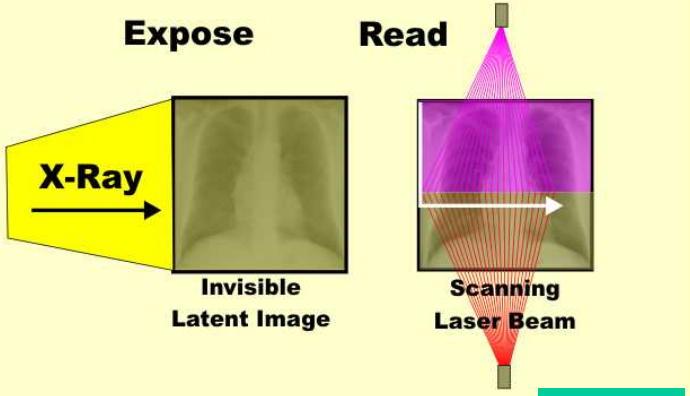
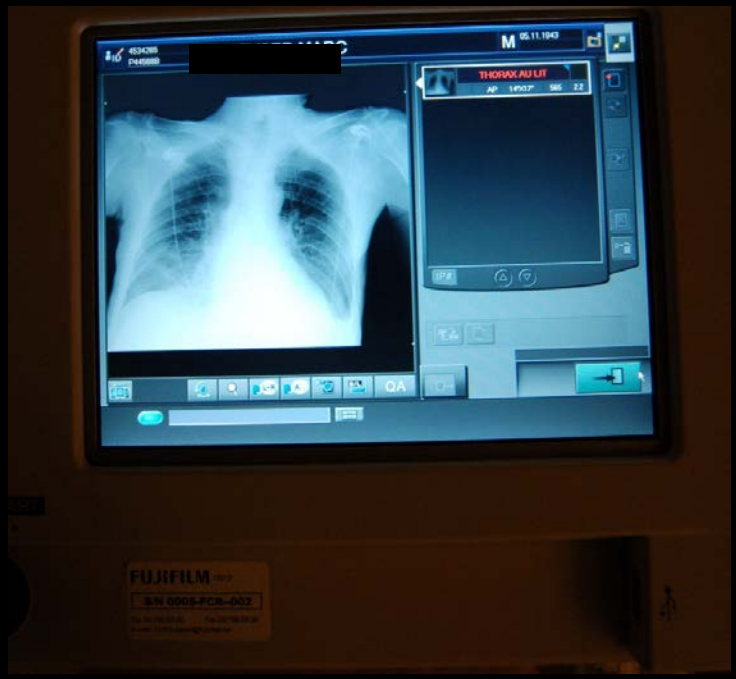
Le thorax chez le patient alité

ORTHO REGULAR
BOBBY
ORTHO REGULAR

Stimulable Phosphor Receptor





Bobbys

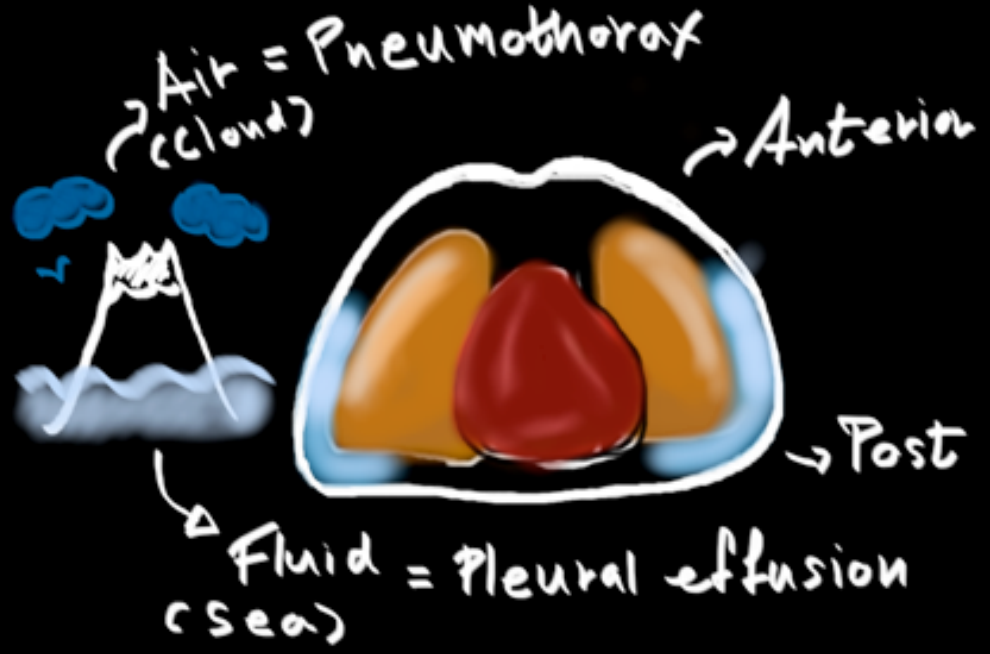
- En position couchée ou semi-assise
- Tube à environ 1m
- Inspiration si possible
- Synchrone au respirateur
- Cassette sensible
- 73 Kv 1.6 mAs
- Expérience du technicien

Assis

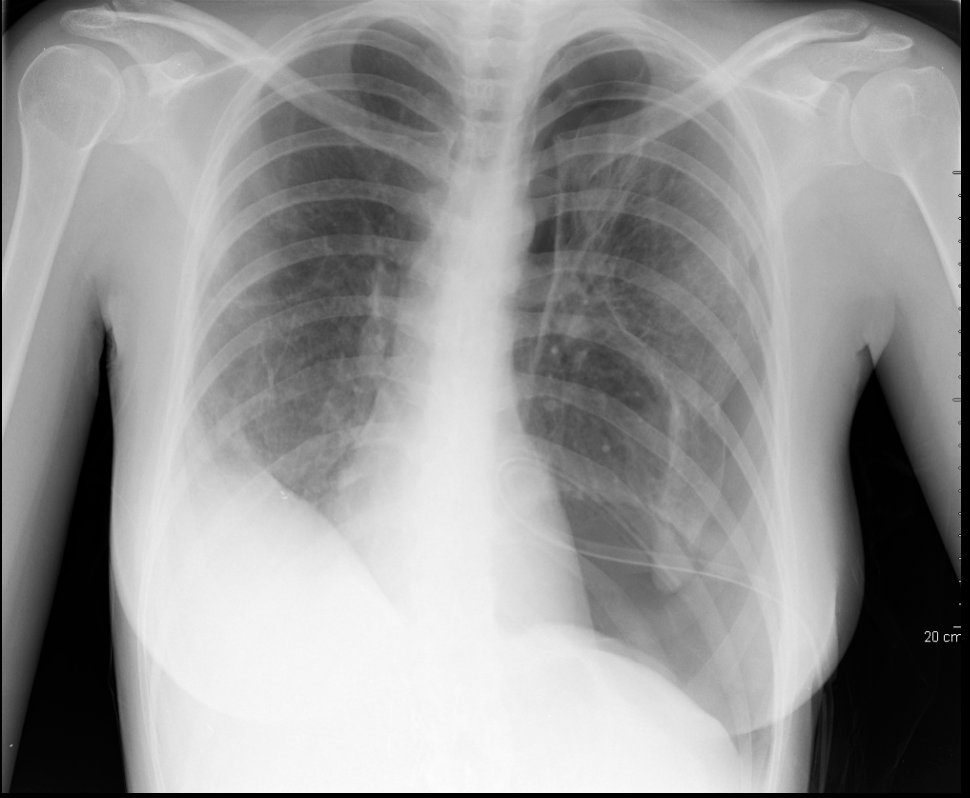
Couché

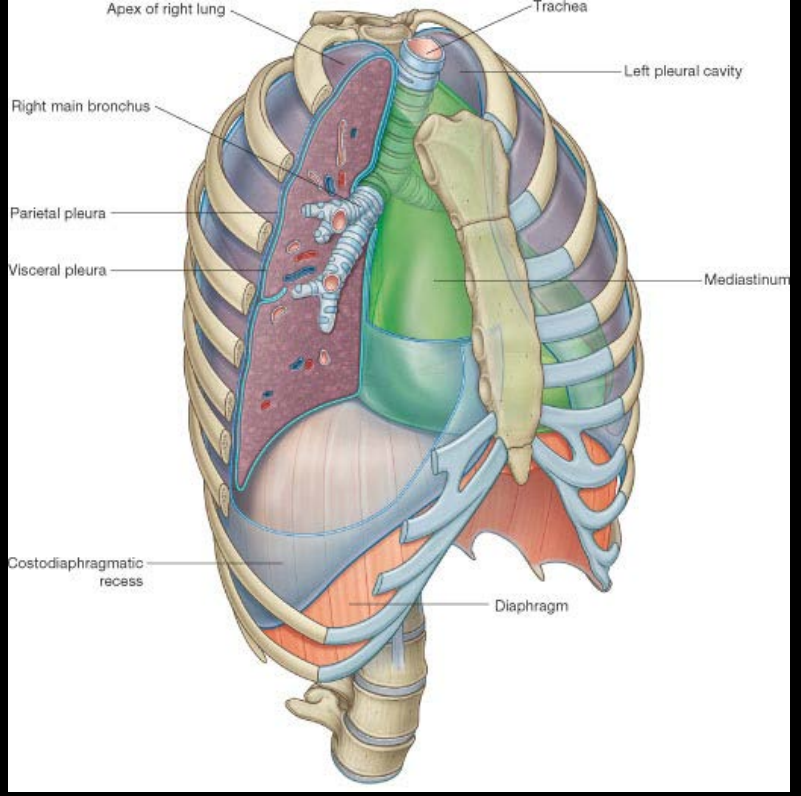
Modifications du thorax en position couchée

- Coeur apparait plus large
- Coupoles ascensionnées
- Côtes horizontalisées
- Arcs antérieurs aggrandis
- Epanchement se répartit dans les parties déclives/ air se collecte dans les parties ant.

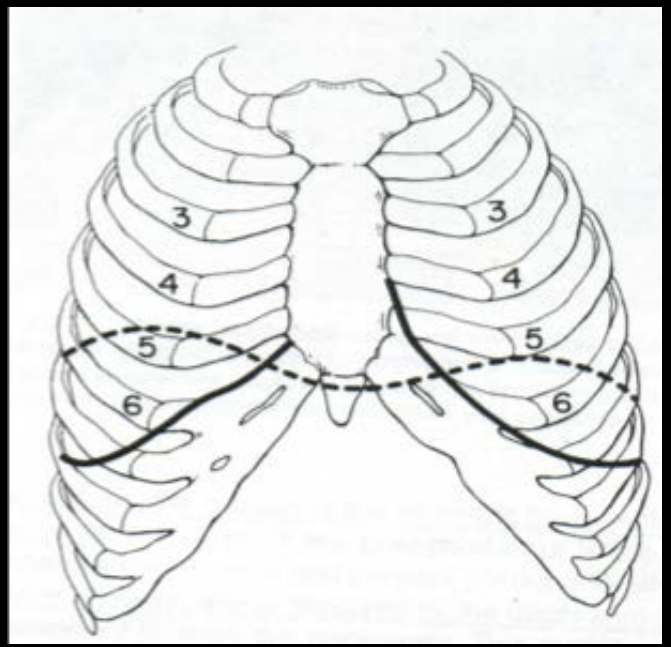

Air = Pneumothorax
(cloud)
Anterior
Post
Fluid = Pleural effusion
(sea)

R


20 cm


Apex of right lung
Trachea
Left pleural cavity
Right main bronchus
Parietal pleura
Visceral pleura
Mediastinum
Costodiaphragmatic recess
Diaphragm

PNO

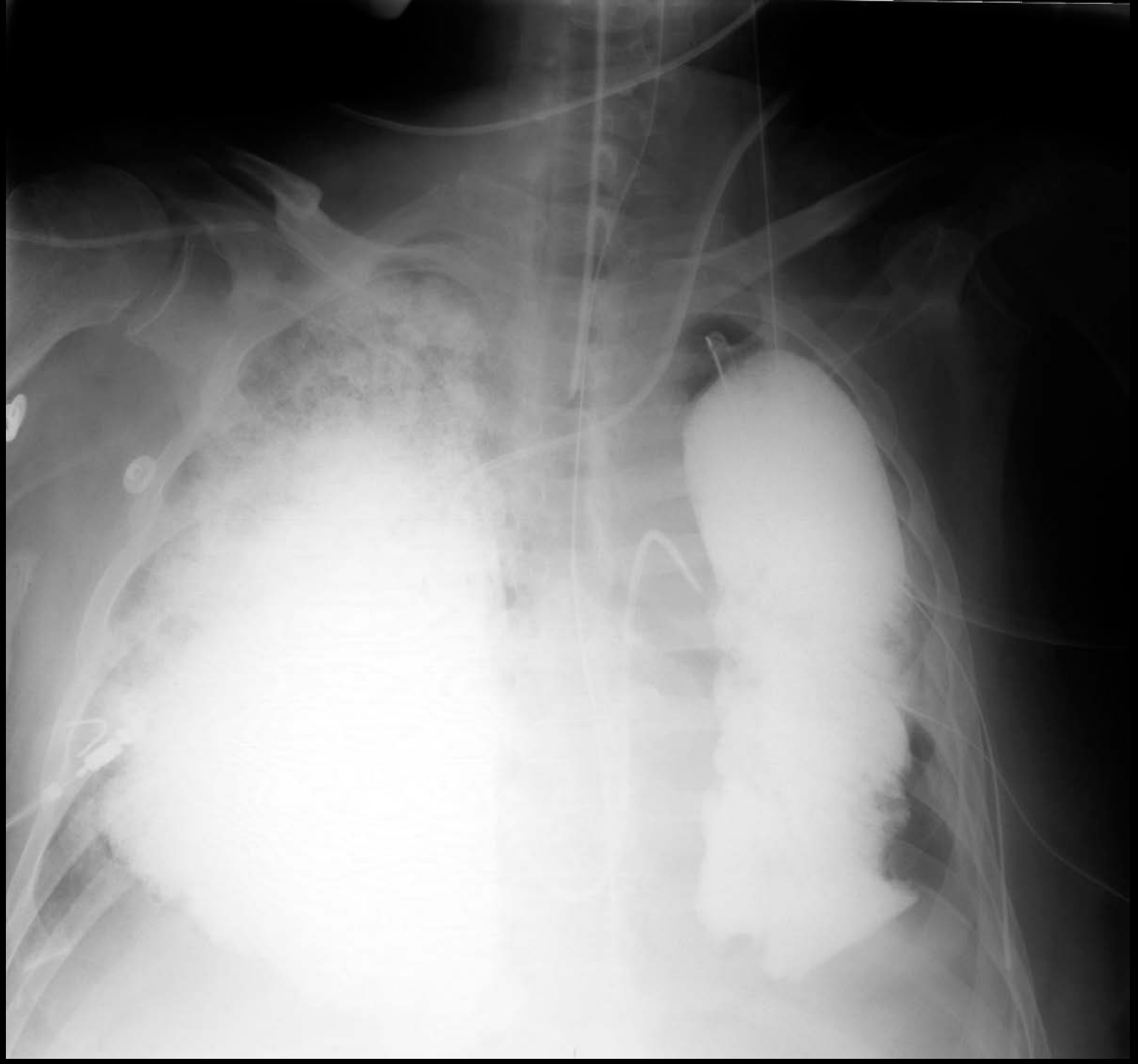

3
4
5
6
3
4
5
6

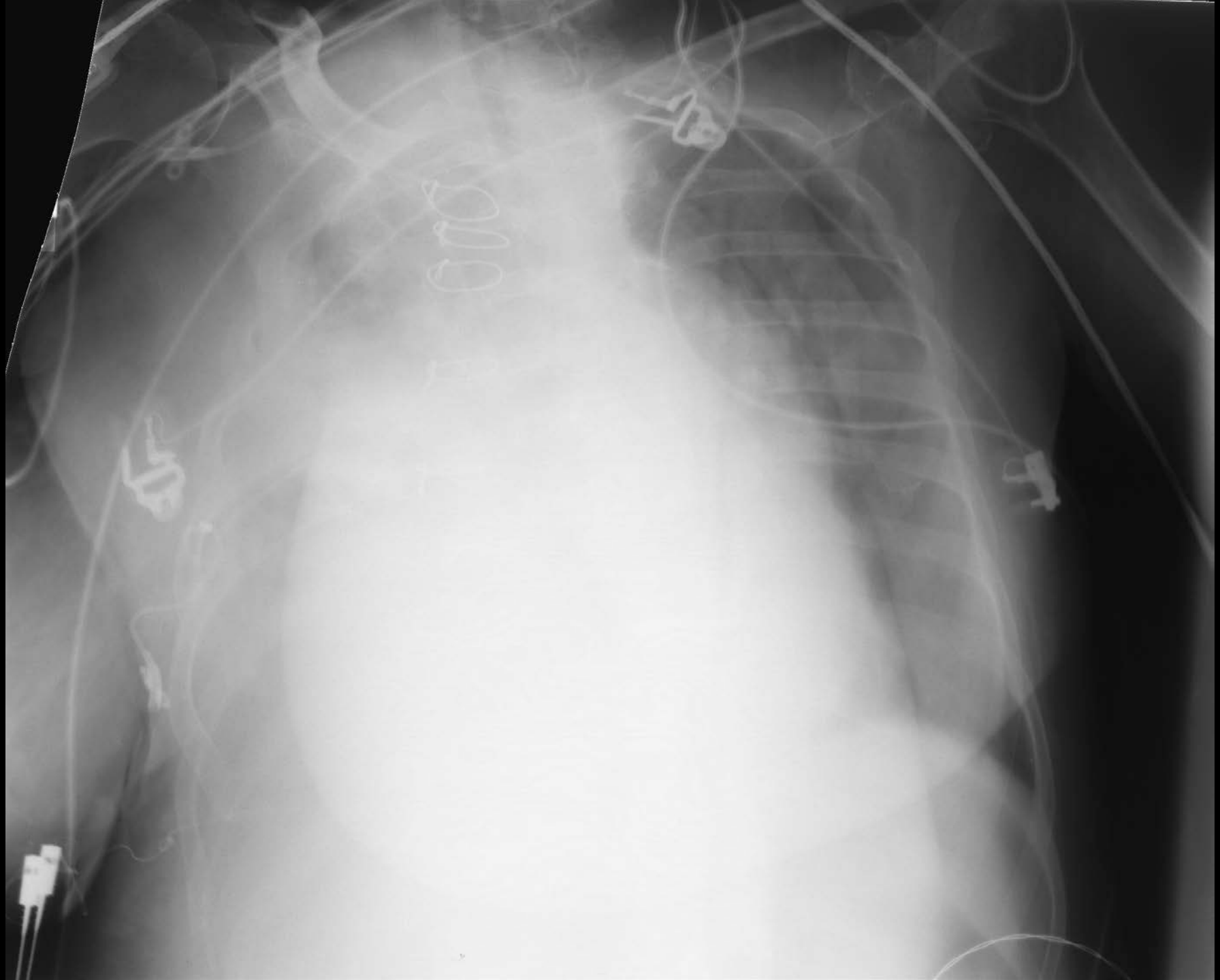
Critères de qualité

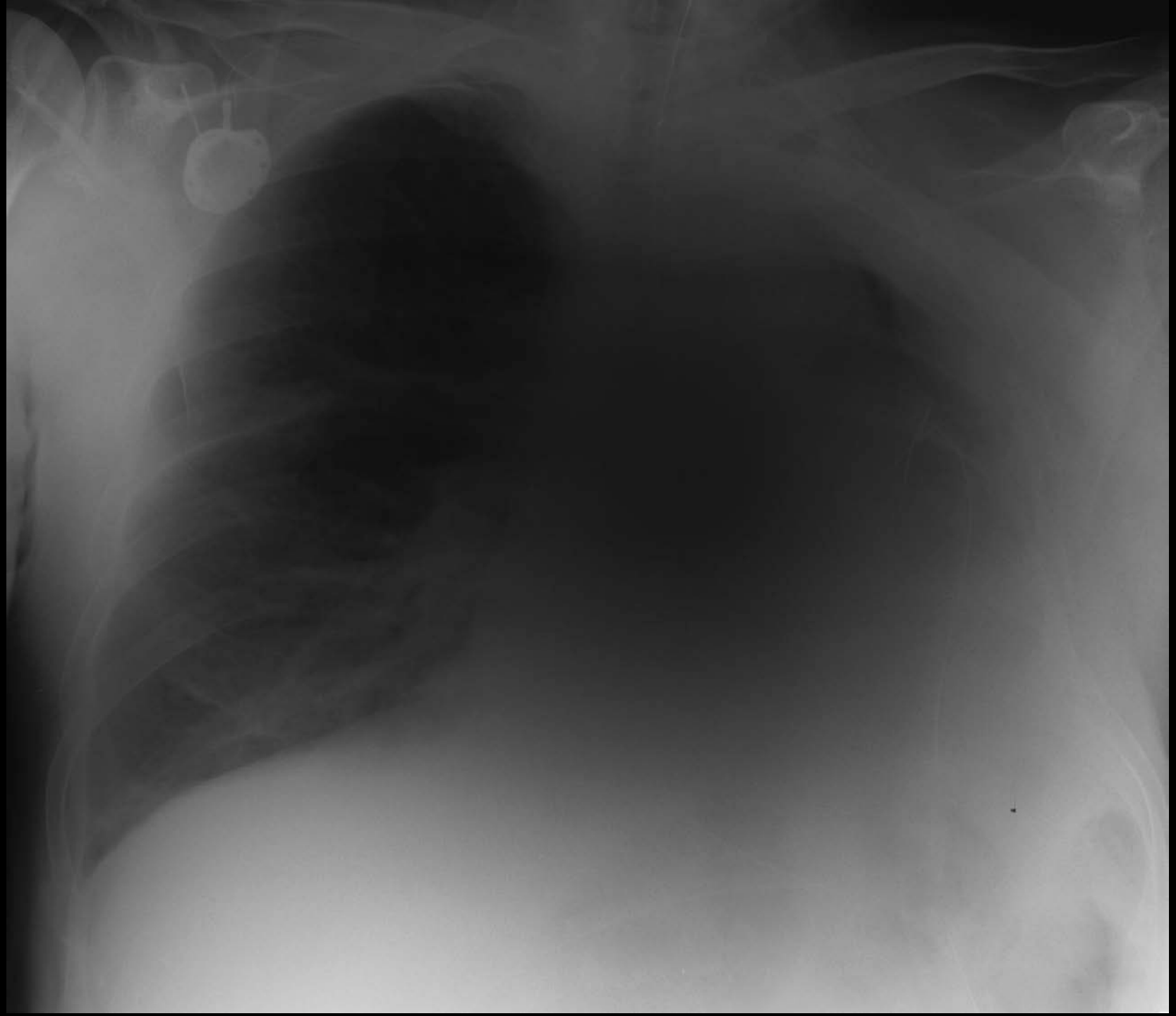
- Thorax bien centré
- Bonne dose
- Patient de face
- Inspiration maximale
- Cliché net, pas flou
- Rayon perpendiculaire, éviter le Fleischner

