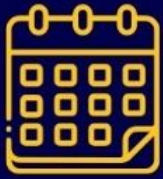
PRODI SPESIALIS PULMONOLOGI & KEDOKTERAN RESPIRASI FK UNMUL

SIMPOSIUM & WORKSHOP TUBERCULOSIS DALAM RANGKA DIES NATALIES FK UNMUL KE-22



Sambutan
Dekan FK Unmul

Problems and Solutions of Tuberculosis Management in Primary Care Setting



2 DESEMBER 2023

WORKSHOP 08.00 -10.00 WITA

SIMPOSIUM 10.15-13.00 WITA

Hotel Senyur Samarinda

SIMPOSIUM :

1. Prof. Dr. dr. Soedarsono, Sp.P(K)
Recent Management of Tuberculosis and
The Problems
2. dr. Fariz Nurwidya, Sp.P(K), Ph.D
Respiratory Symptoms After Tuberculosis:
Problems and Solution
3. dr. Mauritz Silalahi, Sp.P(K), MARS
Tuberculosis Infection Control in Workplace



WORKSHOP:

- How to Interpret Chest X Ray
1. dr Abdul Mu'ti, M.Kes., Sp.Rad
 2. dr. Yudanti, Rastiti, M.Kes., Sp. Rad,

Fasilitas:

- SKP IDI
- Simposiumkit
Sertifikat
- Snack & Lunch



Kuota terbatas
simposium 200
workshop 50

Investasi
Simposium IDR 150 k
Workshop IDR 250 k
Paket IDR 300 k

Thalia Shasa
BNI 755176838
081254799910

<https://bit.ly/SimposiumWSTB>

SIMPOSIUM DAN WORKSHOP TUBERKULOSIS

WORKSHOP		
HOW TO INTERPET CHEST X RAY		
Waktu	Topik	Penanggung jawab
07.30-08.00	Registrasi Ulang Workshop dan Simposium	Panitia
08.00 – 10.00	Workshop How to Interpret Chest X Ray Dr. Abdul Mu'ti, M.Kes, Sp.Rad Dr. Yudanti Riasiti, M.Kes, Sp.Rad (Moderator)	Sie Acara
09.30 - 10.00	Registrasi ulang simposium	Panitia
SIMPOSIUM		
" PROBLEMS AND SOLUTION OF TUBERCULOSIS MANAGEMENT IN PRIMARY CARE SETTING"		
Waktu	Topik	Penanggungjawab
10.00 – 10.30	Pembukaan - Menyanyikan Lagu Indonesia Raya dan Mars FK Unmul - Doa - Sambutan Ketua Panitia - Sambutan Dekan Fakultas Kedokteran Univ. Mulawarman	MC dan sie Acara Mc. Khairunnida Rahma., M.Si
Simposium		
Moderator : dr. Marwan, M.Kes., Sp.P(K)		
10.45 – 11.45	" RECENT MANAGEMENT OF TUBERCULOSIS AND THE PROBLEMS" Prof. Dr.dr. Soedarsono, Sp.P(K)	Sie Acara
11.45 - 12.00	"RESPIRATORY SYMPTOMS AFTER TUBERCULOSIS:PROBLEMS AND SOLUTION " dr. Fariz Nurwidya, Ph.D, Sp.P(K)	
12.00 – 12.30	"TUBERCULOSIS INFECTION CONTROL IN WORKPLACE" dr. Mauritz Silalahi, Sp.P(K), MARS	
12.30 – 13.00	Diskusi tanya jawab	
Penutupan (MC)		