

# Pleural Diseases

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# Headings

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- Pneumothorax
- Malignant Pleural Mesothelioma
- Pleural Effusions

# Pneumothorax

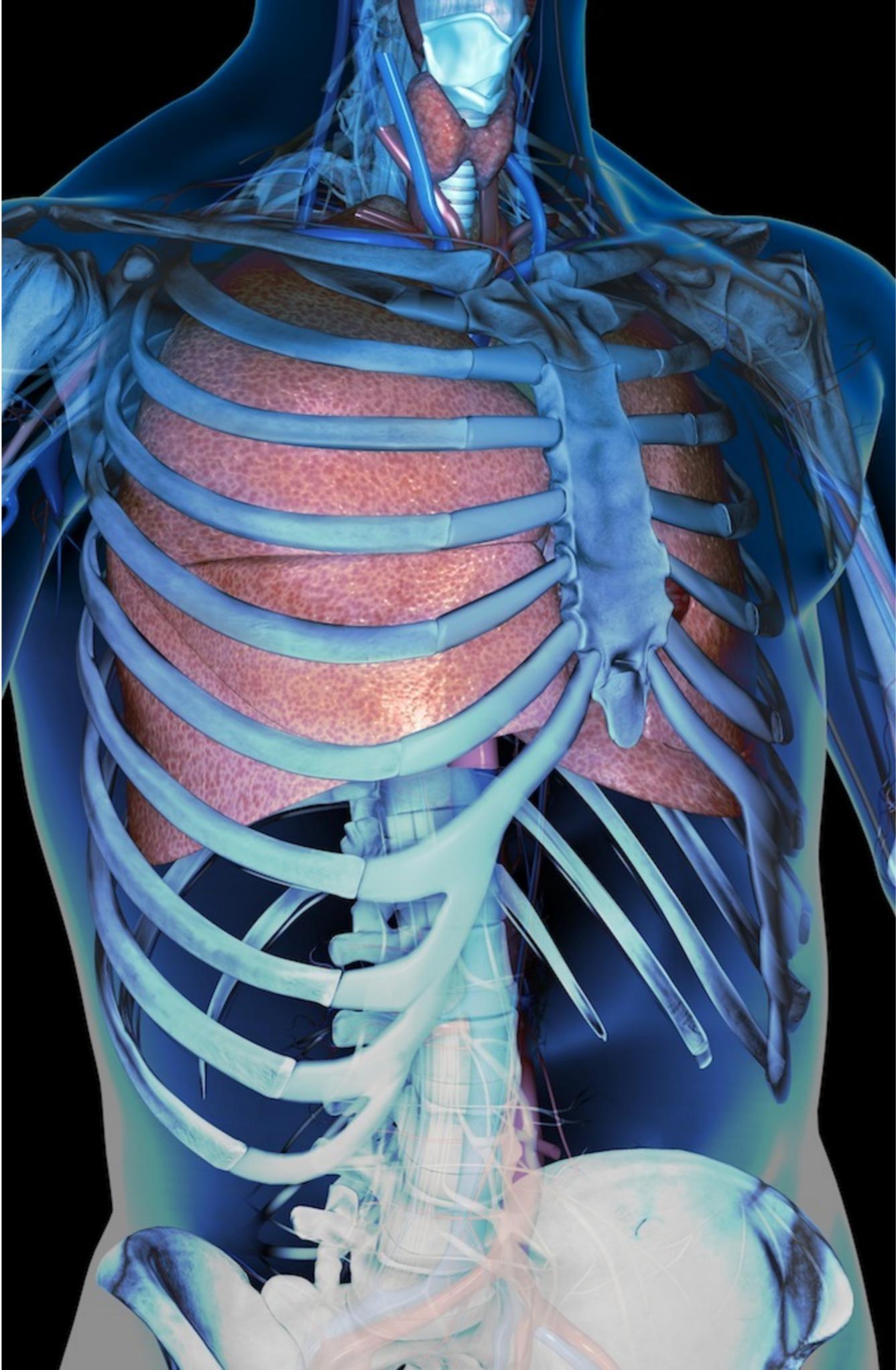
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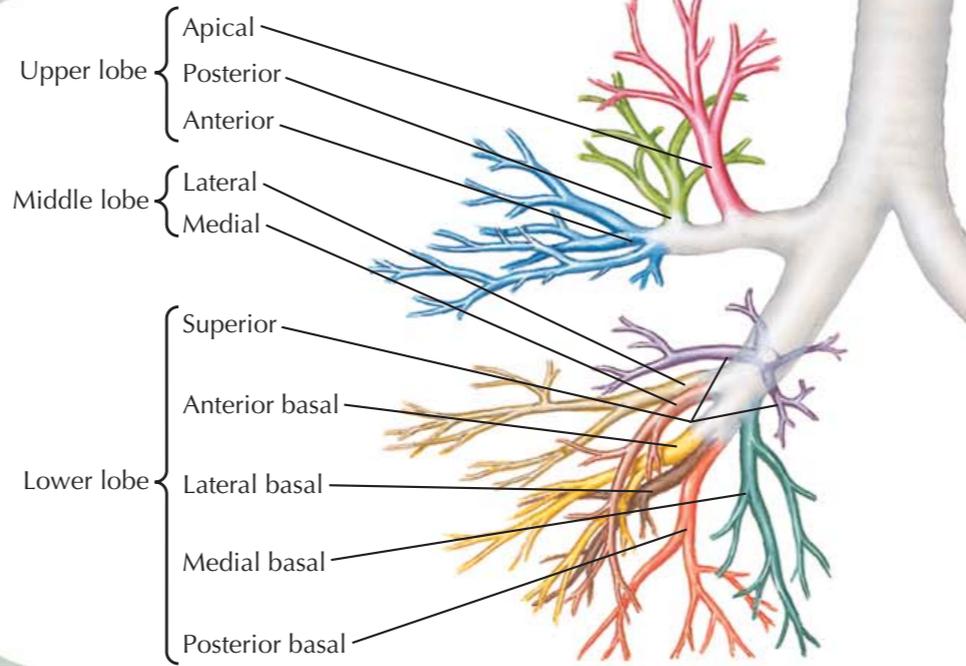




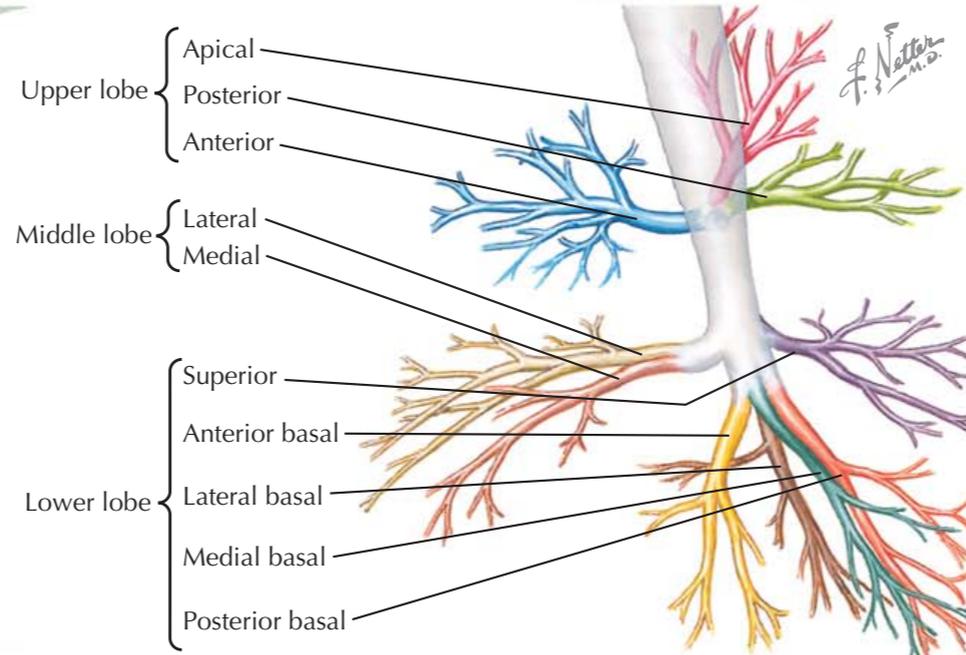




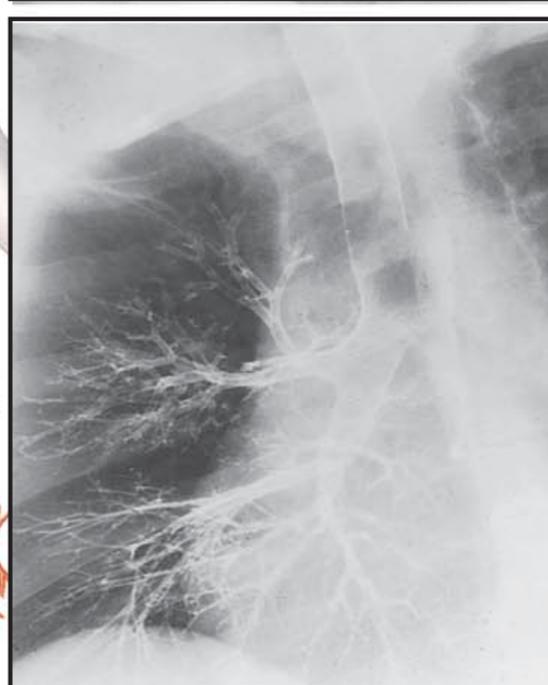
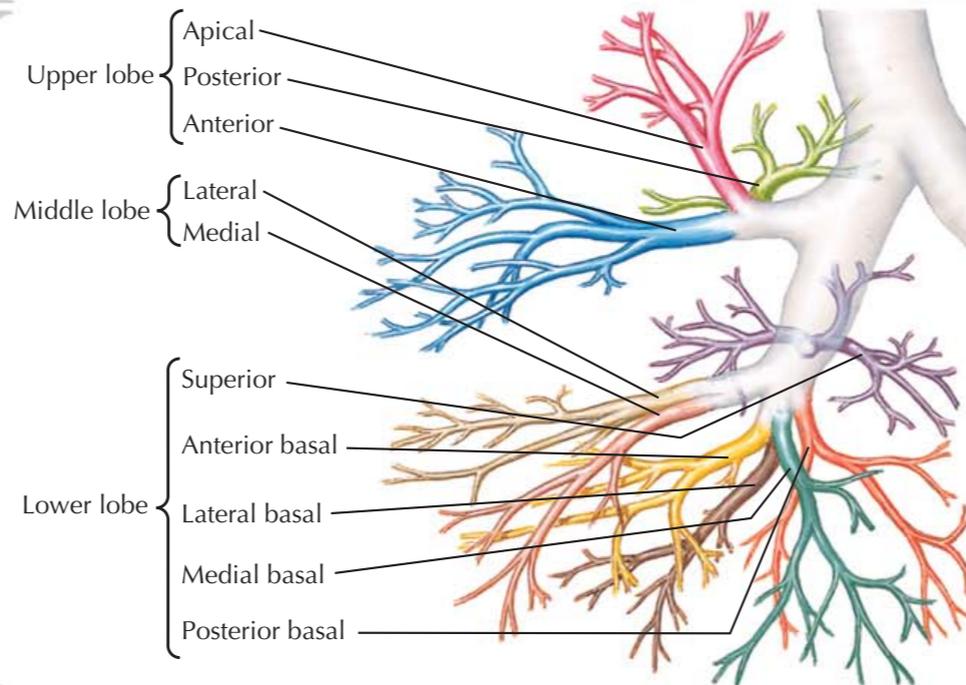
**PA projection**



**Lateral projection**

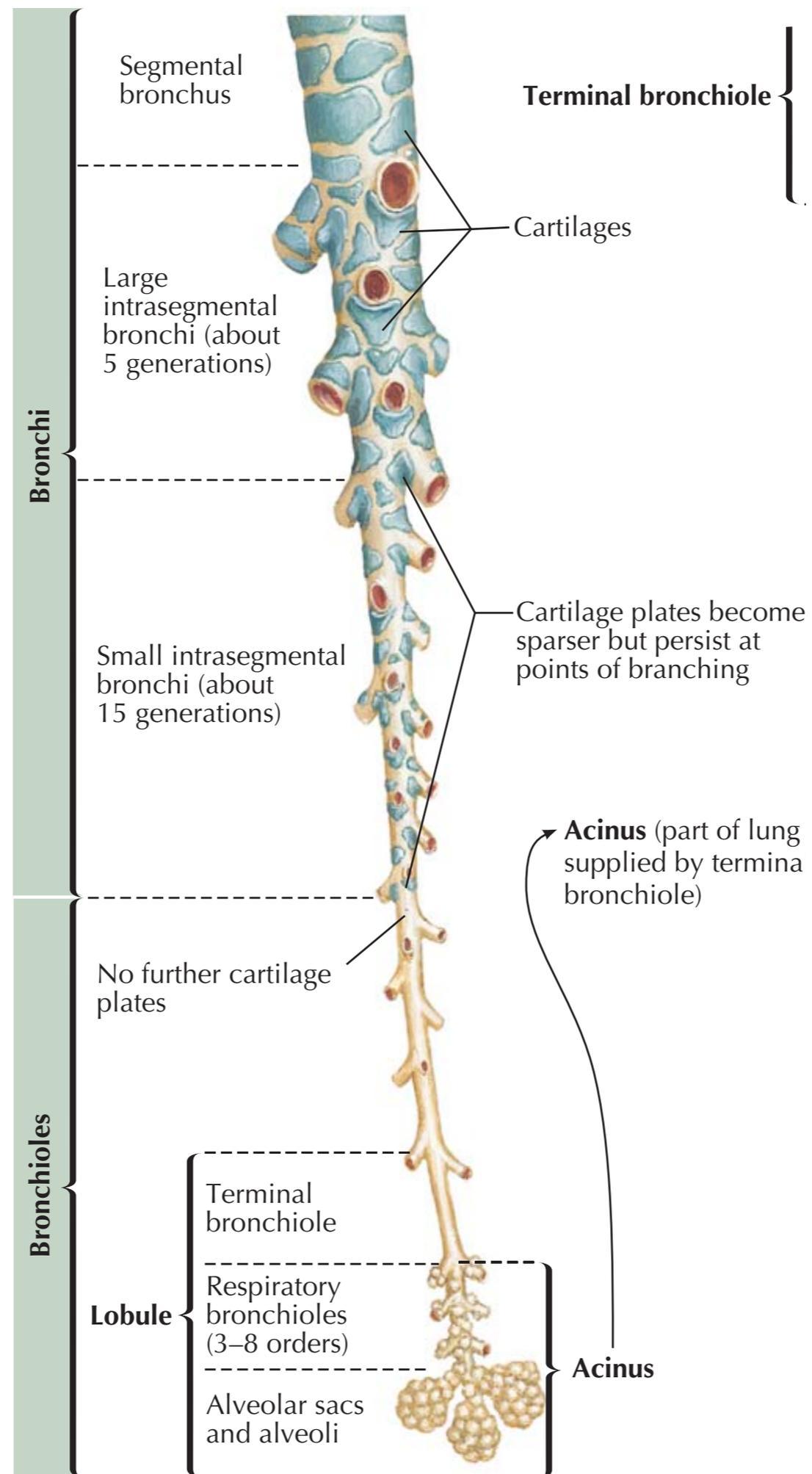


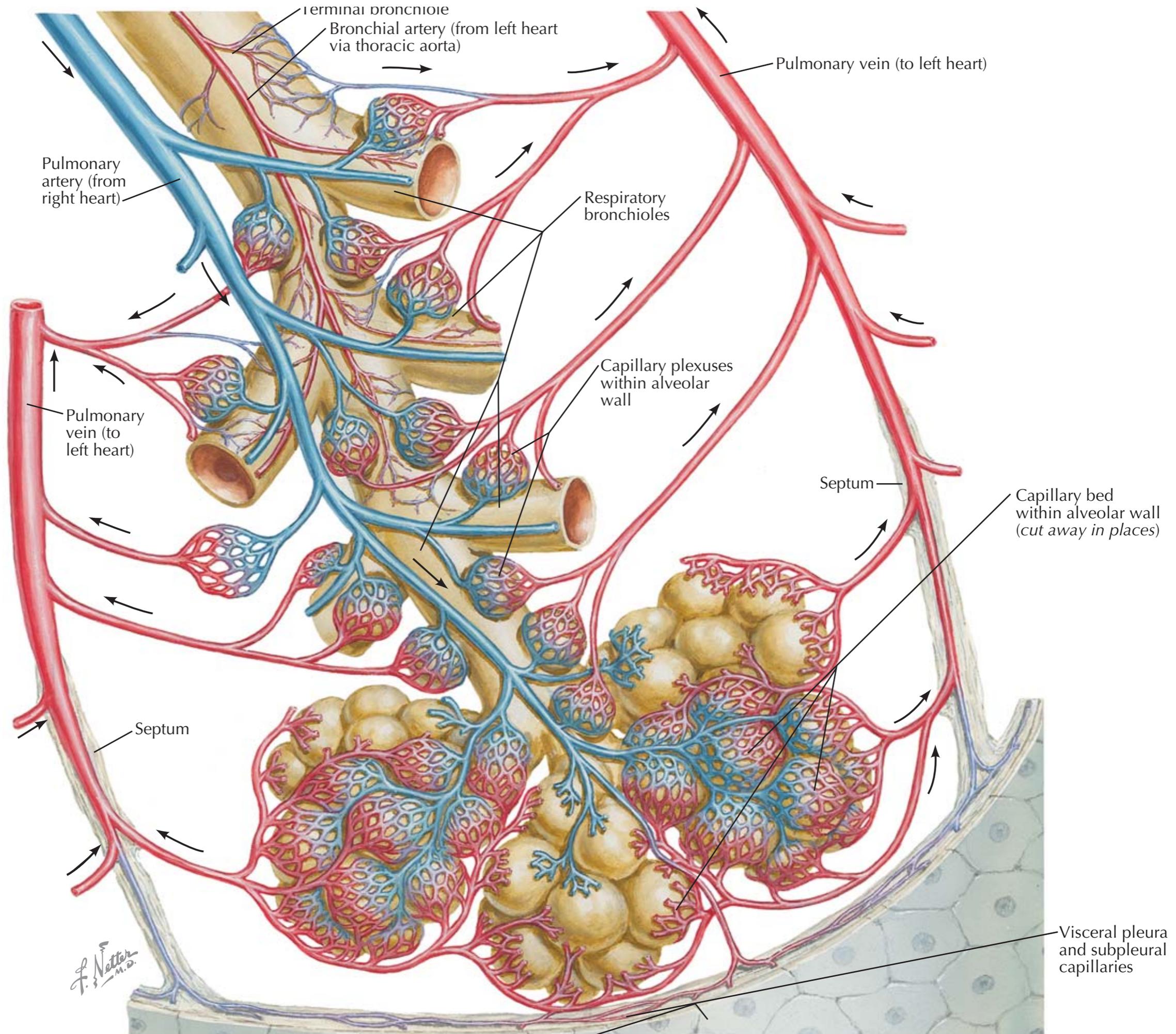
**Left anterior oblique projection**











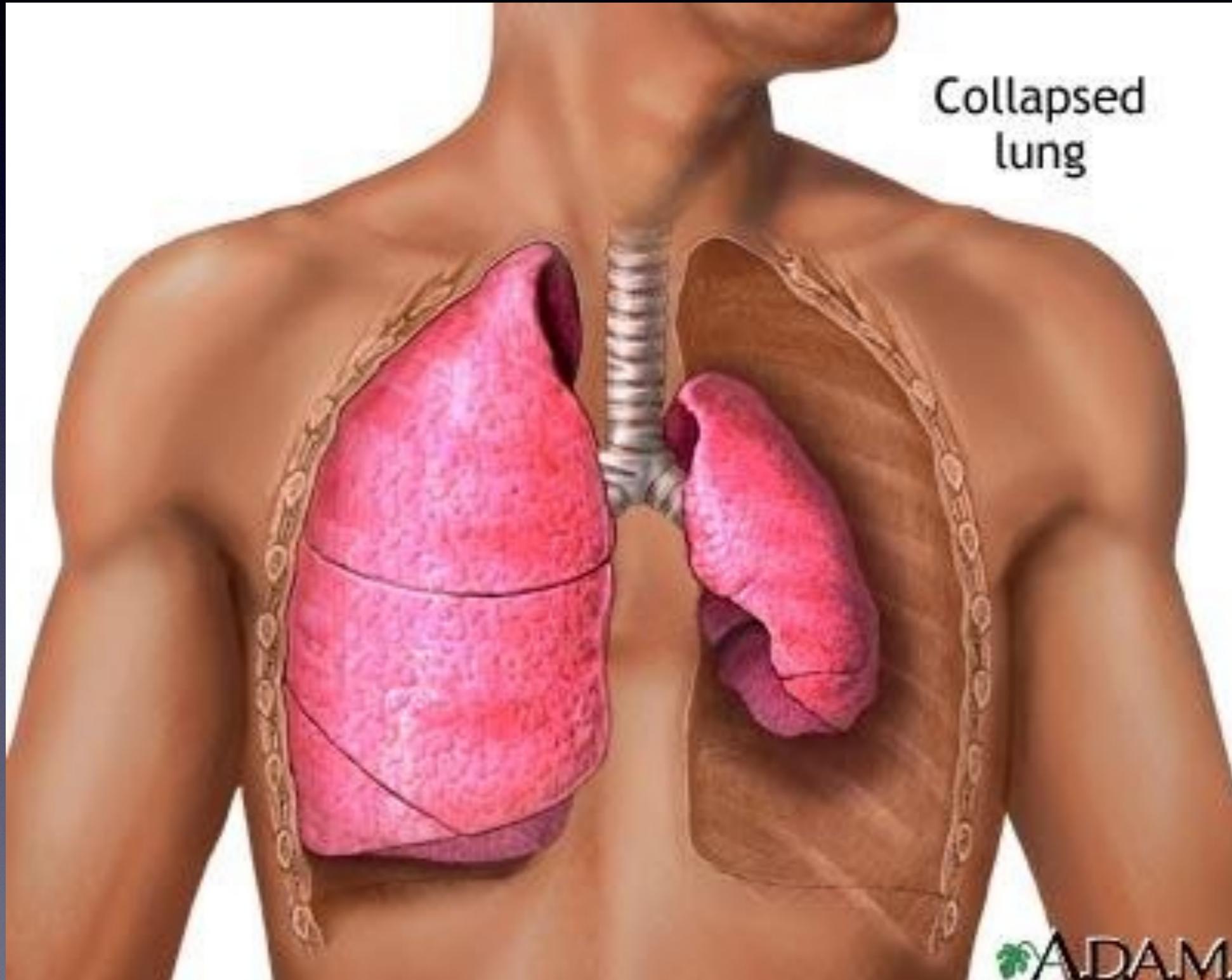
# Pneumothorax

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- Pneumothorax is the collection of air in the pleural space—that is, loss of lower pressure between the lung and the chest wall.
- Incidence: 8 - 14 /100.000/year
- A typical patient with **spontaneous** pneumothorax
  - Young (21-26 years old)
  - Long
  - Thin
  - Smoker
  - Male

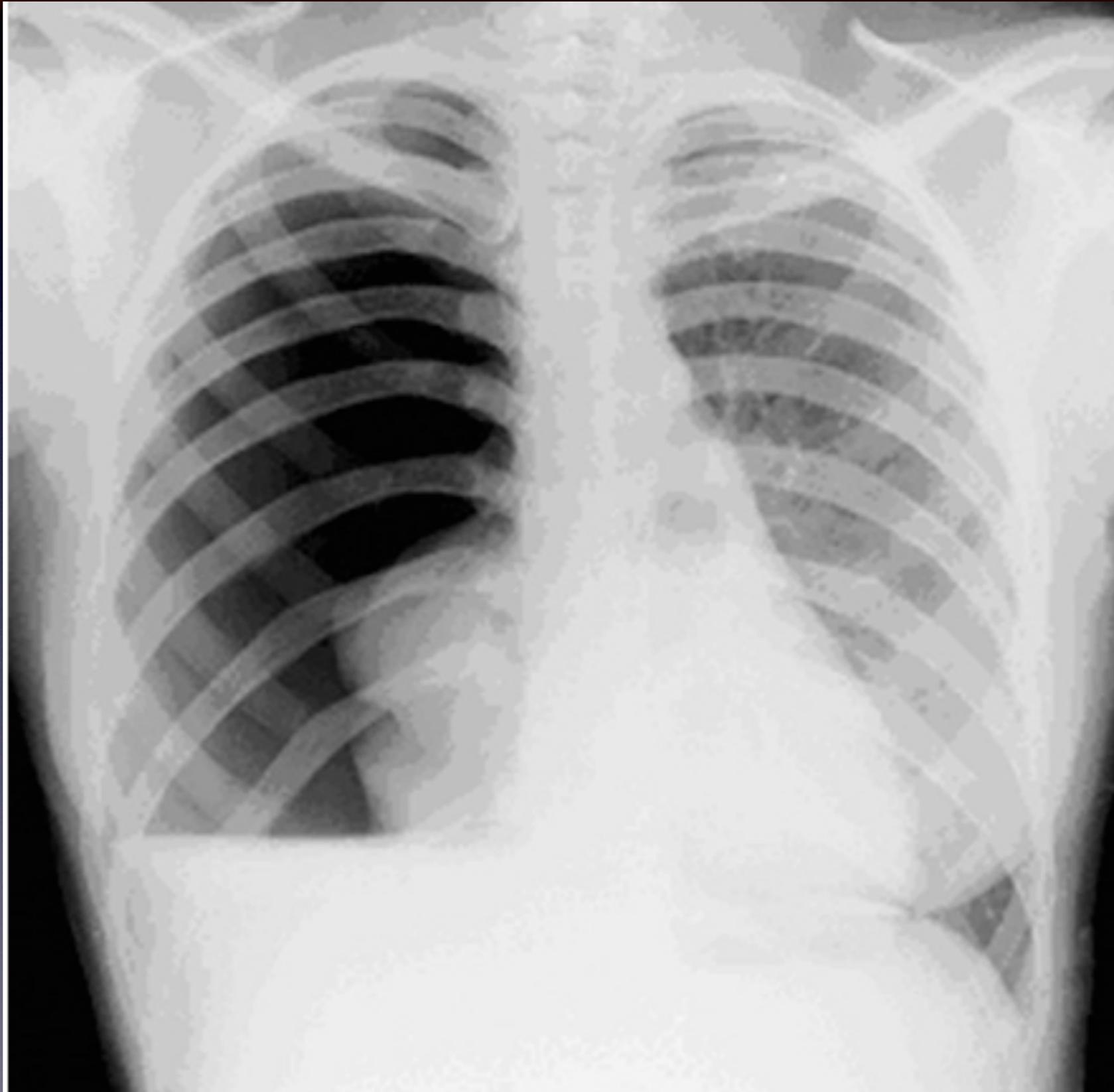
# Pneumothorax

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# Pneumothorax

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# Classification

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- Spontaneous
  - Primary : No-underlying lung pathology
  - Secondary : Associated with a lung pathology
  - Catamenial : Synchronous with menstruation
- Traumatic
  - Penetrating injury
  - Blunt
  - Barotrauma
- Iatrogenic (CVP catheter, bronchoscopy, trans-thoracic needle aspiration)
- Secondary to infection
- Secondary to airway obstruction
- Secondary to lung cancer

# Diseases Associated with Spontaneous Pneumothorax

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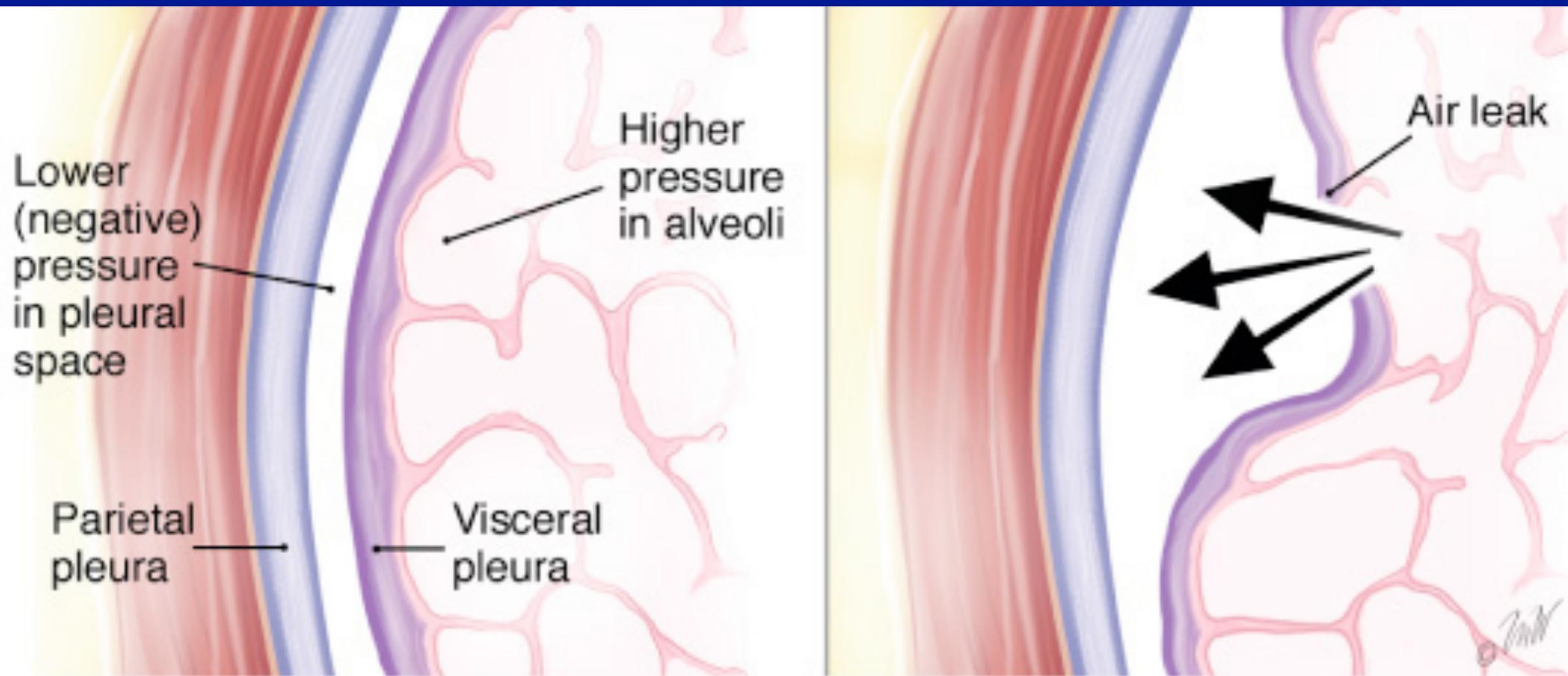
- Alpha-1 Antitrypsin deficiency
- Marfan's Disease (*fibrillin-1 mutation*)
- Tuberous-Sclerosis (*tsk-1,2 mutation*)
- Cystic fibrosis (*CFTR mutation*)
- Birt-Hogg-Dube Syndrome (*FLCN*)

# Diagnosis

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- Postero-anterior Chest radiograph
- Tomography
- Clinical symptoms and signs

# Pneumothorax



A

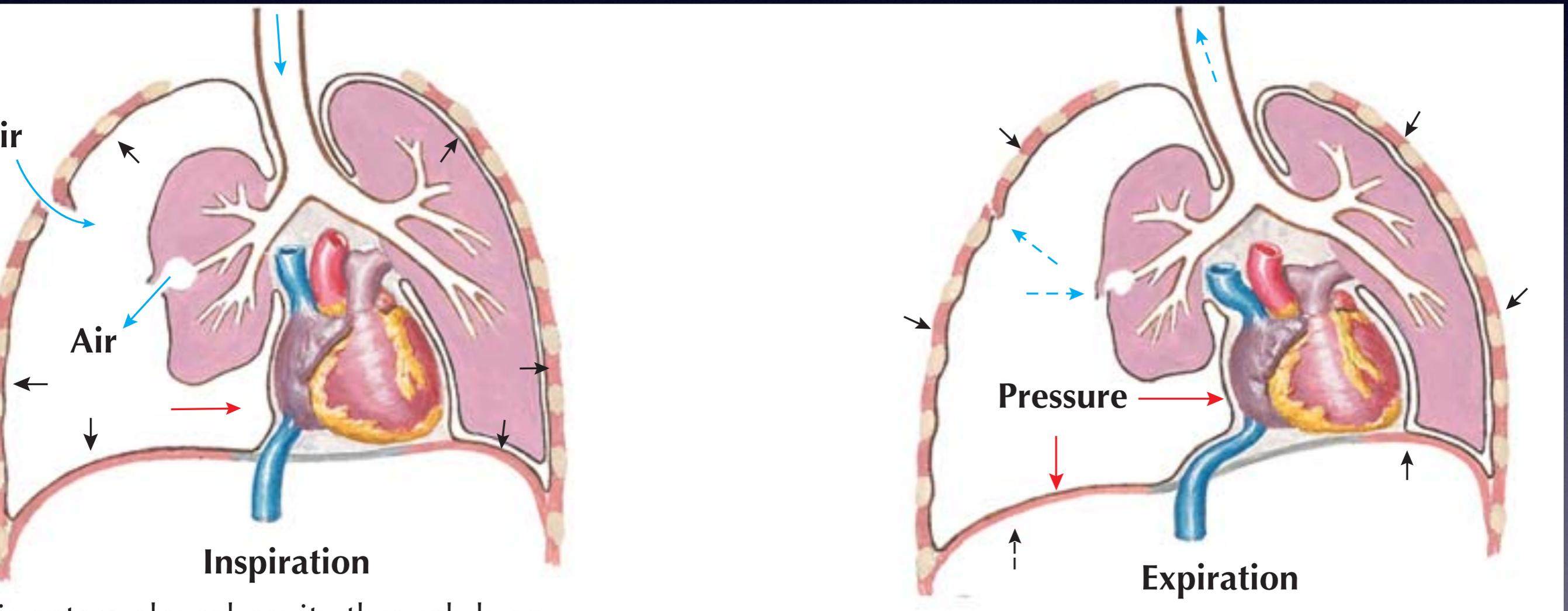
B

# Symptoms

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- Sudden chest pain initiated during resting.
- Sharp pain
- Dyspnea
- Cardiopulmonary failure  
(Tension pneumothorax)