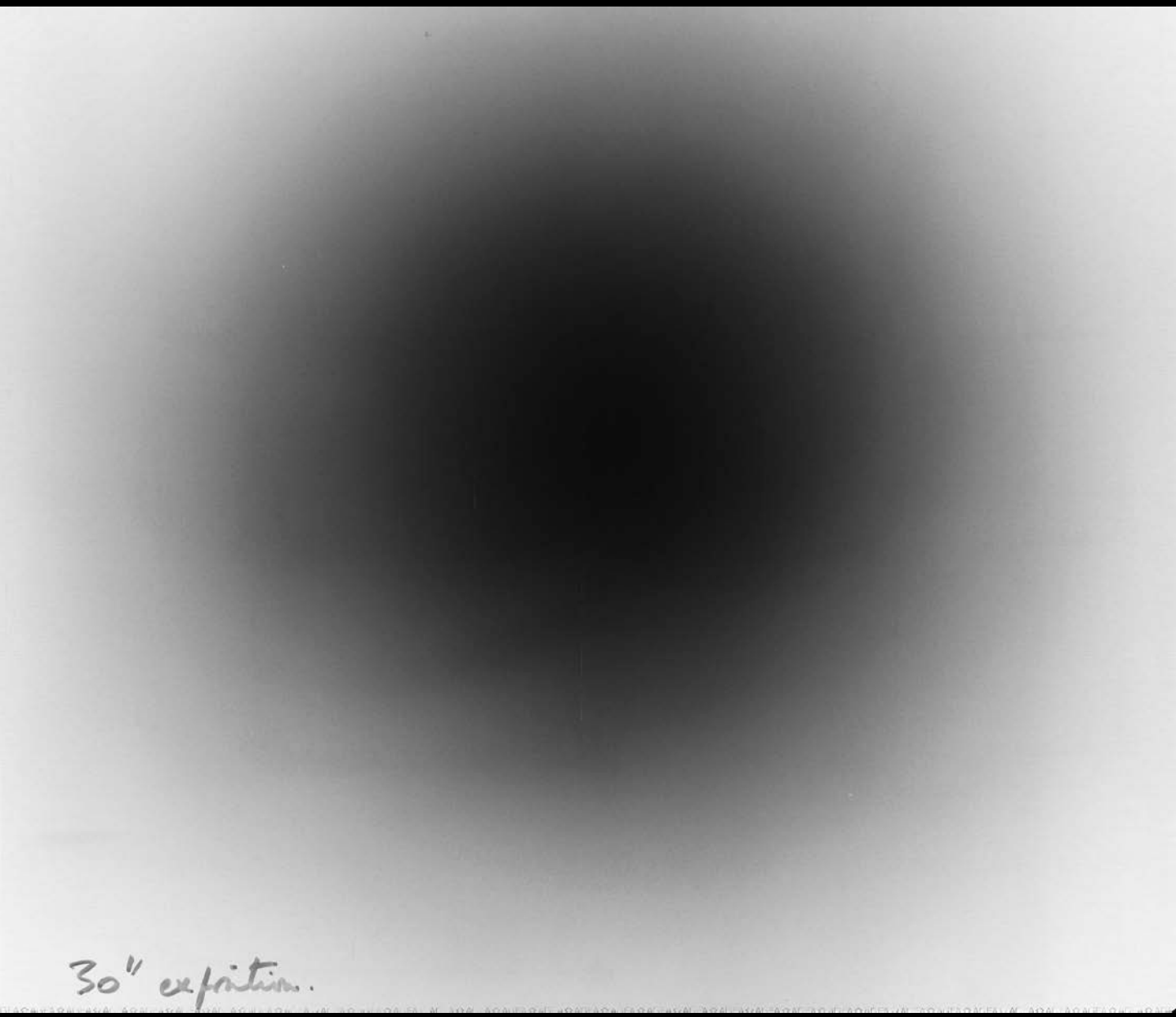
Conseils et précautions

- Le nom doit toujours être à droite du patient
- Nom correct
- Date correcte
- Hygiène (laver les mains/protection des cassettes)
- Tenir une liste ou afficher au lit du patient la dose idéale pour un patient donné





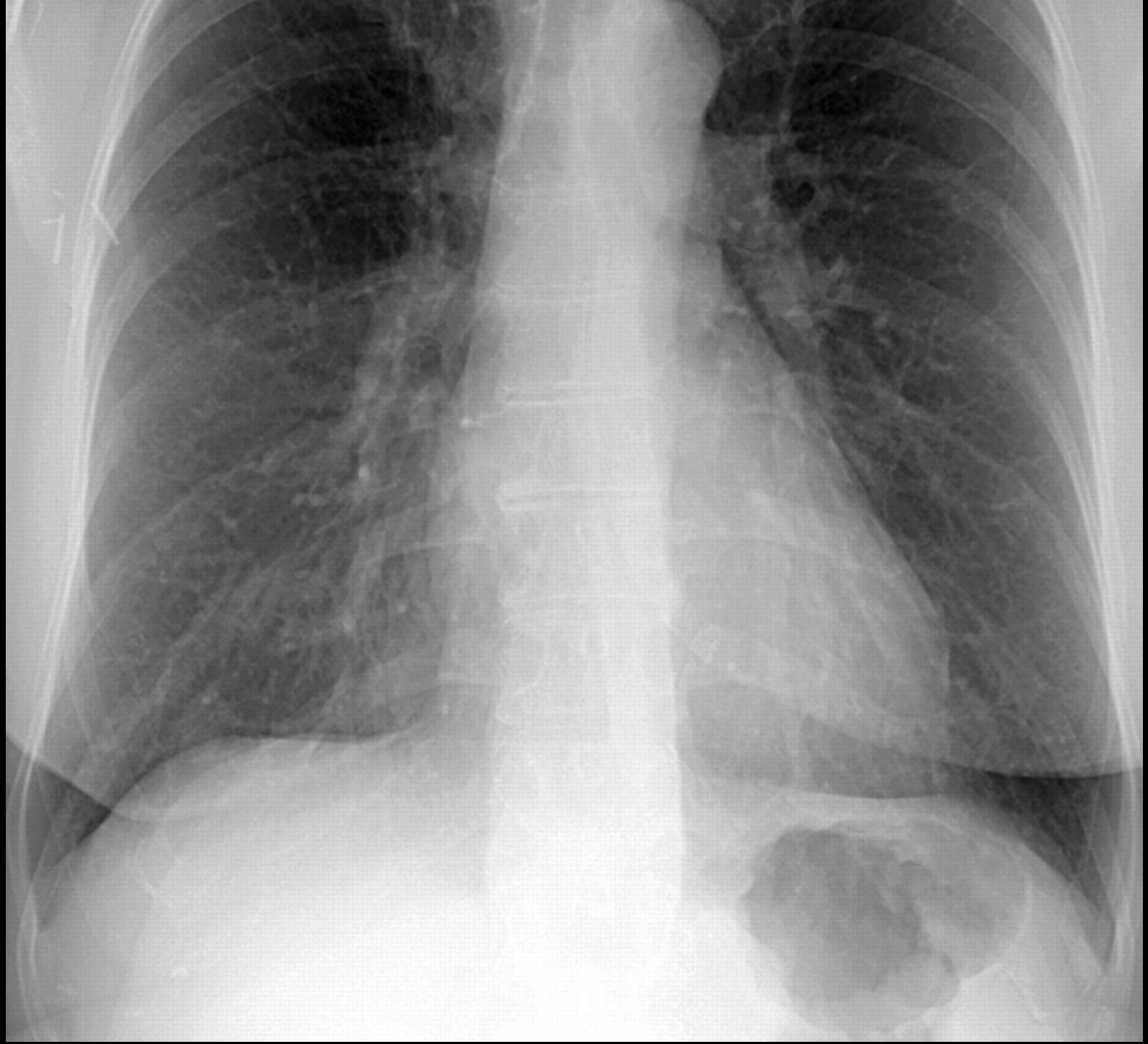


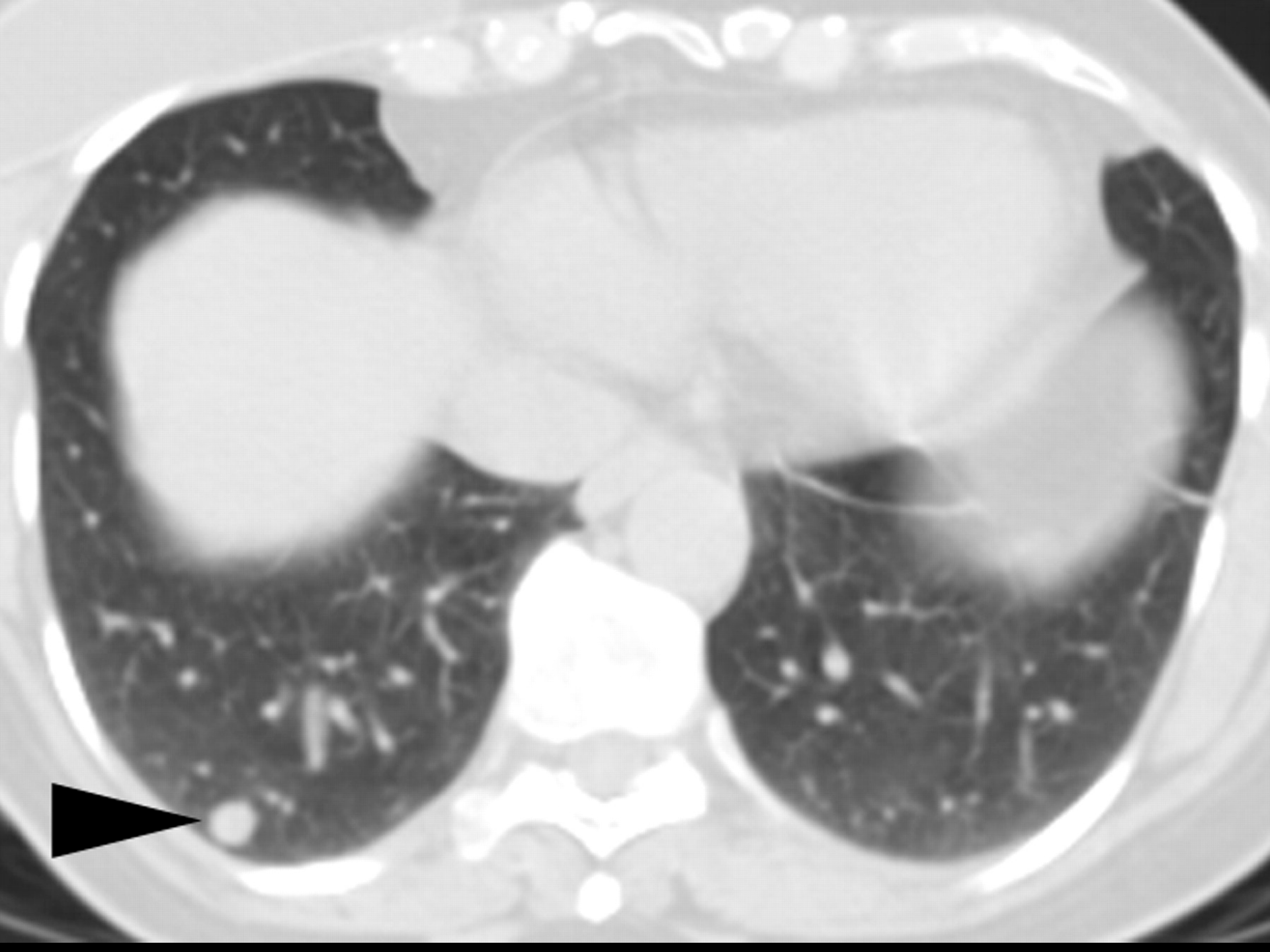

30" exposition.

Le thorax numérique

Plan

- Nouveaux détecteurs
  - Radiographie analogique
  - Radiographie numérique
    - CR
    - Détecteurs plans
- Post-processing
- Développements en affichage
- Nouvelles applications





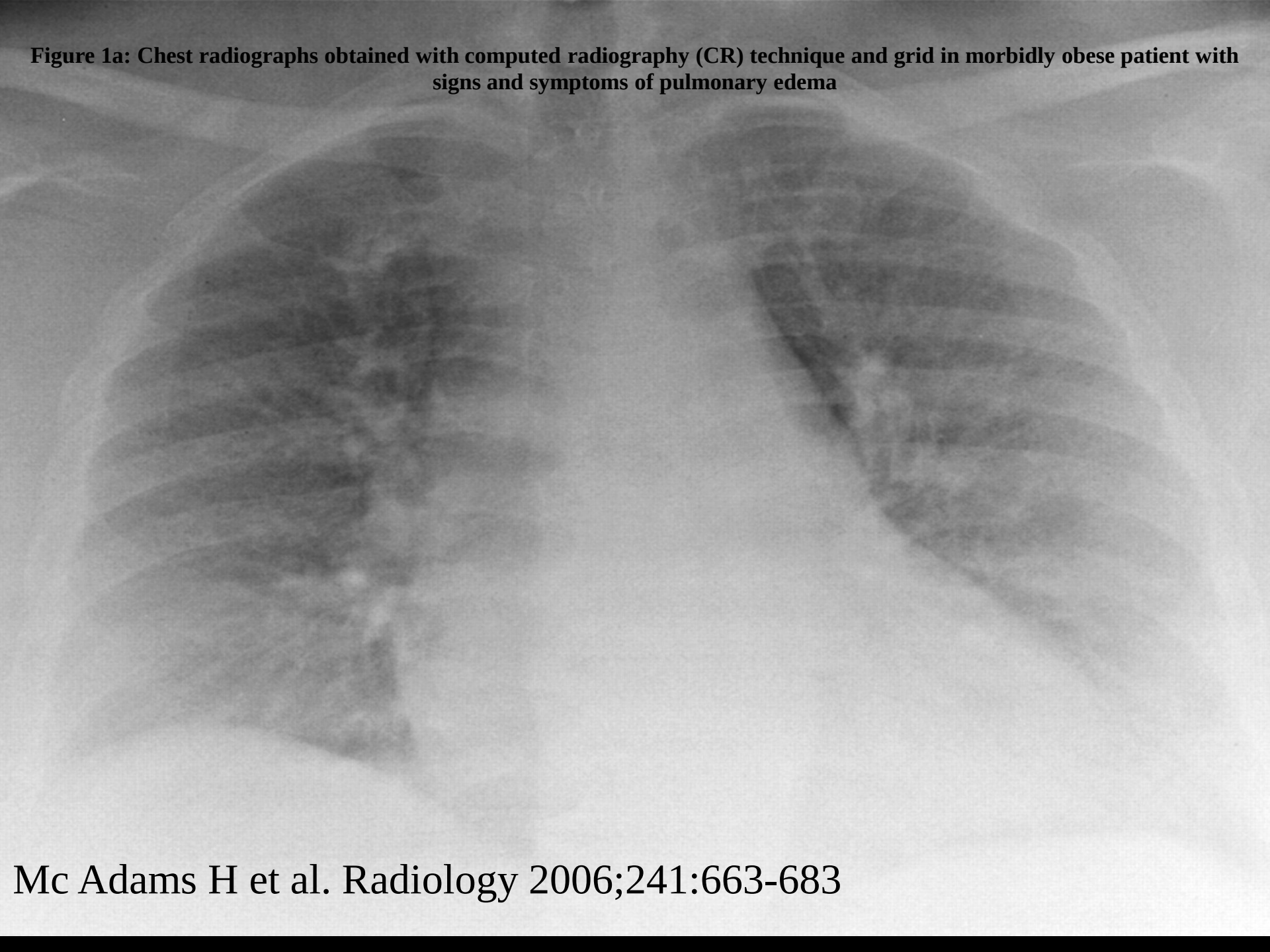
Radiographie digitale

- Technologie au Phosphore (transportable) (CR)
  - Transformation du signal lumineux d'un écran photo-stimulable en un signal numérique
- Détecteurs plans (fixe)
  - Silicium amorphe + iodure de césium
  - Taille du pixel: 143 μ
  - Images de 43 x 43 cm

Système CR

- Computed radiography
- Technologie la plus répandue
- Phosphore photo-stimulable (phosphore barium halides)
- Technologie moins coûteuse
- Qualité d’imagerie < technologie détecteurs plans

Figure 1a: Chest radiographs obtained with computed radiography (CR) technique and grid in morbidly obese patient with signs and symptoms of pulmonary edema



Mc Adams H et al. Radiology 2006;241:663-683

Figure 1b: Chest radiographs obtained with computed radiography (CR) technique and grid in morbidly obese patient with signs and symptoms of pulmonary edema

Avantages du système CR

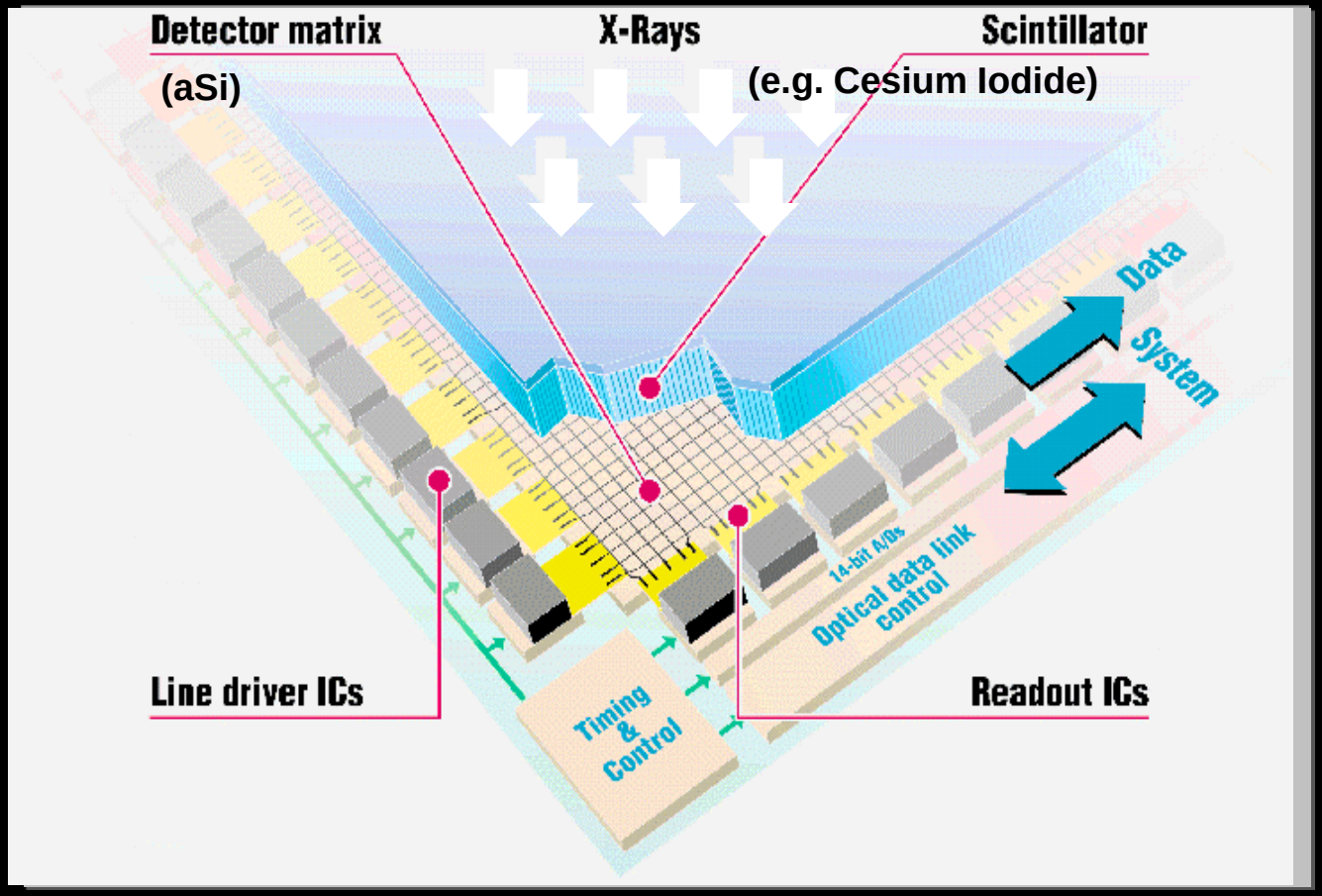
- Taille identique aux cassettes traditionnelles
- Portable: au lit du patient
- 1 seul lecteur central pour de multiples cassettes

Détecteurs plans

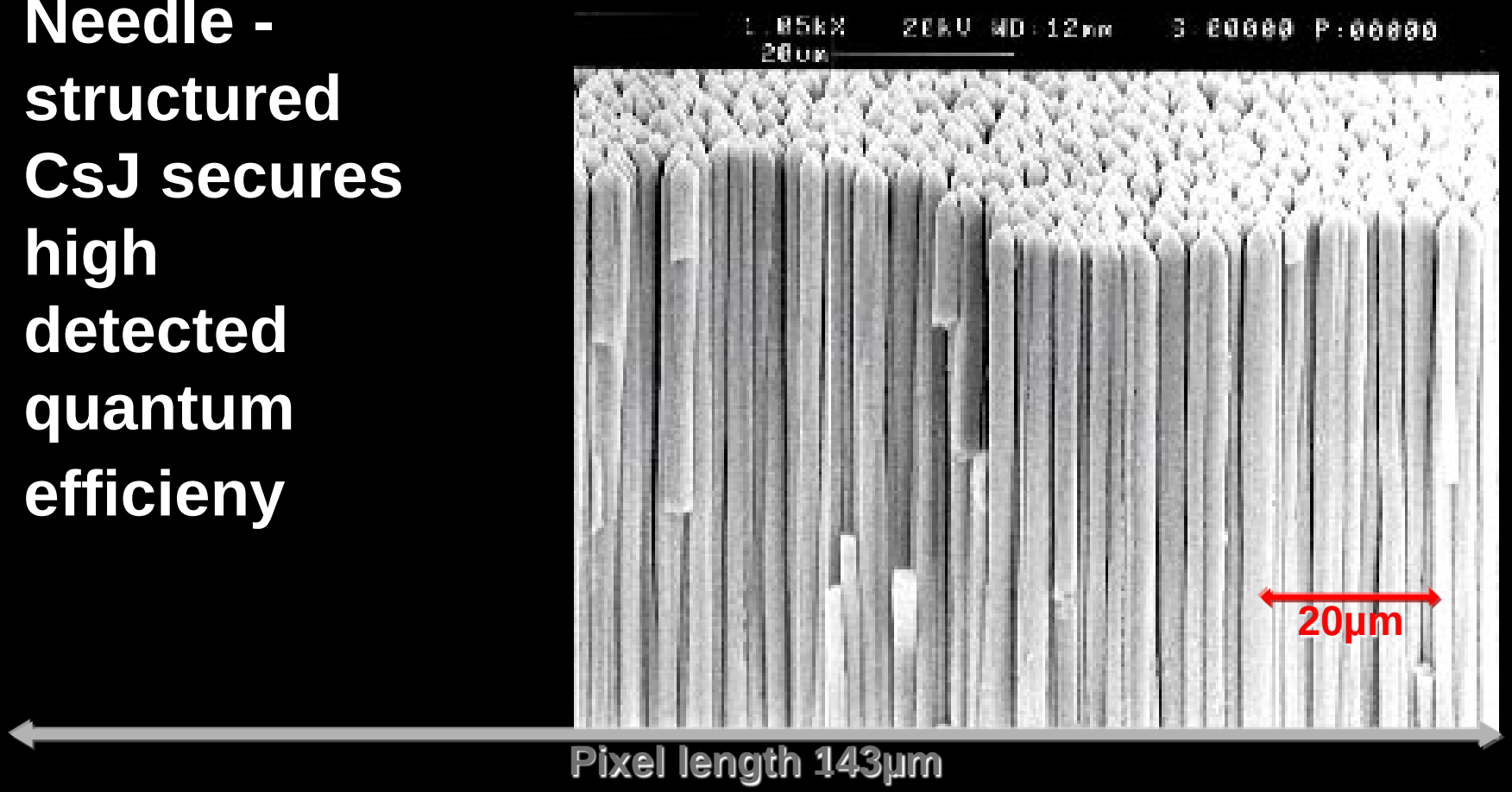
- Silicium amorphe
- Thin-film transistors (tft)
- 2 types de détecteurs plans
  - Indirects: couche photoconductrice, iodure de Césium
  - Directs: Sélénium amorphe
- Après exposition: conversion pixel par pixel des informations

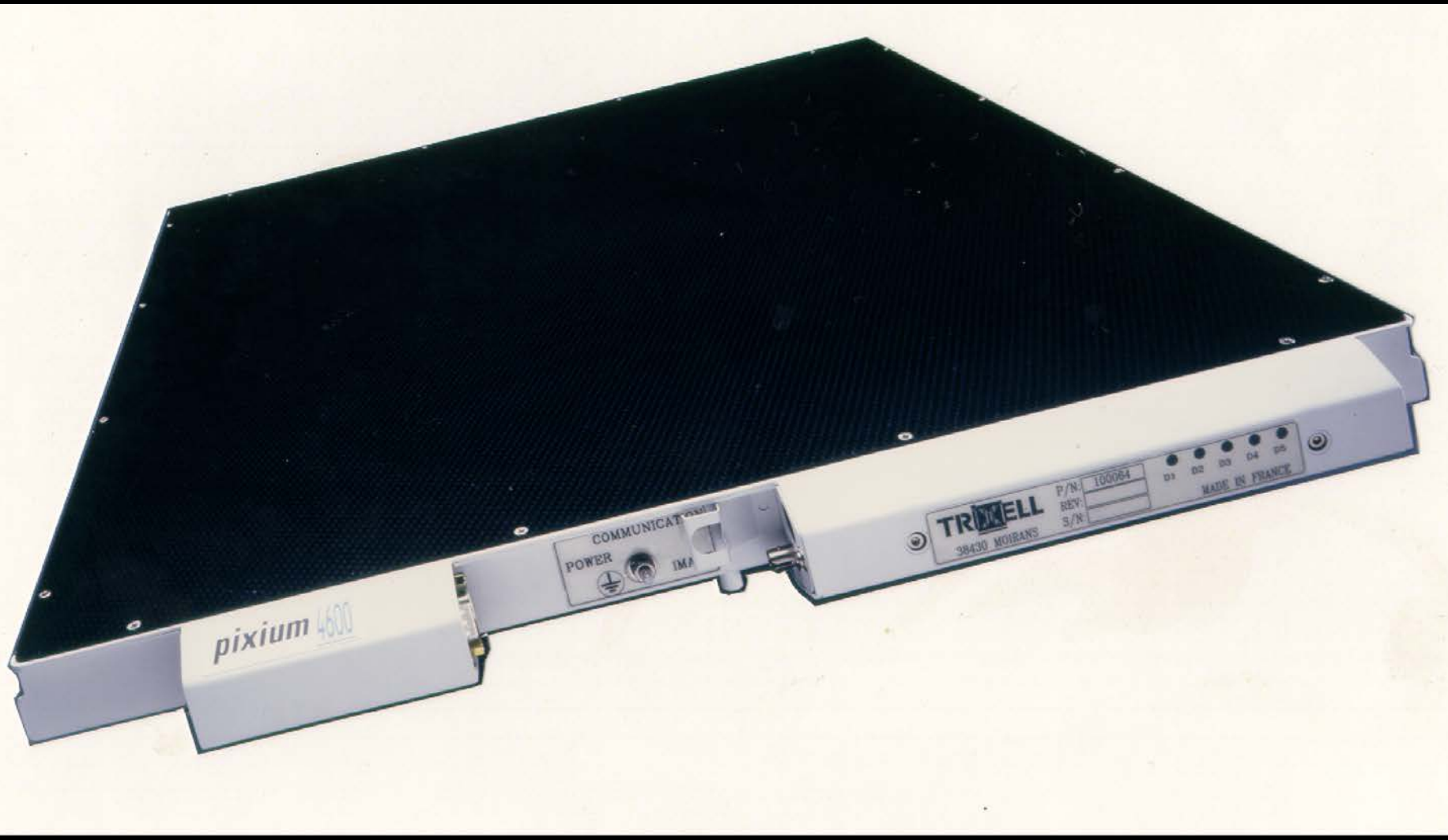
PHILIPS

Détecteurs plats



Needle - structured CsJ secures high detected quantum efficieny




pixium 4600
POWER
TRIXELL
38430 MOIRANS
P/N: 100084
REV:
S/N
MADE IN FRANCE

Avantages des capteurs plans

- Haute résolution en contraste
- Résolution spatiale détecteurs plans supérieure au Phosphore
- Diminution de la dose au patient
- Plus de cassettes
- Rapidité
- Diminution des examens à refaire, baisse du côut des films (petit format, CD Rom)
- Transmission des données
- CAD

Traitement des images

- Présentation optimale des images
  - Preprocessing
  - Post-processing
- Affichage des images
- Permettre une aide à la détection
  - Image de soustraction en double énergie
  - Image de soustraction temporelle
  - Tomosynthèse digitale
- CAD

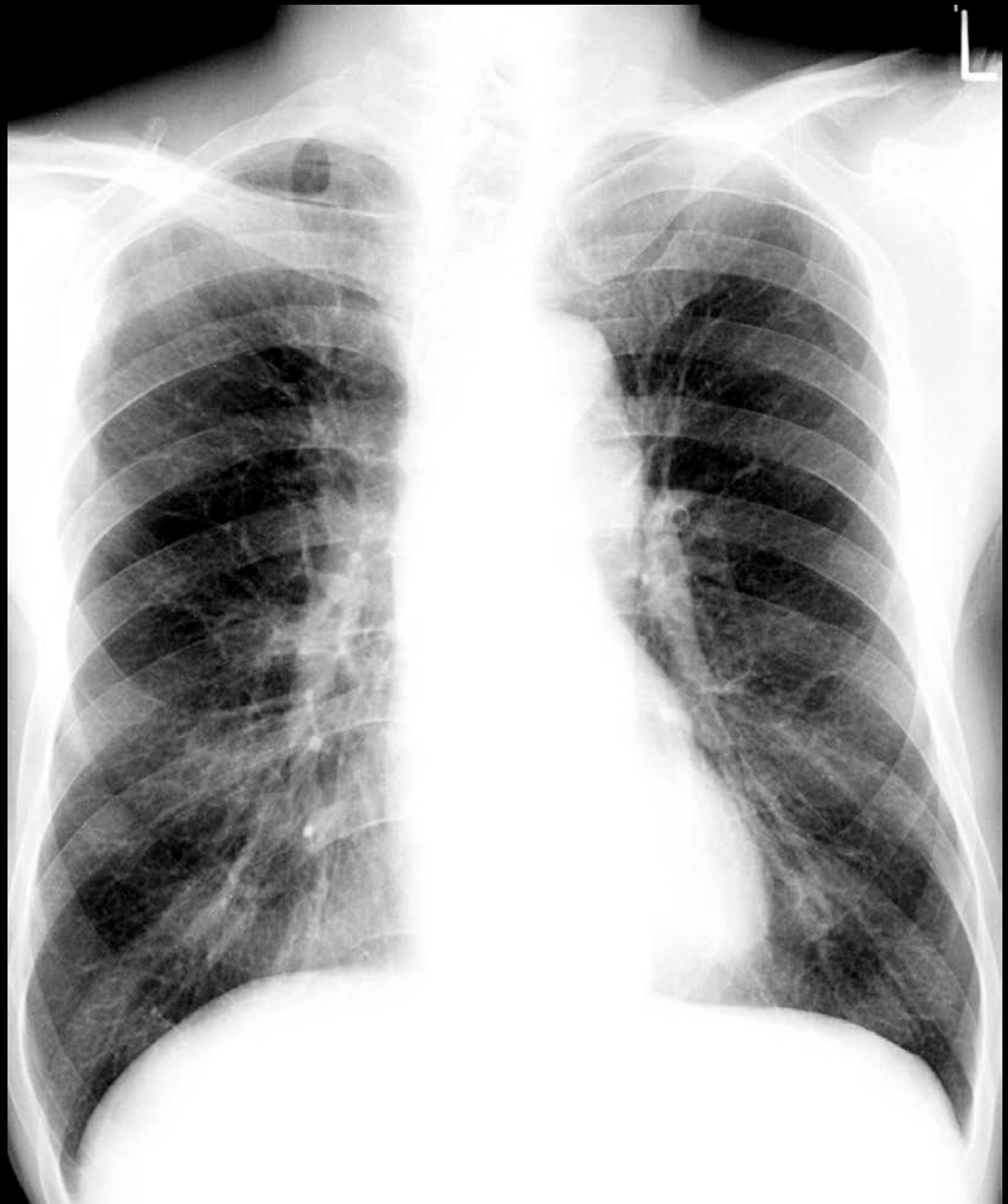
Pre-processing

- Correction
  - Correction des anomalies des détecteurs au niveau des données brutes
  - Non uniformité, pixels inactifs, variation de courant
  - Calibration
- Etalonnage
  - Analyse d’histogramme et sélection des valeurs utilisés dans le traitement de l’image

Post processing

- Processing en niveau de gris
  - Même apparence que l'image analogique
- Rehaussement des bords
  - Rehaussement des détails fins
  - Modification de la fréquence spatiale
- Processing multifréquence
  - Manipulation complexe du spectre des fréquences
    - Accentuation des contrastes dans une région en gardant toutes les informations dans une autre région

Figure 6a: Effects of various (a-c) gray-scale and (d-f) equalization postprocessing schemes on appearance of a posteroanterior chest radiograph



6b: Effects of various (a-c) gray-scale and (d-f) equalization postprocessing schemes on appearance of a posteroanterior chest radiograph

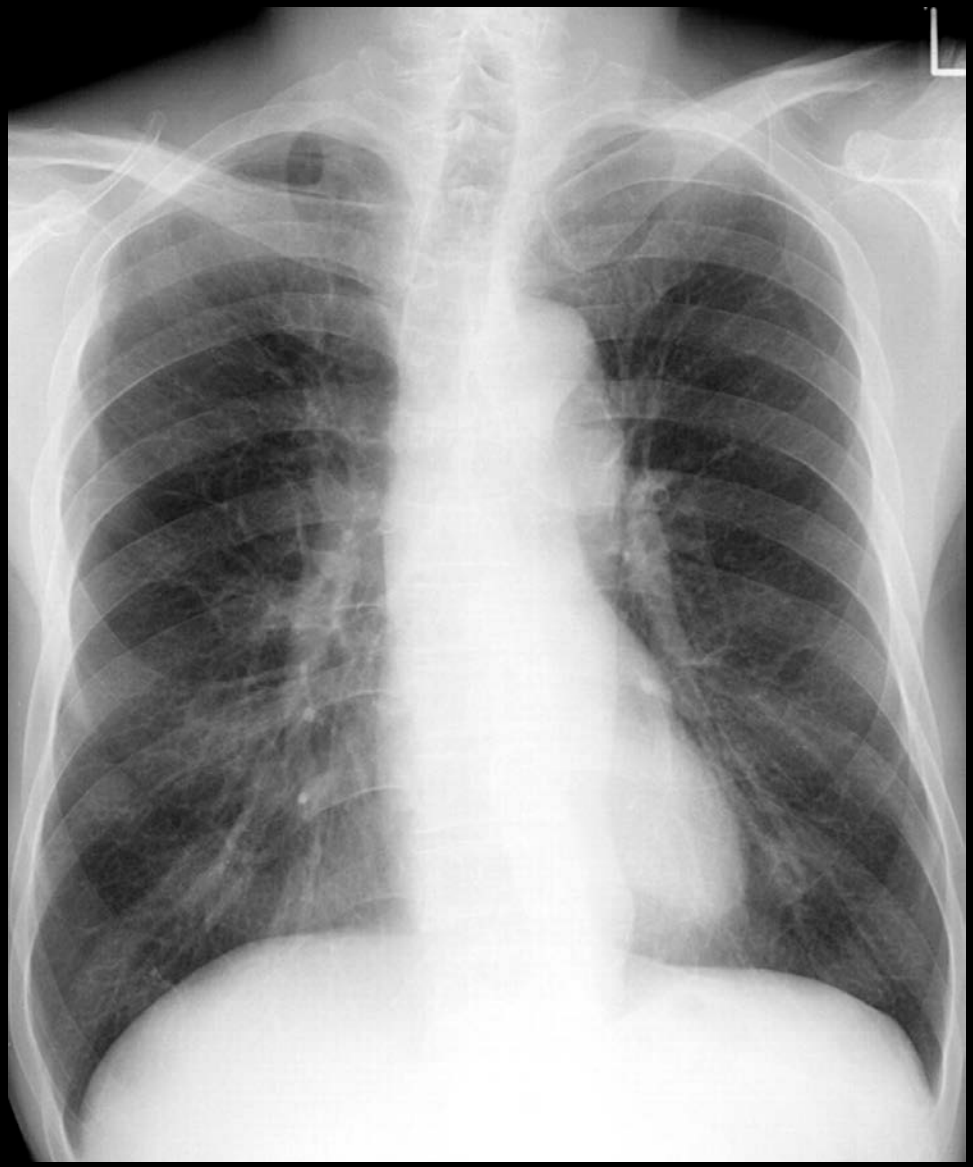


Figure 6c: Effects of various (a-c) gray-scale and (d-f) equalization postprocessing schemes on appearance of a posteroanterior chest radiograph

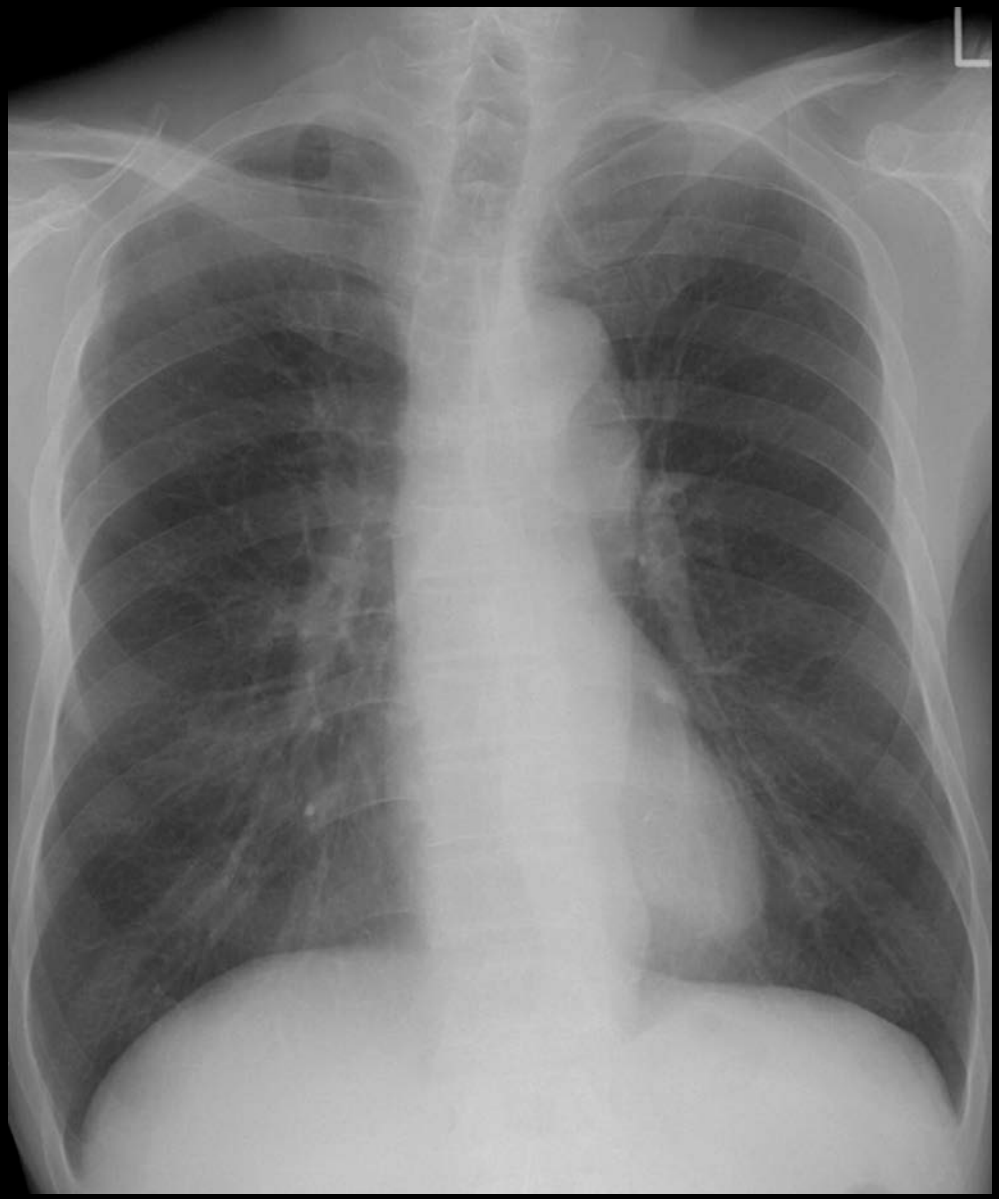


Figure 6d: Effects of various (a-c) gray-scale and (d-f) equalization postprocessing schemes on appearance of a posteroanterior chest radiograph