# Tension Pneumothorax

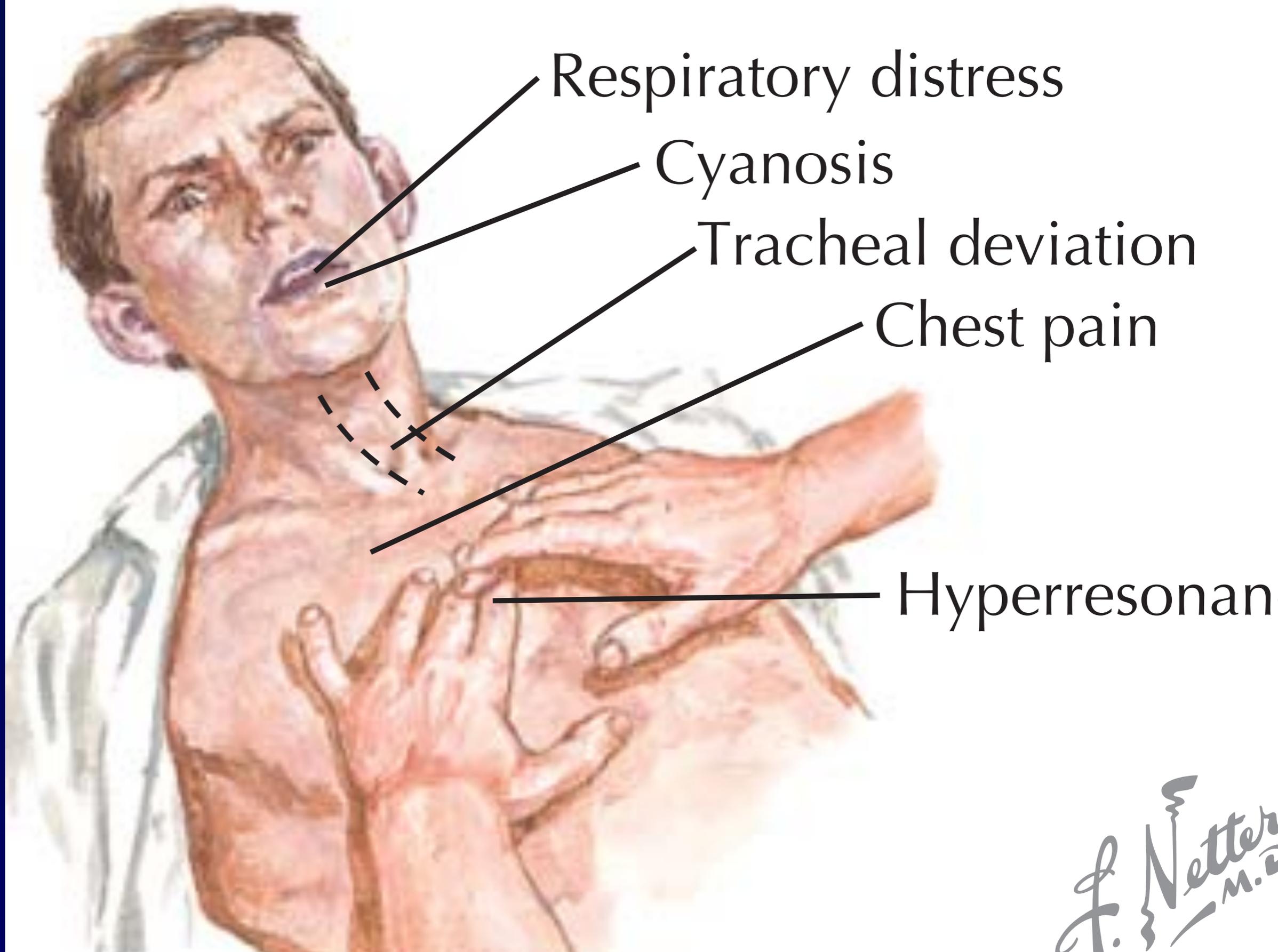


# Tension Pneumothorax

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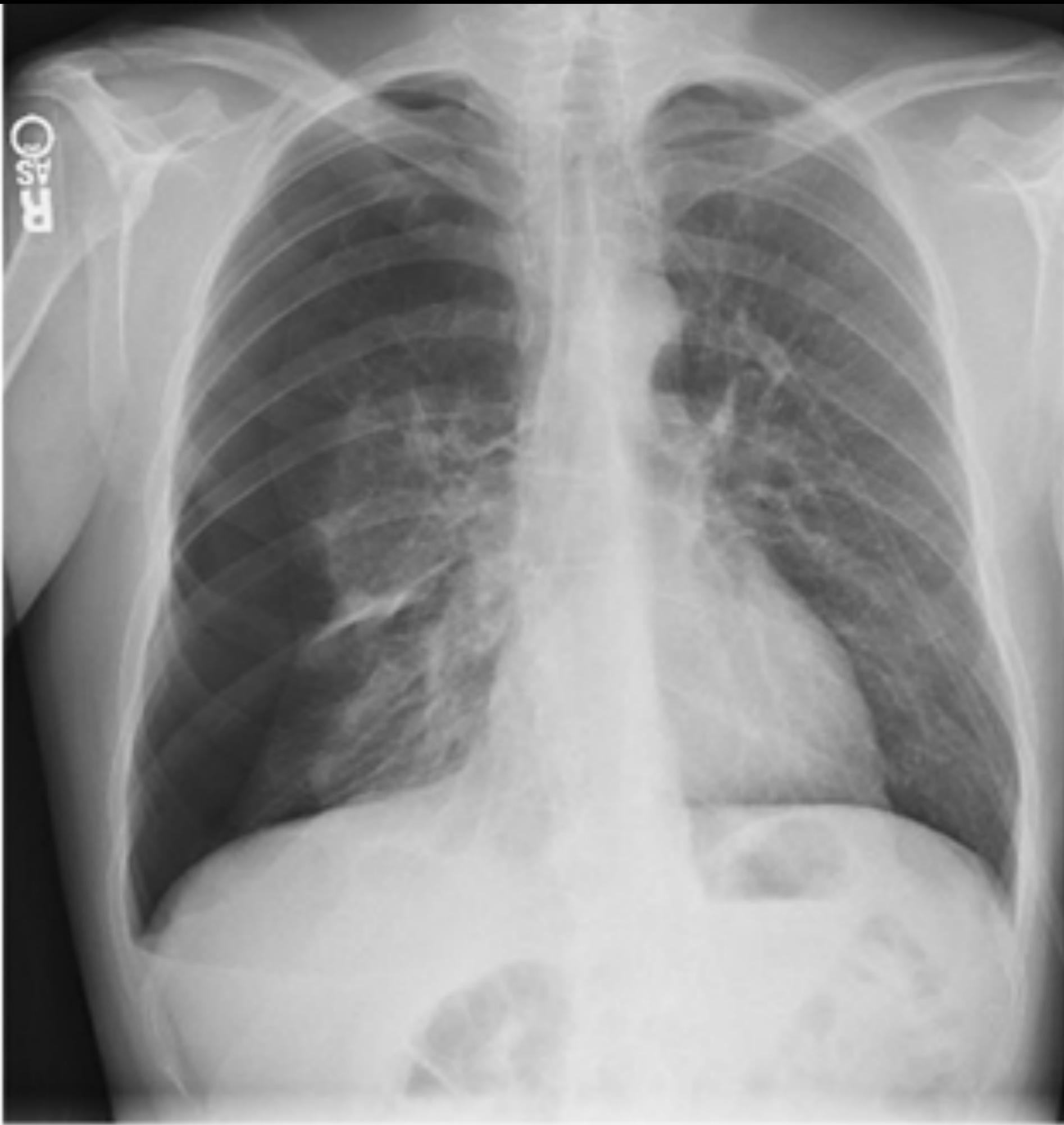
# Clinical manifestations

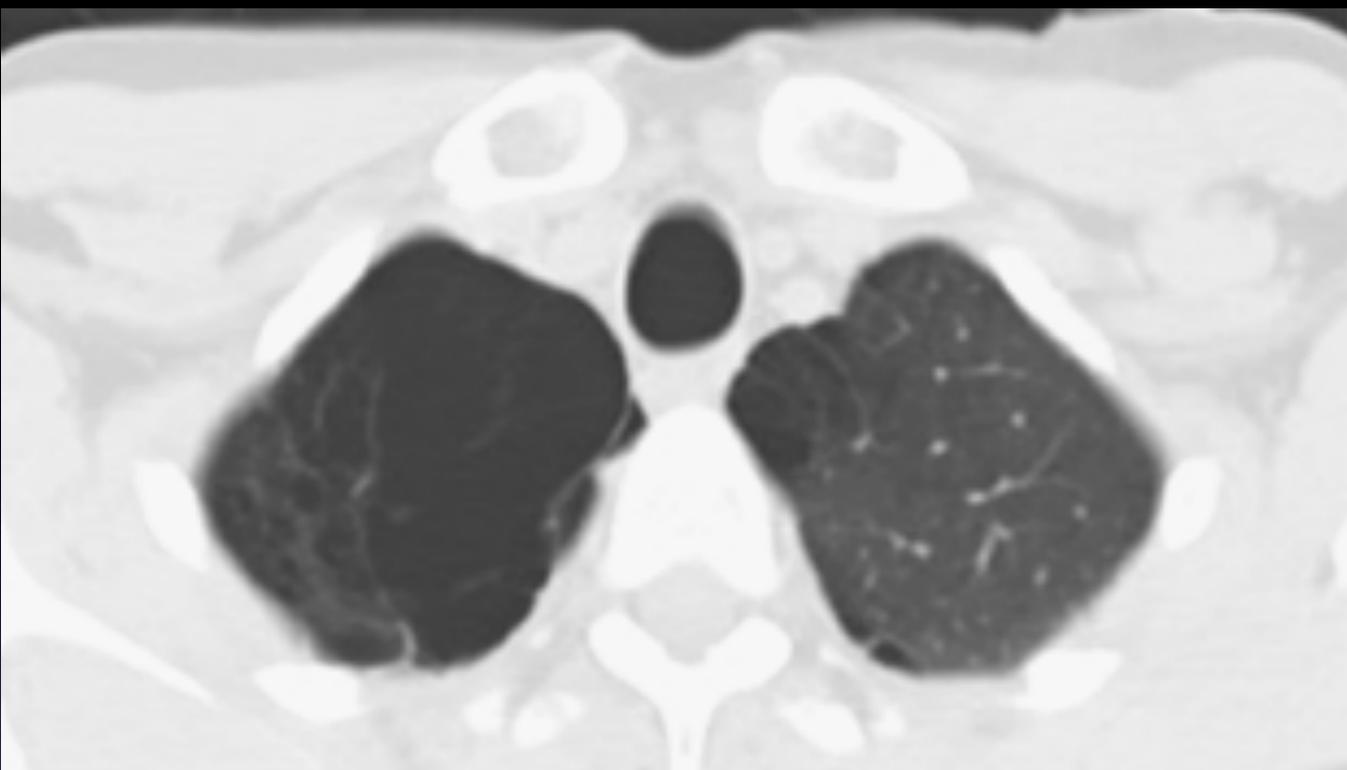


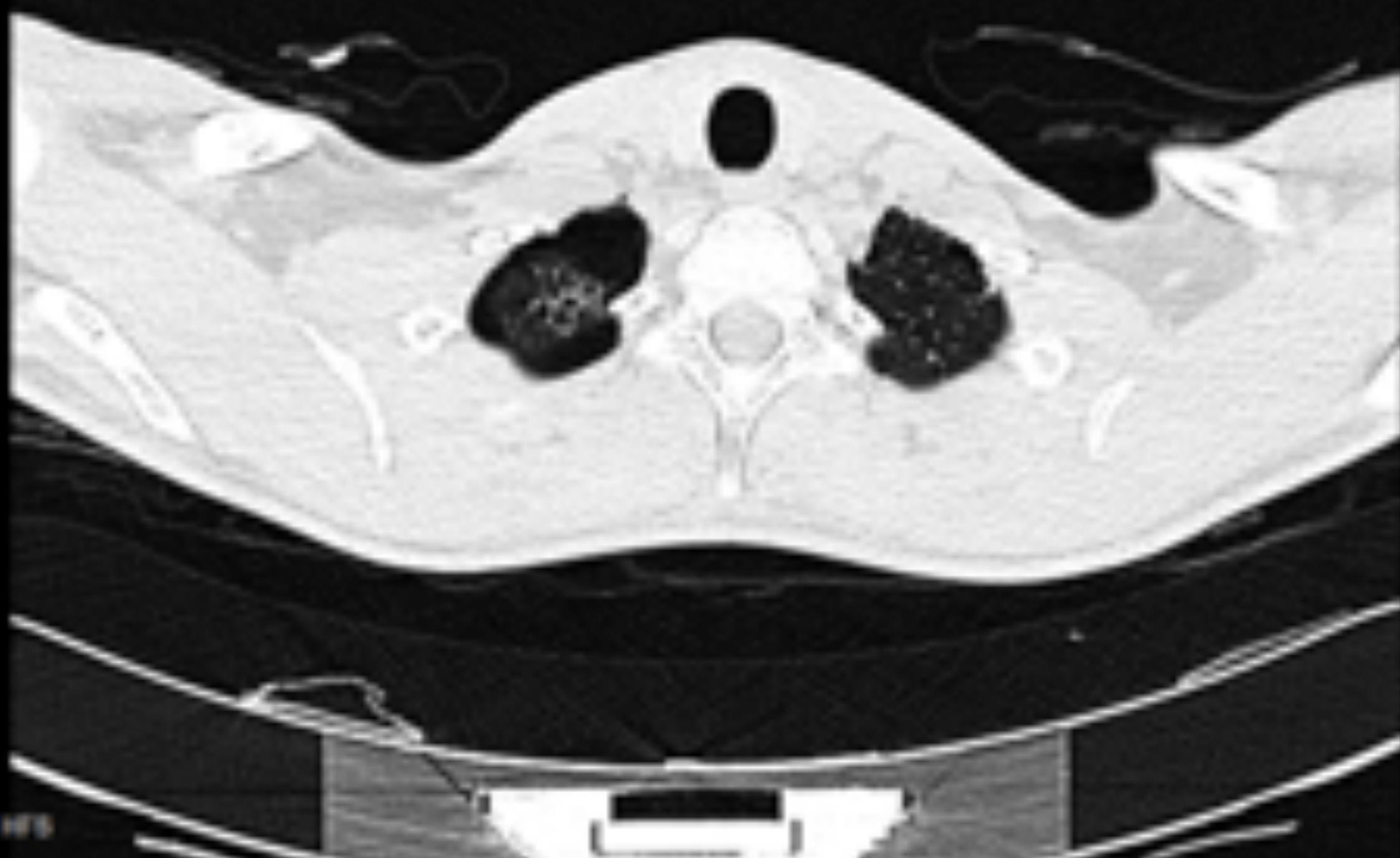




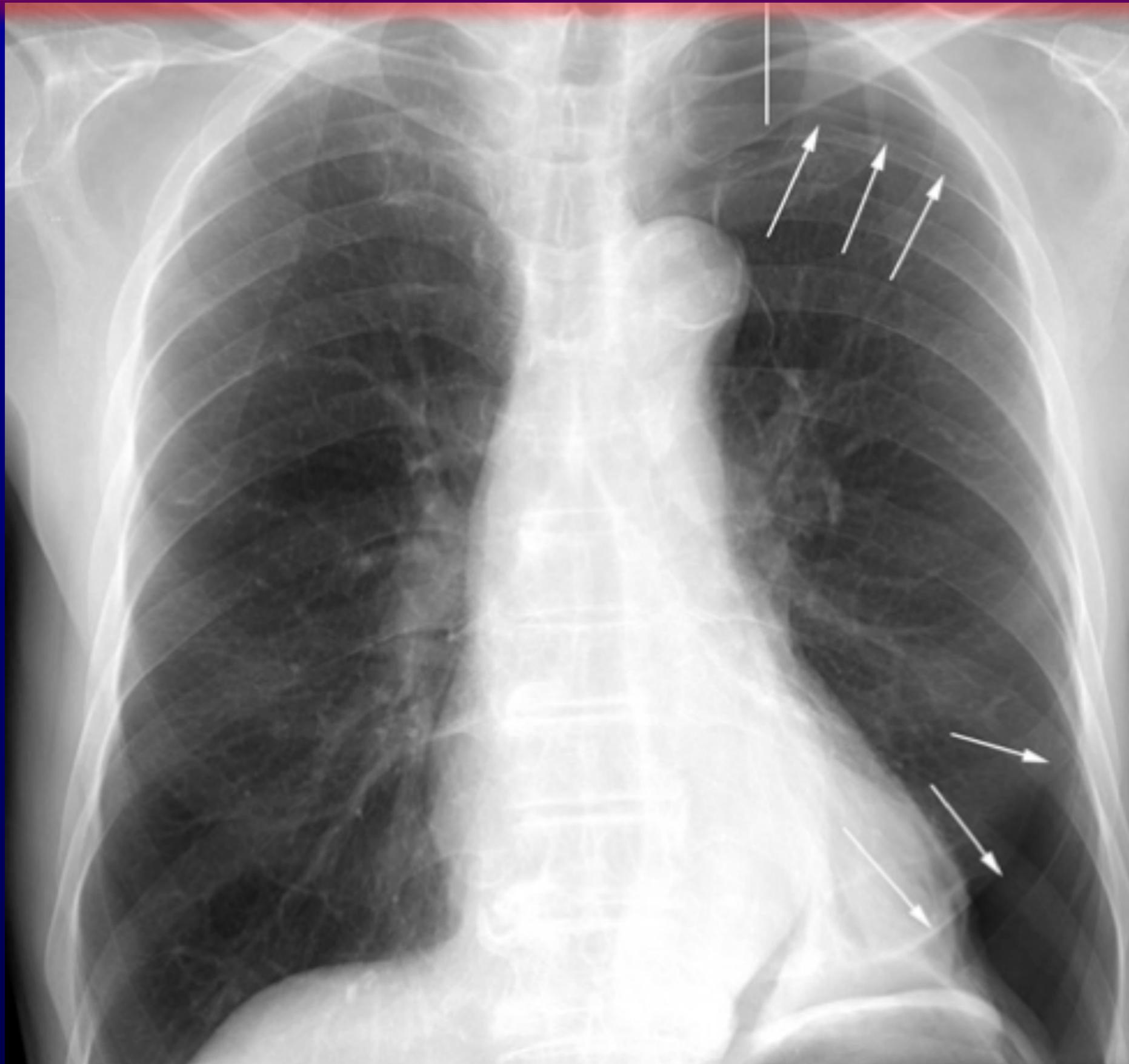
Needle Decompression  
Take 1  
Angle 1  
Good bubbly





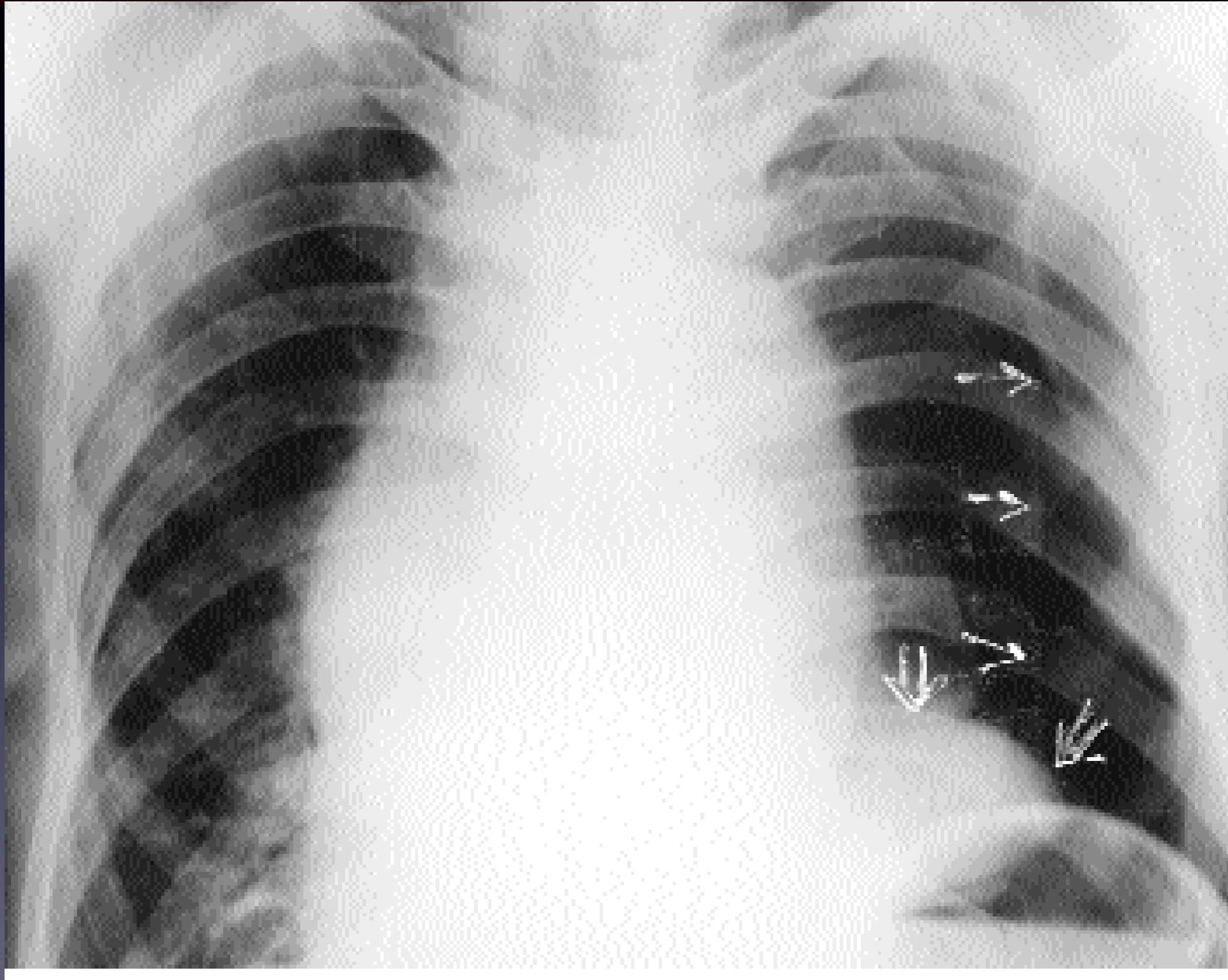


# Partial Pneumothorax



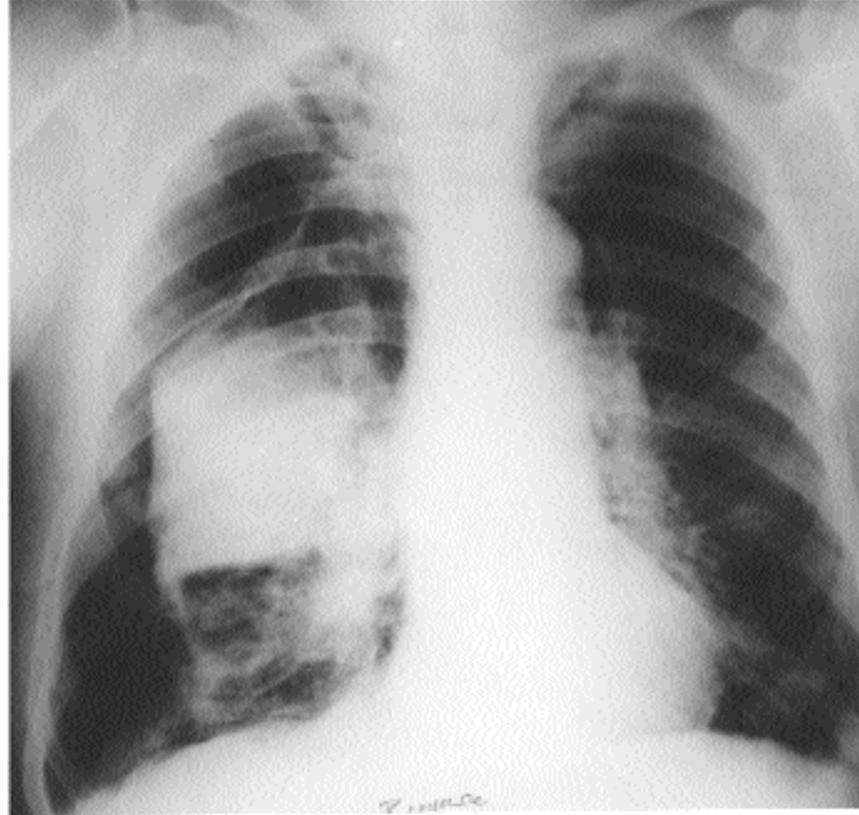
# Pneumothorax secondary to pulmonary tumor

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# Pneumothorax secondary to pulmonary tumor

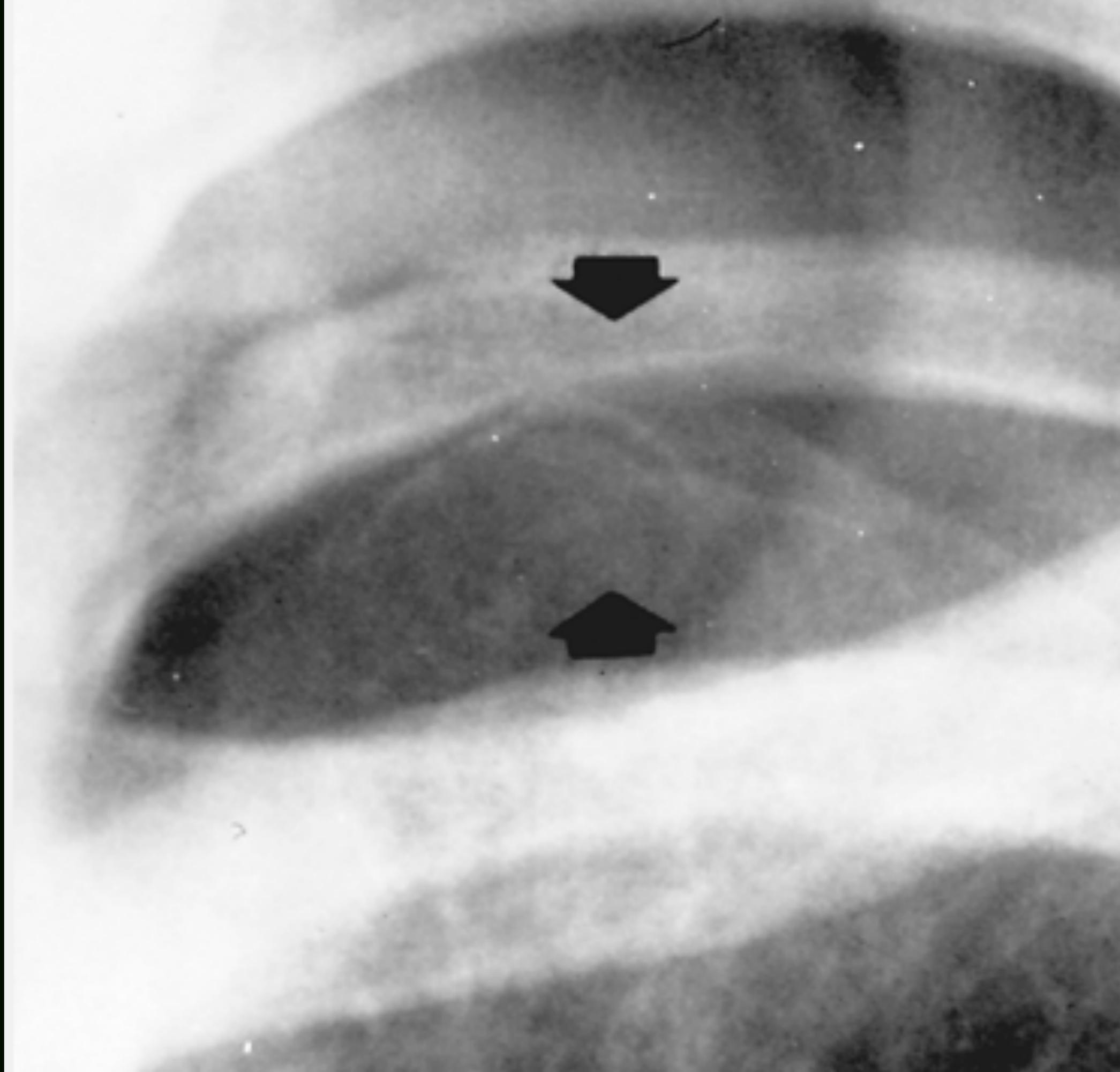
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# Classification

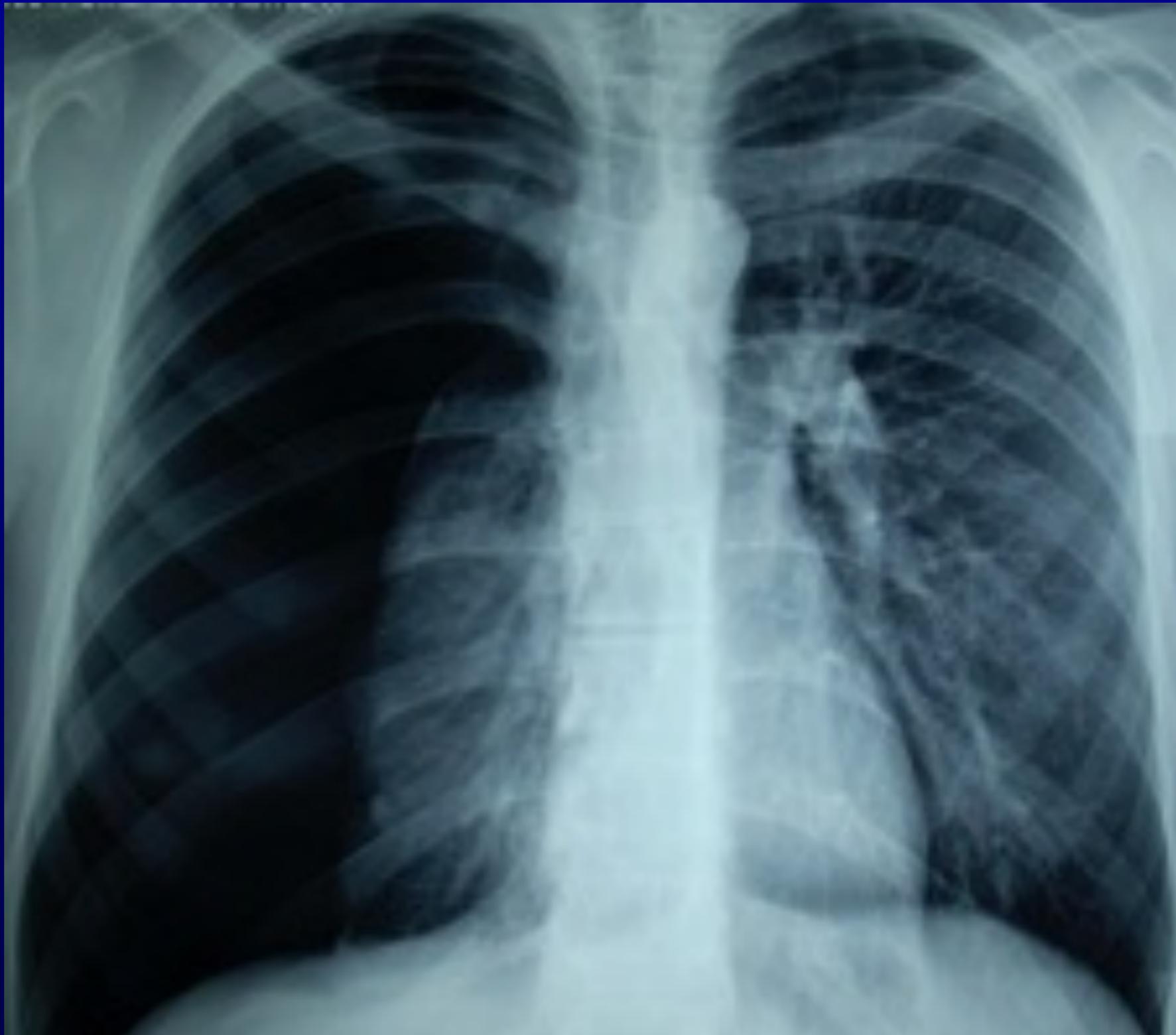
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- Small Pneumothorax:  $\leq 20\%$
- (Large) Pneumothorax :  $>20\%$