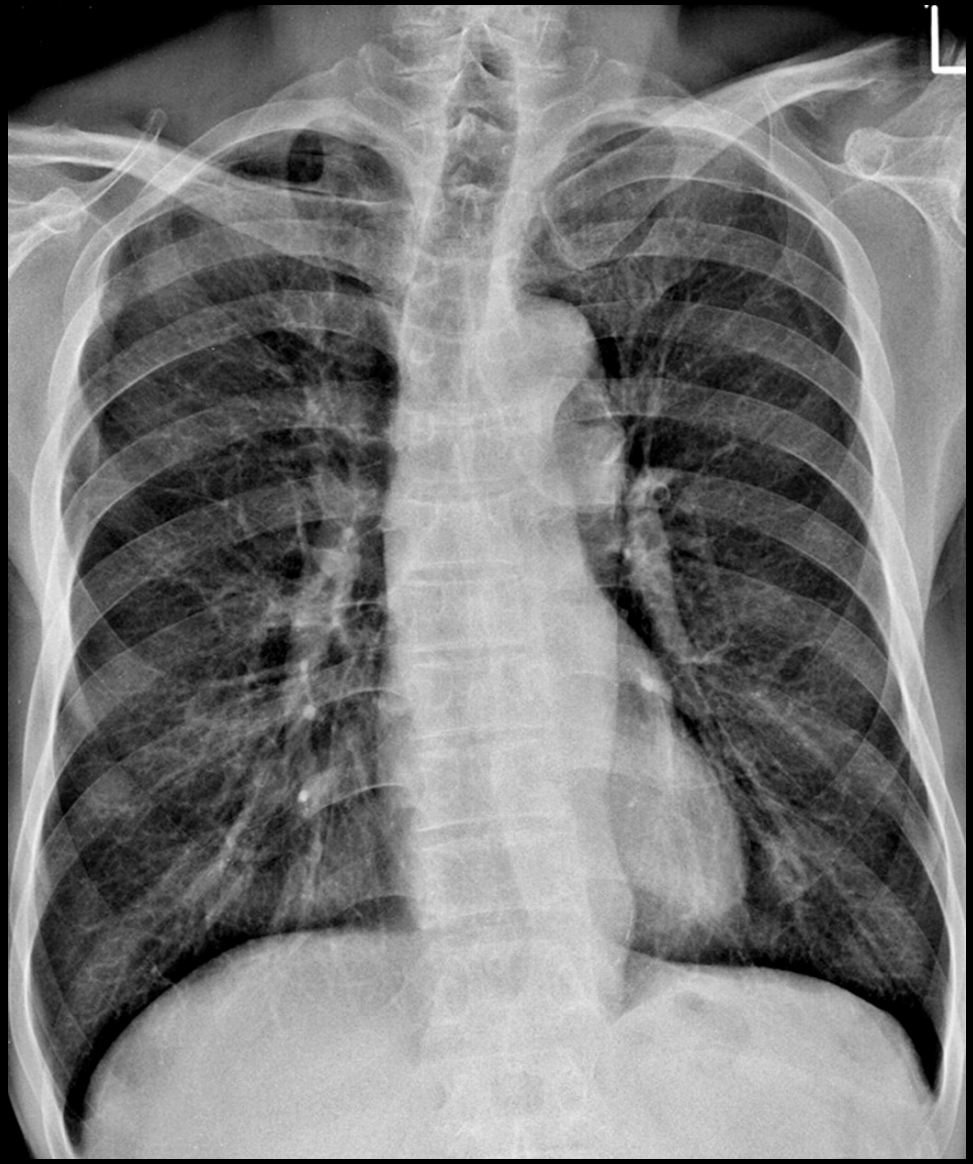


Figure 6e: Effects of various (a-c) gray-scale and (d-f) equalization postprocessing schemes on appearance of a posteroanterior chest radiograph

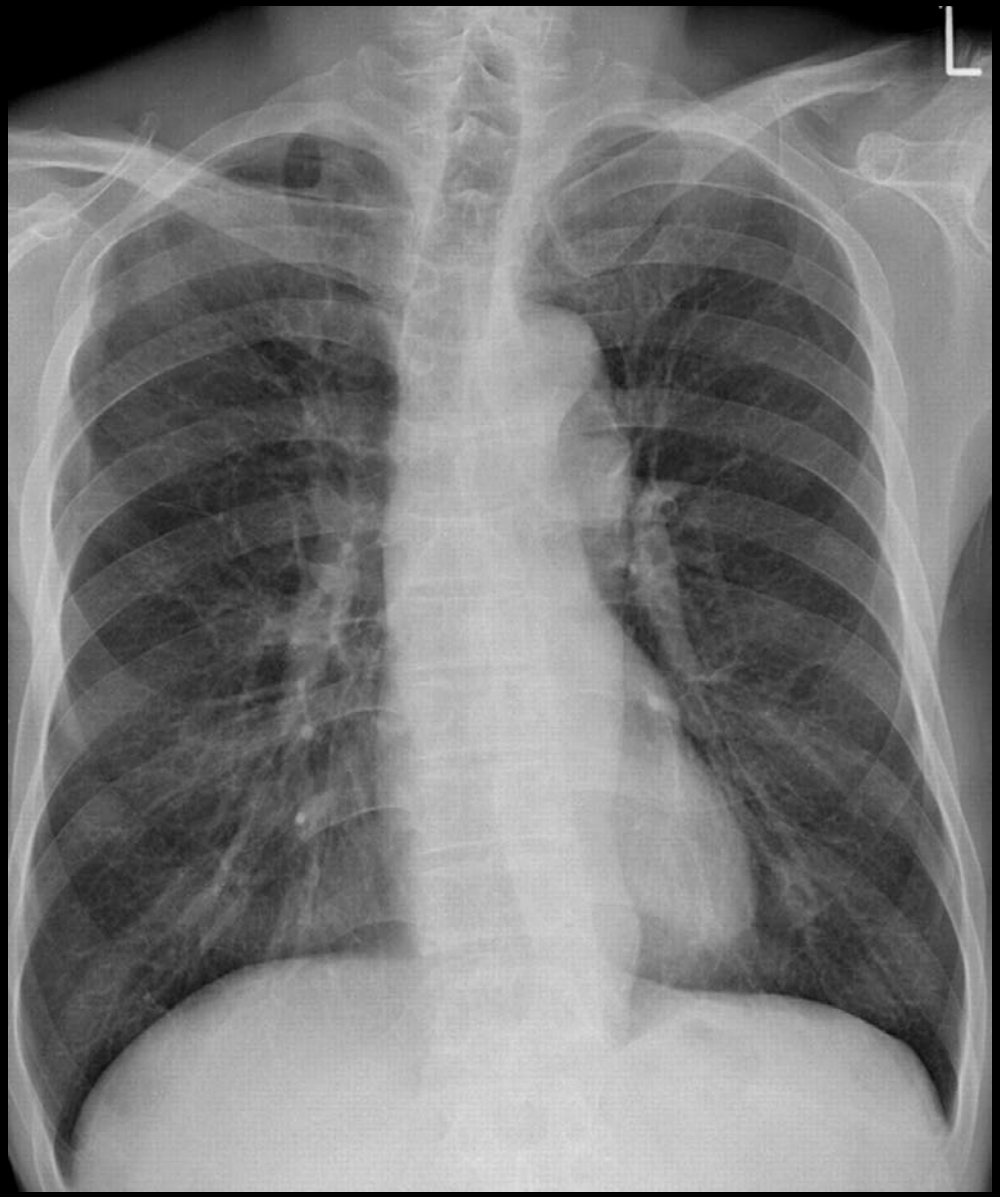
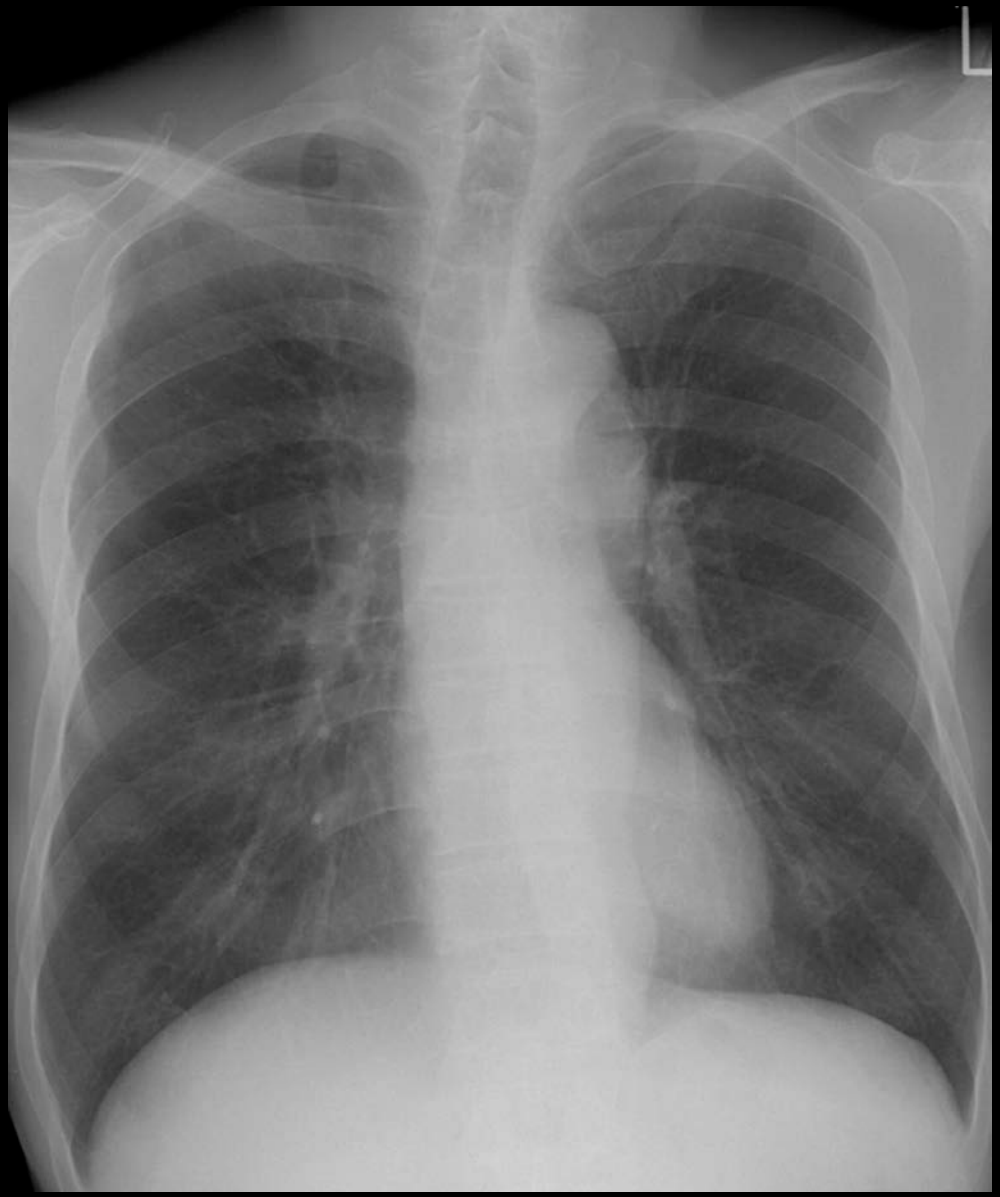
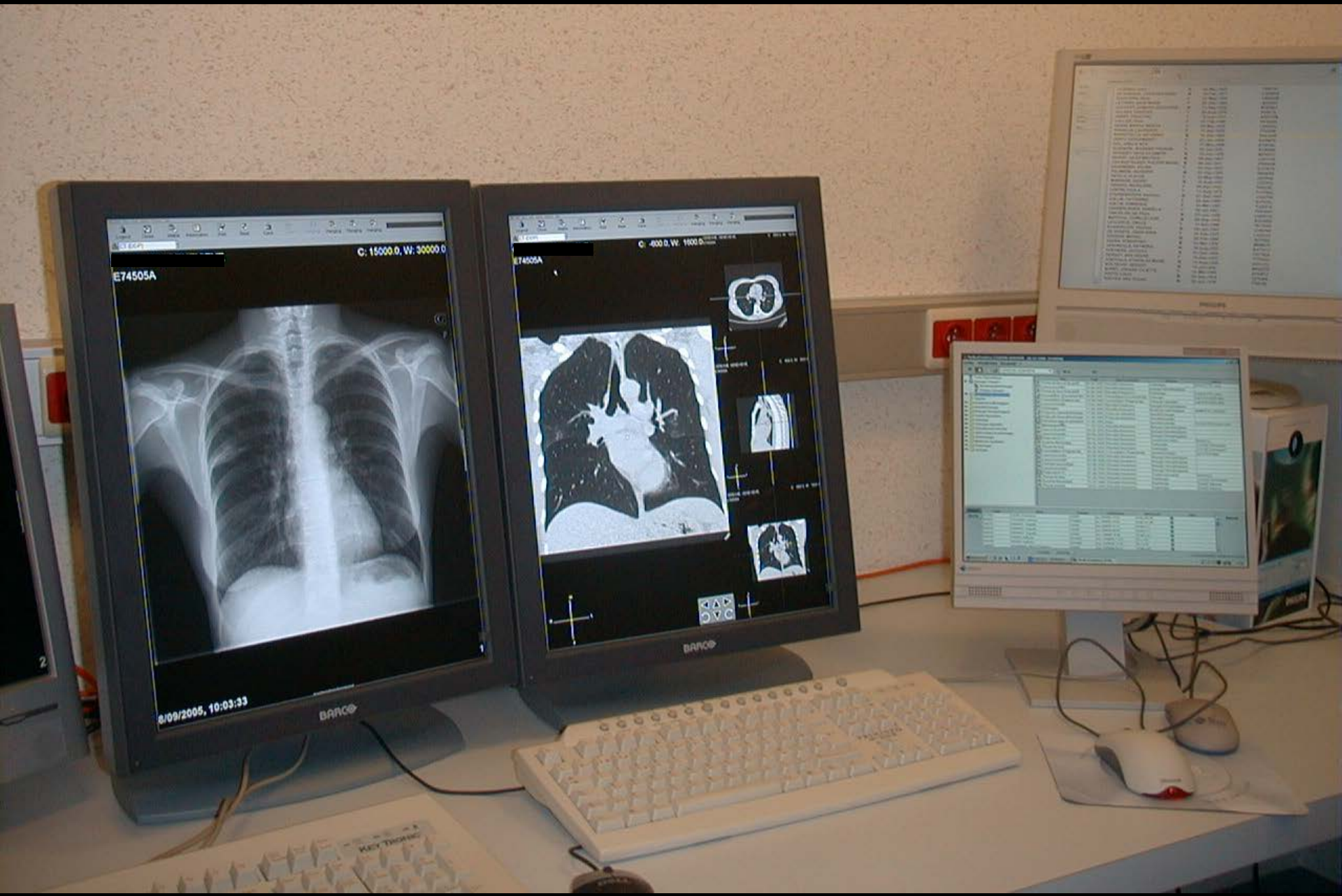


Figure 6f: Effects of various (a-c) gray-scale and (d-f) equalization postprocessing schemes on appearance of a posteroanterior chest radiograph



Display

- Disparition film radiographique
- Ecrans à cristaux liquides
  - Résolution accrue
  - Diminution du poids
  - Diminution encombrement
  - Diminution réflexion
  - Augmentation profondeur de l’image
- Moniteurs noir et blanc
- Moniteurs couleurs


C: 15000.0, W: 30000.0
E74505A
8/09/2005, 10:03:33
BARCO
C: -600.0, W: 1600.0
E74505A
BARCO

KODAK DIRECTVIEW Web Software
v5.1
Ouverture de session
Réception
Administration
HEALTH IMAGING
A BETTER VIEW OF LIFE.
Limitation de responsabilité | Copyright stman Kodak Company, 2003

E74505A
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8/09/2005, 10:03:59
E74505A
C: 15000.0, W: 30000.0
8/09/2005, 10:03:33
E74505A
C: -590.0, W: 1600.0

Imagerie de soustraction à double énergie

- 2 faisceaux à énergie différente
- Bas kV, haut kV
- Combinaison des 2 images
- Calcium
- Tissus mous
- Augmentation de détection des nodules pulmonaires

Figure 7a: Dual-energy subtraction radiography in healthy middle-aged woman

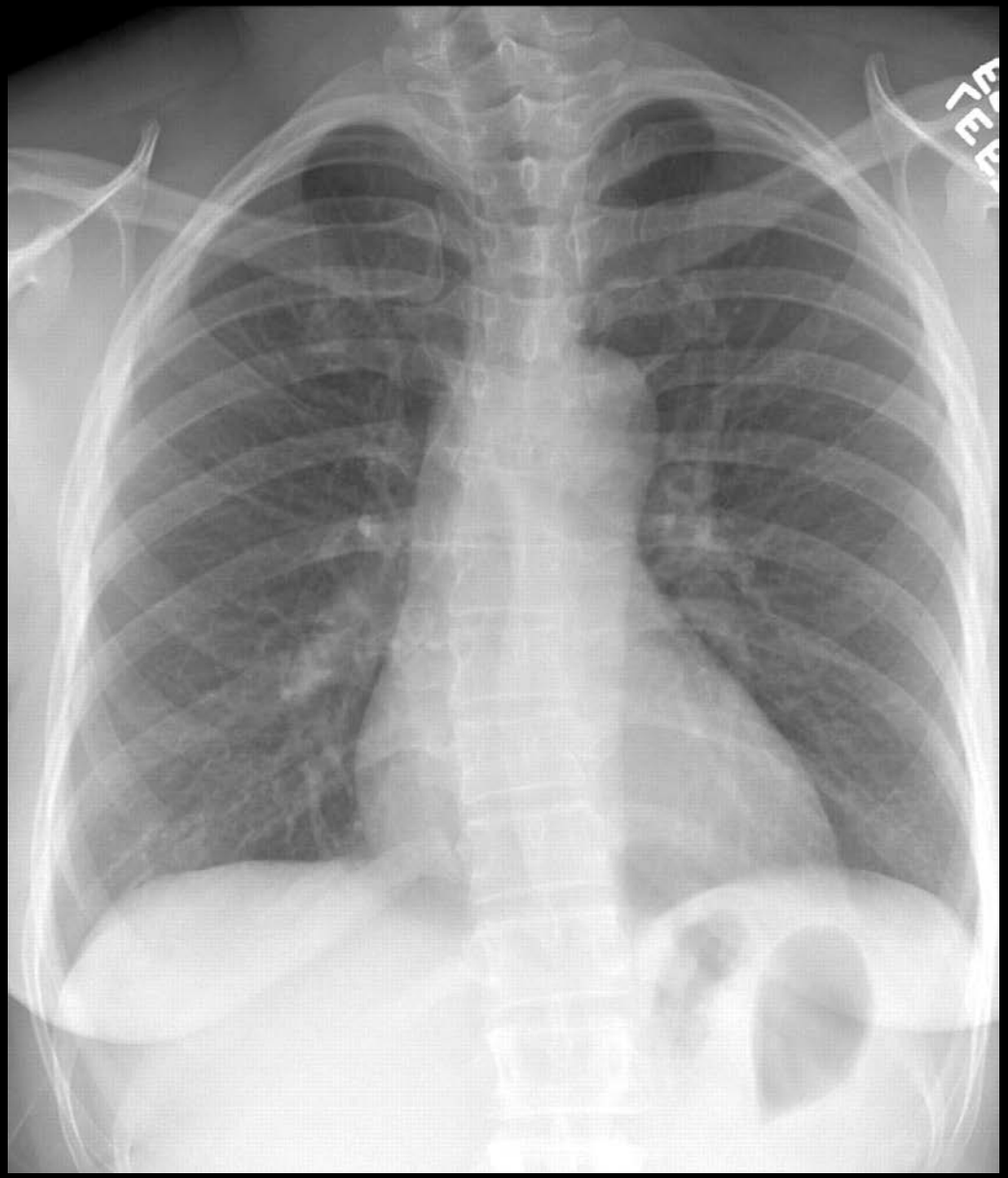
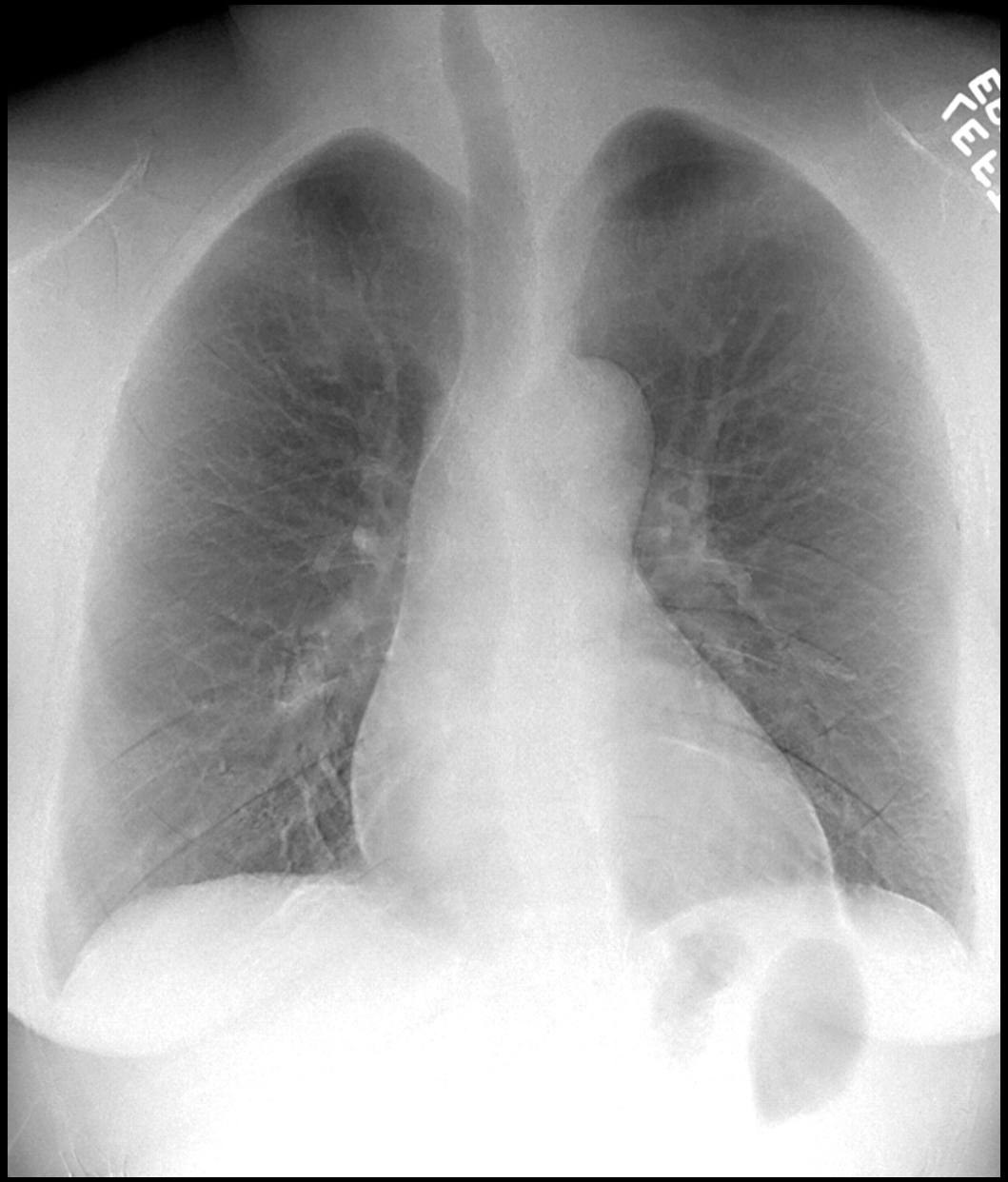


Figure 7b: Dual-energy subtraction radiography in healthy middle-aged woman



7c: Dual-energy subtraction radiography in healthy middle-aged woman

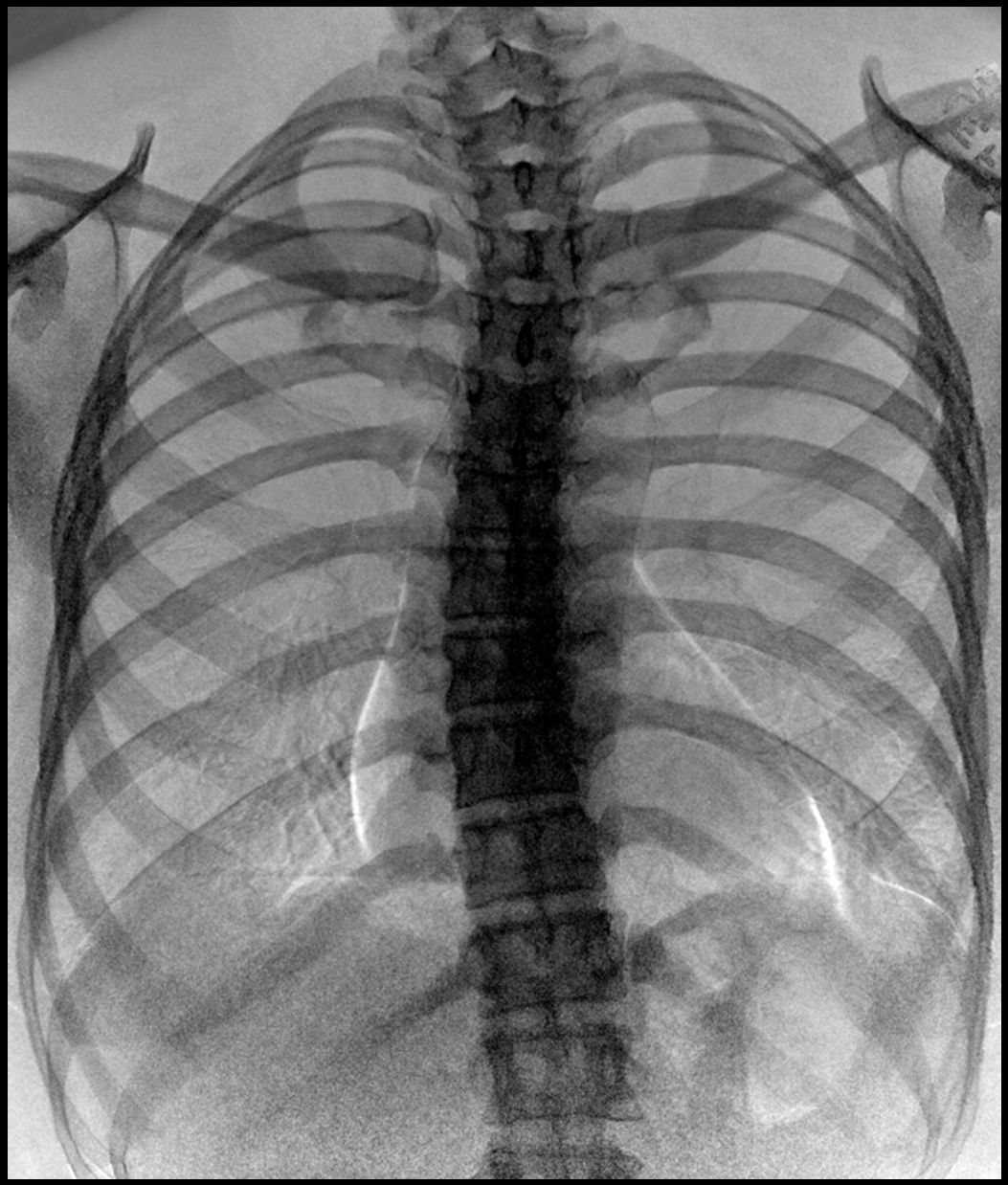


Figure 9a: Dual-energy subtraction radiography in a healthy middle-aged man

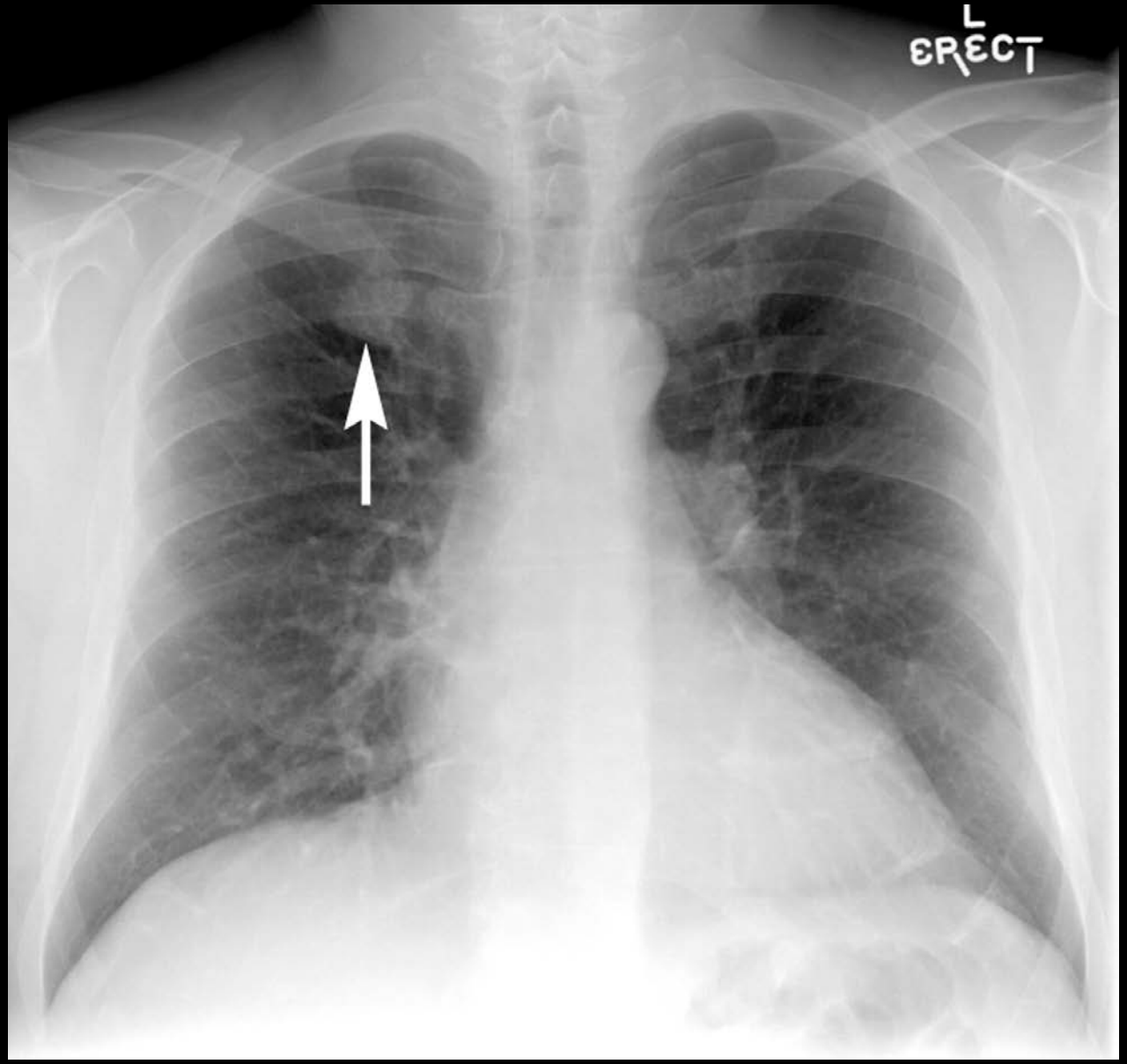
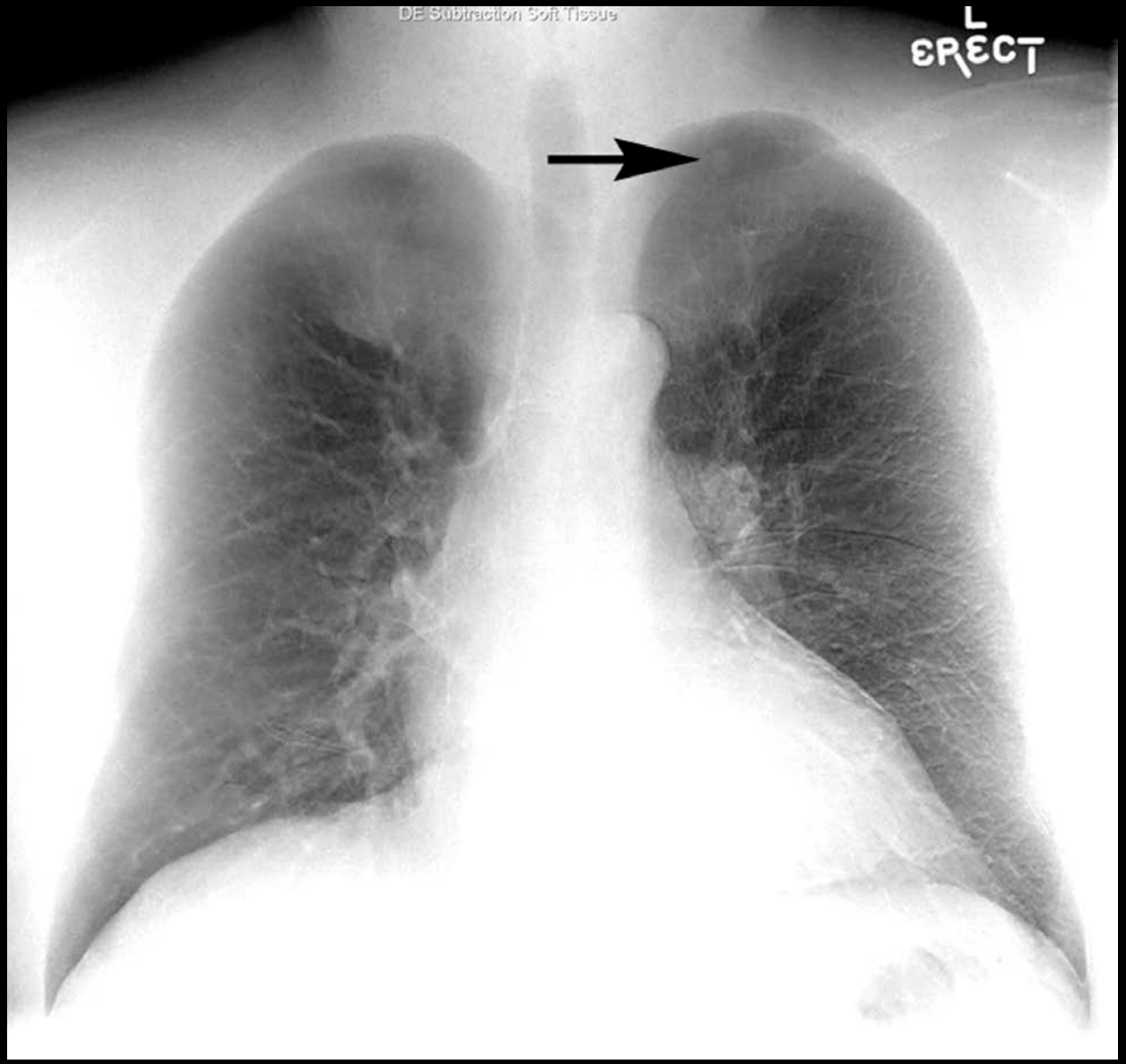


Figure 9b: Dual-energy subtraction radiography in a healthy middle-aged man



9c: Dual-energy subtraction radiography in a healthy middle-aged man

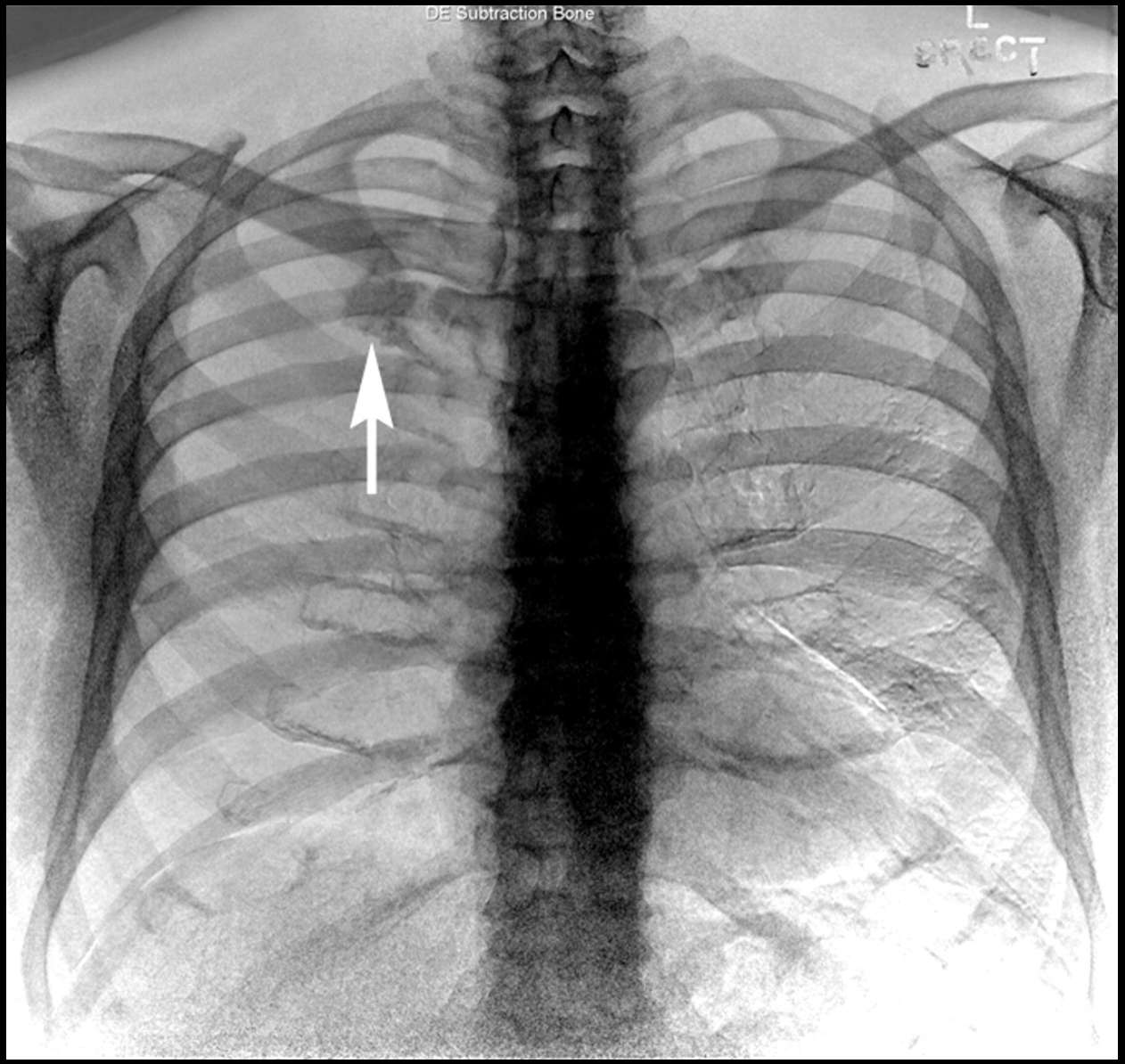


Figure 10b: Dual-energy subtraction radiography in an elderly man

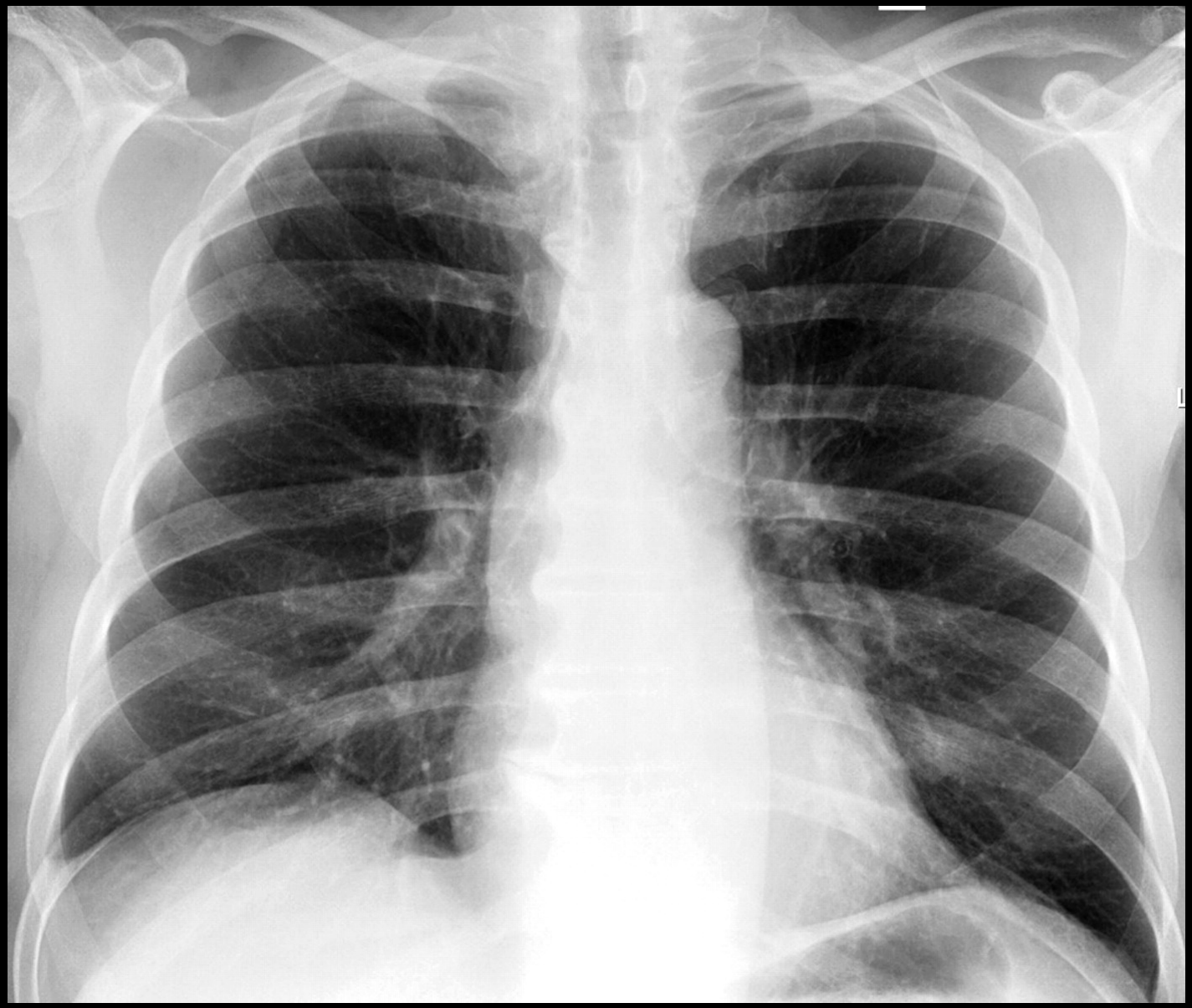
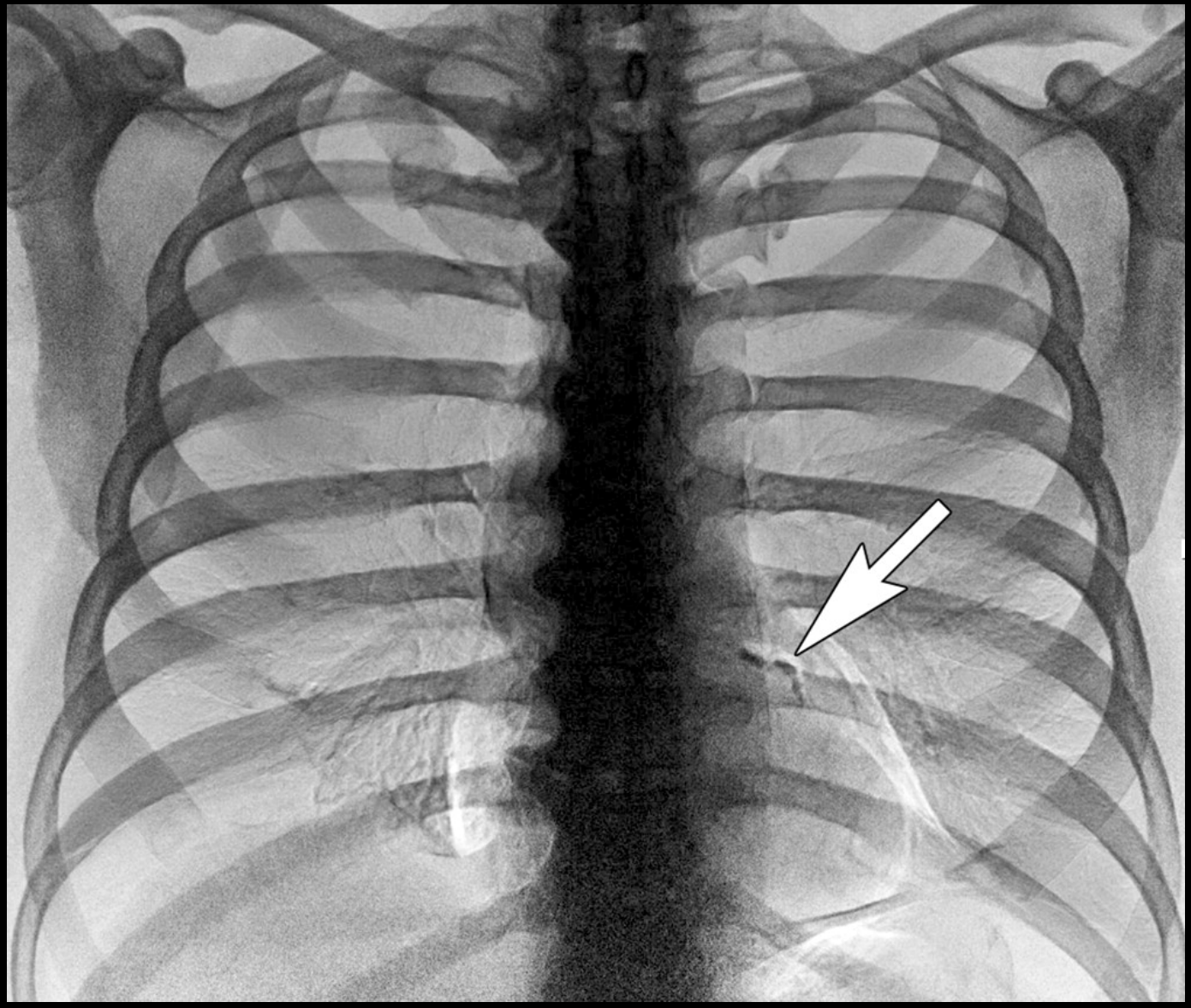