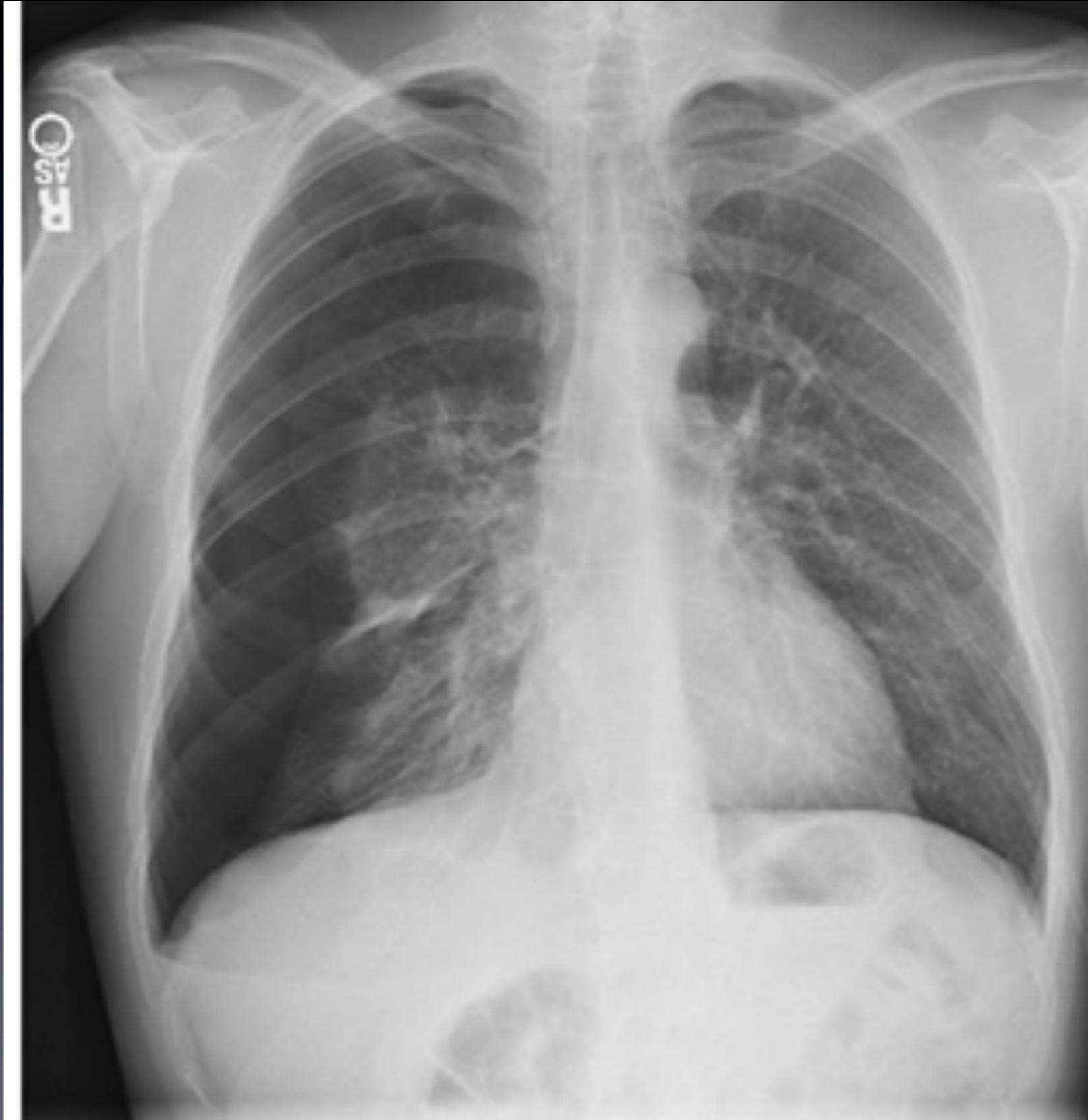


# Total Pneumothorax

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# Partial Pneumothorax





# Treatment

## Small Pneumothorax

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- Oxygen

Nasal Oxygen: App. 10 lt/min

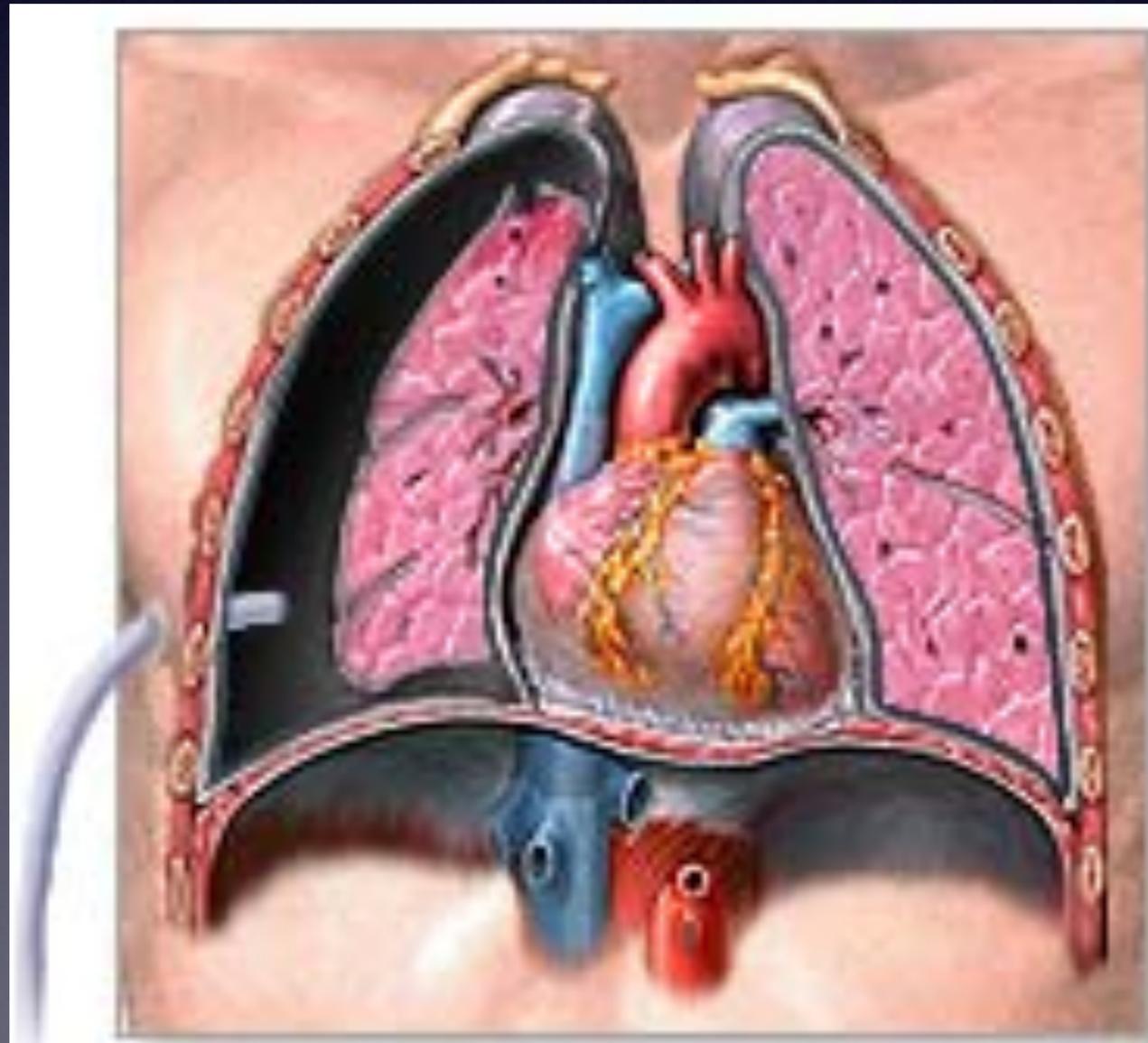
Predicted re-expansion : 2.5 %/day

- Until the lung reaches 1 cm distance from apex.

# Pneumothorax

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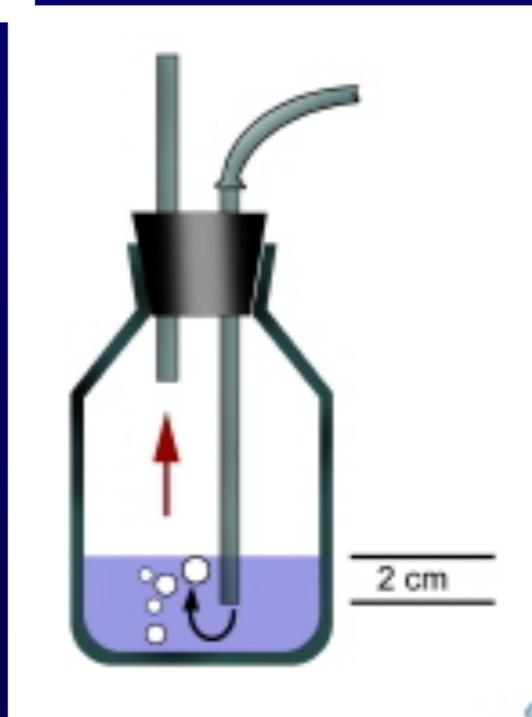
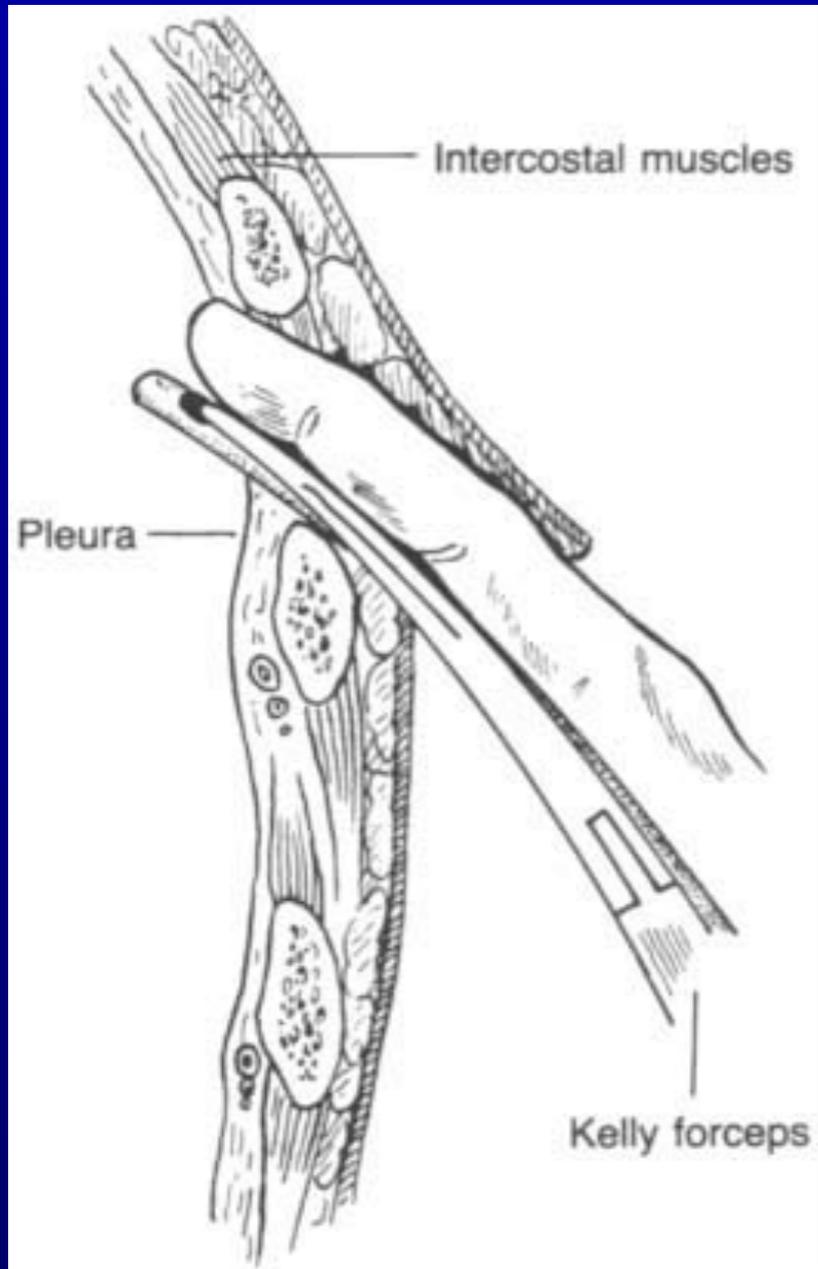
## Thorax Tube (Tube Thoracostomy)



# Total Pneumothorax

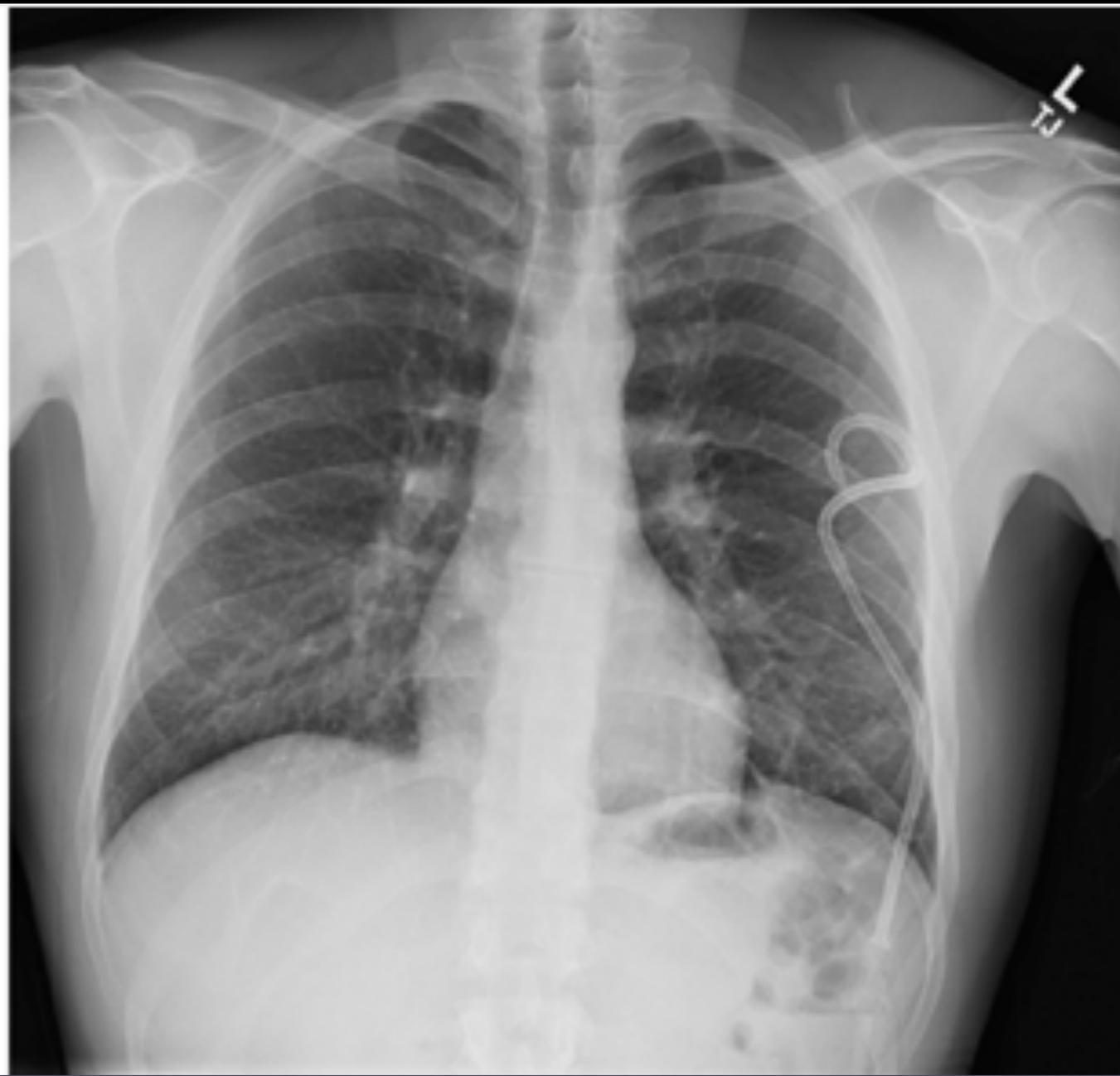
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Smallest: 24 F tube



# Electronic Drainage System





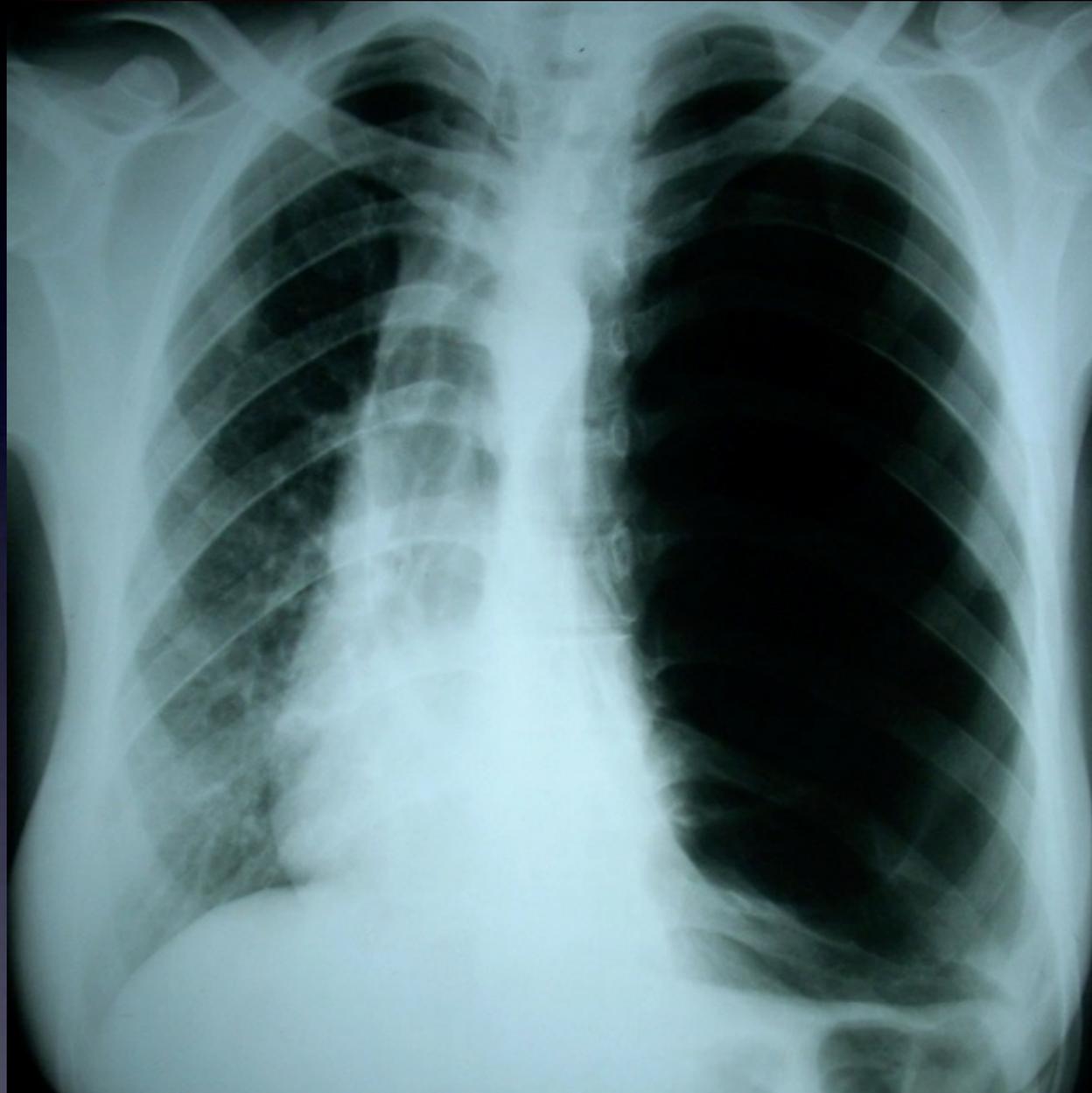
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# Differential Diagnosis

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# Bullae? Pneumothorax

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32 years old  
female

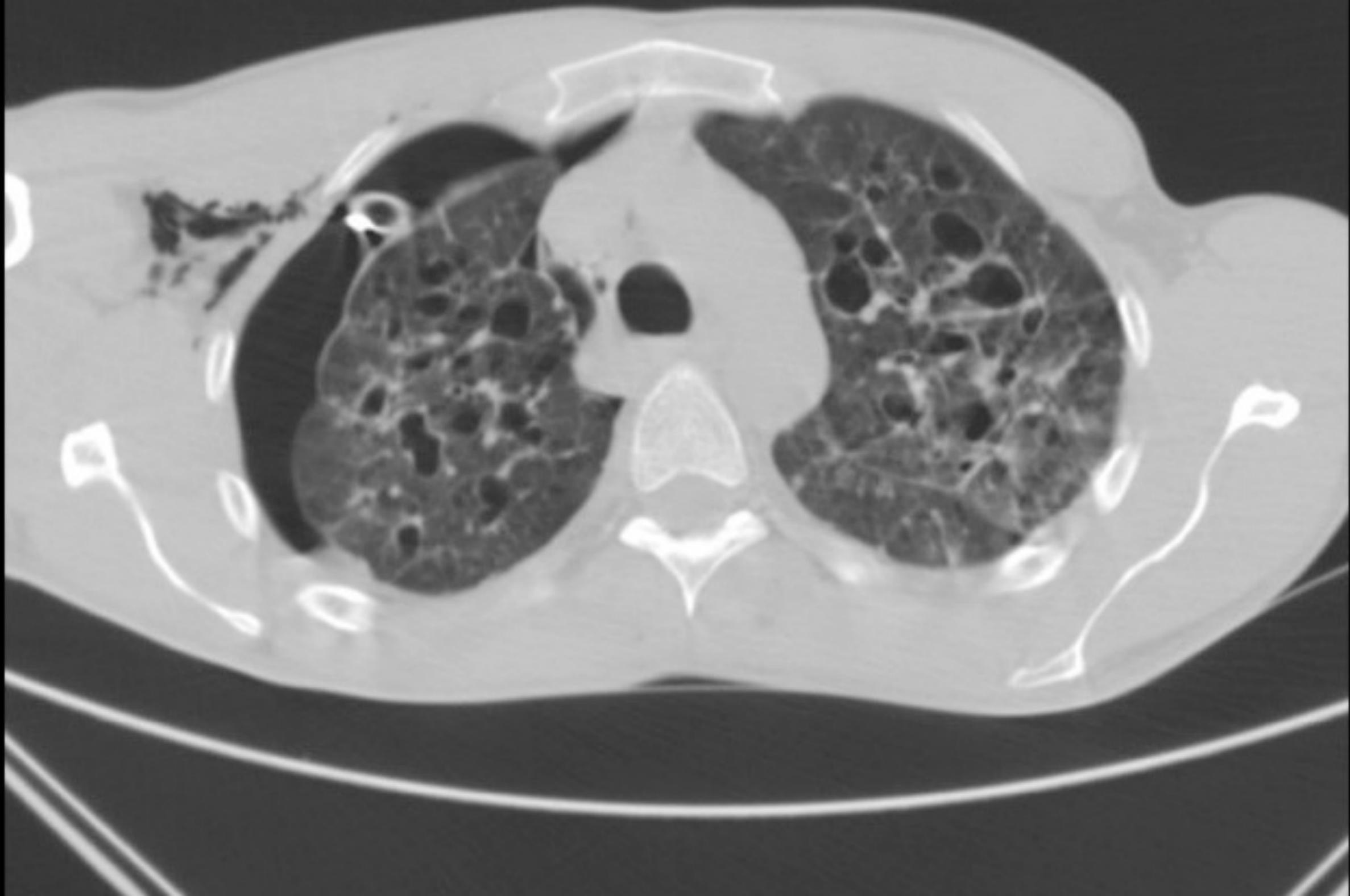
Compression  
index: 5

Non-  
smoker

Heart: Normal

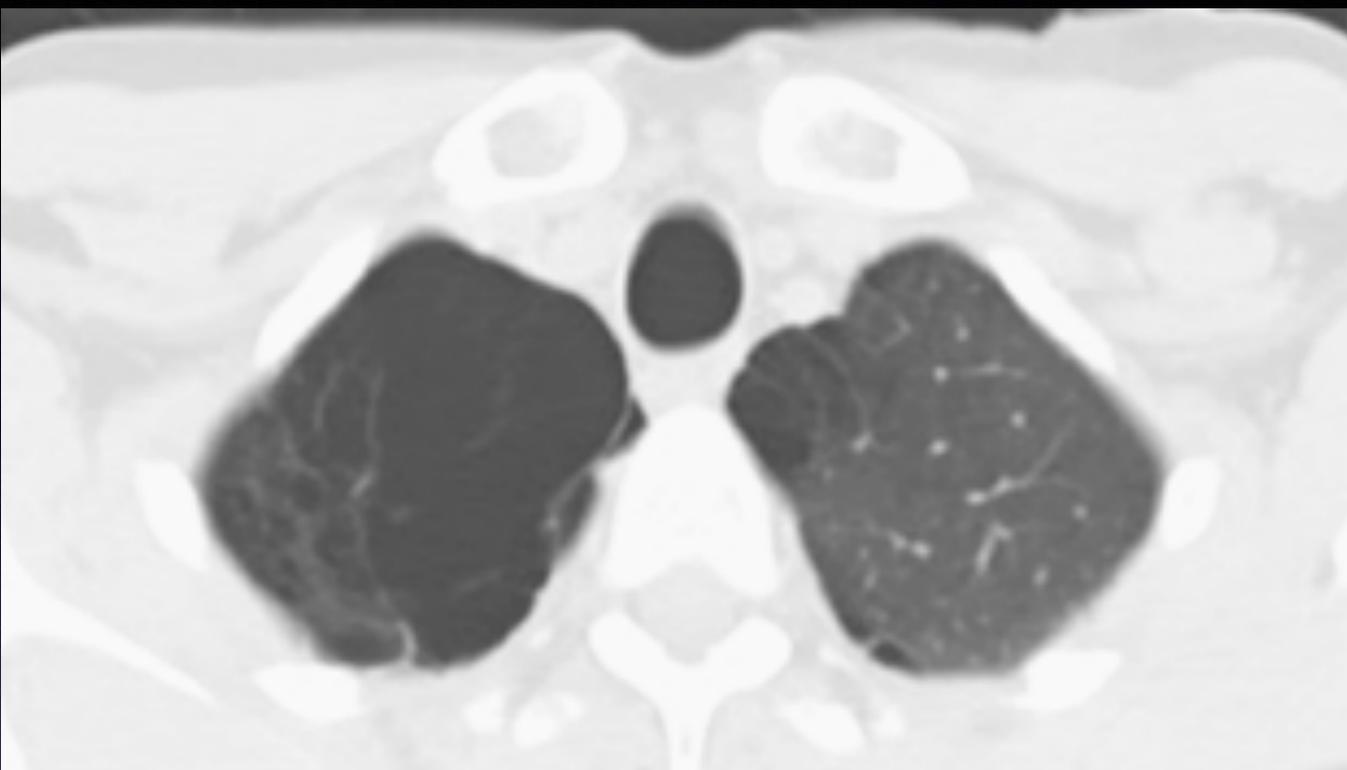
Dyspnea:  
Initiated 5  
months ago

# Secondary spontaneous pneumothorax

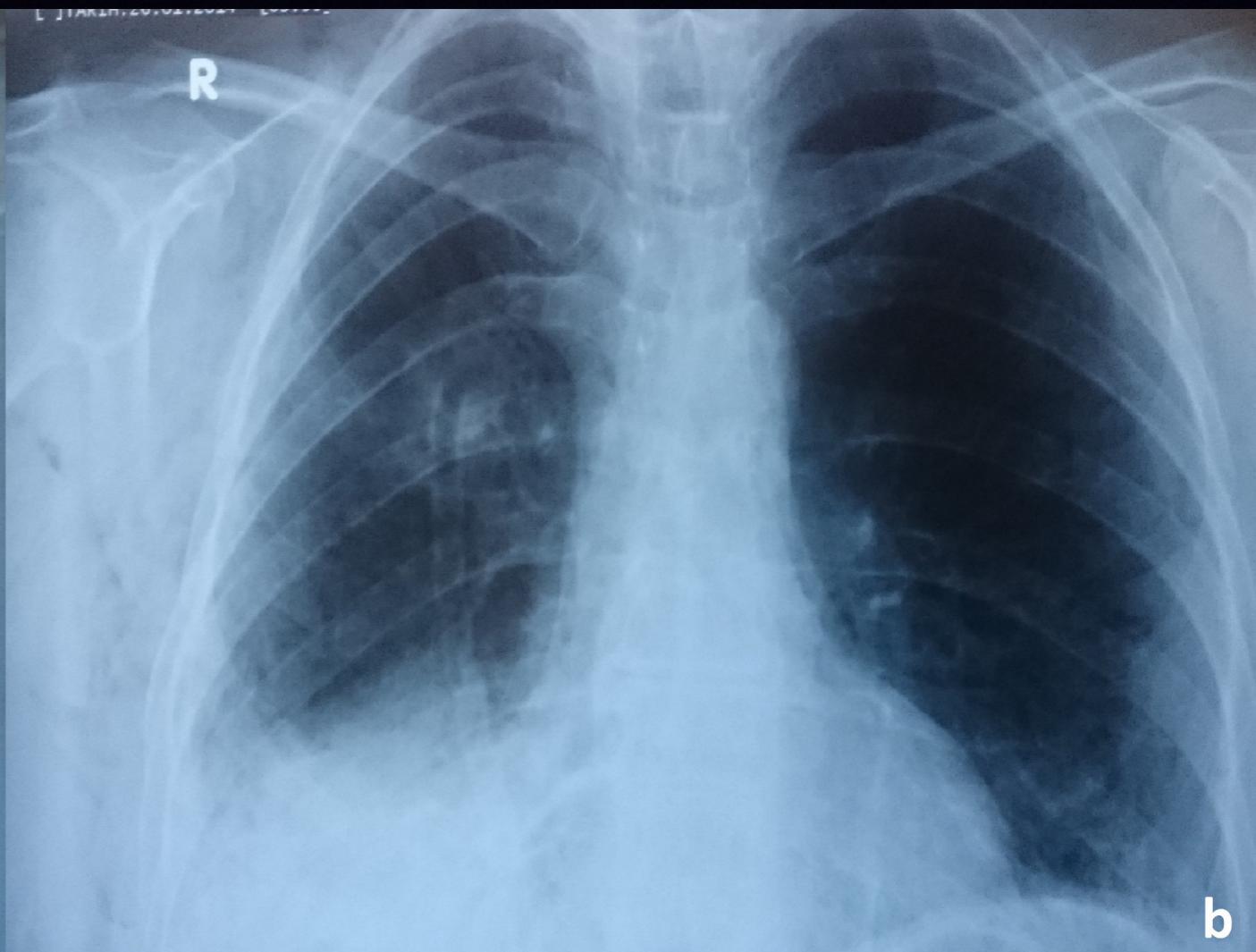
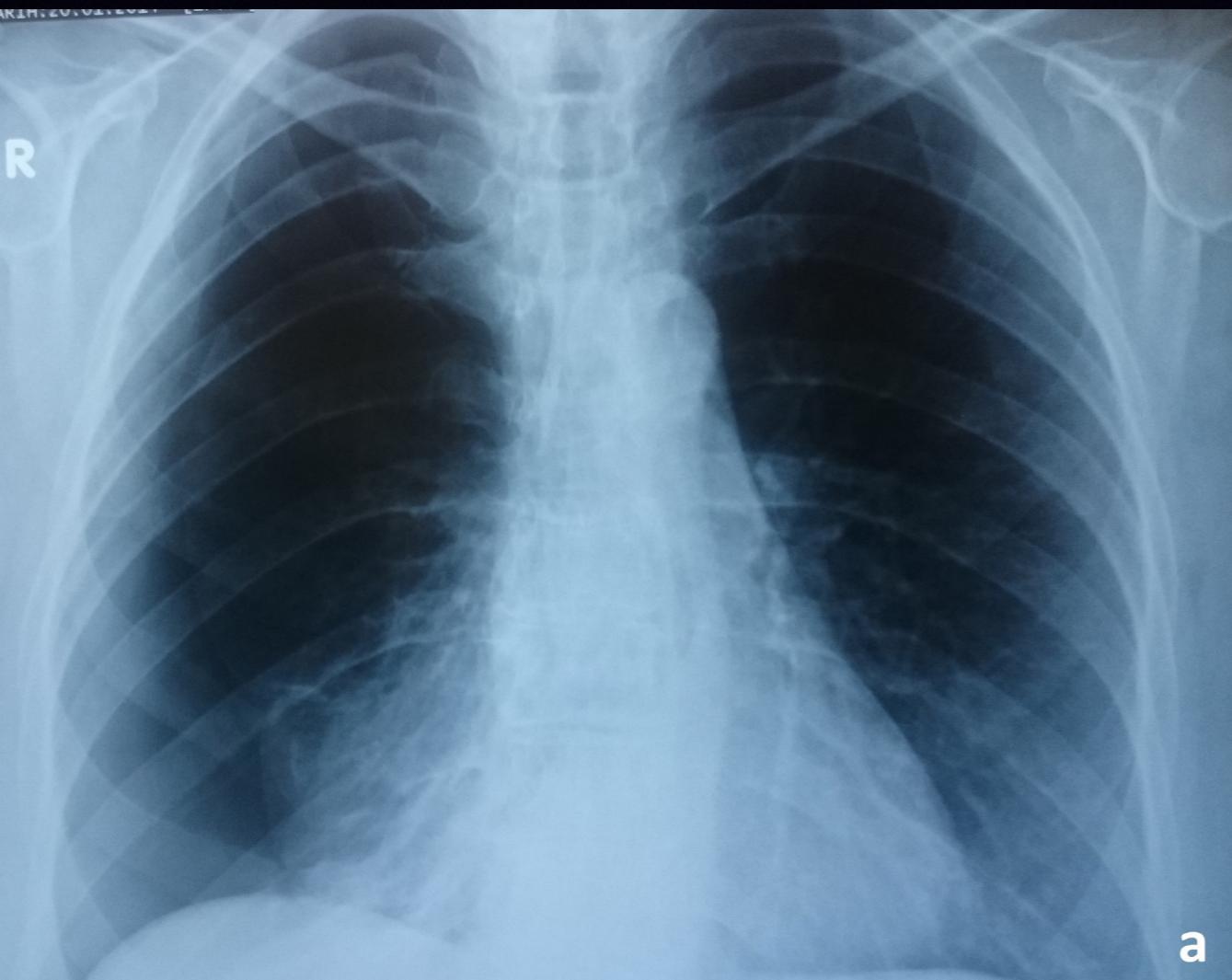


# Bilateral pneumothorax secondary to thoracic trauma (Firegun)





# Pneumothorax developed following 'Acupuncture'

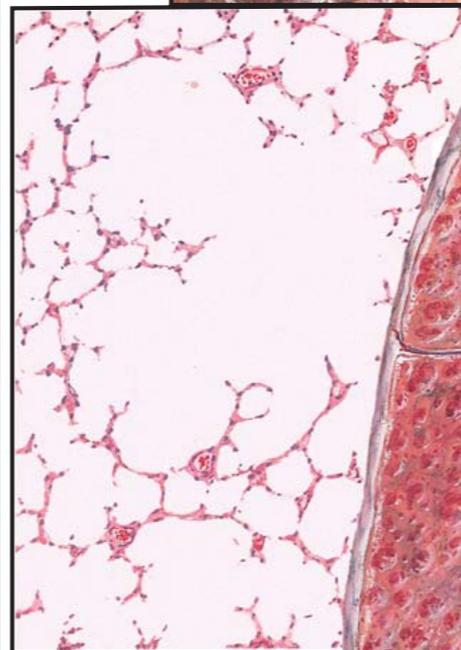


# Development of Emphysema and Bullae in COPD Patients

## CENTRIACINAR (CENTRILOBULAR) EMPHYSEMA

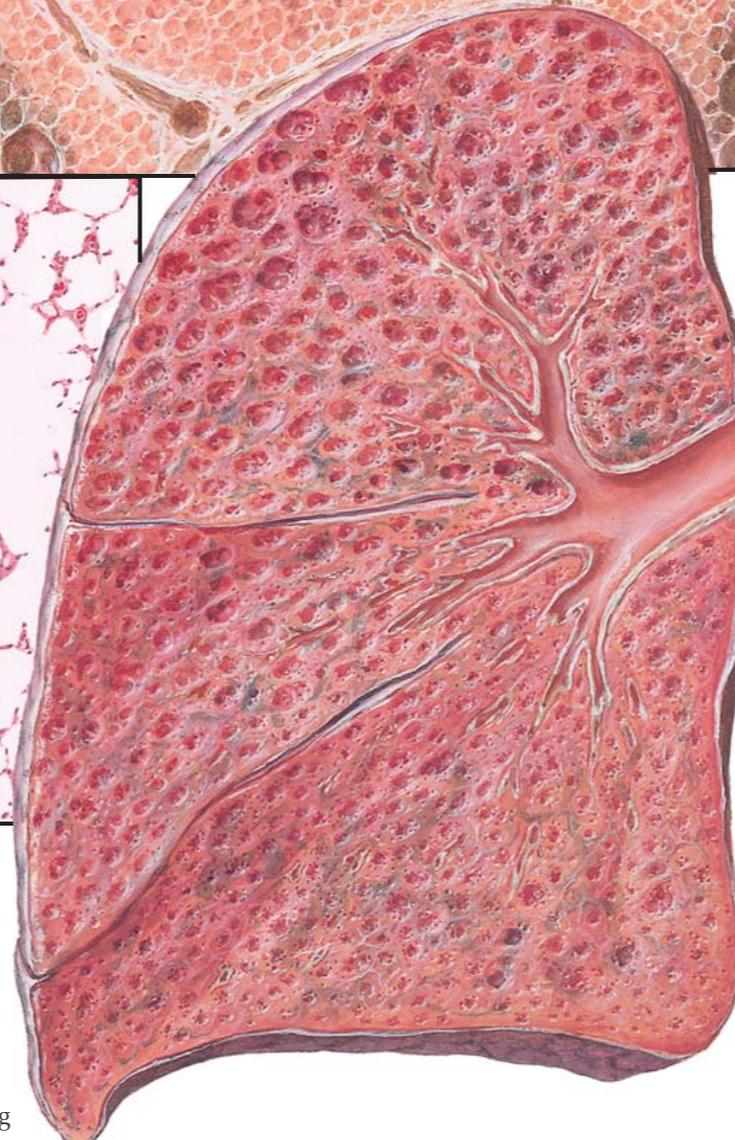
**Magnified section**  
Distended, inter-communicating, saclike spaces in central area of acini

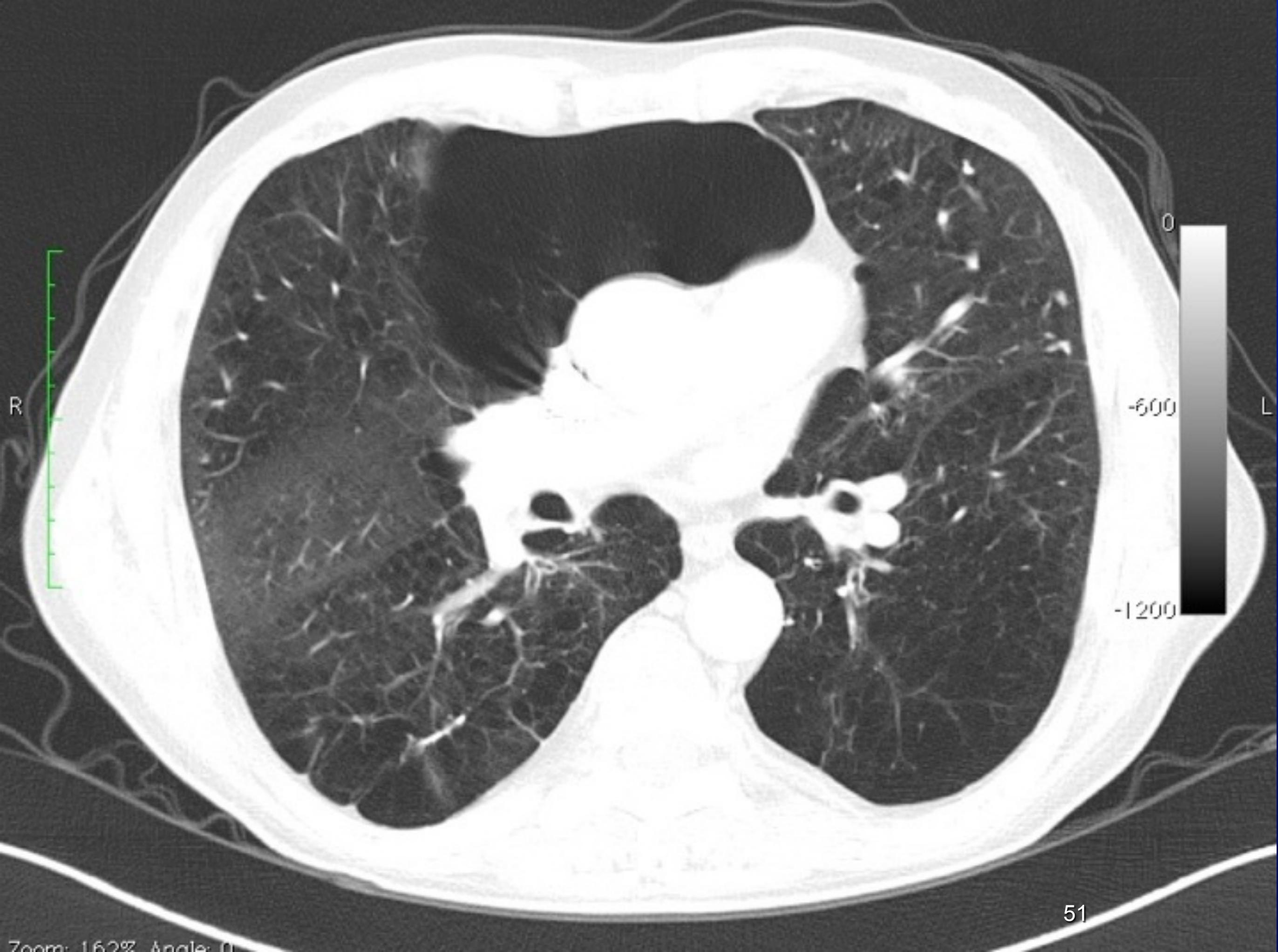
*F. Netter M.D.*



**Microscopic section**  
Distension of airspaces with rupture of alveolar walls

**Gross specimen**  
Involvement tends to be most marked in upper part of lung

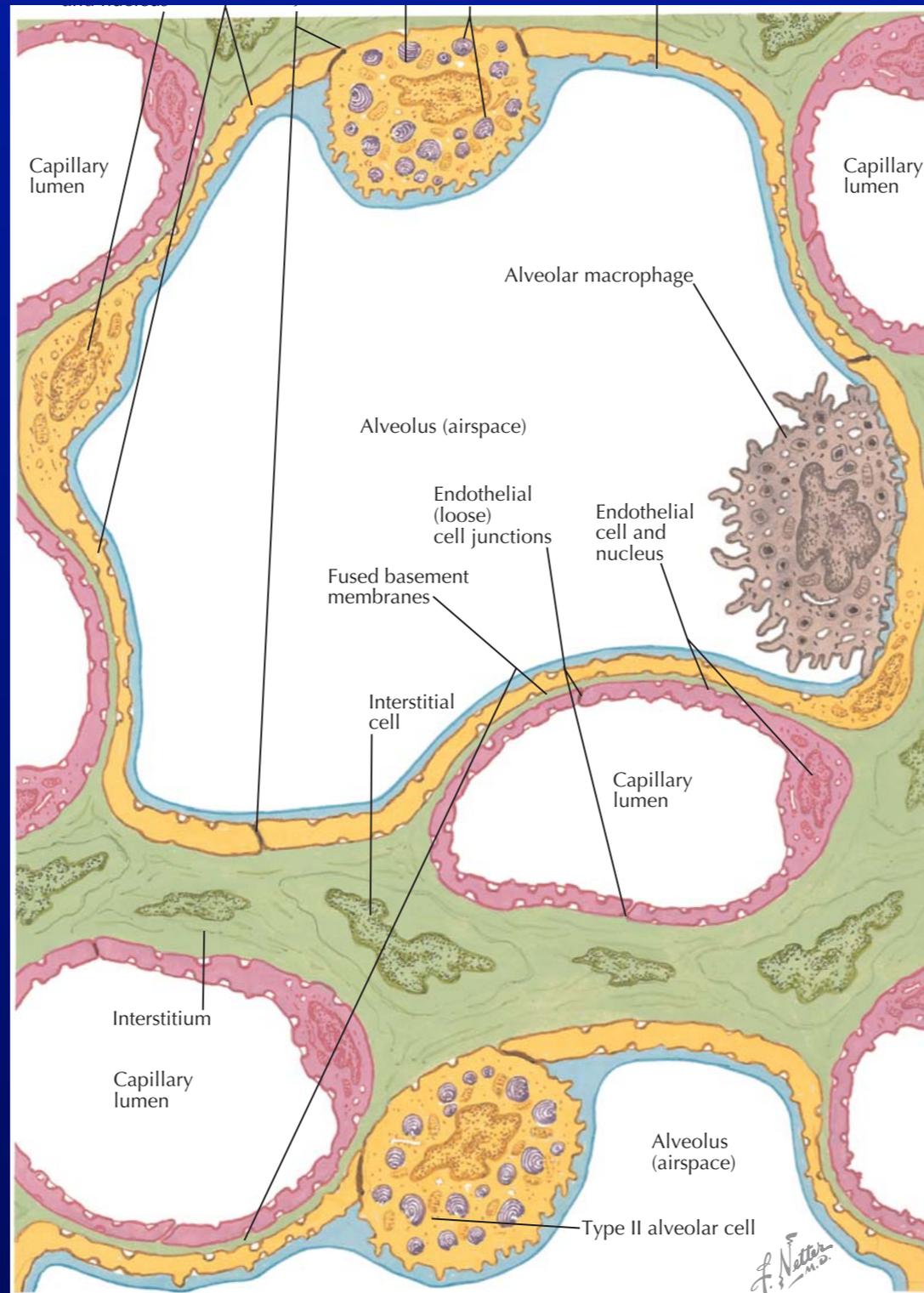




# Bullae+emphysema+pneumothorax



# Re-expansion Edema



# Treatment of Pulmonary 'Re-expansion edema'

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- Diuretic
- Oxygen 4-6 lt/min
- Positive- inotropic agents.

# Indications for surgery

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- Prolonged air leak (>5 days)
- Contralateral pneumothorax
- Recurrent pneumothorax
- First pneumothorax in divers, pilots
- Synchronous bilateral pneumothorax

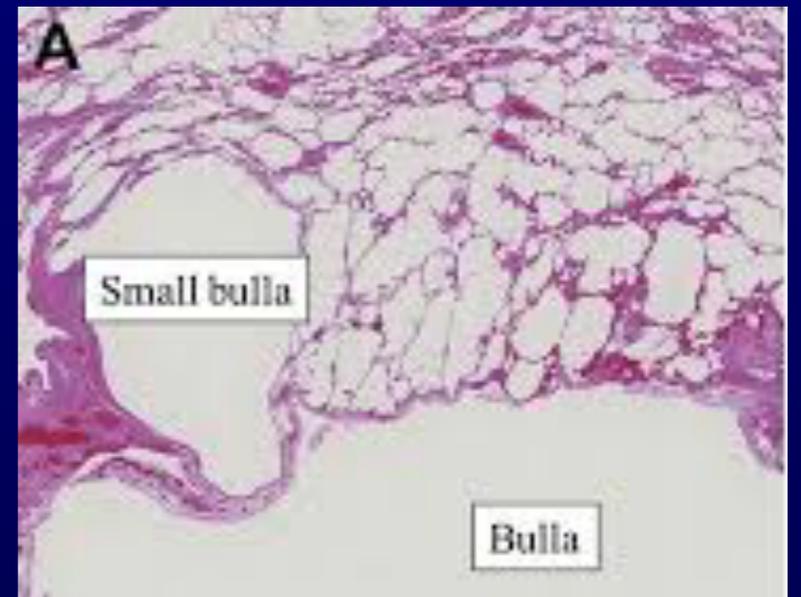


# Which Surgical Procedure?

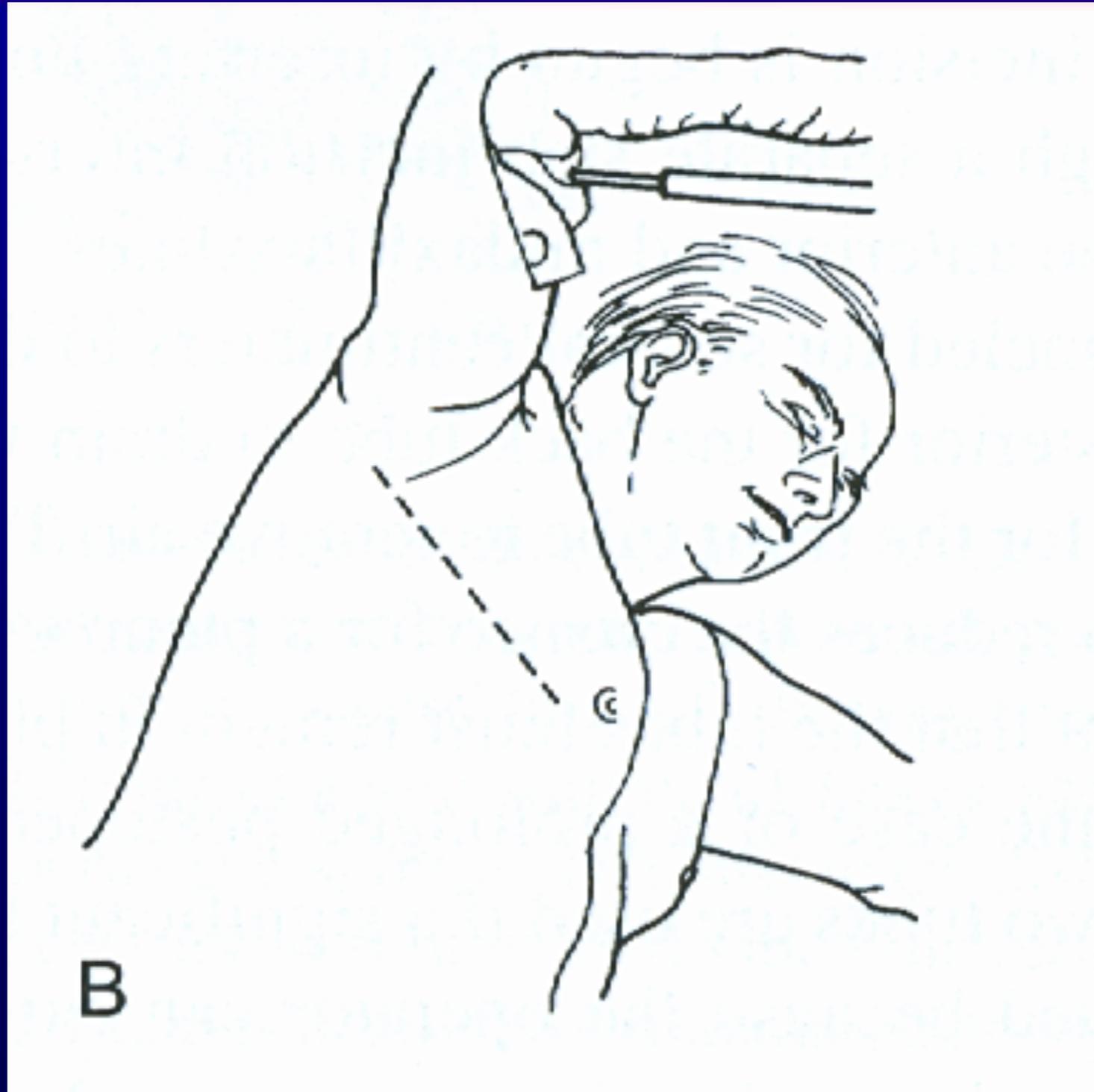
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- ~~Posterolateral thoracotomy~~
- ~~Anterior thoracotomy~~
- Axillary Thoracotomy
- Videothoracoscopy (VATS)

# Bullae



# Axillary Toracotomy I

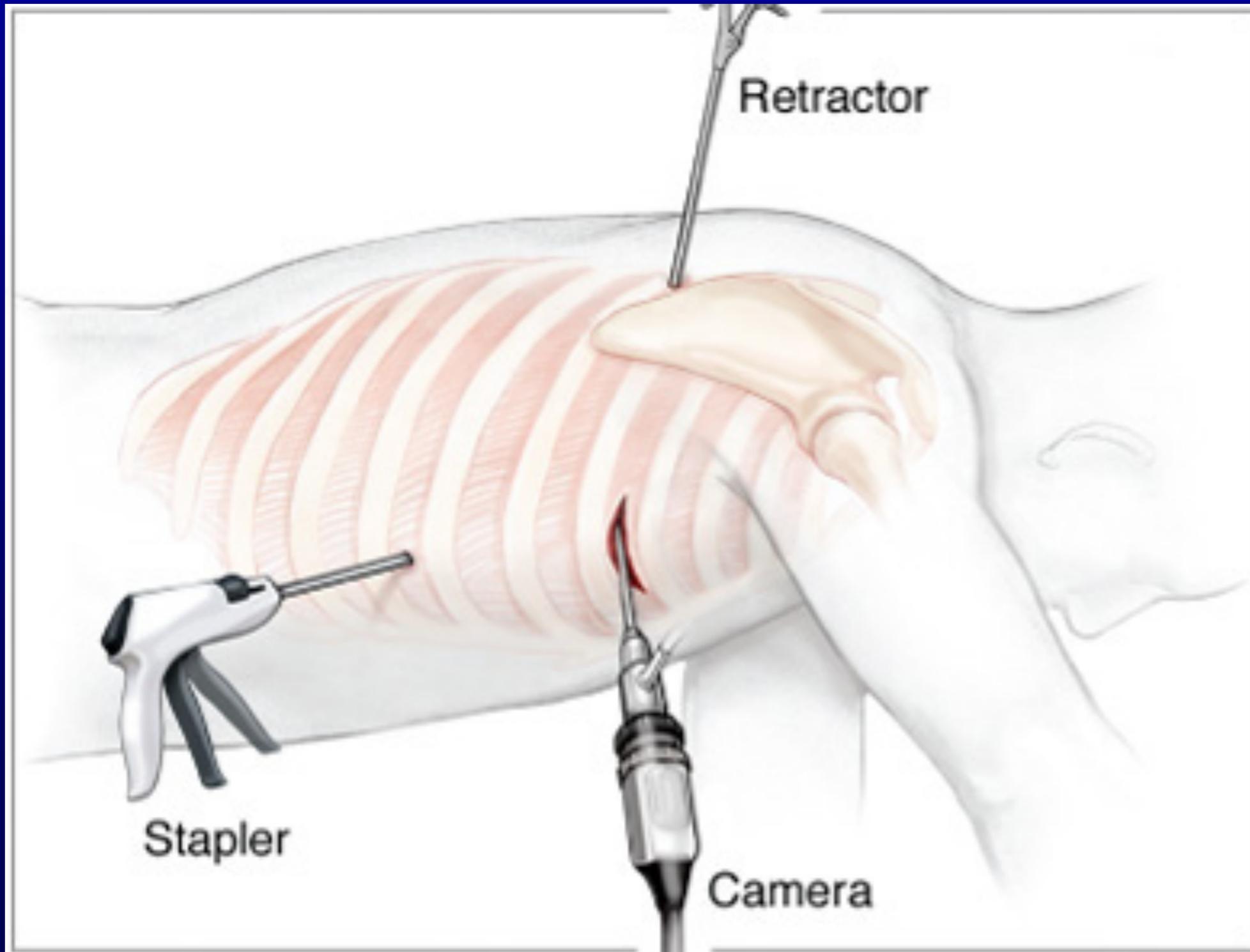


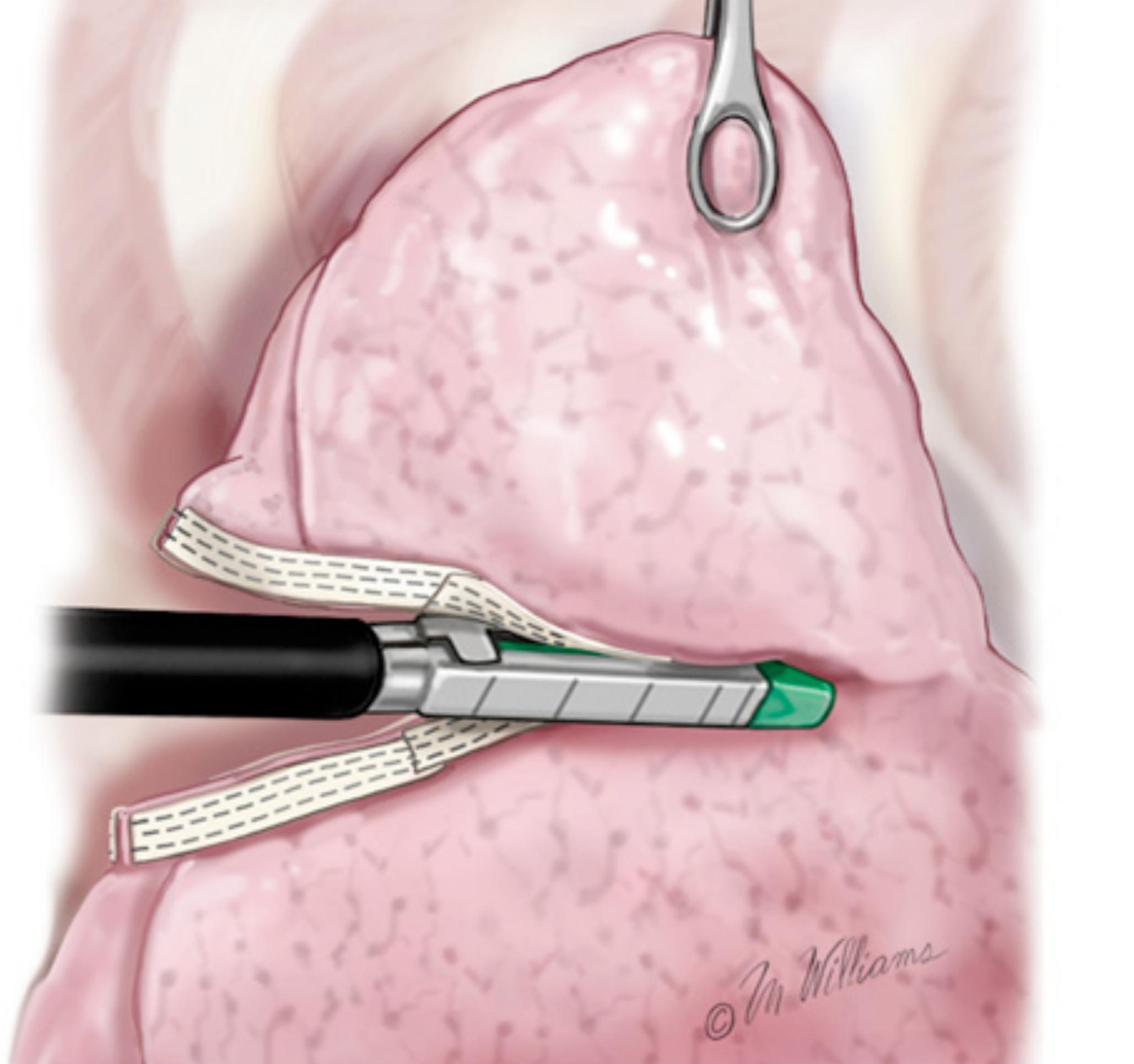
# Axillary Toracotomy II

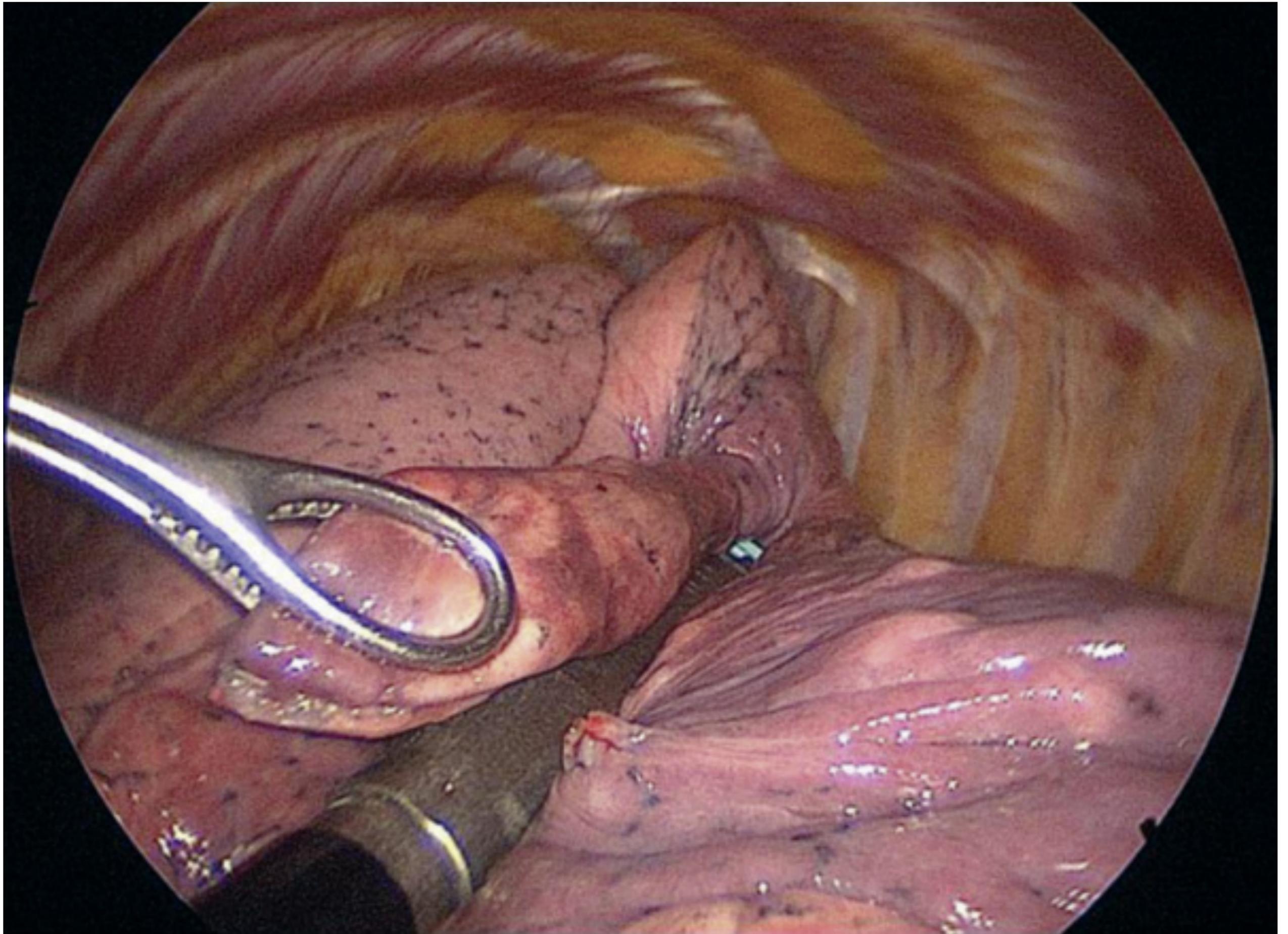
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# Video-Assisted Thoracoscopic Surgery: VATS