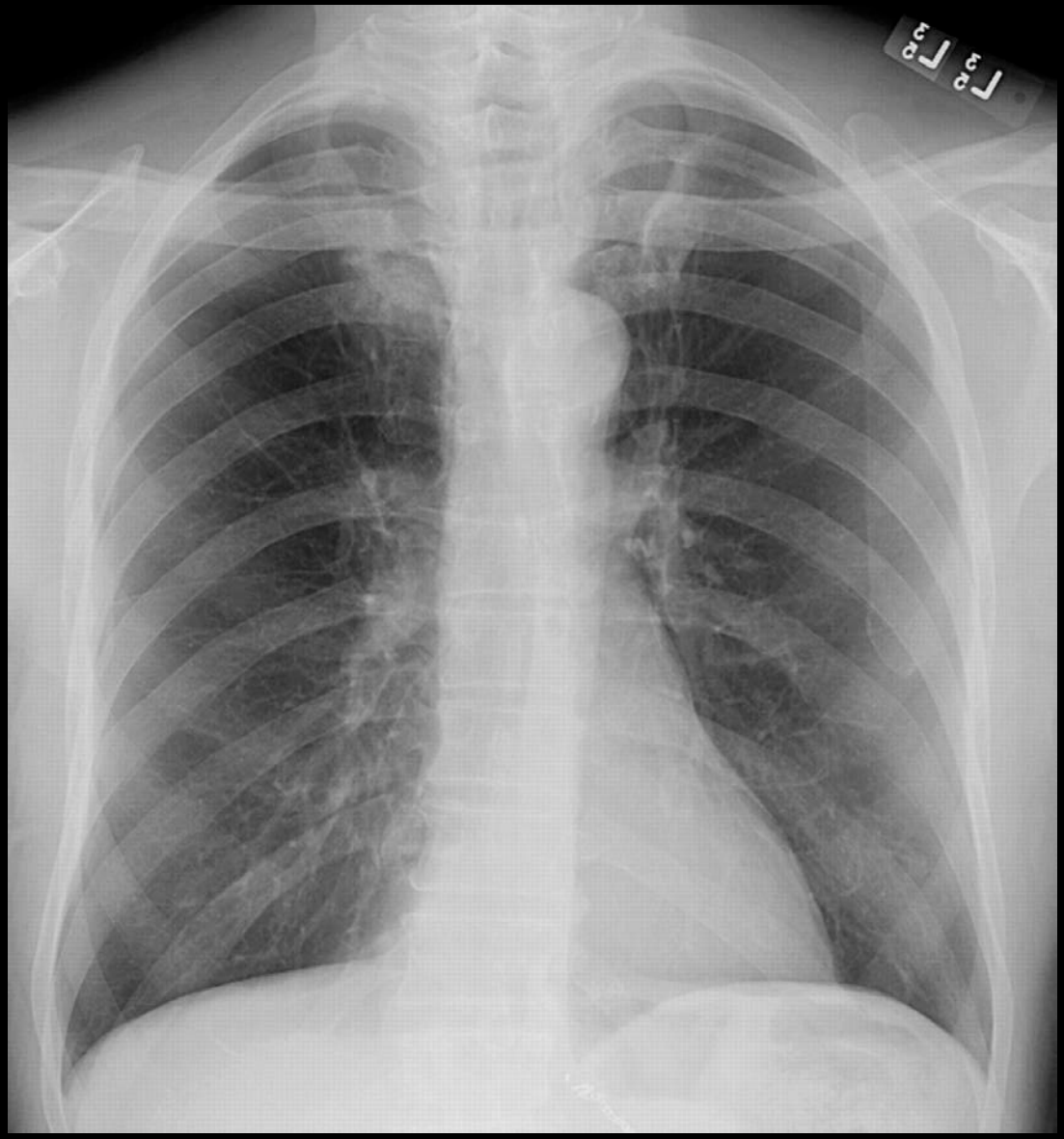
Figure 10a: Dual-energy subtraction radiography in an elderly man



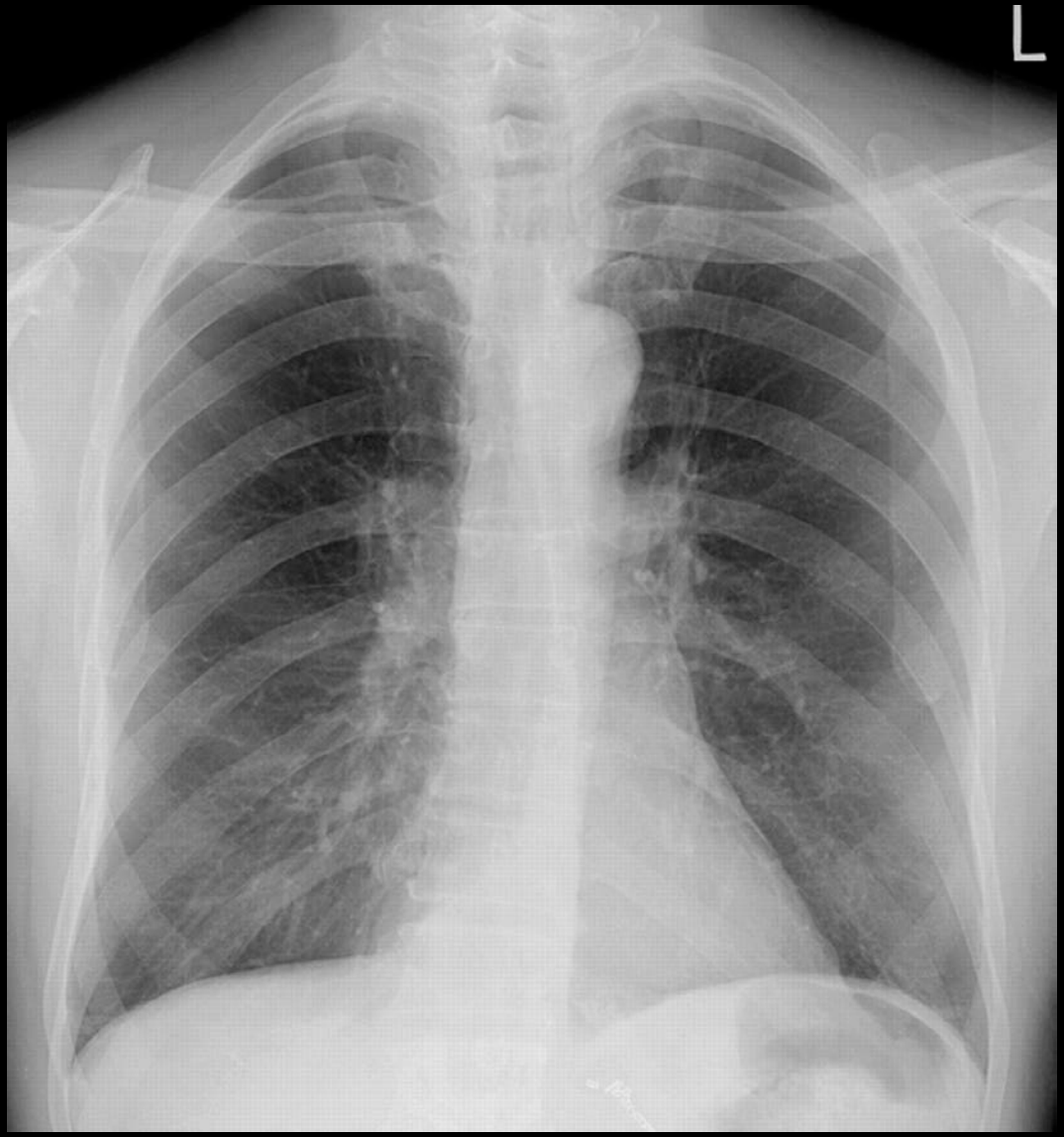
Imagerie de soustraction temporelle

- Soustraction d’une image radiographique antérieure à l’actuelle
- Variation de position générant artefacts
- Gris uniforme là où il n’existe pas de modification
- Résultats préliminaires: amélioration de perception des nodules

Figure 11a: Temporal subtraction radiography in a middle-aged patient



11b: Temporal subtraction radiography in a middle-aged patient



11c: Temporal subtraction radiography in a middle-aged patient

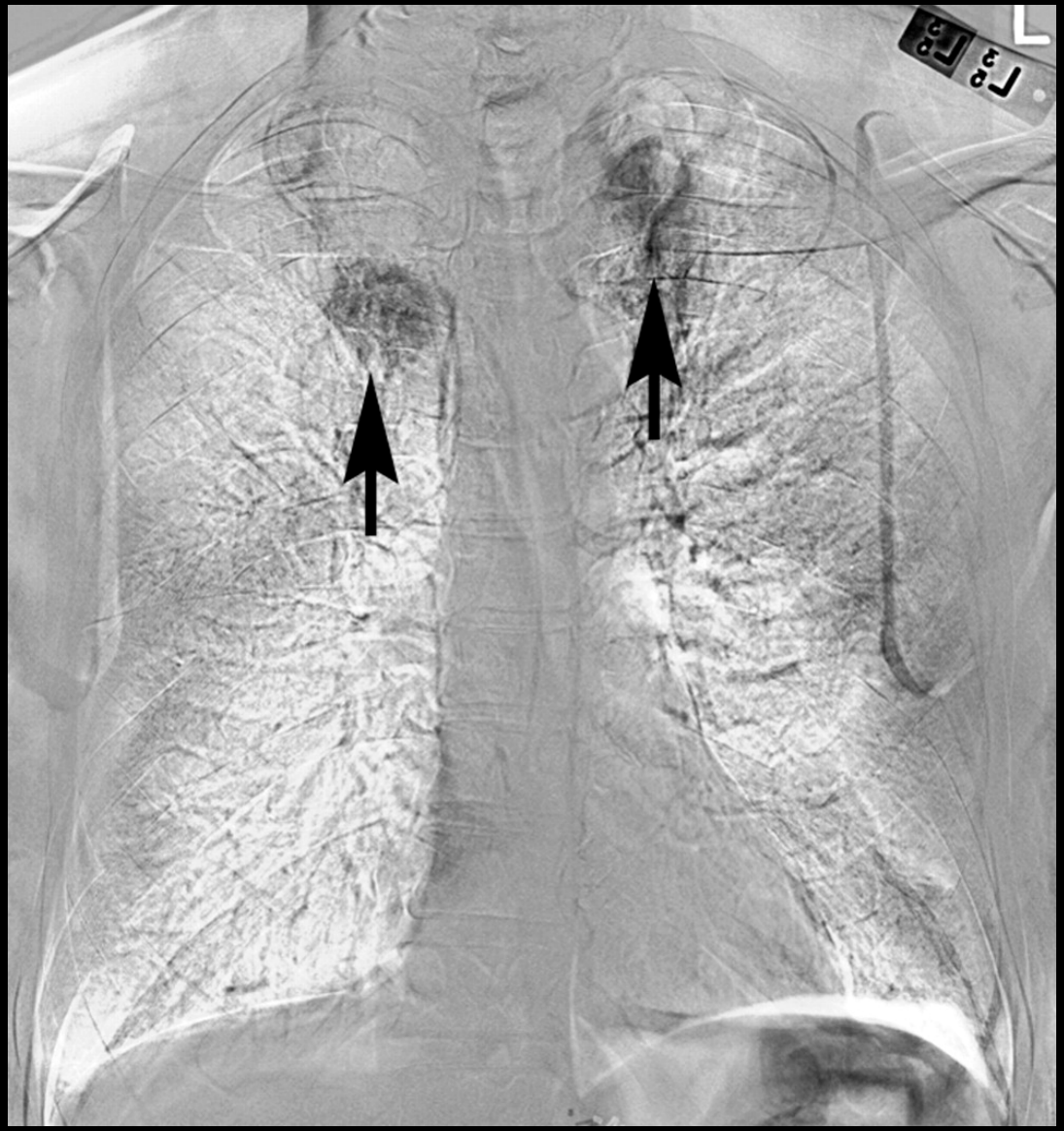


Figure 11d: Temporal subtraction radiography in a middle-aged patient

Figure 11e: Temporal subtraction radiography in a middle-aged patient

Tomosynthèse digitale

- Tomographie digitale
- Multiples plans acquis en 1 passage
- Plans arbitraires
- Différents algorithmes pour rendre l'image plus nette
- Elimination des structures en dehors du plan
- Meilleure détection des nodules

Figure 12a: Images in middle-aged woman with history of right partial mastectomy for breast cancer who presented for routine follow-up (same patient as in Fig 4)

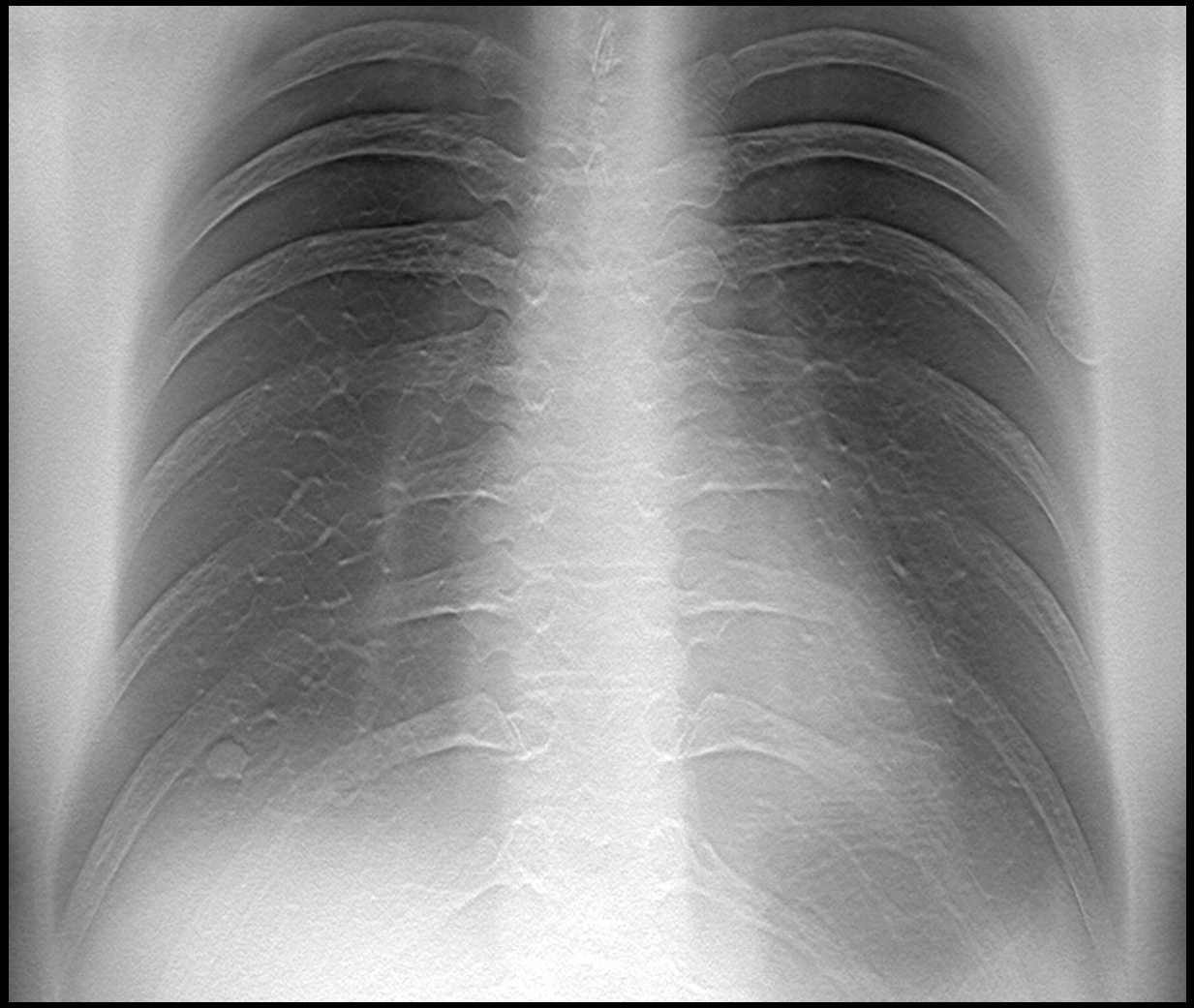


Figure 12b: Images in middle-aged woman with history of right partial mastectomy for breast cancer who presented for routine follow-up (same patient as in Fig 4)