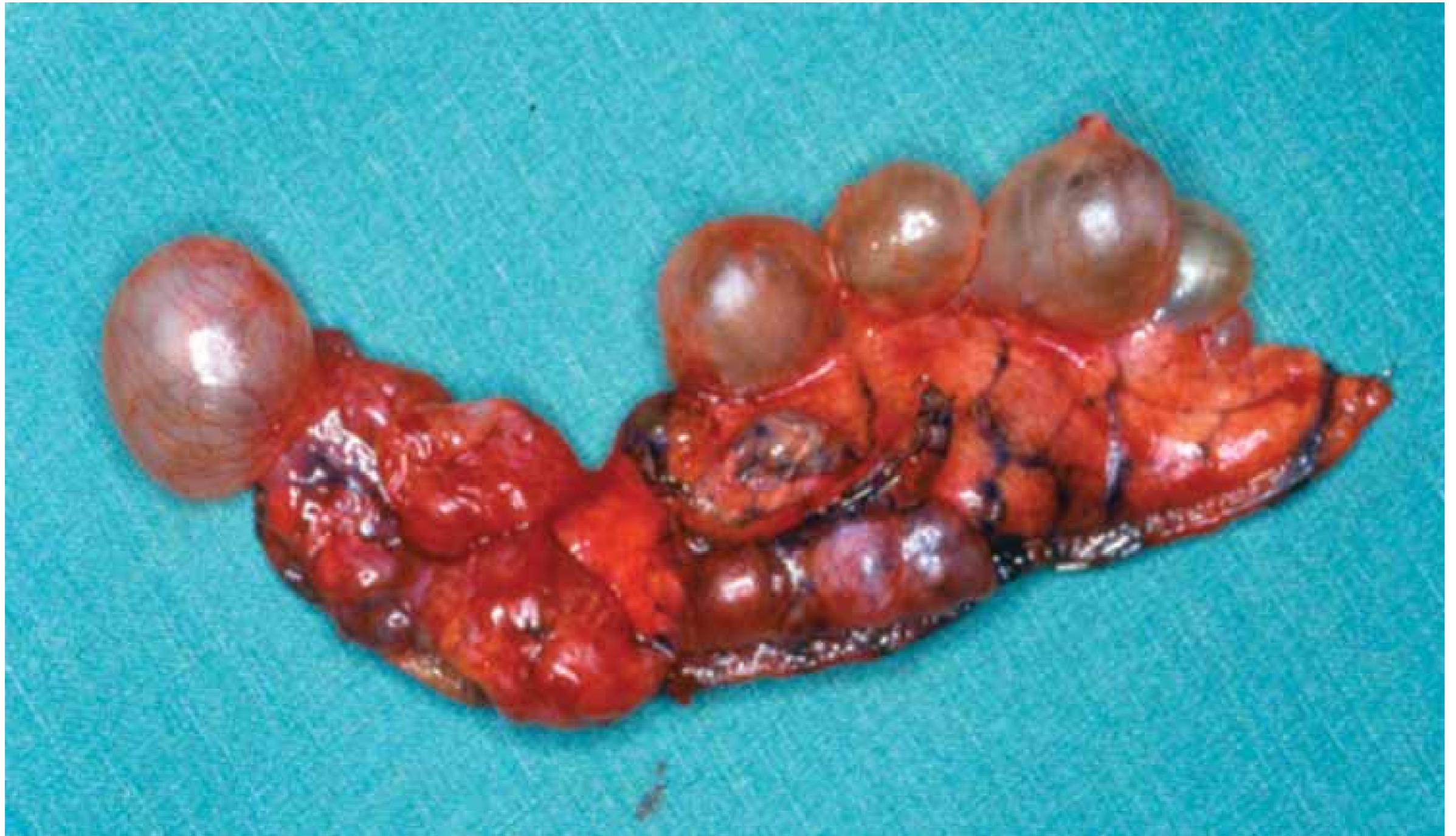


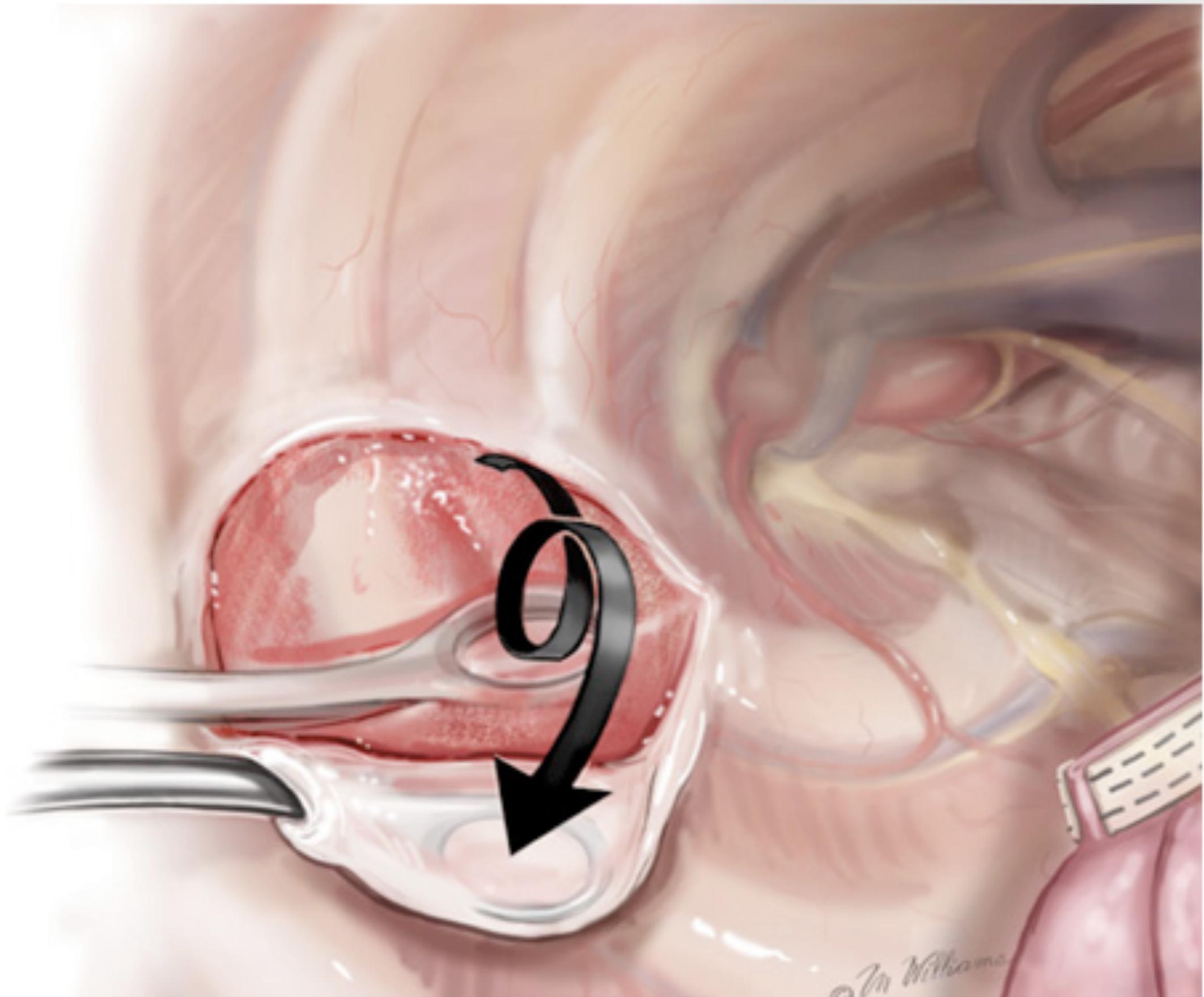






# Resected Material (‘Wedge’ resection)









# Uniportal Video-Assisted Thoracoscopic Surgery

H. Volkan Kara<sup>1</sup> · Akif Turna<sup>1</sup>

Published online: 8 April 2016  
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**Abstract** Starting from 1990's, video-assisted thoracic surgery (VATS) has commonly been used in thoracic surgery clinics. This is a minimally invasive operative technique where the surgery is performed through 2–4 incisions without any rib spreading under the camera vision of surgical field. Including oncological surgery for non-small cell lung cancer, the VATS experience and knowledge has increased in time. These beneficial and successful results encourage thoracic surgeons to perform surgery via smaller sized and number of incisions. This modification brought the definition of 'Uniportal VATS,' which seems to be the highlighted future direction in thoracic surgery as reviewed in the present manuscript.

**Keywords** Uniportal VATS · Thoracic surgery · Non-small cell lung cancer · Minimally invasive surgery

## Introduction

Minimally invasive thoracic surgery was first performed by a physician Dr. Cruise in 1885 as a diagnostic thoracoscopy [1]. In 1910, Jacobaeus used the thoracoscope for induction of artificial pneumothorax for treating pulmonary tuberculosis and referred to his name 'Jacobaeus procedure' [2, 3]. In 1970s, the thoracoscope was a straight hollow tube with an incandescent bulb light located on the

tube's tip without any working channel so with a mandatory second hole for instrumentation. In 1980, video camera system was developed but the lightening was still not sufficient [3]. In 1989, the insufficient lighting providing incandescent light was no more used with the invention of the bright xenon lamp. This revolution about having the surgical field more visible started an incredible inertia to the field of minimally invasive thoracic surgery. All surgical team members including operating room nurse, physician assistant, and surgical trainees had a direct view from the surgical area so that they may help and assist the operating surgeon and also learn key points of surgery more efficiently. This created a knowledge development and competition to do things from less and smaller areas.

Starting from the 1990's, thoracic surgery clinics got involved in video-assisted thoracic surgery (VATS) in the diagnosis and treatment of pulmonary disease where the vision in operating field with a camera system transmitted to screens in the OR [4]. The technique became more common as telescopic-guided minimally invasive procedure in the treatment of pneumothorax [5]. The usage of the system became more popular with pleurectomy and thoracic sympathectomy cases [6]. This was followed by pulmonary wedge resections [7]. Soon afterward, VATS had started to be used in more complex pathologies such as anatomical pulmonary resections. With the principles individual dissection of anatomical structures of lung as pulmonary veins, pulmonary arteries and bronchus also complete systematic mediastinal lymphadenectomy by using the surgical instruments under the screen vision provided by a camera through 2–4 incisions without any rib spreading. This usage had formed a large knowledge accumulation of anatomical resections [8–10] including complex procedures such as chest wall and sleeve resection [11]. The number of the port sides in VATS has been

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This article is part of the Topical Collection on *Thoracic Anesthesia*.

✉ H. Volkan Kara  
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<sup>1</sup> Department Of Thoracic Surgery, Cerrahpasa Medical Faculty, Istanbul University, Cerrahi Monoblok Binası Kat 2, Fatih, 34098 Istanbul, Turkey

# Pleurodesis

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- For patients refusing operation
- Talc (4 - 8 gr)
  - Insufflation
  - Slurry



Acc 1 = 04111

# Synchronous Bilateral Pneumothorax

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- The mechanism is not fully understood
- Contralateral air passage is shown
- It is solely a 'life-threatening' situation (Severe dyspnea, cardiopulmonary failure)
- It is usually seen in patients with parenchymal disease (Interstitial lung disease)



Zoom: 127% Angle: 0  
Im: 44/67 | (S -> I)



Zoom: 127% Angle: 0

Im: 39/67 (S -> I)

Uncompressed

Thickness: 5.00 mm Location: -187.30 mm

P

19.10.2010 10:00:54

Made In OsiriX

# Synchronous bilateral pneumothorax



# Pneumomediastinum

- Causes

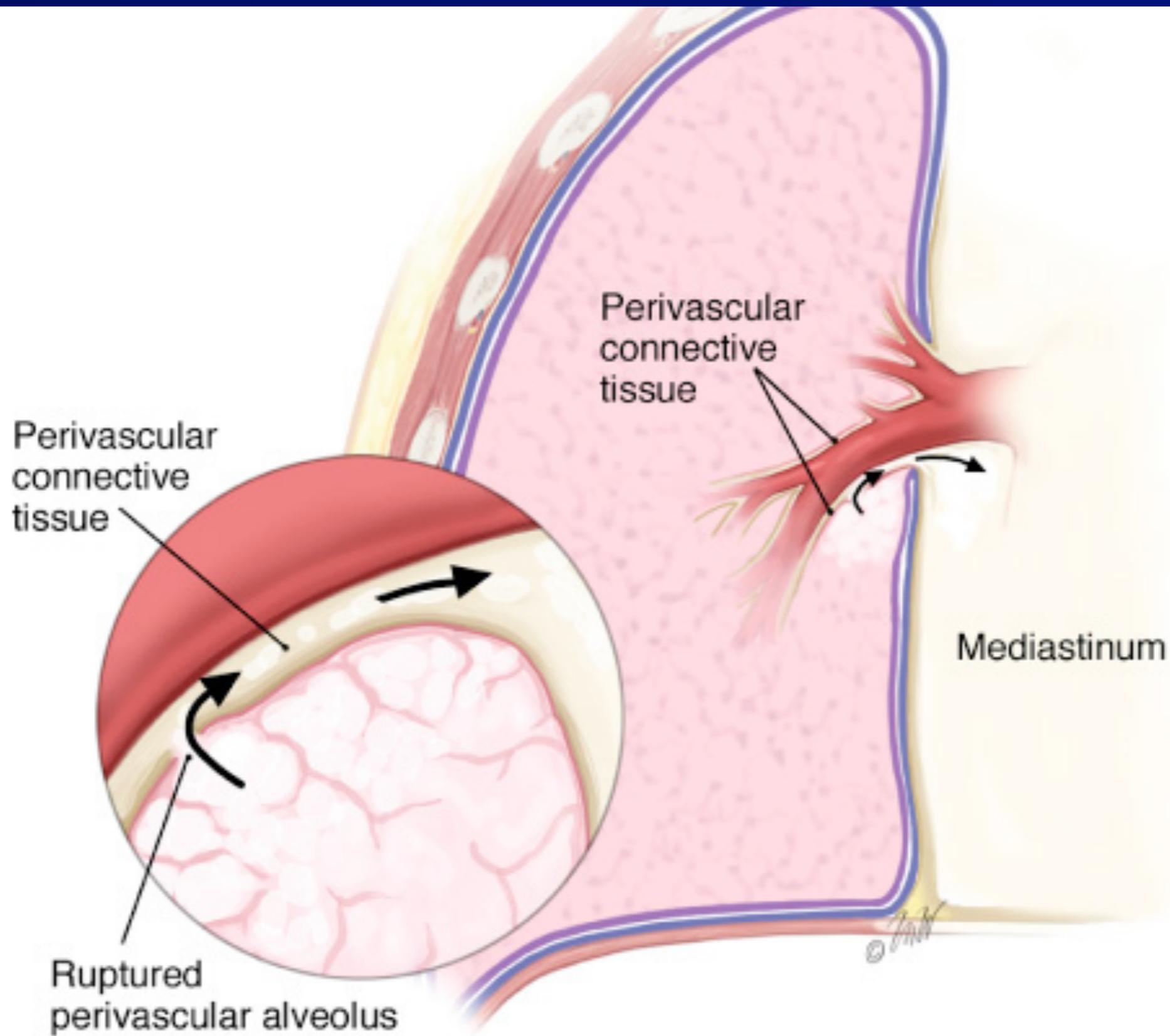
- Spontaneous (Bronchial asthma, COPD),

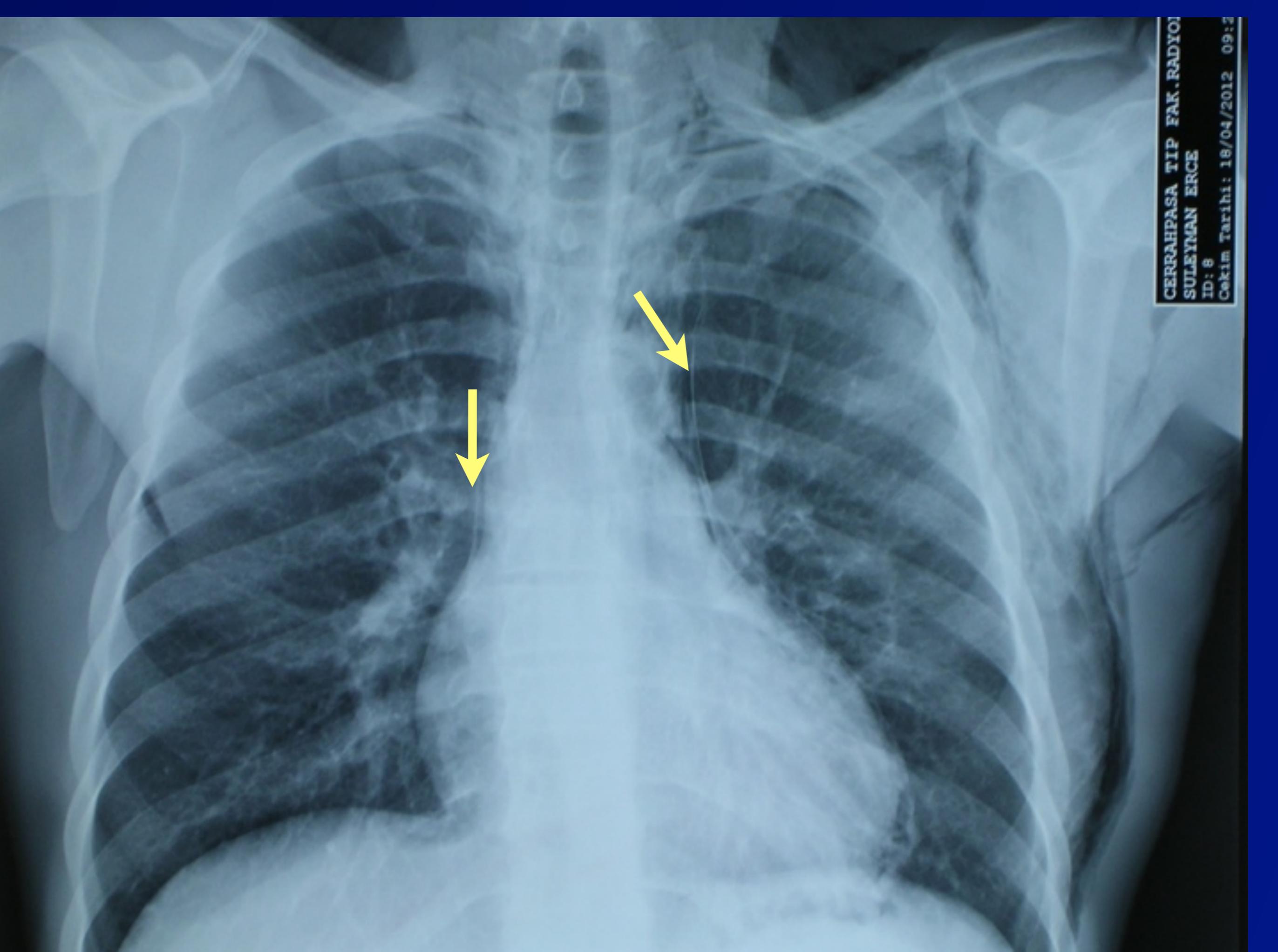
- Trauma (blunt trauma;tracheal or main bronchial rupture, esophageal rupture),

- Iatrogenic (Tracheal, esophageal, abdominal surgery)

- Management: Conservative, Surgery  
(Mediastinostomy)

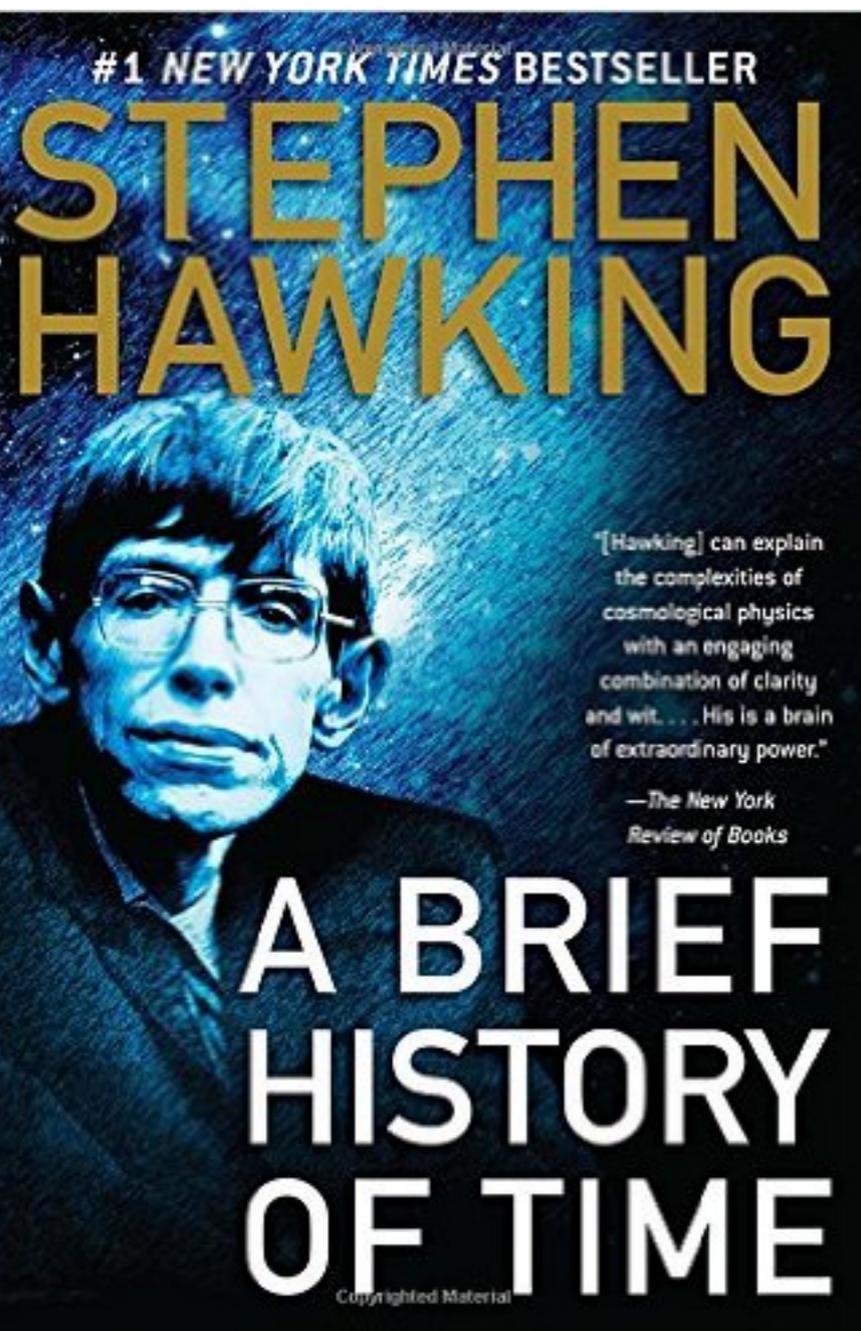
# PNEUMOMEDIASTINUM





CERRAHPASA TIP FAK. RADIYO  
SULEYMAN ERCE  
ID: 8  
Cekim Tarihi: 18/04/2012 09:2

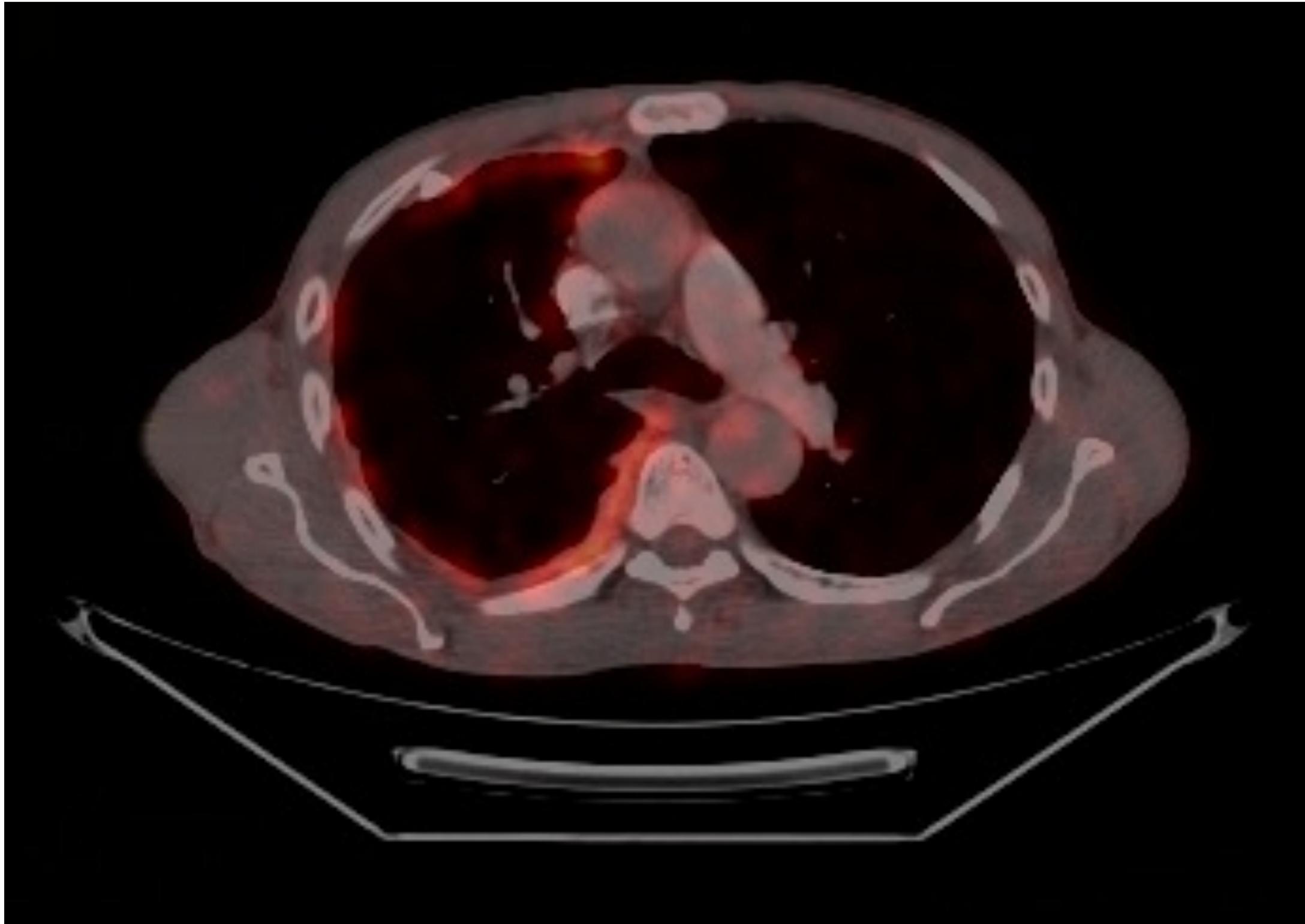




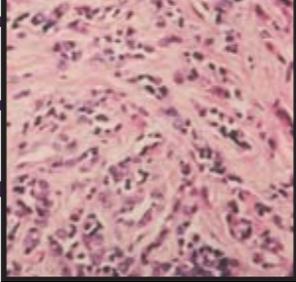
*There was a young lady of Wight  
Who travelled much faster than light.  
She departed one day,  
In a relative way,  
And arrived on the previous night.*



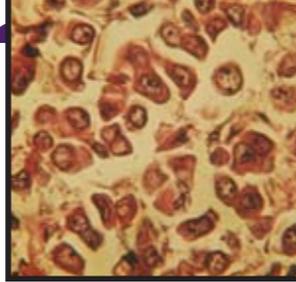
# MESOTHELIOMA



# M



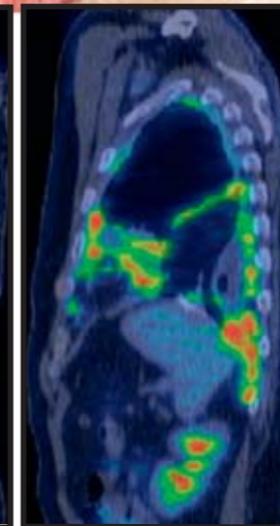
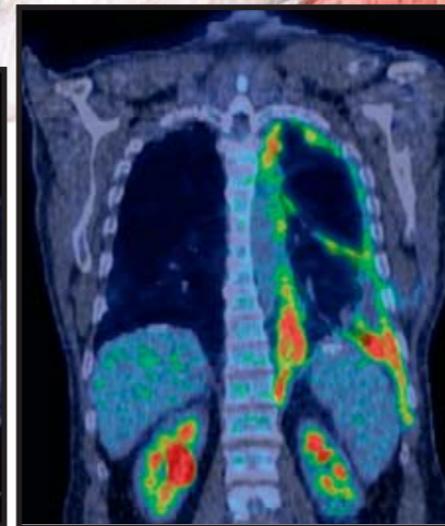
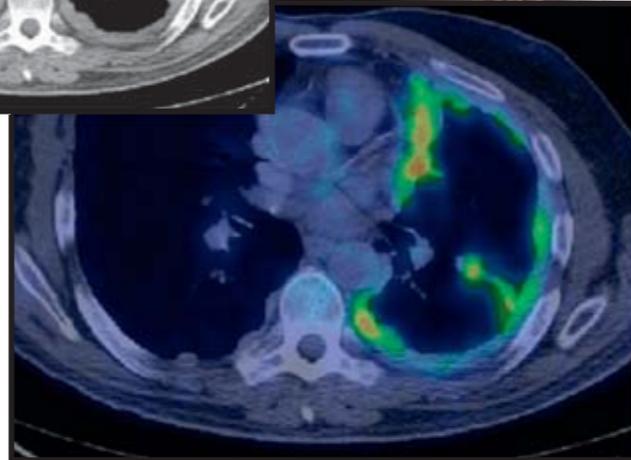
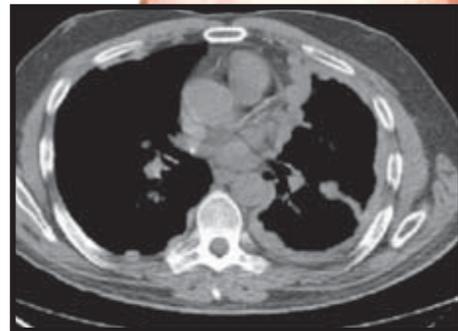
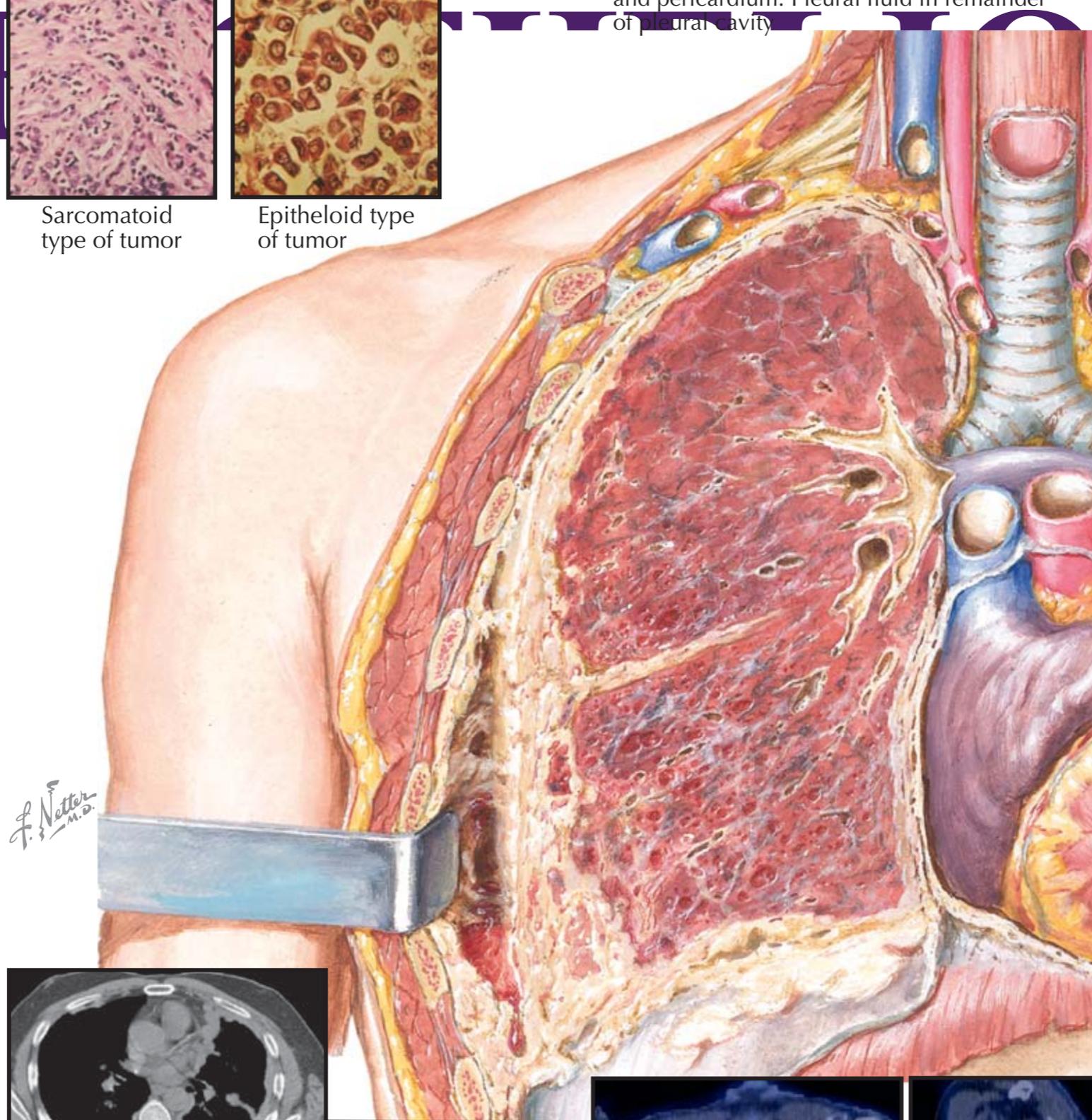
Sarcomatoid type of tumor



Epithelioid type of tumor

and pericardium. Pleural fluid in remainder of pleural cavity

# MA



# MESOTHELIOMA

- Diffuse Malignant Mesothelioma is an uncommon and lethal cancer for which there are limited treatment options
- Pleural tumor
- Related to asbestos (silicate fiber) exposure
  - Serpentine
  - Amphibole (crocidolite, amosite, tremolite, anthrophyllite, and actinolite asbestos)

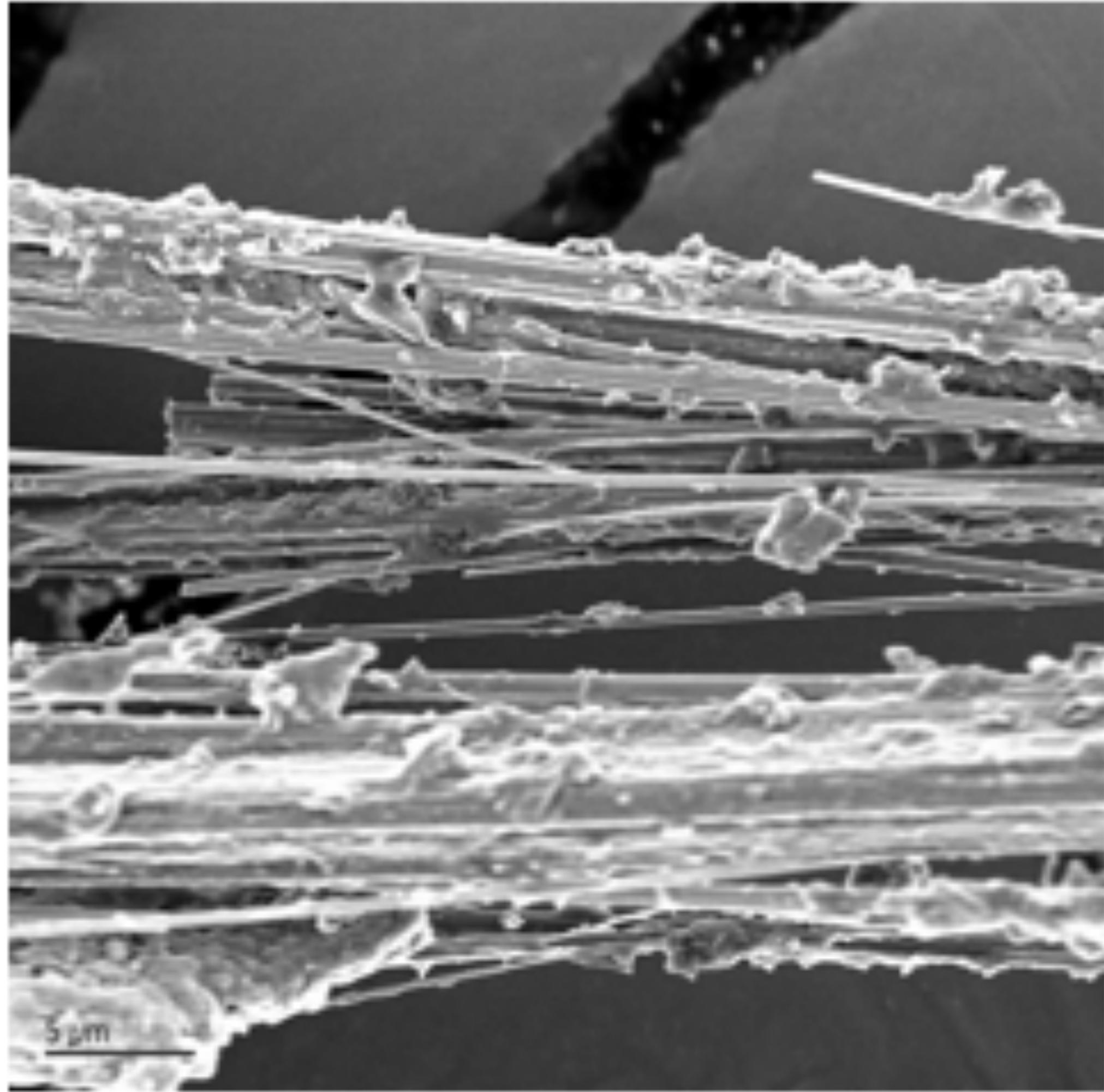


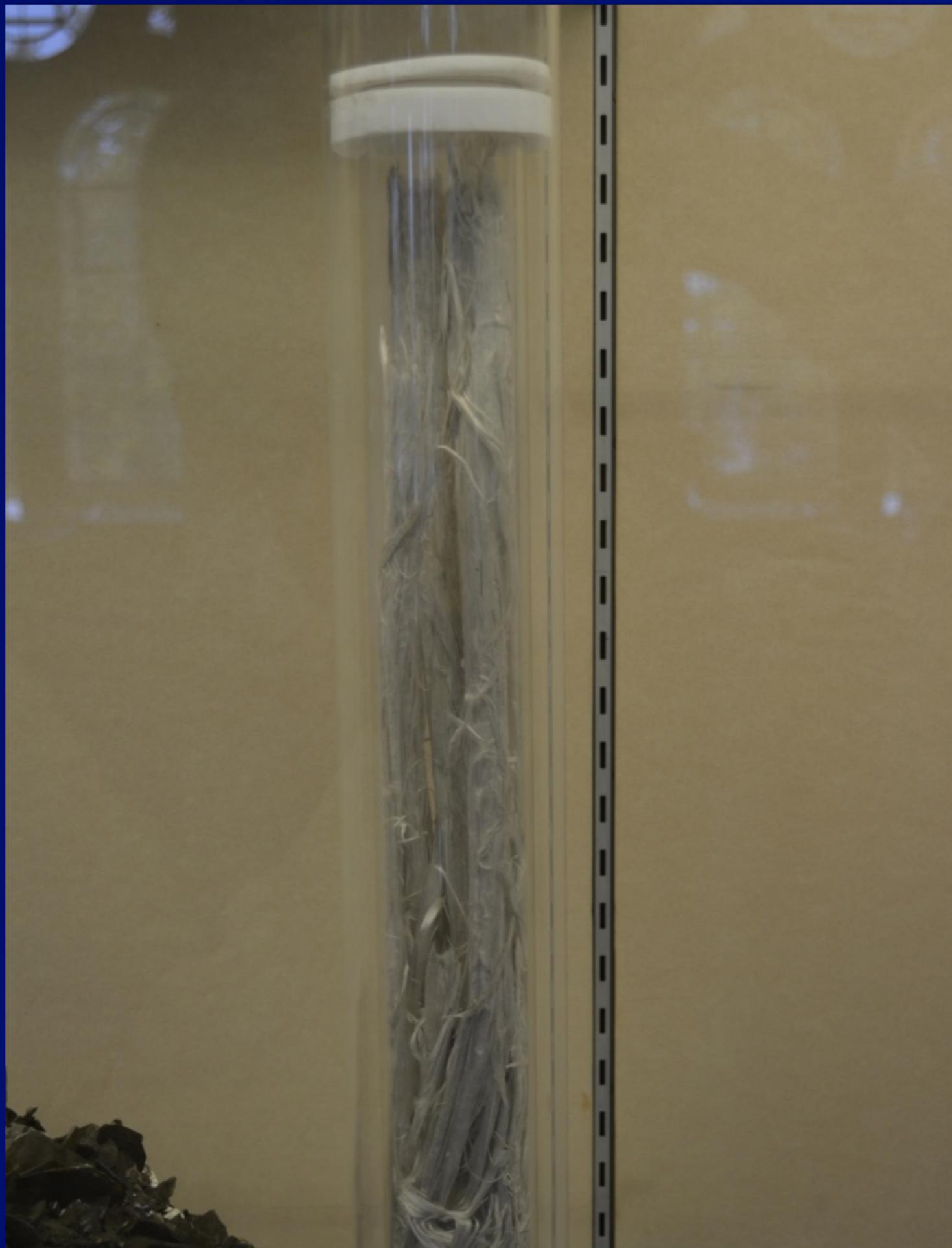




crocidolite



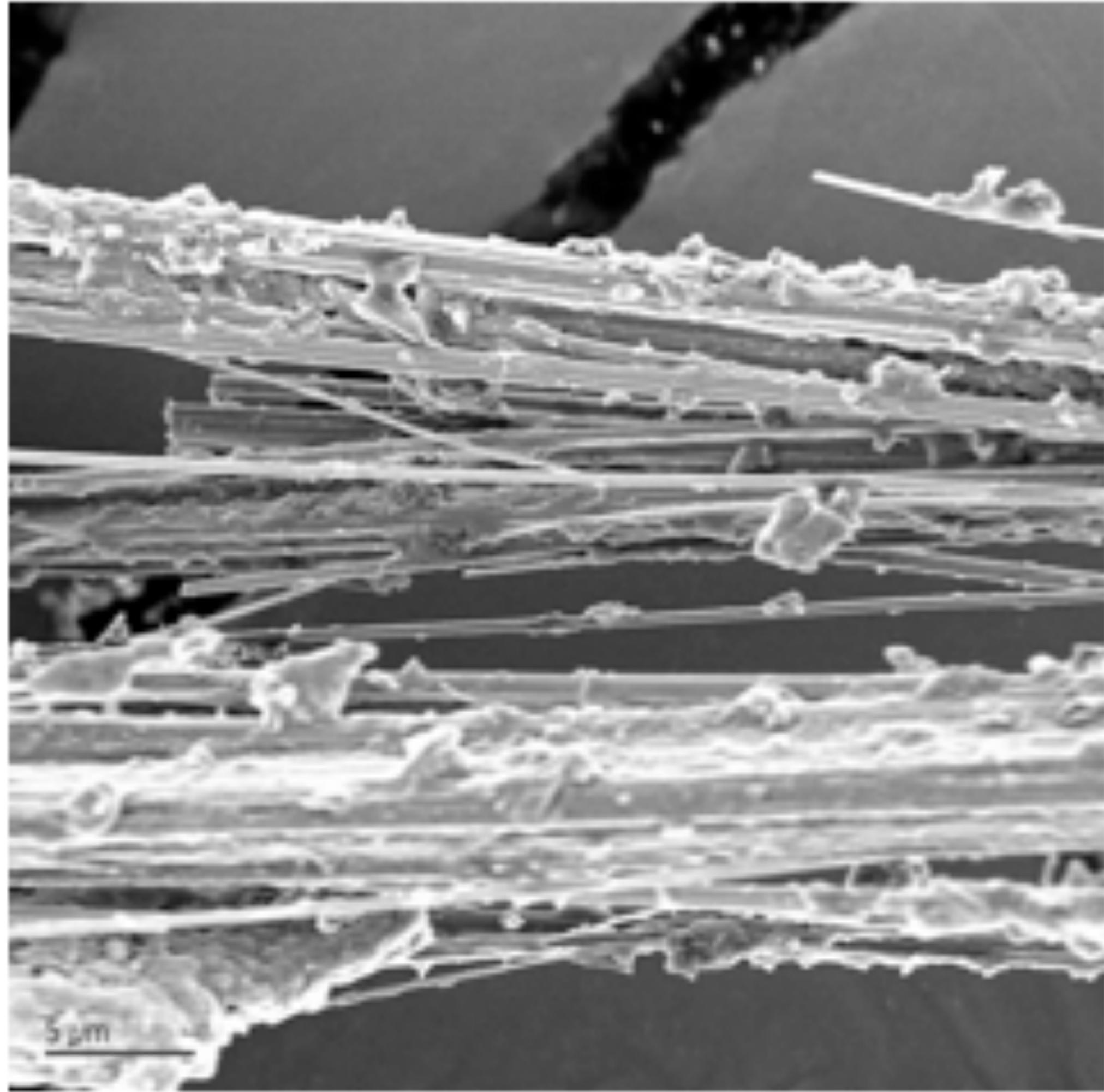


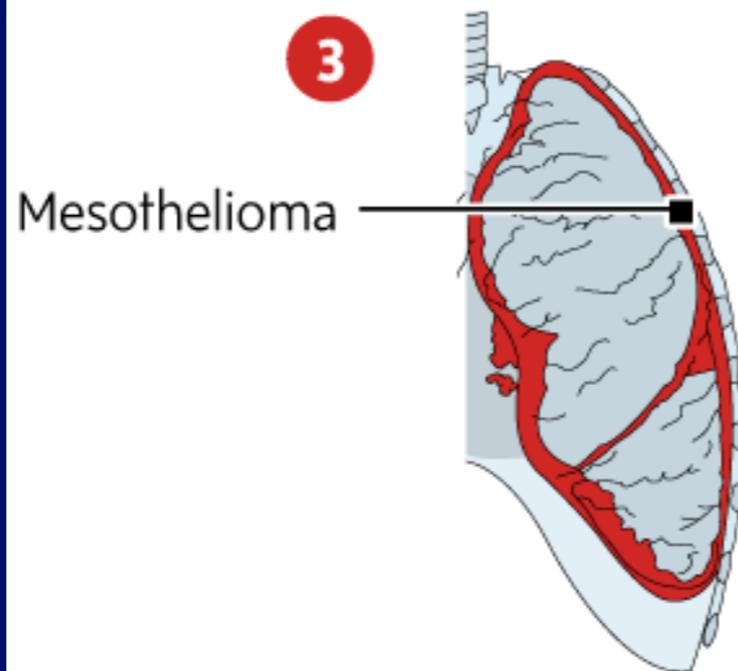
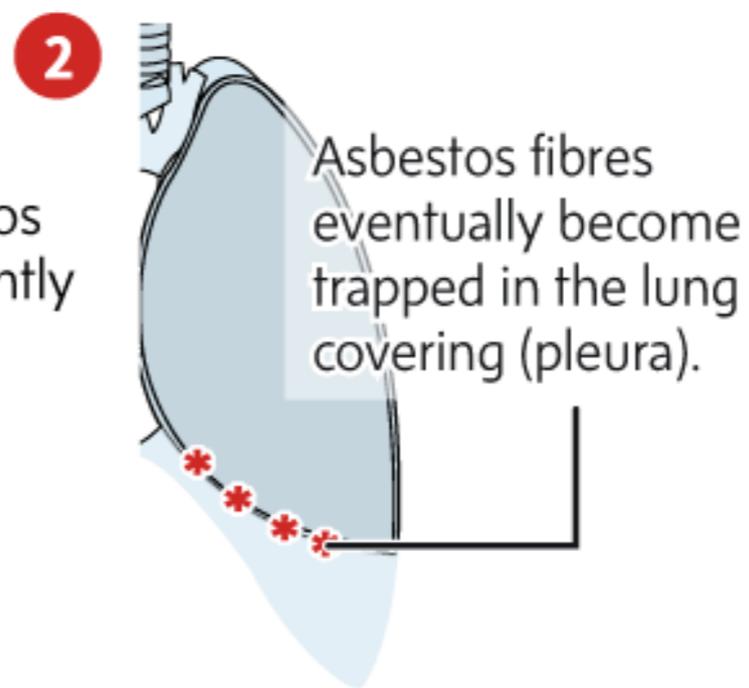
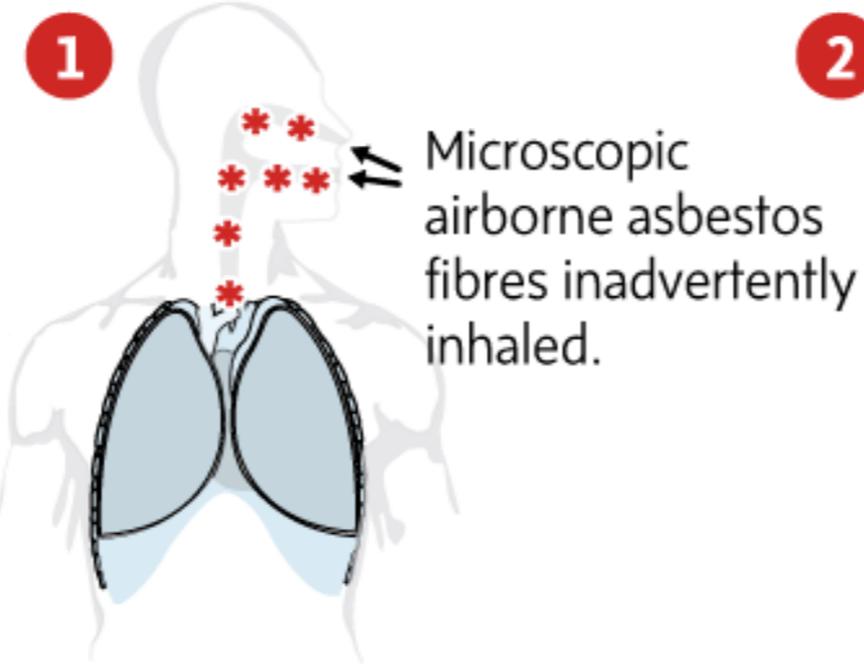


'POLITE'  
quartz  
id

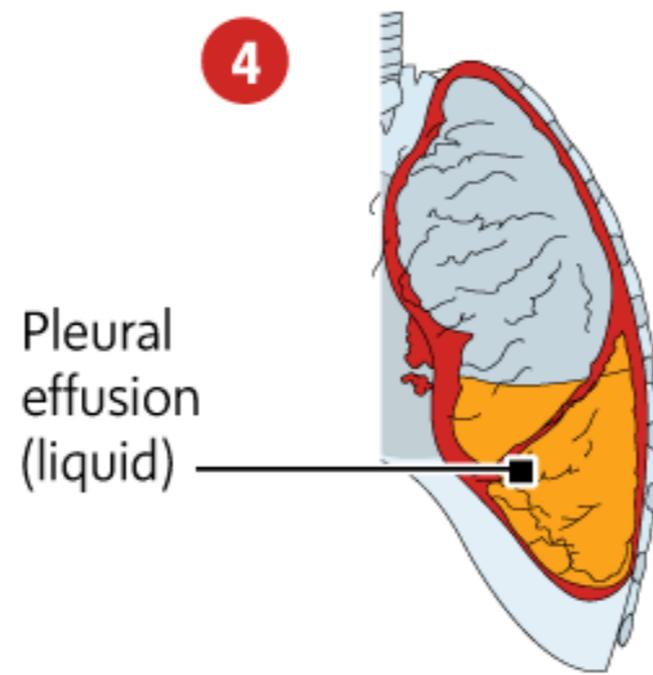


'ASBESTOS'  
silky fibres  
M. L. G. ...

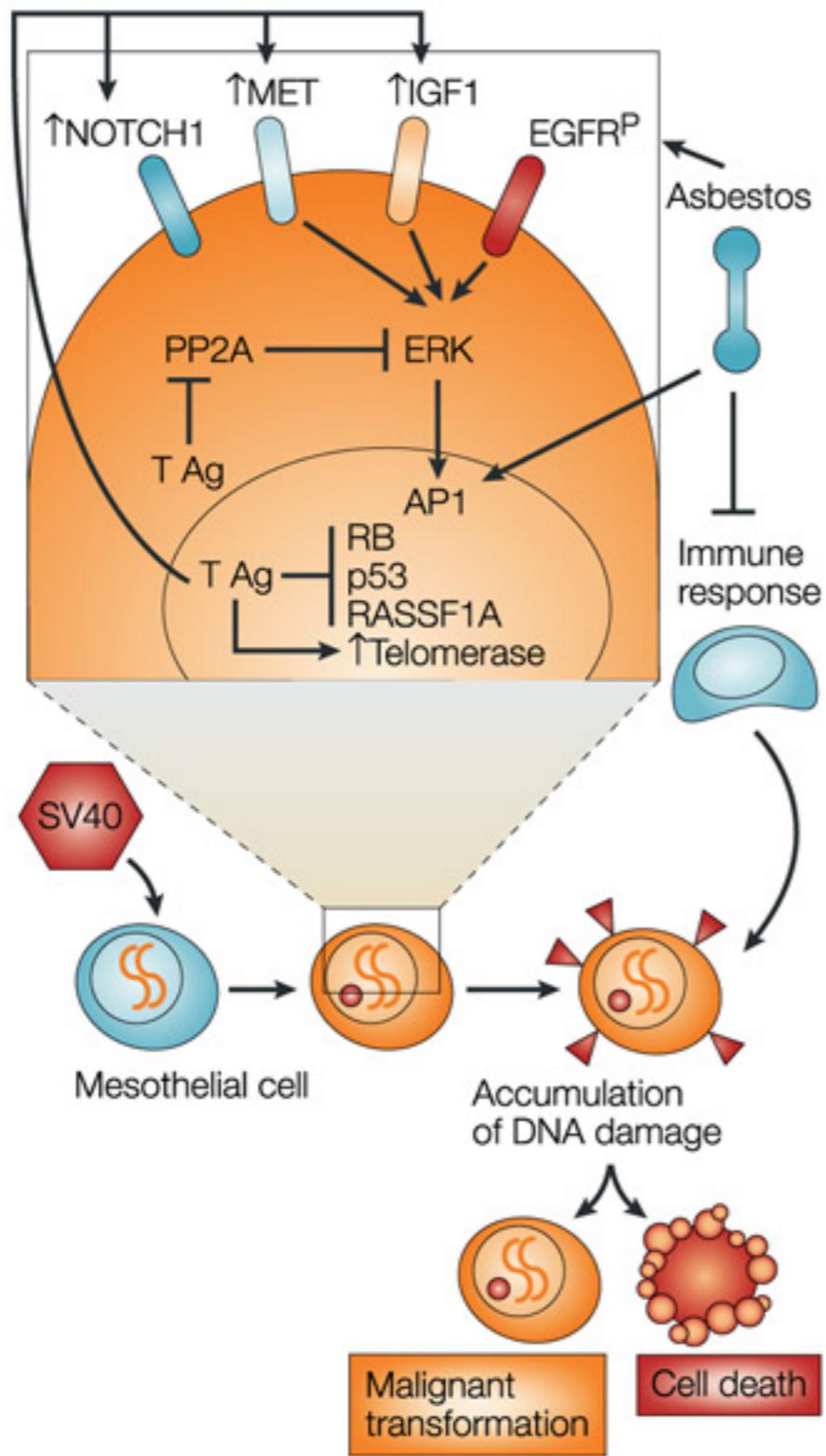




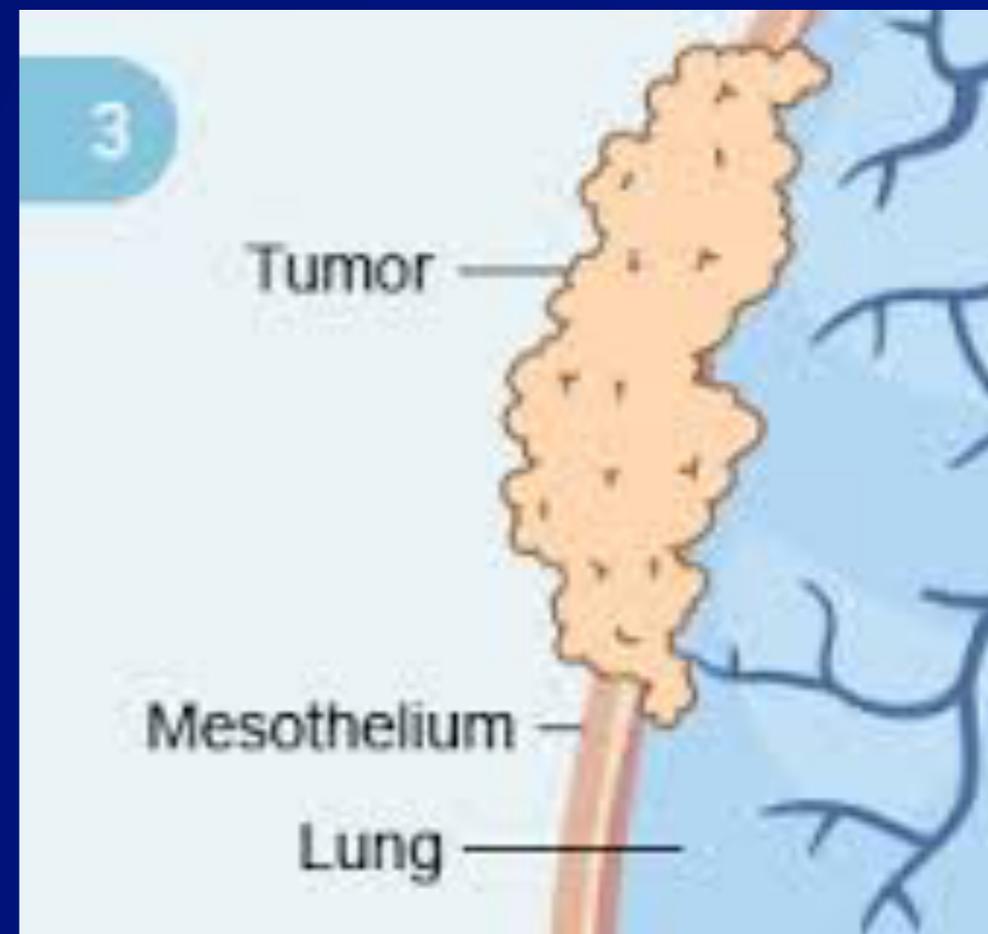
Asbestos fibres cause chronic inflammation and injury. Eventually this leads to calcium buildup in scar tissue and the development of mesothelioma.



Mesothelioma cells can "pull" fluid into pleural space, forming an effusion.



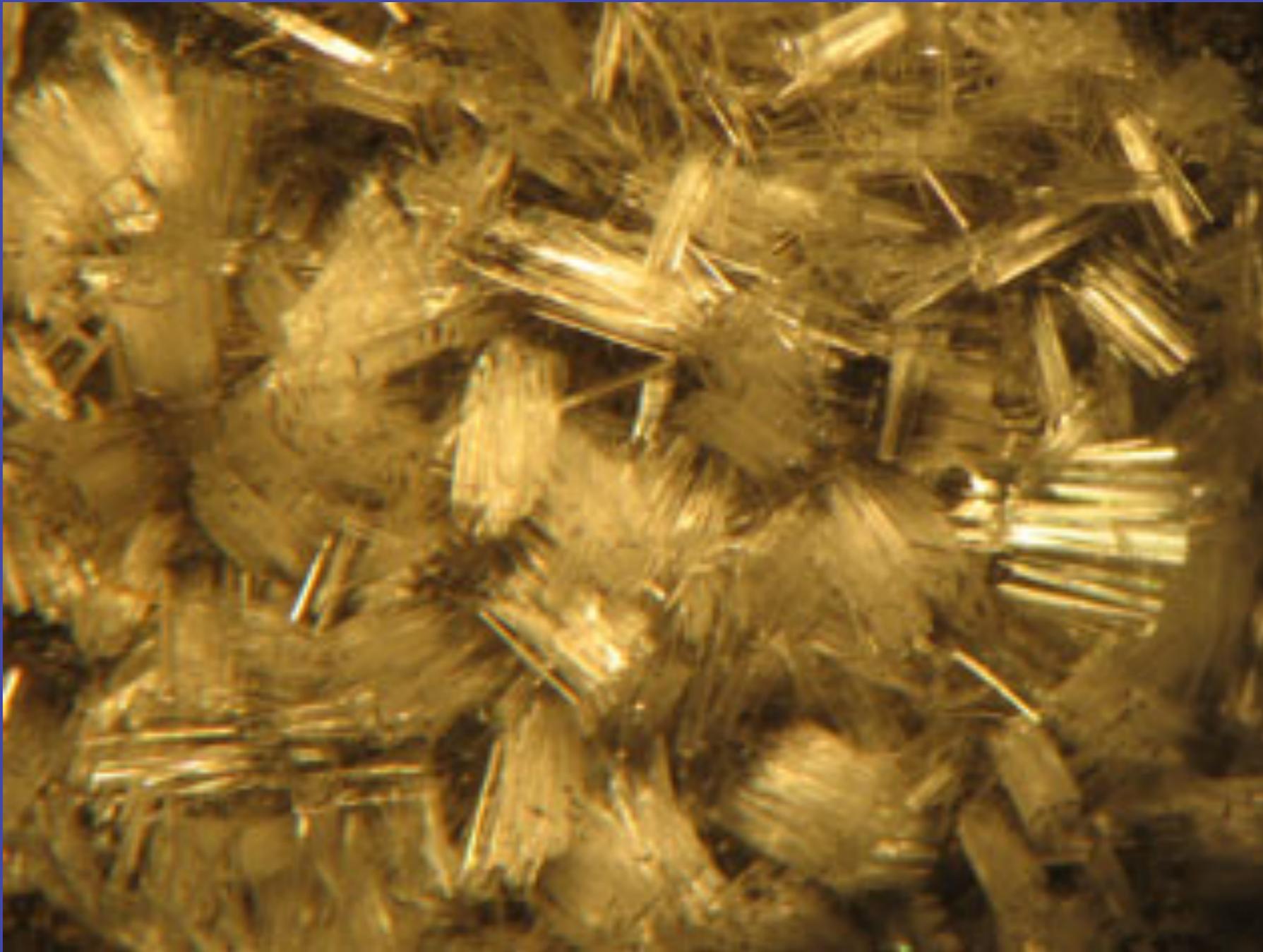
Nature Reviews | Cancer



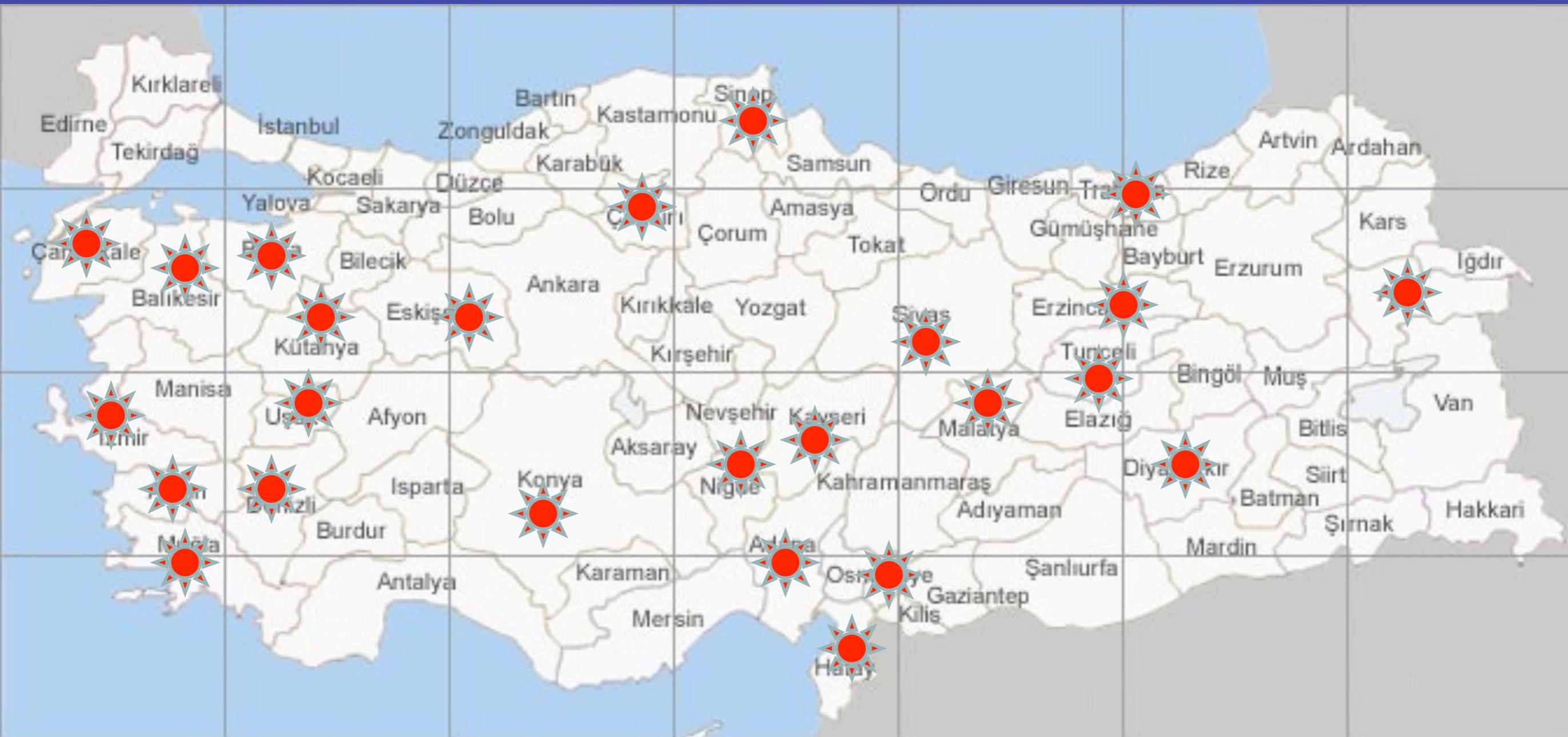
# Crysotile ( White Asbestos )



# Erionite ( Zeolite )



# Asbestos and Erionite in Soil in Turkey





*Article*

# Turkey National Mesothelioma Surveillance and Environmental Asbestos Exposure Control Program

Selma Metintaş <sup>1,2,†</sup>, Hasan Fevzi Batırel <sup>3,†</sup>, Hasan Bayram <sup>4,†</sup>, Ülkü Yılmaz <sup>5,†</sup>, Mehmet Karadağ <sup>6,†</sup>,  
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† On behalf of the Turkish Mesothelioma Working Group.