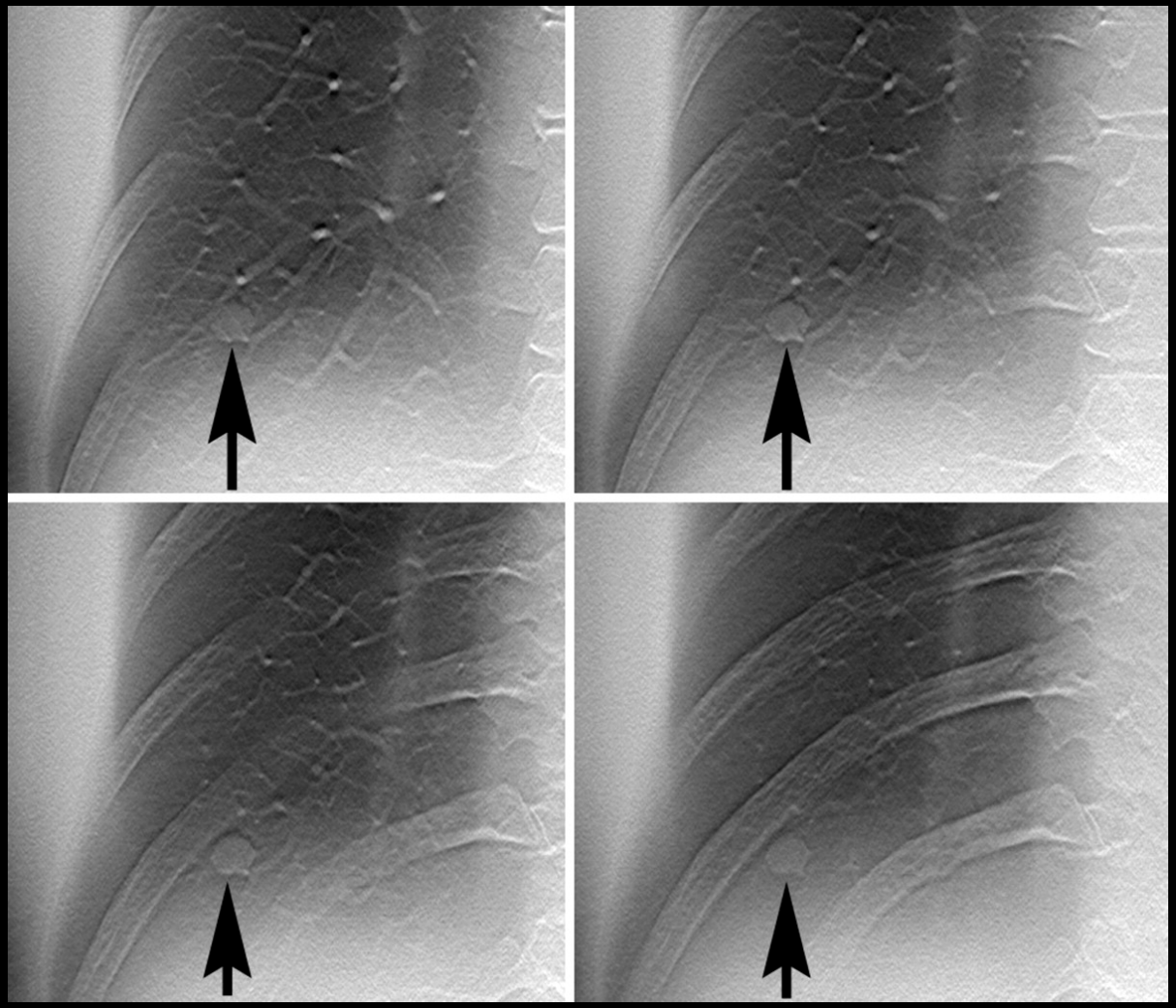


Figure 12c: Images in middle-aged woman with history of right partial mastectomy for breast cancer who presented for routine follow-up (same patient as in Fig 4)

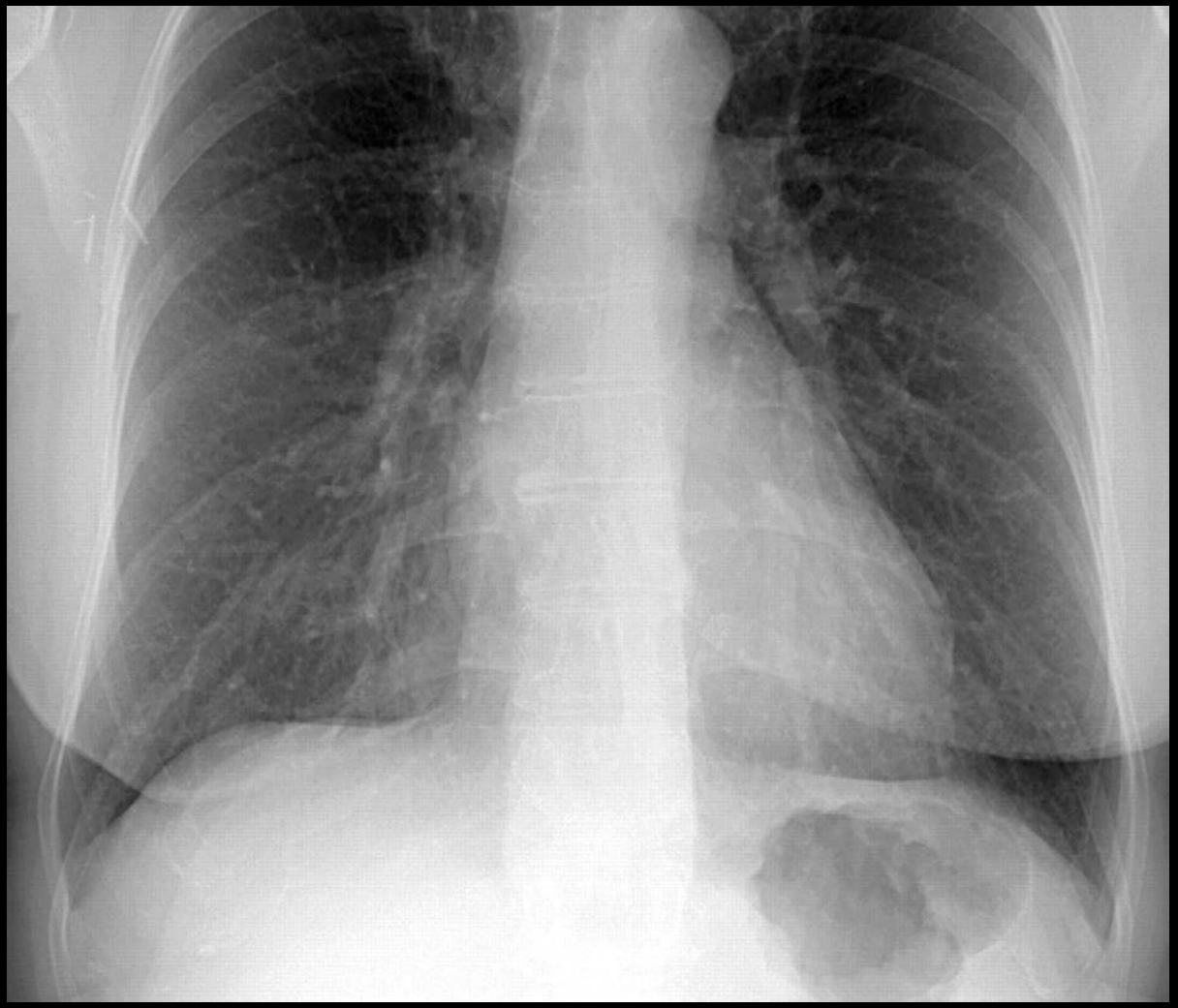


Figure 13a: Images in middle-aged man

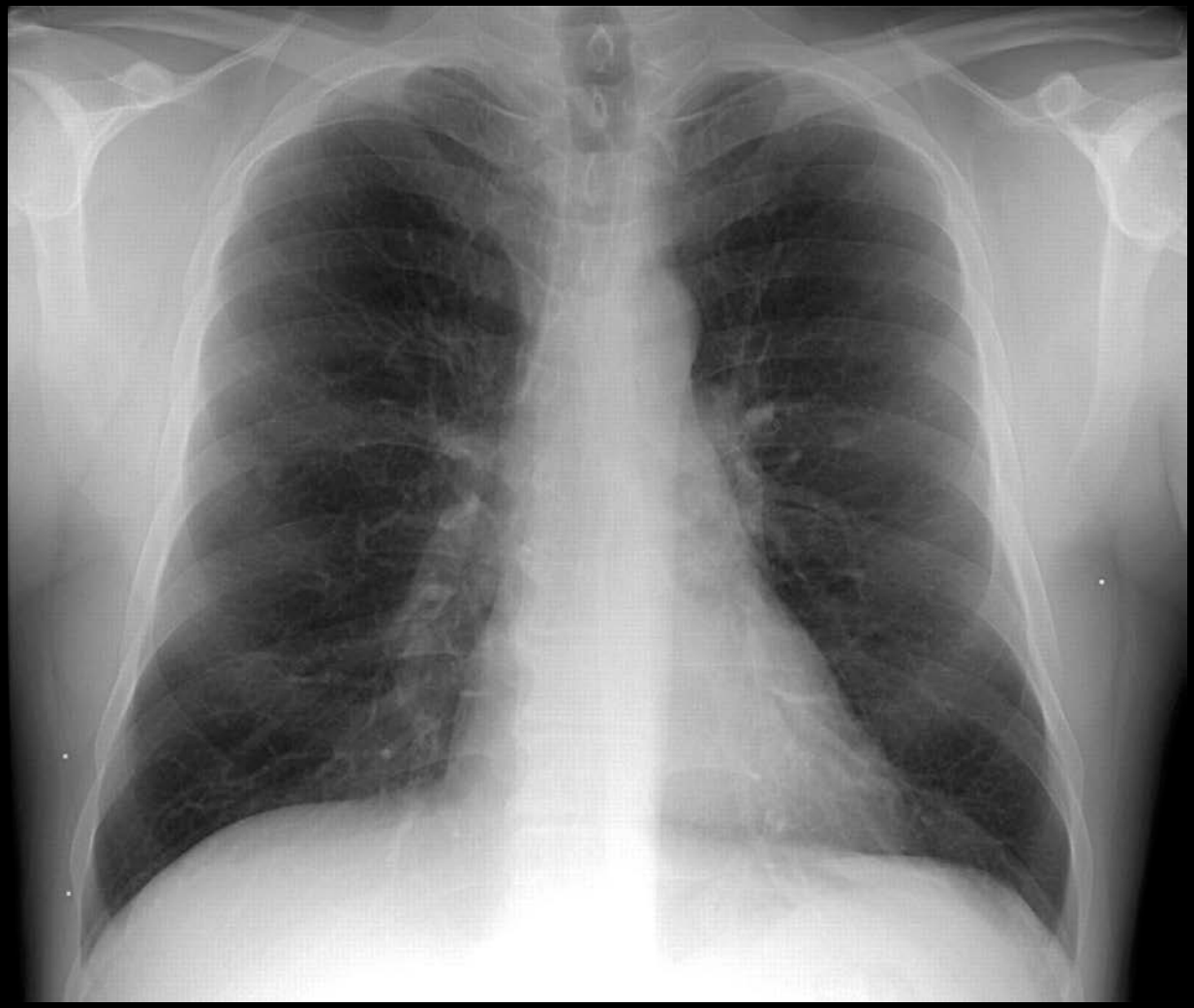


Figure 13b: Images in middle-aged man

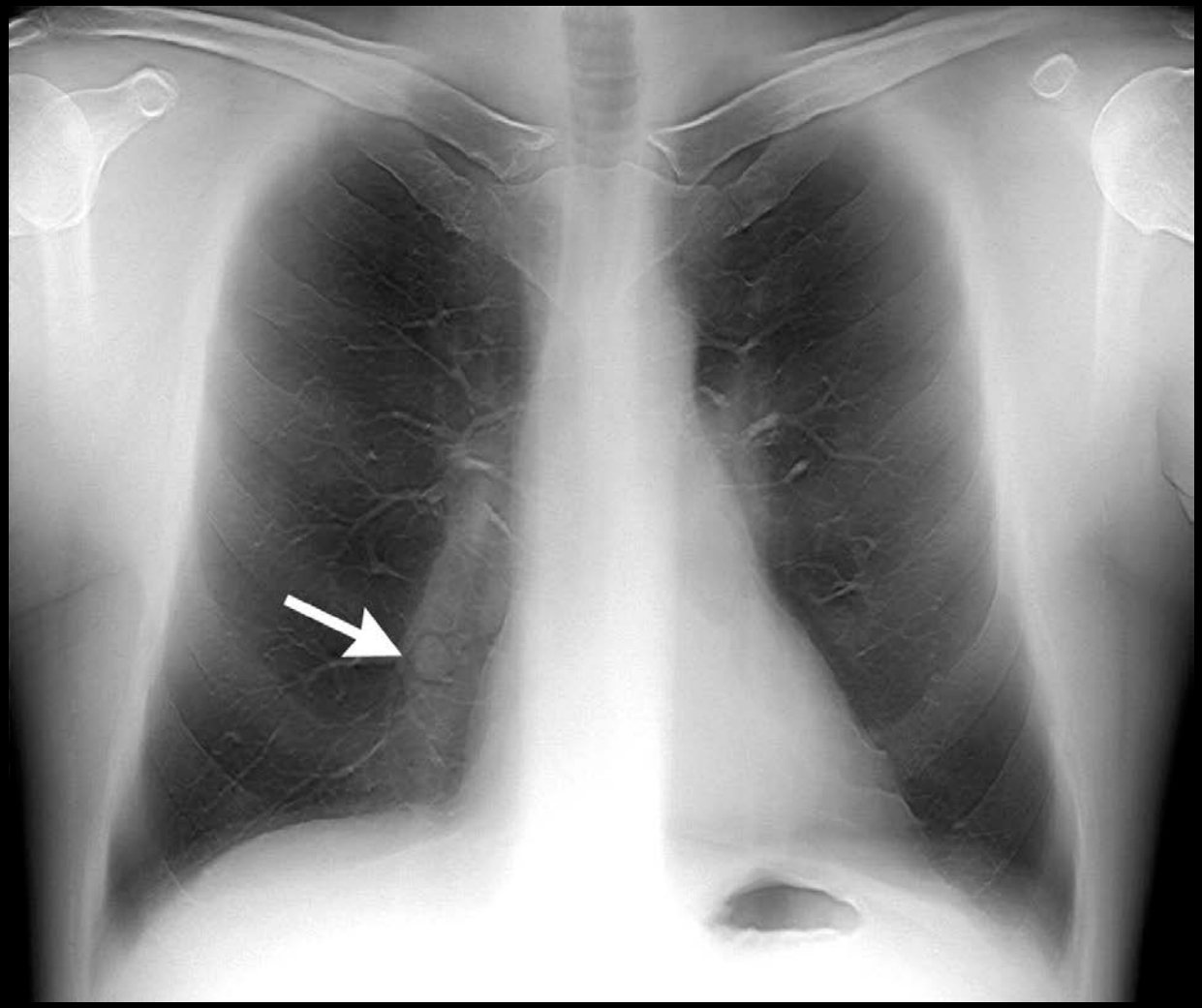


Figure 13c: Images in middle-aged man

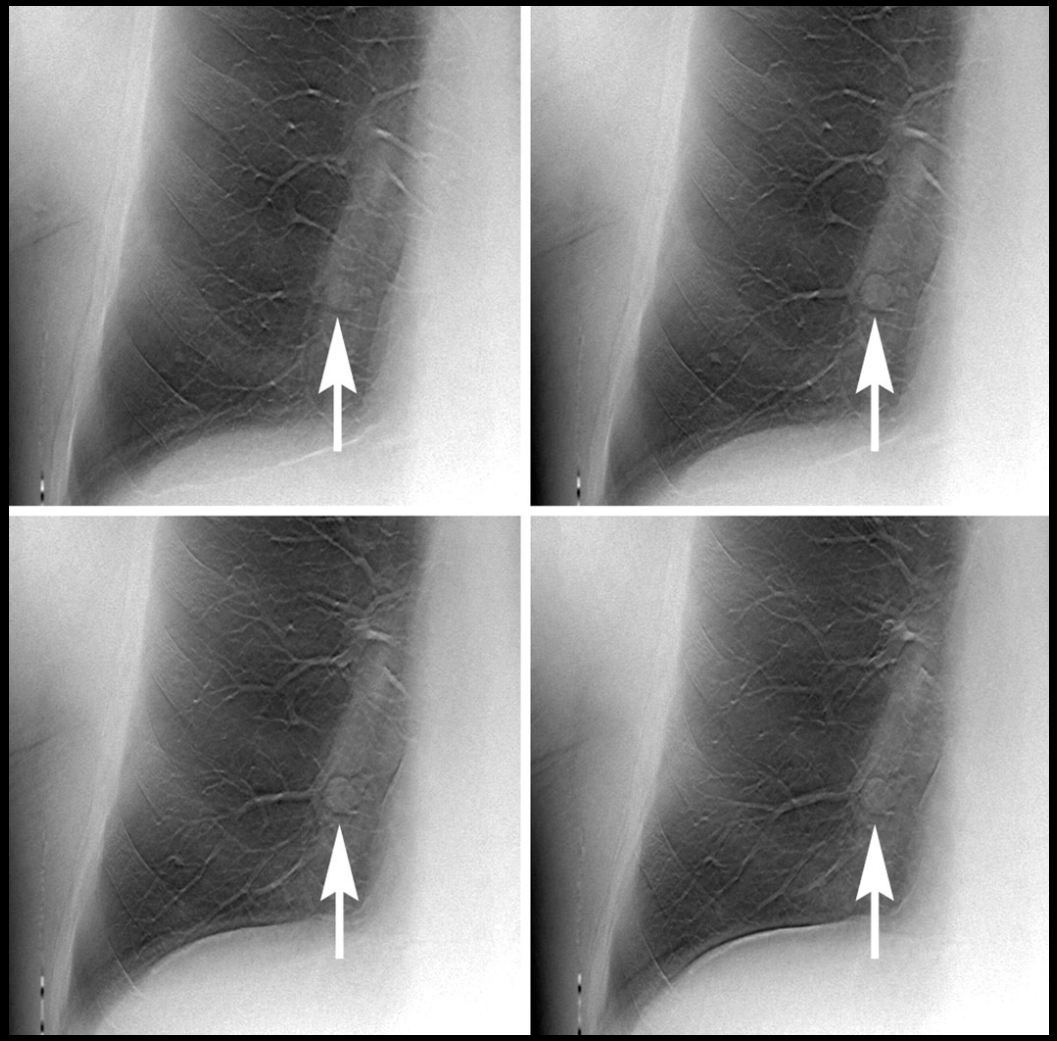


Figure 14a: Images in middle-aged man

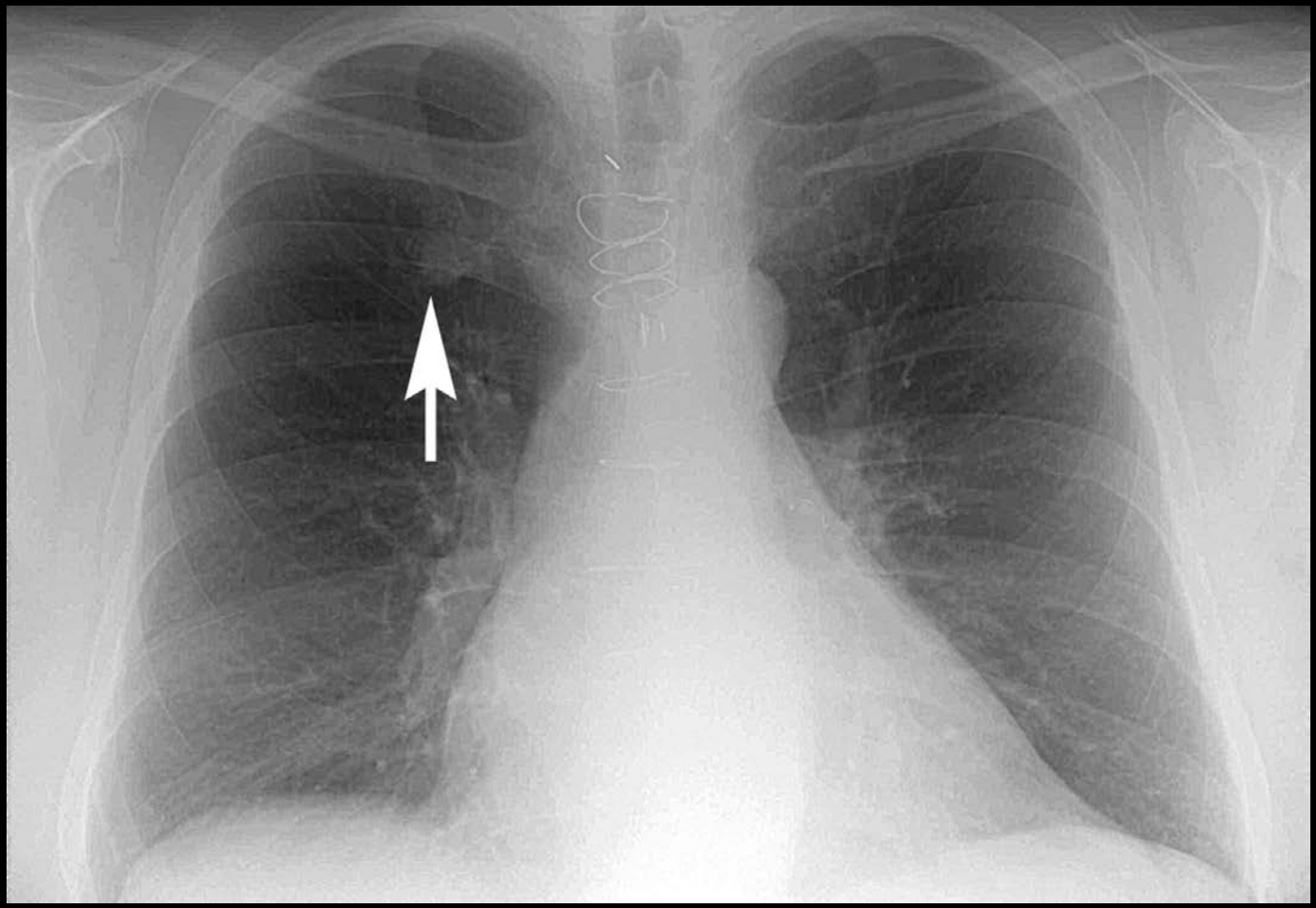
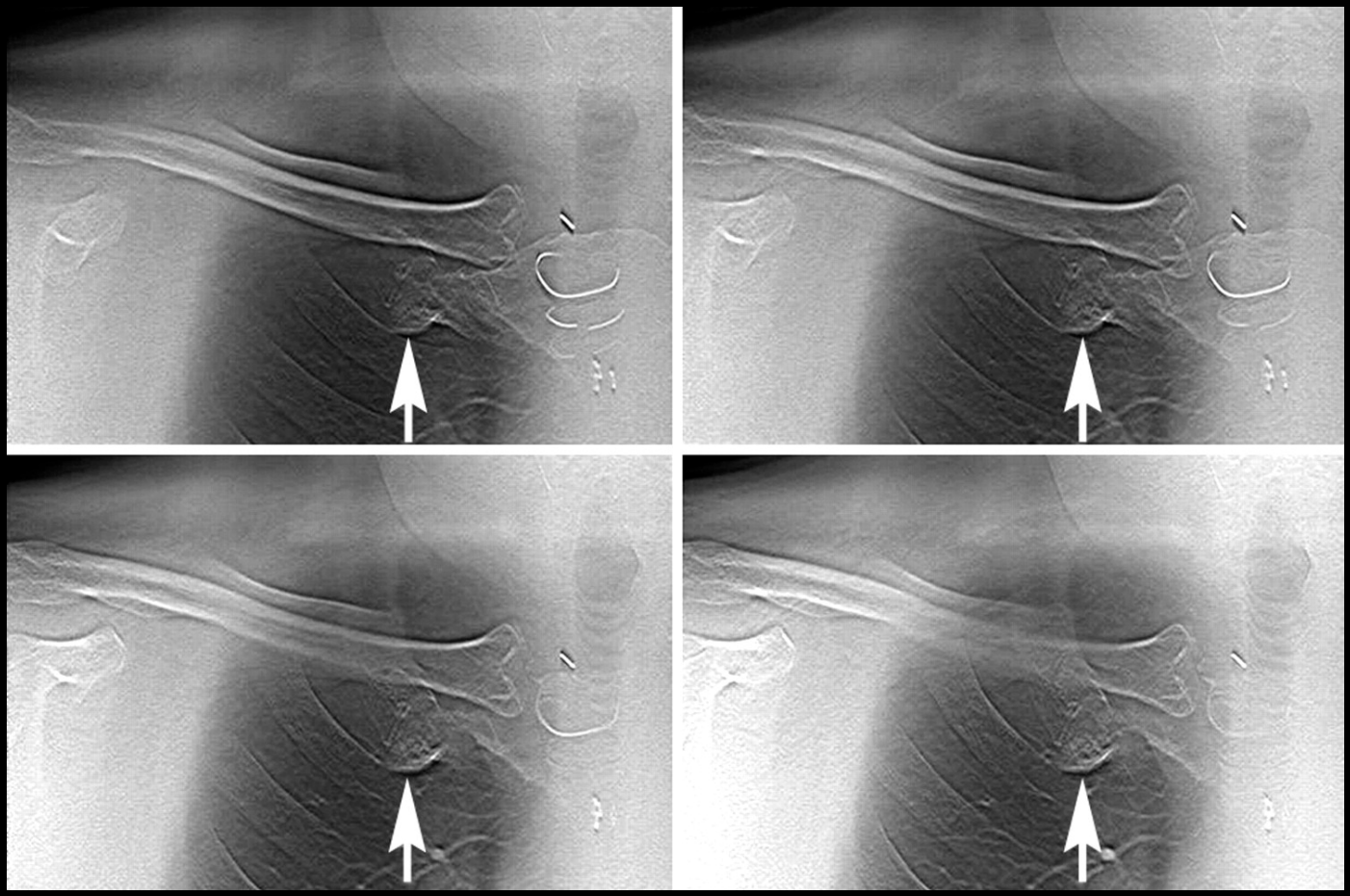