# Populations with asbestos exposure

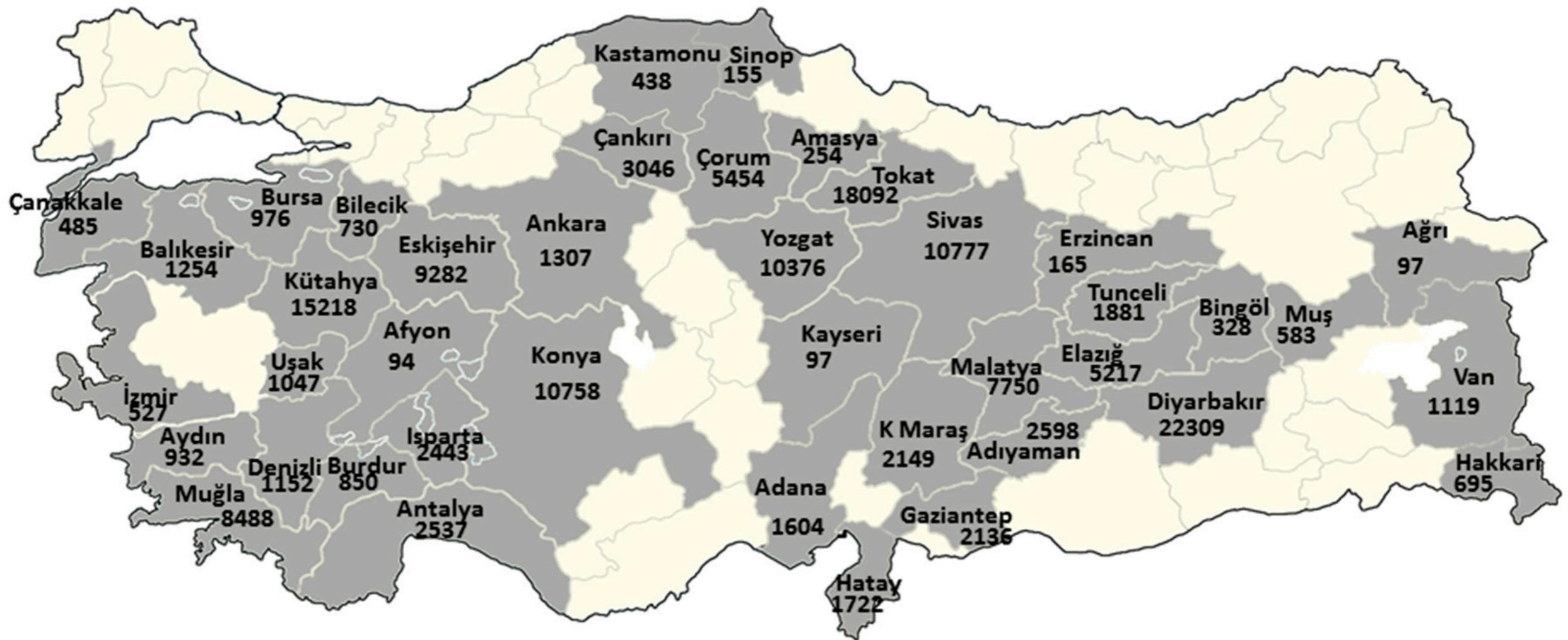


Figure 2. Population living in rural areas, where there is still asbestos exposure ongoing.

# İnsidans

Table 2. Crude and standardized mesothelioma incidence rates.

	Crude Incidence Rate Annual per 100,000 (95% CI)	Standardized Incidence Rate * Annual per 100,000 (95% CI)
Turkey		
Male	1.86 (1.79–1.89)	2.88 (2.86–2.89)
Female	1.49 (1.43–1.56)	1.86 (1.85–1.87)
Total	1.84 (1.79–1.92)	2.33 (2.32–2.34)
Villages with continuing asbestos exposure **		
Male	79.94 (67.64–92.17)	87.27 (87.21–87.33)
Female	66.92 (55.84–78.00)	68.44 (68.39–68.49)
Total	73.42 (65.30–81.67)	79.00 (78.94–79.06)



Aktif Köpükler

SÜPER

# Bingo

Elde Yıkama

EKONOMİK

SÜPER

# Bingo

Elde Yıkama

Aktif Köpükler

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# Bingo

Elde Yıkama

Aktif Köpükler

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TUZKÖY VE KARAIN KÖYLERİNDE 720 KİŞİ 'KANSERLİ KONUTLAR'A HAPSOLDU

# KANSER HAPSI!

Nevşehir'in 3 köyündeki evlerin akciğer zarı kanserine (mezotelyoma) yol açtığı tespit edilince köylerin taşınmasına karar verildi. Ancak köy nüfusu kadar konut yapılmayınca köylüler mağdur oldu...

Köylüler kanser riskine rağmen eski evlerinde oturmaya devam ediyor.



Tuzköy'ün yaklaşık 300 metre ilerisine yepyeni bir köy inşa edildi. Ancak konutların sayısı yetersiz kaldı.

Kanserli köylerin hikâyesi 40 yıl önceye dayanıyor... Hacettepe Üniversitesi'ne, Nevşehir'in Tuzköy, Karain, Sarıhıdır köylerinden, çok sayıda mezotelyoma (asbestin yol açtığı akciğer zarı kanseri) vakası gelmeye başlayınca bilim insanları köylerde bir araştırma yaptı.



Burak Dursun

Araştırma evlerin yapımında kullanılan kaya tüflerinin içindeki minerallerin kansere neden olduğunu ortaya çıkardı. Evlerin zemininde de bu madde tespit edilince 3 kanserli köyün taşınması gündeme geldi.

## Evlerde yaşam sürüyor

Nüfusu en fazla ve ölüm oranı en yüksek olan Tuzköy'ün taşınması için 1980'de Bakanlar Kurulu kararı alındı. Ancak karara rağmen köy taşınmadı. 1983'te bu defa köyün yerinde ıslah edilmesi kararı çıktı, bu da olmadı. Tuzköylüler 'mezotelyoma'dan ölmeye devam etti, köye yeni mezarlıklar kazıldı. Sonra 2004'te yeniden köyün taşınması kararı çıkartıldı ve Tuzköy'ün yaklaşık 200-300 metre ilerisine yepyeni bir köy inşa edildi. Ancak risk teşkil eden alanda yaşayan insanların taşınması için yapılan konutların sayısı yetersiz kalmıca, köylünün bir kısmı evlerinde oturmaya devam ediyor.

## '26 yaşında ölen var'

Tuzköy'deki eski yerleşim yerinde kanser riskine karşı yaşamını sürdürenlerden biri de 39 yaşındaki Suat Kayaharman. "Buradaki riskin farkındayız. Yeni yapılan konutlara gitmek istedik ama yapılan konut sayısı yetersiz olduğu için burada kalmak zorundaydık" diyen Kayaharman, yeni yapılan köyde hayvancılık yapılmadığını ancak hastalık nedeniyle işi bırakmayı bile göze aldığı söyledi. Aynı mahallede yaşayan Ahmet Ünal da, "Köyümüzde 26 yaşında kanserden ölen var. Kanserden dolayı köyün yaş ortalaması 45 ile 50 arasında" diye konuştu.

Tuzköy'de AFAD tarafından yeni yapılan konutlara taşınanlar ise yıllar sonra hiç beklemedikleri bir borçla karşılaştığı için mutsuz. Oruç Kayaharman, "Devletimiz bizi kanserden kurtarmak için ev yaptı. Fakat bu borç çıkınca yeni bir kansere yakalandık" diye dert yandı. Yeni köyün sakinlerinden Mehmet Uğurlu ise "Böyle bir yer olmaz. Bu yanlışlığın düzeltilmesini bekliyoruz" dedi.

görevlendirilen sanıklarda irtelen askeri rin 'gizli olup ştırdı. anın sonunda, ralan bilgilerin sahte olduğu bir gizlilik dereceli ü ortaya çıktı. , karargâh içinde şavir Hakim m Köse'ye

lgelerle ilgili örüşlerde, askeri belgeler' ttiği anlaşıldı. çilerle soruşturma zaf askerin de la sonuçlanan / bir casusluk ştı.

Köse, 'zorunlu' den alındı. Bu nin göreve mi de göz önüne lacaktır.

★ ★ eri casusluk pas olduğunun yla birlikte devlet i kadrolarında ve idari sadece Türk eri ve İçişleri nırlı kalmayacak. m pas olduğu 'de başlatılan yeni ecinde Merkez li Savunma olmak üzere lği, Gümrük nlığı, Maliye şma ve Sosyal nlığı, Ekonomi ji Bakanlığı, m Bakanlığı, nlığı, Gıda Tarım Bakanlığı'nda başlatıldı ya da re.

ırdaki konusu da yeralan ilgili t bilgilerin up olmadığı, belgelere gizli rokratlar tespit nda idari ve adli yürütülecek. ağılantılı olan aya çıkartılacak. rasideki kumpas ususluk davasıyla mbanın büyüğü, syası ile geliyor. ı güzelleştiren adınlara yönelik tyırmıcılığın ve mutlu bir ak dileğiyle tüm rt Dünya Kadınlar n...)



Suat Kayaharman, "Köyün durumu belli, endişeliyiz. Bu hastalıktan dayımı 37 yaşında kaybettim. Hayvancılık yapıyorum" diyor.

## 'Tuzköy'de tam bin kat daha fazla'

Karain'in taşınmasıyla ilgili çalışmalar yürüten ekipte yer alan ve köyün yeni yerinin Tıbbi Jeoloji raporunu hazırlayan Jeoloji Mühendisi Dr. Eşref Atabey, şunları söyledi:

"TOKİ, Karain'de yeni yapılan konutların 2014'te teslim edileceğini açıklamıştı. Ama 18 imar uygulamasıyla ilgili parselasyon hatası ortaya çıktığı için insanların taşınmasına izin verilmiyor. Mezotelyoma Nevşehir'deki Hâlâ burada yaşayan insanlar kanserle mücadele ediyor. Yıllar önce taşınan Sarıhıdır'da doğanlarda mezotelyoma vakalarına rastlanmıyor. Ancak eski Sarıhıdır köyünde doğanlarda eriyonit mineralinden kaynaklanan akciğer kanseri vakaları saptanmış. Önemli olan solunan havadaki eriyonit tozunun konsantrasyonu. Yeni yapılan konutlar eriyonit tozundan etkilenmeyecek mesafeye yapıldı. Dünyada milyonda bir görülen Mezotelyoma'nın (akciğer zarı kanseri), Karain ve Tuzköy'de bu orandan tam bin kat daha fazla görülüyor. Mezotelyoma Nevşehir'deki 30 köyde görülüyor ama Karain, Tuzköy ve Sarıhıdır köylerinde bu oran çok daha yüksek. Evlerin içlerini, kapı önlerini süpüren kadınlarda toza maruz kalma daha fazla olduğundan, kadınlarda kanser olasılığı daha çok."

## 'Yeni evimize taşınmak istiyoruz'

110 kişinin yaşadığı Nevşehir Ürgüp'e bağlı Karain Köyü Muhtarı Mevlüt Özata, "Bu çevrede akciğer zarı kanseri (mezotelyoma) en yaygın hastalık. Bu hastalık yüzünden köyümüzde şu ana kadar yaklaşık 500 kişi öldü. Köyde yaşayan 110 kişiden 5'i bu hastalıktan müstariptir. Köyümüzde yaşanan ölümlerin yüzde 80-90'ı mezotelyomadan gerçekleşiyor. Mart ayında yeni inşa edilen evlerin kuraları çekilecek. Köy halkı da zaten 'mezotelyoma' yüzünden taşınmak istiyor. Artık sonuna geldik, bir an önce yeni evlerimize taşınmak istiyoruz" diye konuştu.

## 'İkinci etap yapılmadı'

Tuzköy Muhtarı İsmail Topal, köydeki durumu şöyle anlattı; "Köyümüz 2 etapta taşınacaktı. İlk etap tamamlandı ama tüm köylüye yetecek kadar ev inşaat edilmediği için burada hâlâ yaşayan var. Bu bölgeyi arındırmak adına 2 metre toprak döküp ağaçlandıracaktık, onu da yapmadılar. 2. etap çalışmaları ise yapılmaya başlanmadı. Bildiğimiz kadarıyla da yapılmayacak. 214 konutluk yeni bir yerleşim yeri yapıldı. Eski yerleşim yerinde ise tarım yapıldı. Eski yerleşim yerinde 35 civarında ve hayvancılıkla uğraşan 35 civarında aile kaldı. Bunlar, yeni yapılan yerleşim yerinde evlerin birbirine yakın olması ve kura da konut çıkmadığı için taşınmadı. Yeni yapılan konutların yazın dolu. Ama kışları en fazla 150 aile burada kalıyor. Köyümüzde 2 bin kişiyi kapsayan mezotelyoma hastası n nüfusu 1220 ve 20'si kanser hastası."



Özge Özkan, "Apartmanda başkaları da köpek besliyor. Hakkımı arayacağım" dedi.

# 'Kanserli köy' taşındı

*Nevşehir'de 'Kanserli köy' olarak bilinen Karain Köyü 8 kilometre uzağa taşındı. Yeni yerlerine alışmaya çalışan köylülerin kaygısı artık kanserden çok, yeni evlerinin borcu*

**BURAK DURSUN İstanbul**

Hikâyesi 40 yıl önceye dayanan ve 'Kanserli köy' olarak bilinen Nevşehir'in Tuzköy, Karain, Sarıhıdır köylerinden, binlerce ölüm yaşanması üzerine bölge halkının evleri incelenmeye başlandı. Bölge halkının yaşadıkları evlerin yapımında kullanılan kaya tüflerinin içindeki minerallerin 'mezotelyoma'ya (asbestin yol açtığı akciğer zarı kanseri) neden olduğu ortaya çıktı. Evlerin zemininde de bu madde tespit edilince 3 kanserli köyün taşınması gündeme geldi.

İlk olarak nüfusu en fazla ve ölüm oranı en yüksek olan Tuzköy'ün taşınması için çalışmalara başlatıldı ve 7 sene önce köyün 300 metre ilerisine yeni evler inşaat edildi. A ve B bölgesi olmak üzere ikiye ayrılan Tuzköy'de öncelikle A bölgesinde yaşayan kişilerin yeni köye taşınması düşünülmüş ancak yapılan ev sayısı yetersiz kalınca bazı köylüler riskli olduğu belirtilen evlerinde oturmaya devam etmek zorunda kalmıştı. Karain Köyü'nde ise uzun zamandır yapılması çalışılan evlerin inşaatı tamamlandı ve köylüler yeni evlerine taşınmaya



başladı. Ancak köylülerin en büyük derdi yeni evlerinin parasını nasıl ödeyecekleri.

## 'Açıkta kalan yok'

163 kişinin yaşadığı Ürgüp'e bağlı Karain Köyü Muhtarı Mevlüt Özata, yeni köyün 8 kilometre uzakta olduğunu belirterek, "Bu çevrede akciğer zarı kanseri en yaygın hastalık. Bu hastalık yüzünden köyümüzde şu ana kadar 500 kişi öldü. Bu yüzden köy halkı da taşınmak istiyordu. Köydeki konut sayısı ka-

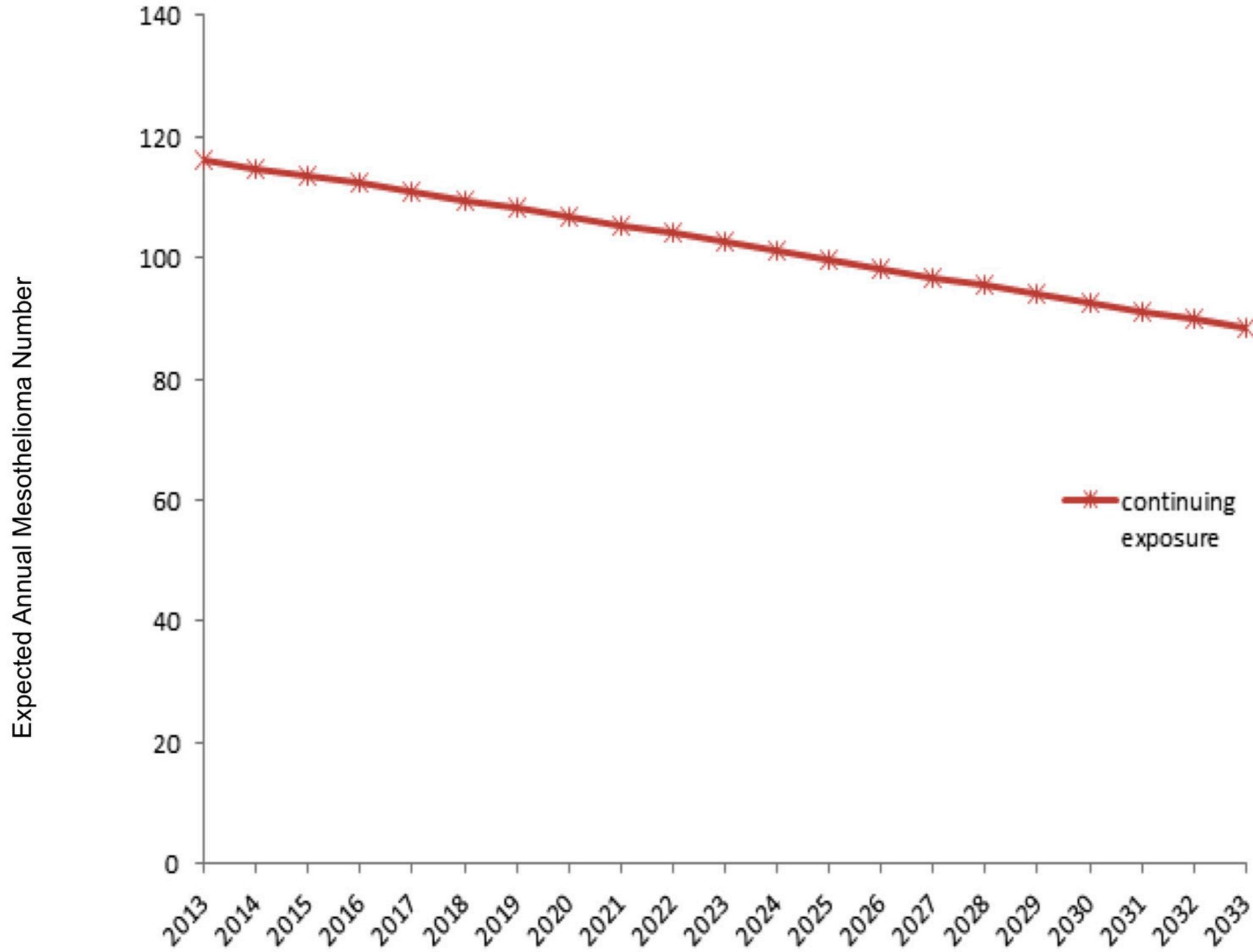
dar yeni yere ev yapıldı. Kimse evsiz kalmadı" dedi.

Anneannesini 'mezotelyoma' yüzünden kaybeden Hasan Tural da 47 yıl sonra yeni köye taşınmış ama evlerden memnun olmadığını söylüyor. "Benim orada dedemden kalma 8 odalı evim vardı ama burada 2 odalı bir evde yaşıyorum" diyen Tural, fiziki şartlarda sıkıntılar yaşadığını ve okulun uzak olmasının da kendilerini zorladığını anlatıyor.

## 'Ne kadar ödeyeceğiz?'

Karain Köyünde yaşayan ve ailesinde bir kişinin bu hastalıktan öldüğünü söyleyen 18 yaşındaki Bekir Türkoğlu da, "Ürgüp bölgesinde yapılan evleri para karşılığında verdiler. Ev için ne kadar vereceğimizi bilmiyorum. Bize iki sene para vermeden oturacağımız söylendi ondan sonra ödeme planı çıkarılacakmış" diye konuştu.

# 'Expected Incidences'



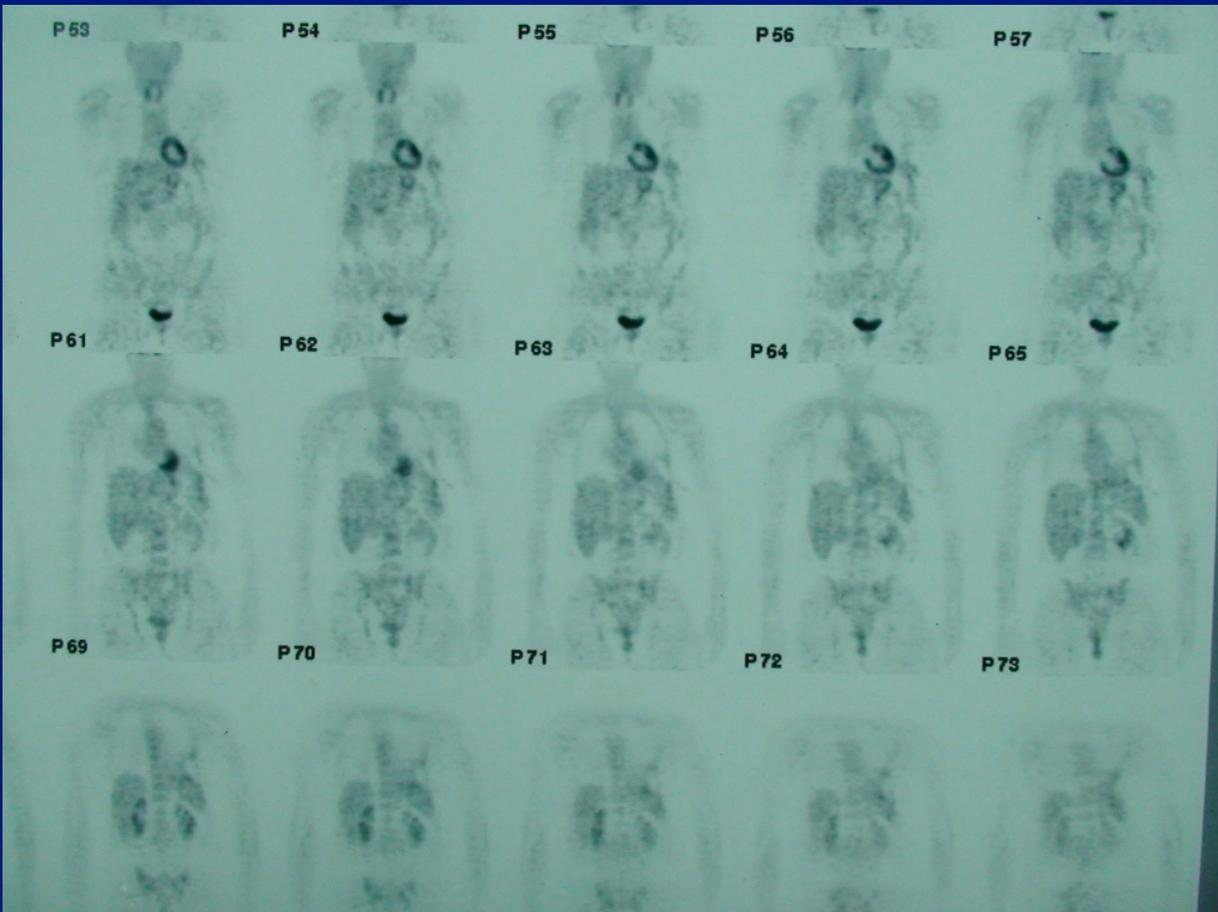
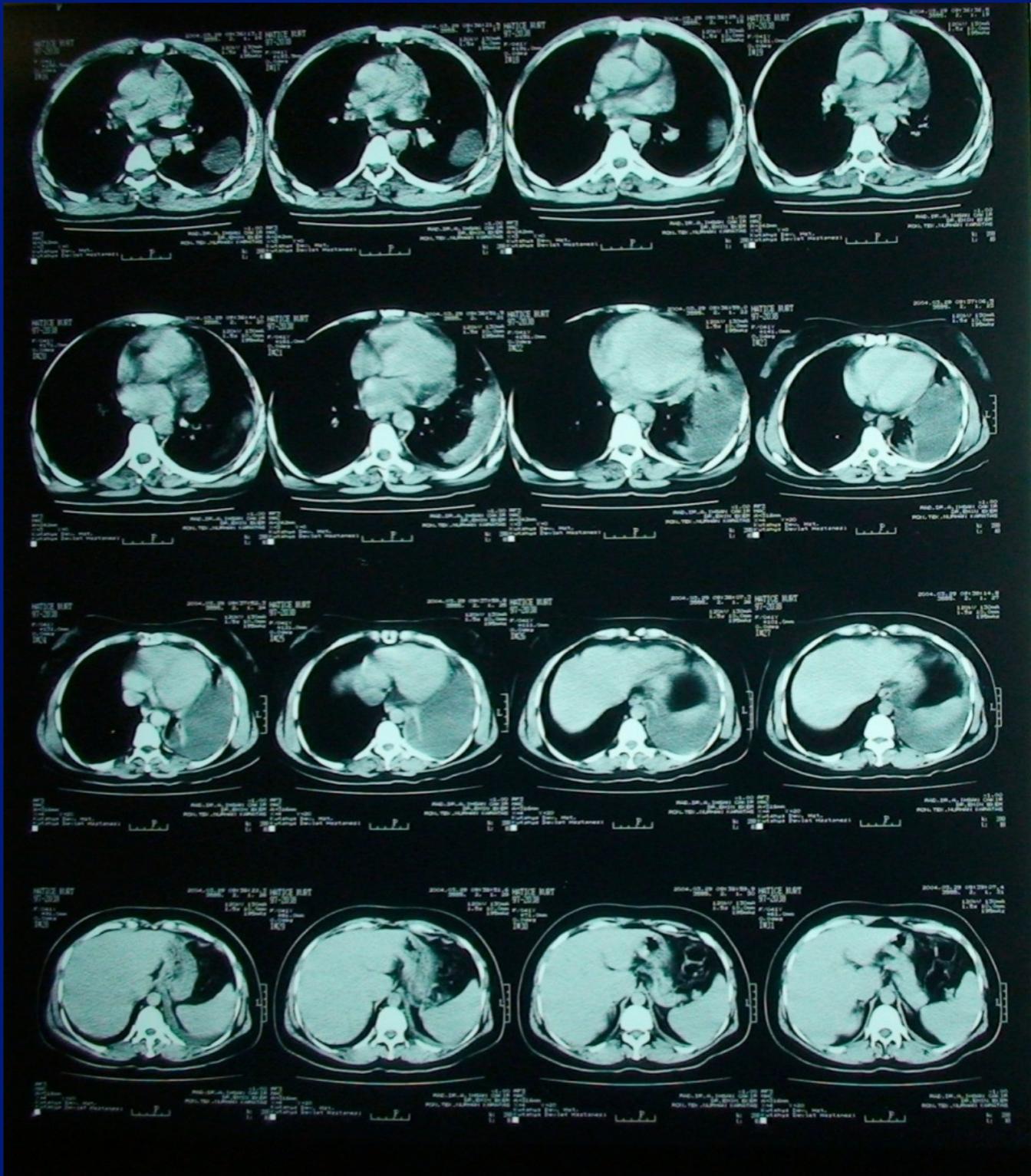
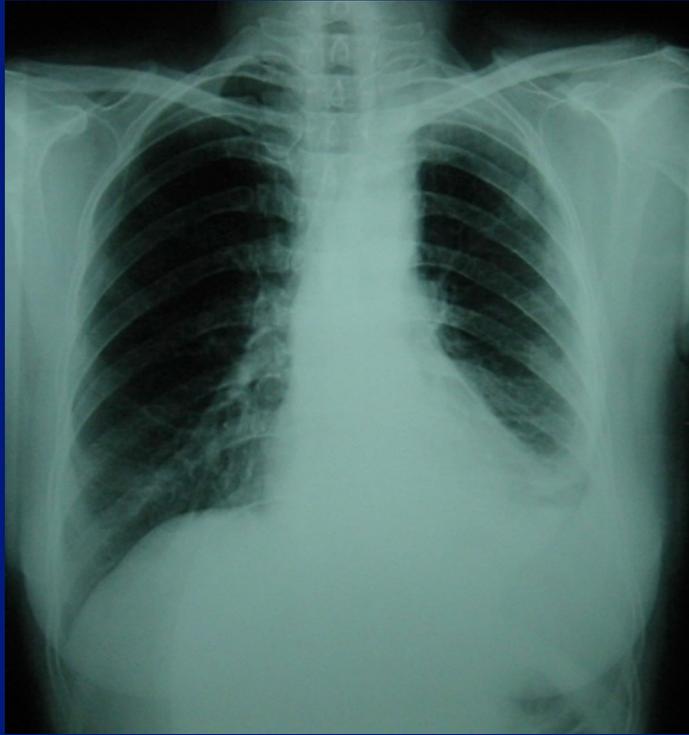
# MESOTHELIOMA

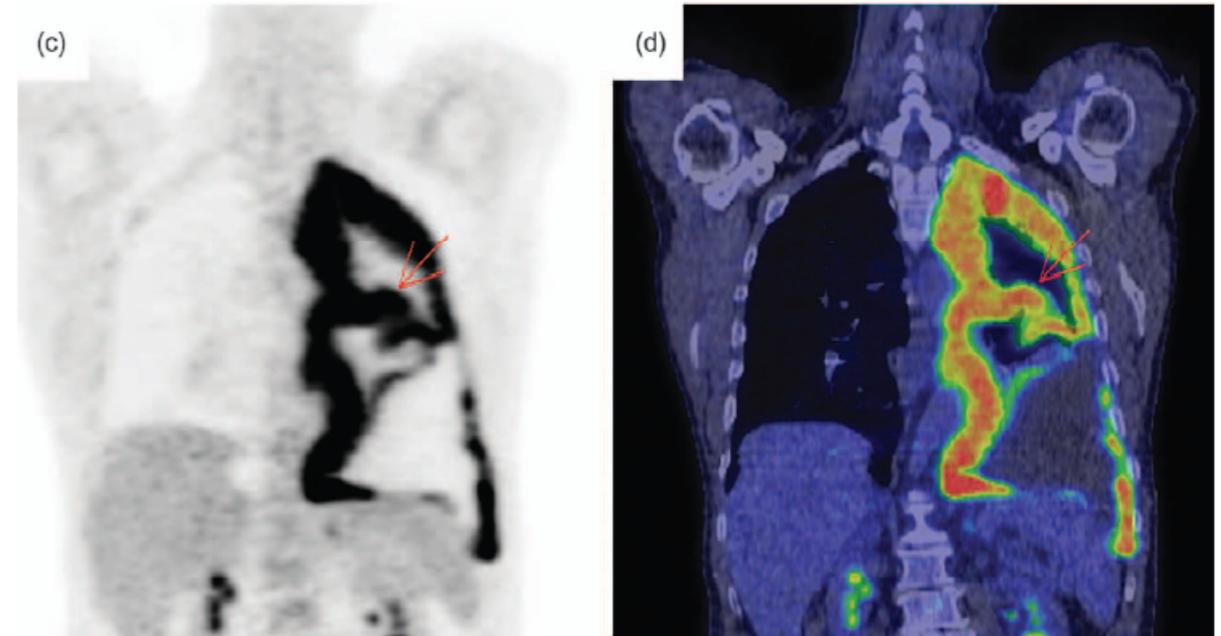
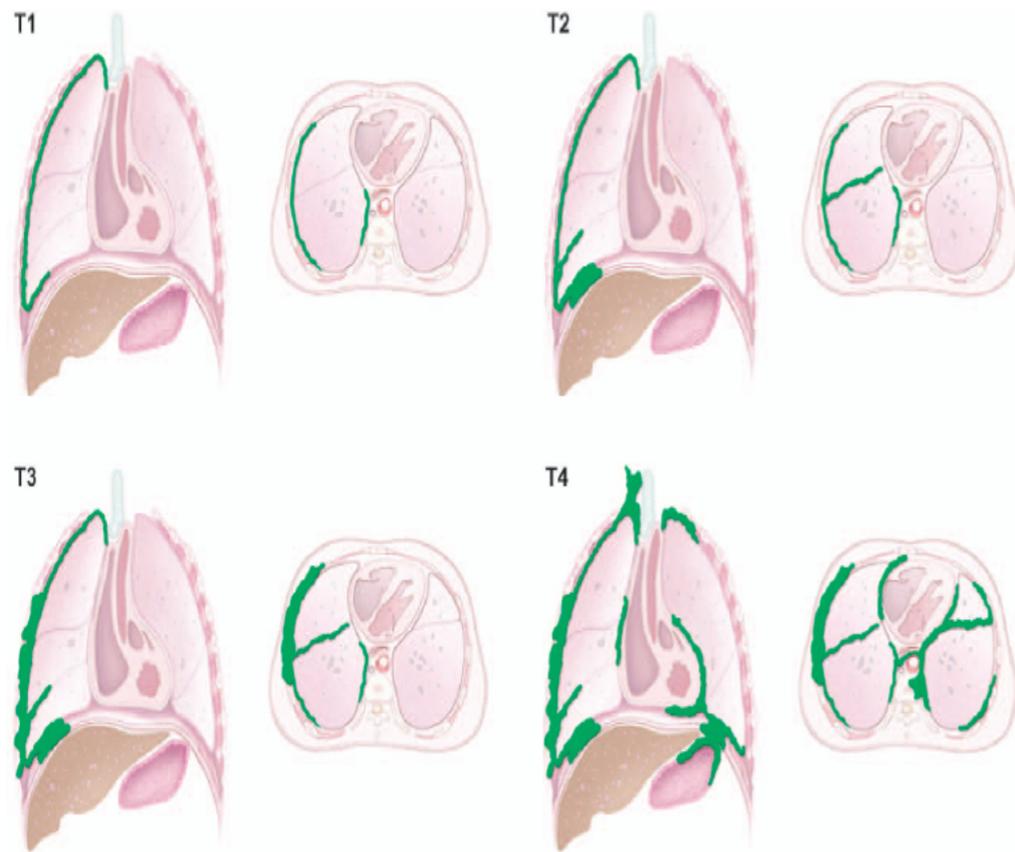
- Diffuse malignant mesothelioma
  - Epitheloid
  - Sarcomatoid
    - Desmoplastic
  - Biphasic
- Localized malignant mesothelioma
- Well differentiated mesothelioma
- Adenomatoid tumor

# Symptoms

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- **Chest pain**
- **Chest discomfort**
- Dyspnea
- Cough
- Fever
- Dysphagia
- Hoarseness





- **FDG-Uptake Pattern:** Focal or linear in early stages  
 : Irregular mass lesions in advanced stages

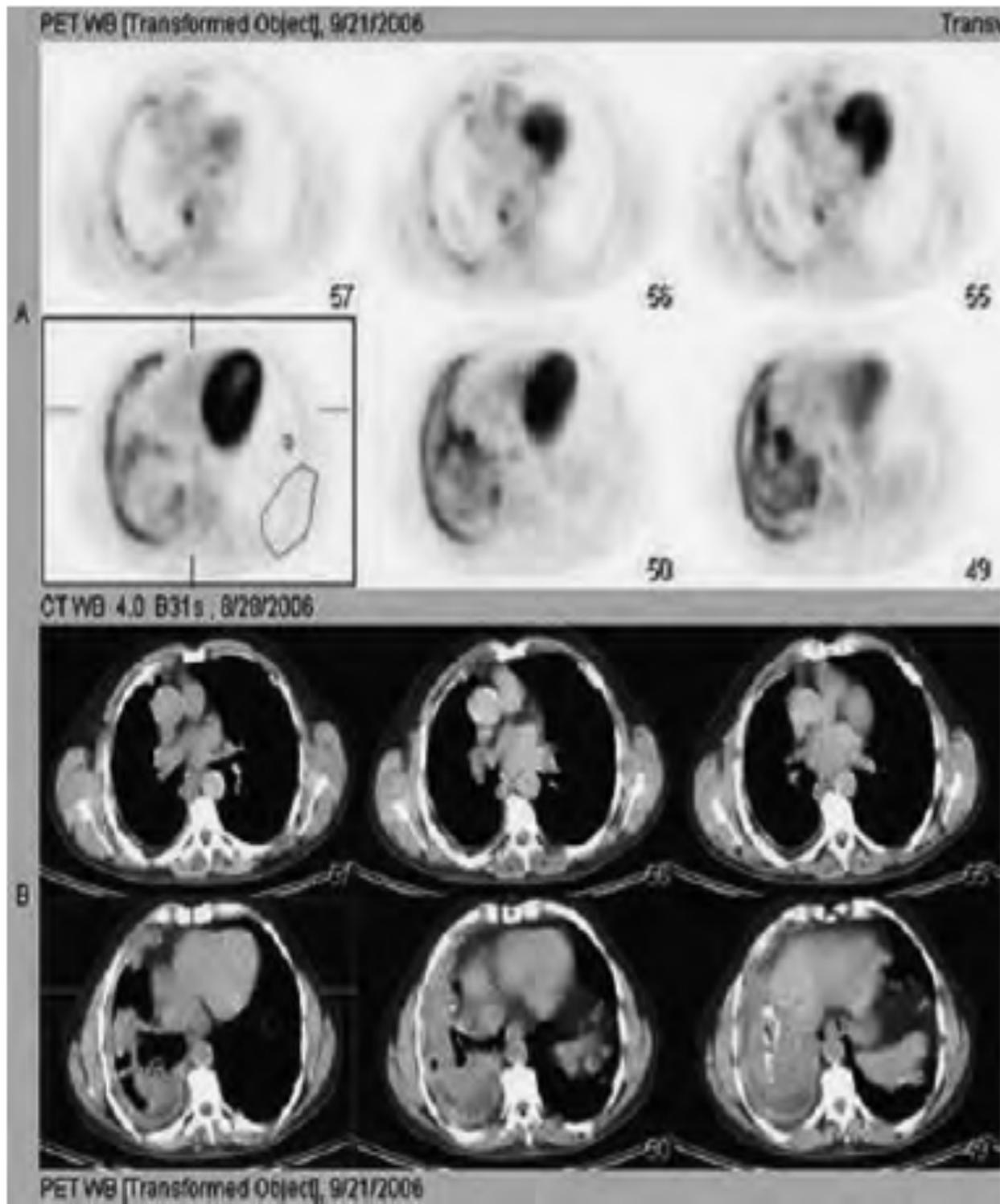


Fig. 1 View of malignant pleural mesothelioma (SUVmax: 11.7).