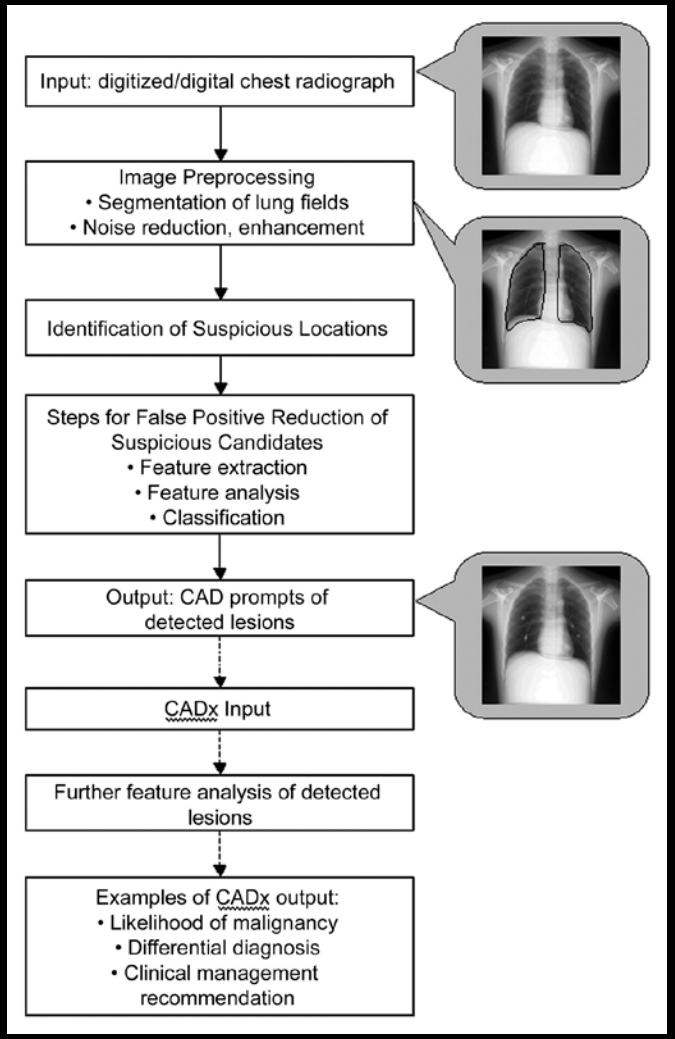
Figure 14b: Images in middle-aged man



Outils d’aide à la détection

- Détecte des anomalies de façon automatique
- Agit comme un second lecteur
- Améliore la performance du radiologue
- Détection des nodules principalement
  - Mesure de l’ICT
  - Caractérisation des lésions infiltrantes pulmonaires

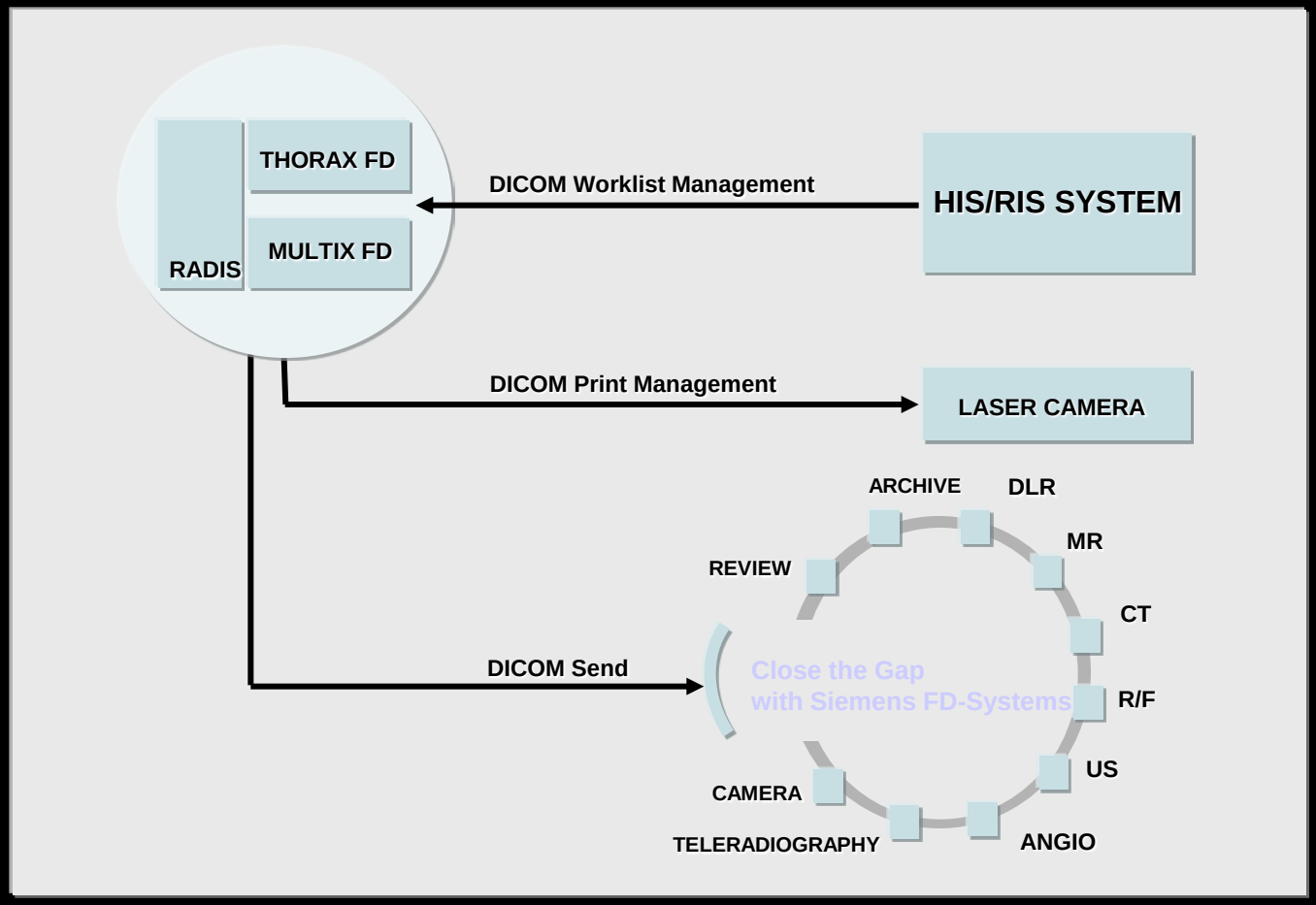
Figure 15: Flow diagram illustrates operation of CAD system



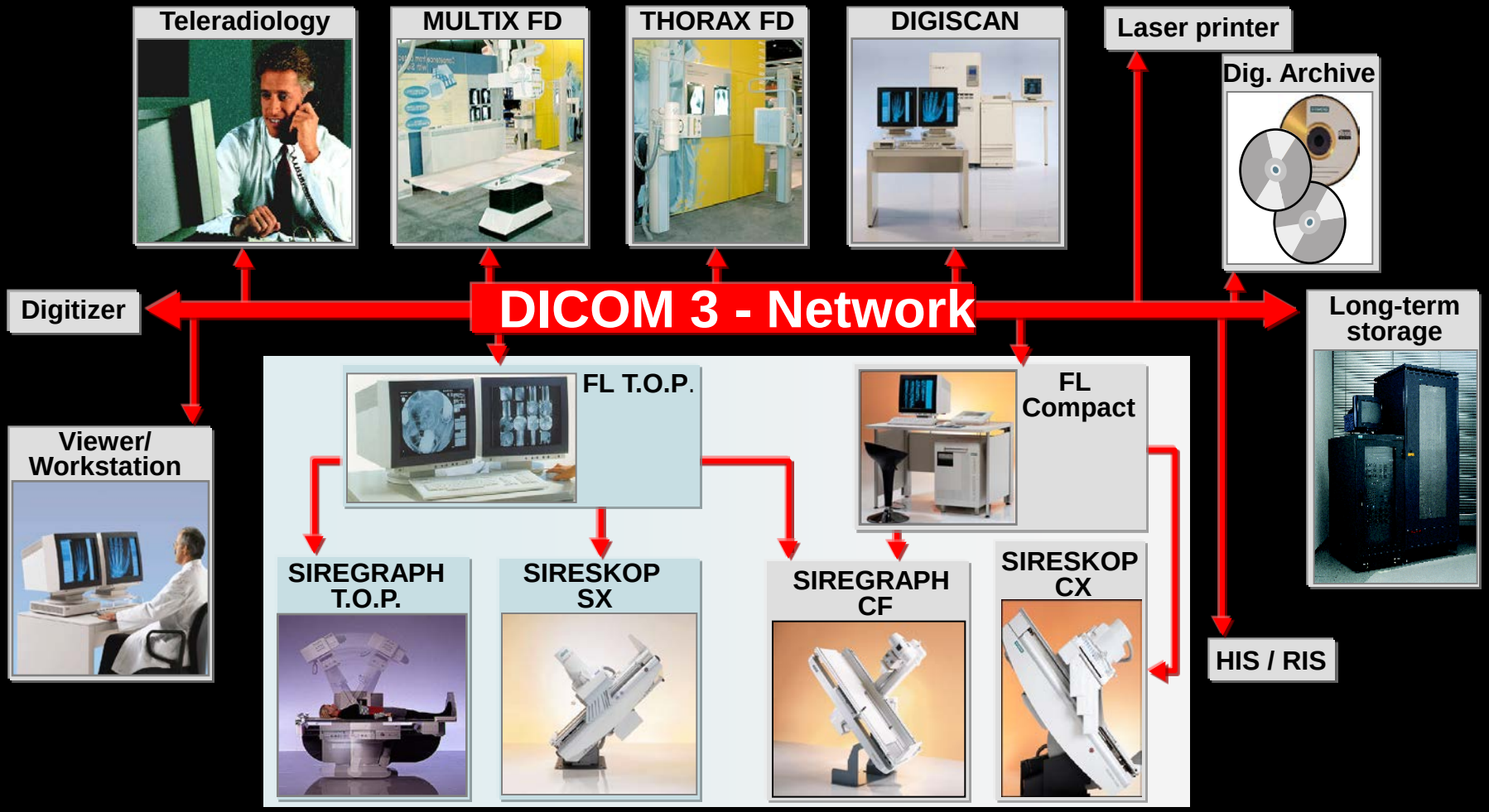
Avantages de l’image digitale

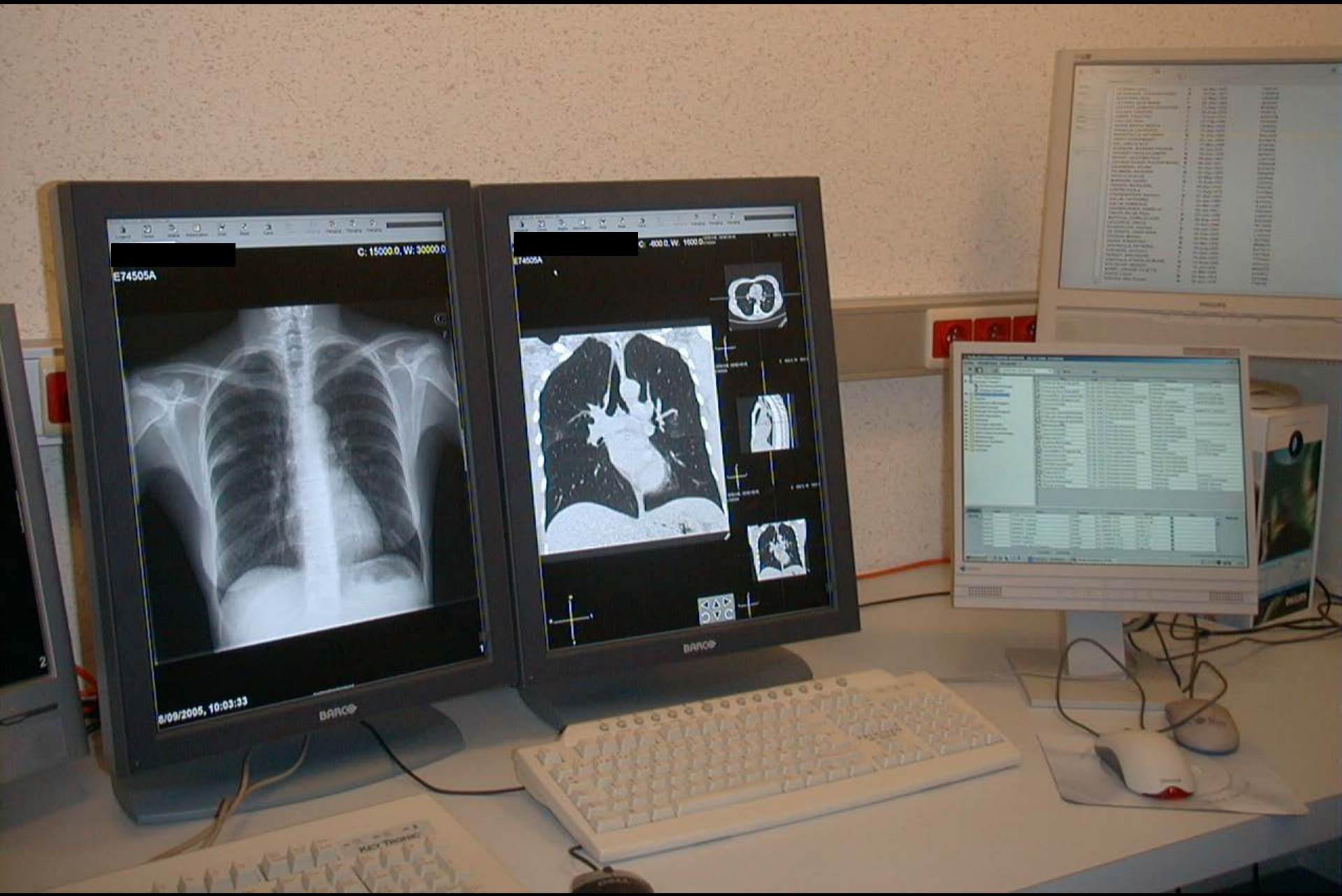
- Optimisation de l’affichage sans modifier les paramètres d’acquisition
- Post-processing
- Archivage électronique
- Augmentation workflow
- Acquisition rapide de multiples images

Networking with DICOM



Digital Network for Radiology

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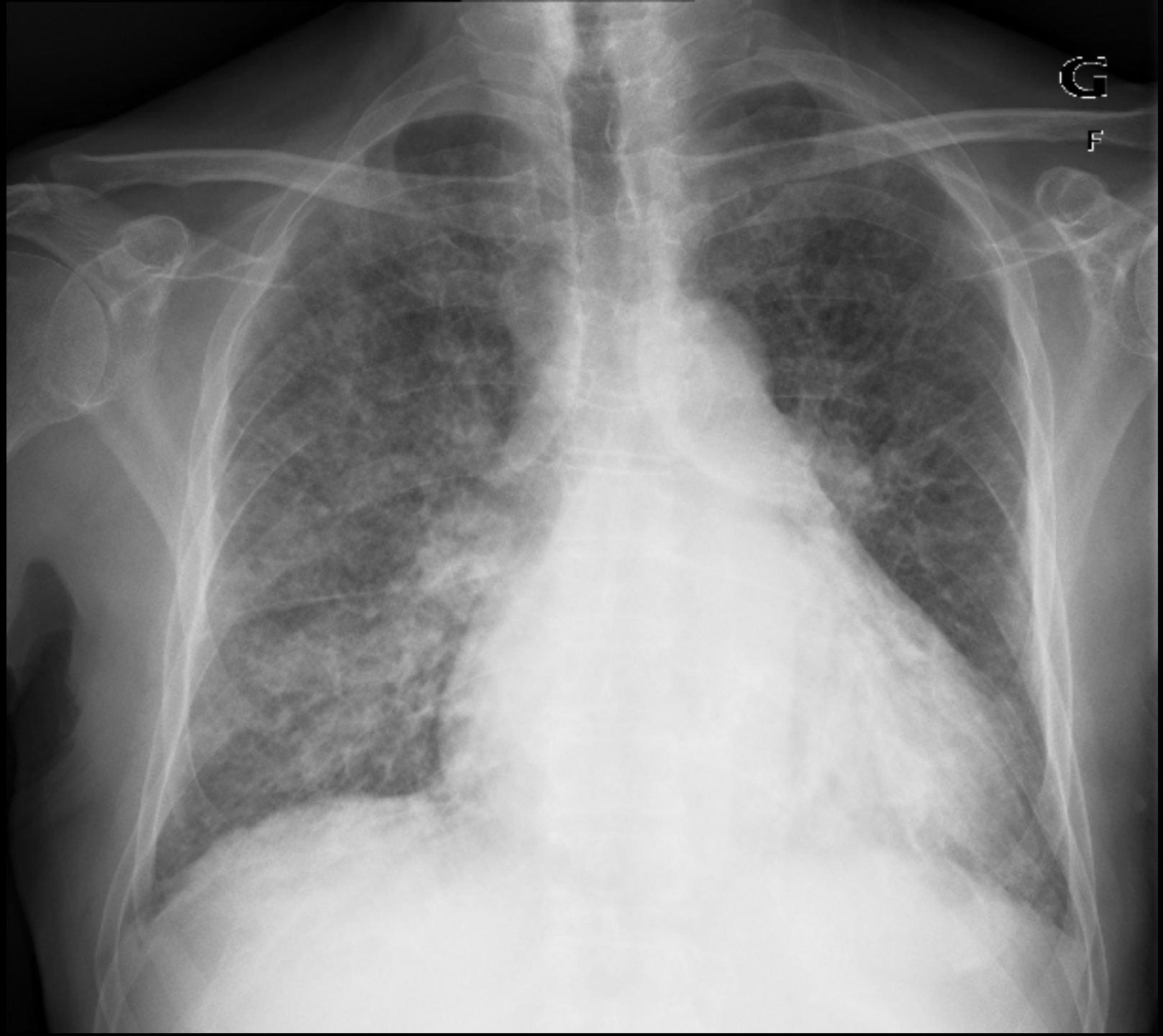
Side by side comparison of 2 modalities

Flat detector panel

40-MDCT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