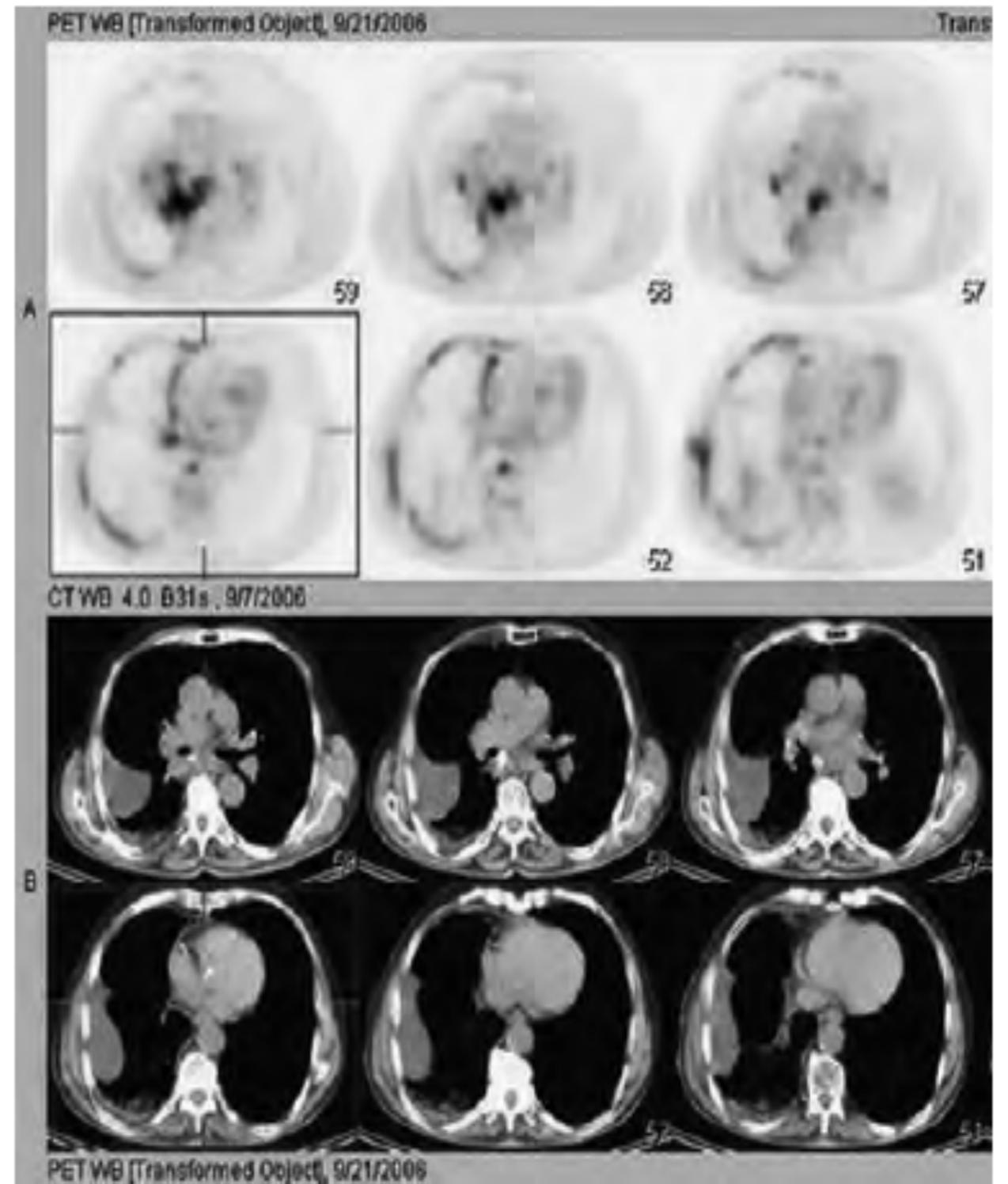
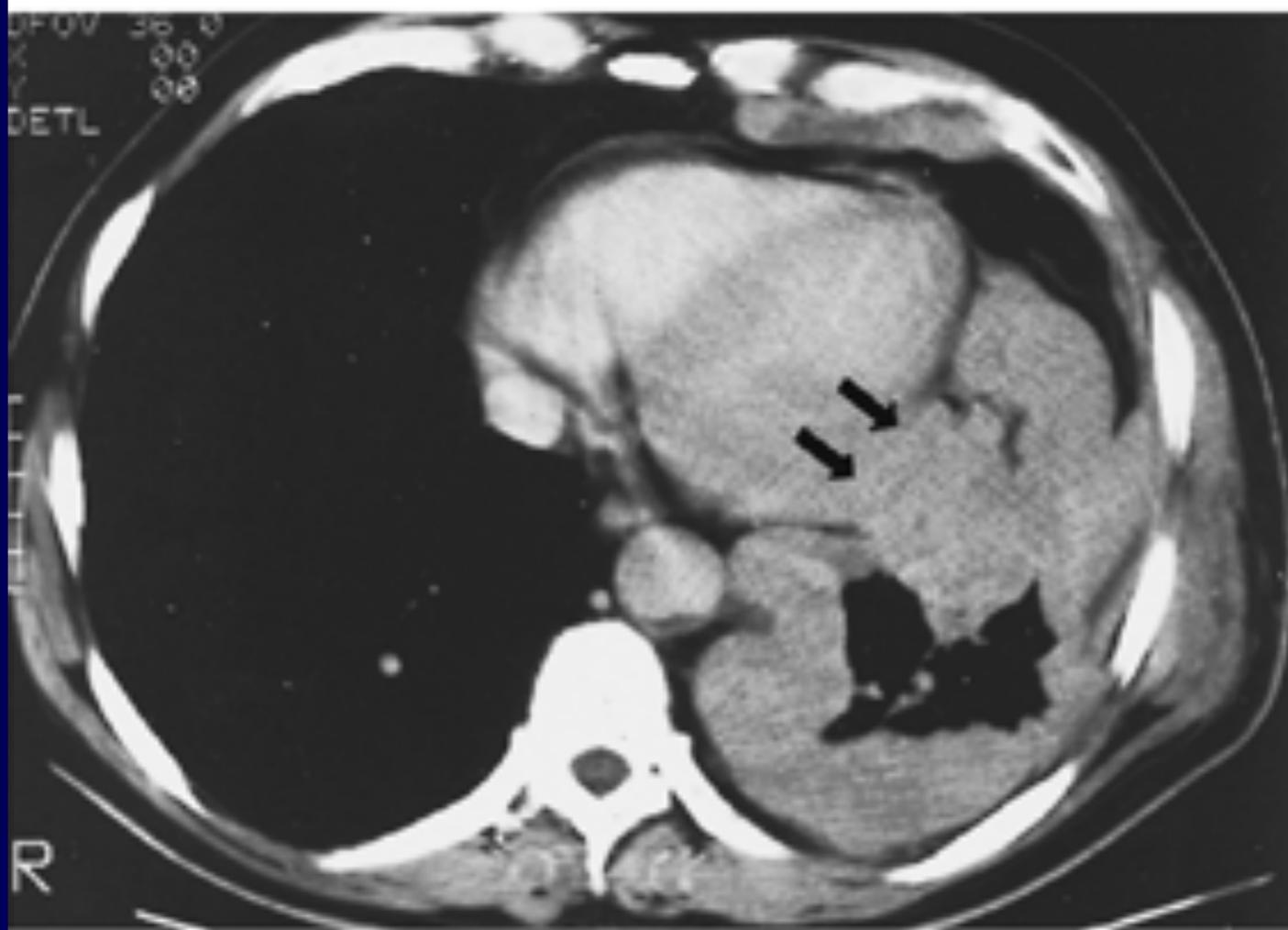
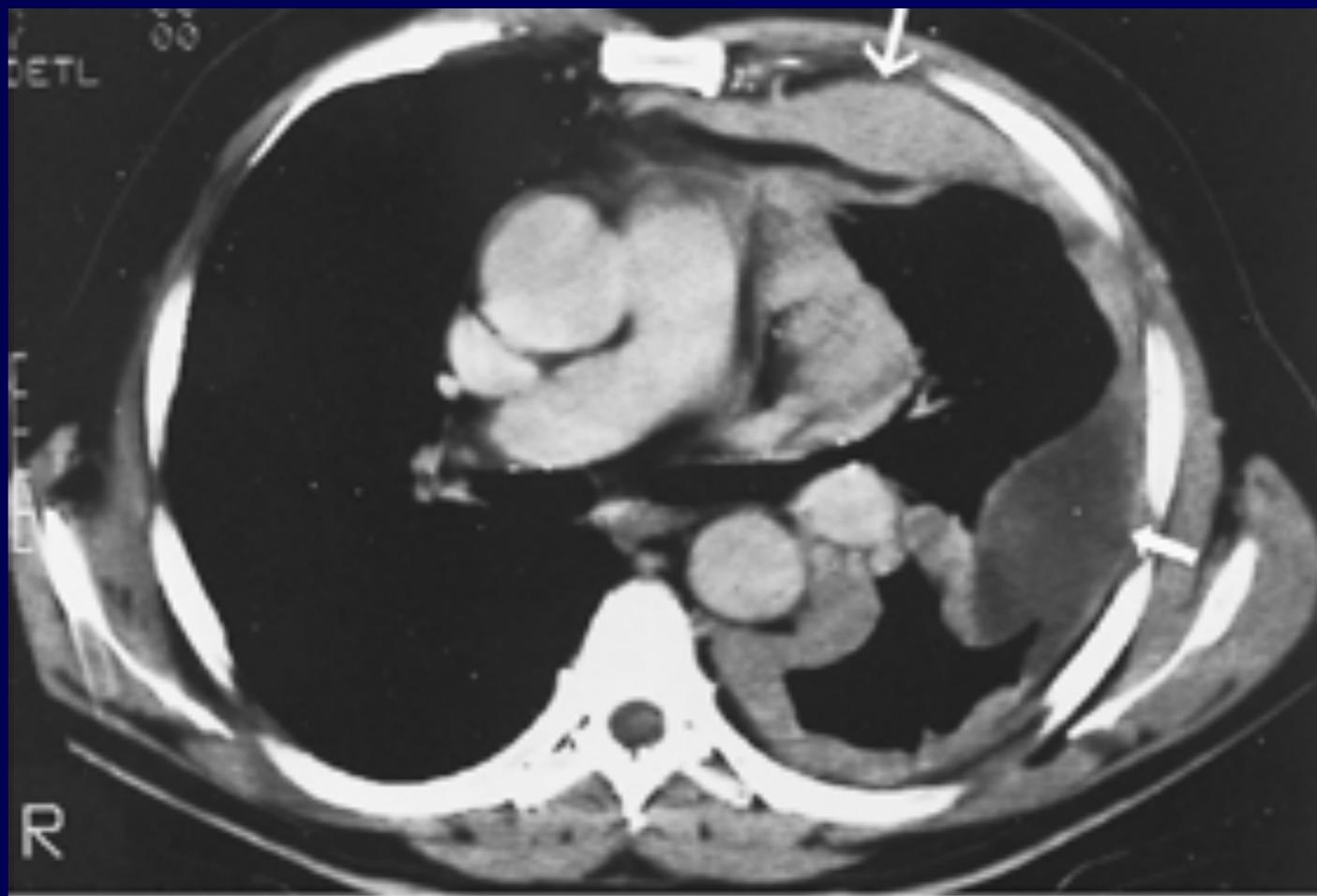


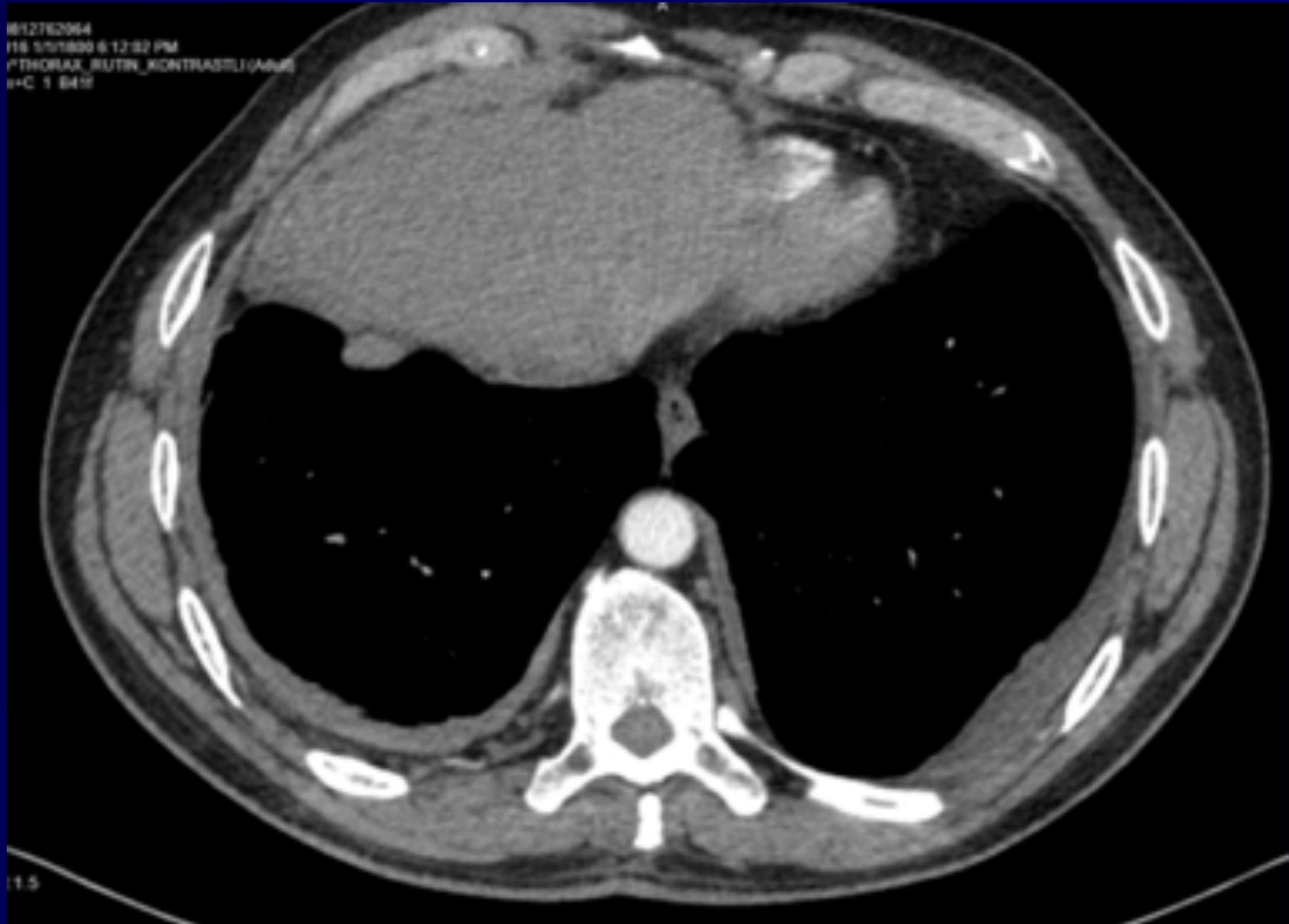
Fig. 2 Tuberculous pleuritis (SUVmax: 5.6).



**26y-o woman  
Mesothelioma  
(Stage III)**



**The patient was born and raised in Çermik/Diyarbakır**



# Paraneoplastic Syndromes

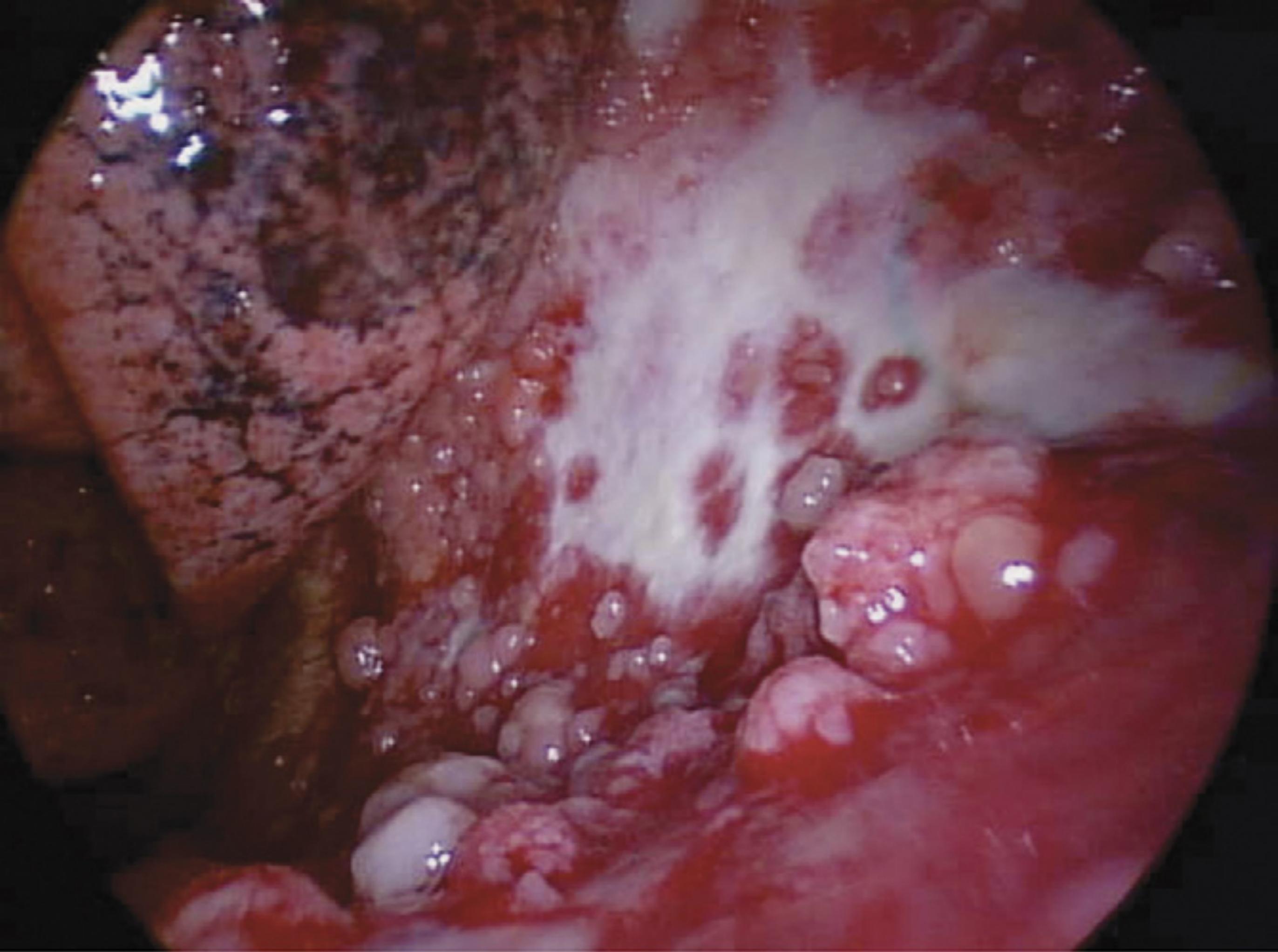
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- Autoimmune hemolytic anemia
- Hypercalcemia
- Hypoglycemia
- Hypercoagulability
- iADH

# Diagnosis

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- Pleural cytology
- Pleural biopsy
  - TTNA
  - Tru-cut
  - VATS
  - Thoracotomy (Rarely needed)



# STAGING

**T0 : No evidence of primary tumor**

**T1 : Tumor involves ipsilateral parietal pleura, with or without focal involvement of visceral pleura**

**T2 : Tumor involves any of the ipsilateral pleural surfaces with at least one of the following:**

Confluent visceral pleural tumor (including fissure)

Invasion of diaphragmatic muscle

Invasion of lung parenchyma

**T3 : Describes locally advanced but potentially resectable tumor**

Tumor involves any of the ipsilateral pleural surfaces with at least one of the following:

Invasion of the endothoracic fascia

Invasion into mediastinal fat

Solitary focus of tumor invading the soft tissues of the chest wall

Nontransmural involvement of the pericardium

**T4 : Describes locally advanced technically unresectable tumor**

Tumor involves any of the ipsilateral pleural surfaces with at least one of the following:

Diffuse or multifocal invasion of soft tissues of the chest wall

Any involvement of rib

Invasion through the diaphragm to the peritoneum

Direct extension of any mediastinal organs

Direct extension to the contralateral pleura

Invasion into the spine

Extension to the internal surface of the pericardium

Pericardial effusion with positive cytology

Invasion of the myocardium

Invasion of the brachial plexus

# STAGING

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**T1 : Tumor involves ipsilateral parietal pleura, with or without focal involvement of visceral pleura**

# Therapy

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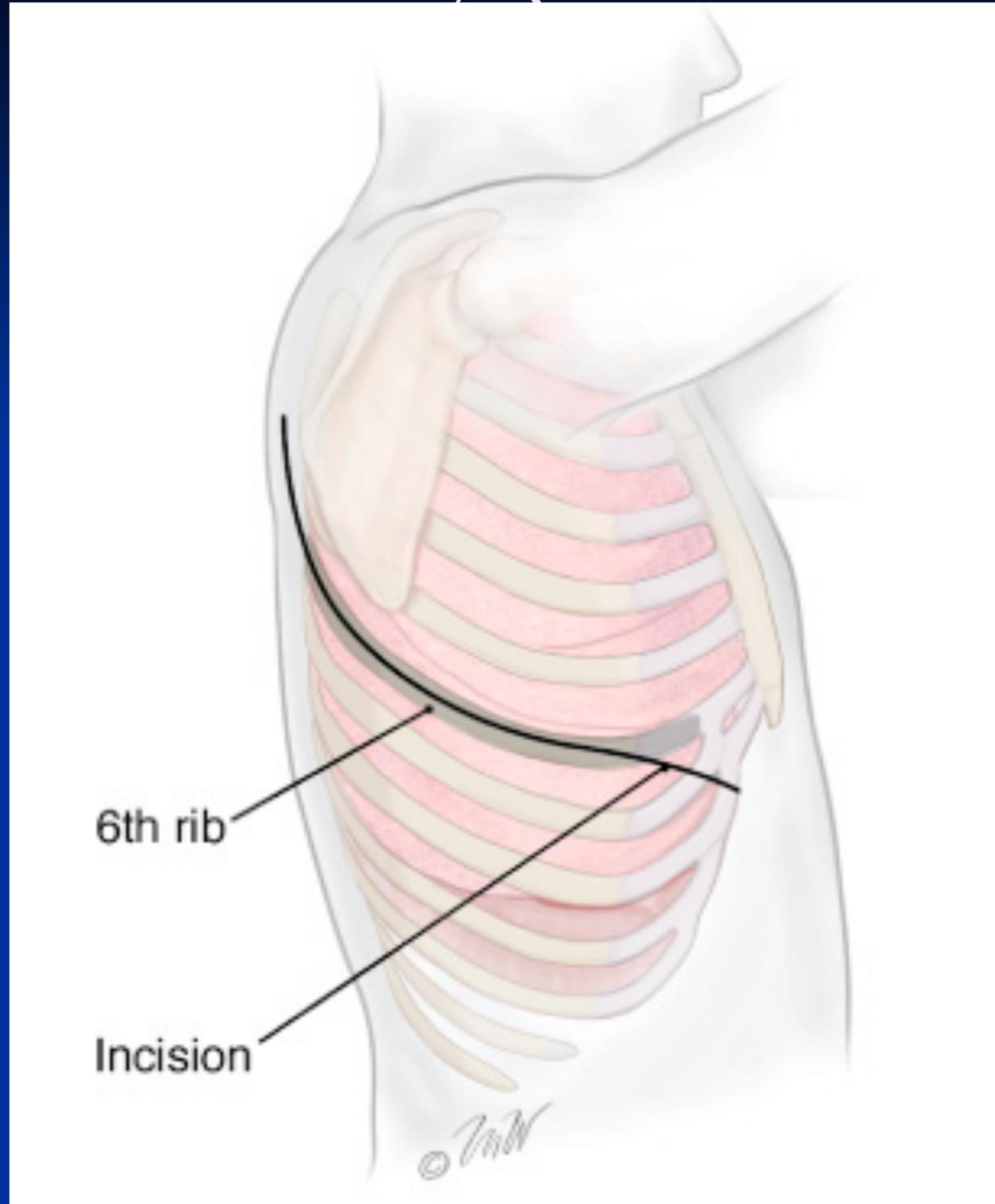
- Chemotherapy
- Radiotherapy
- Surgical Therapy

# Surgery

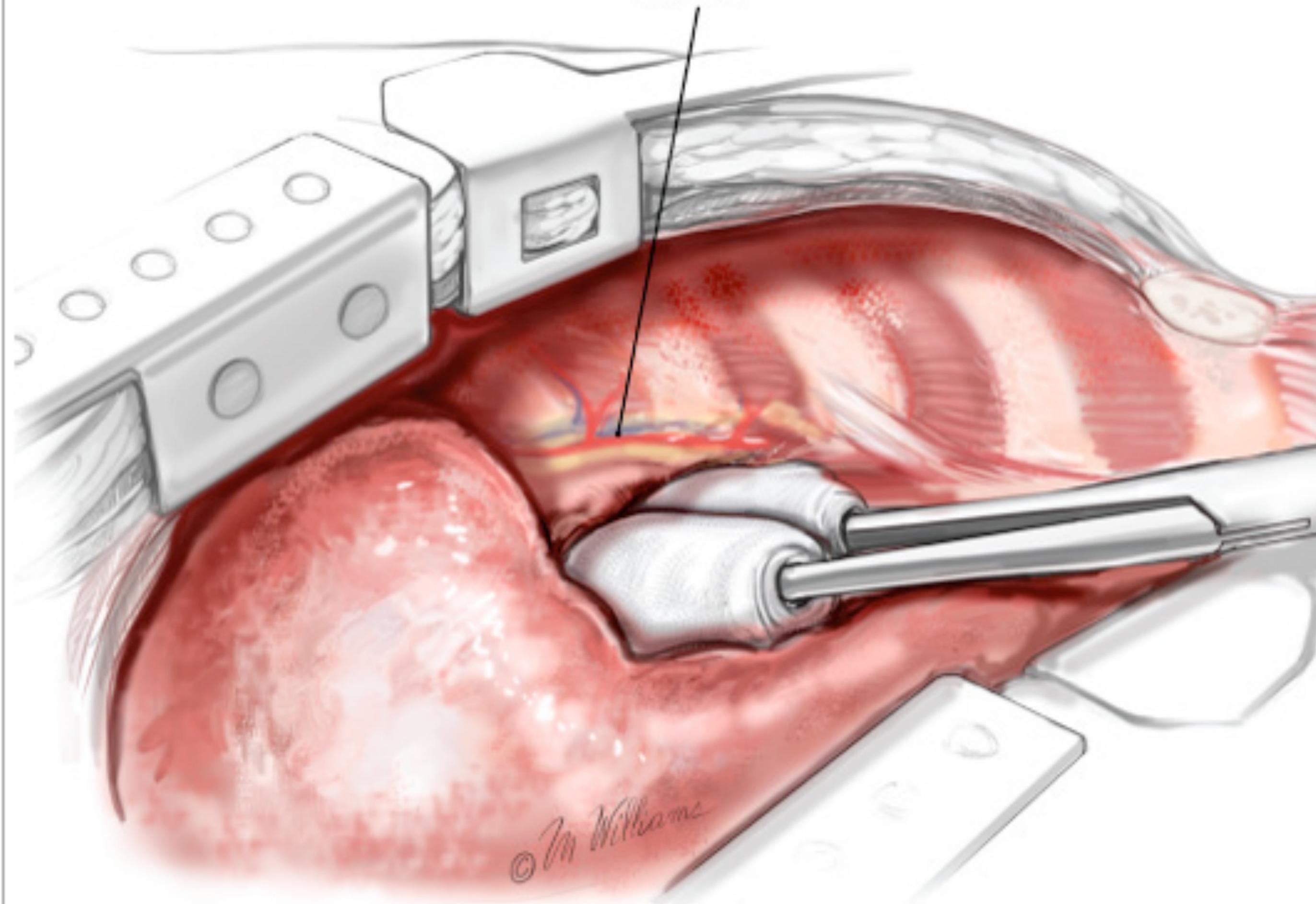
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- Intention to Treat
  - Pleurectomy / Decortication
- Palliative
  - Pleurodesis
  - Decortication

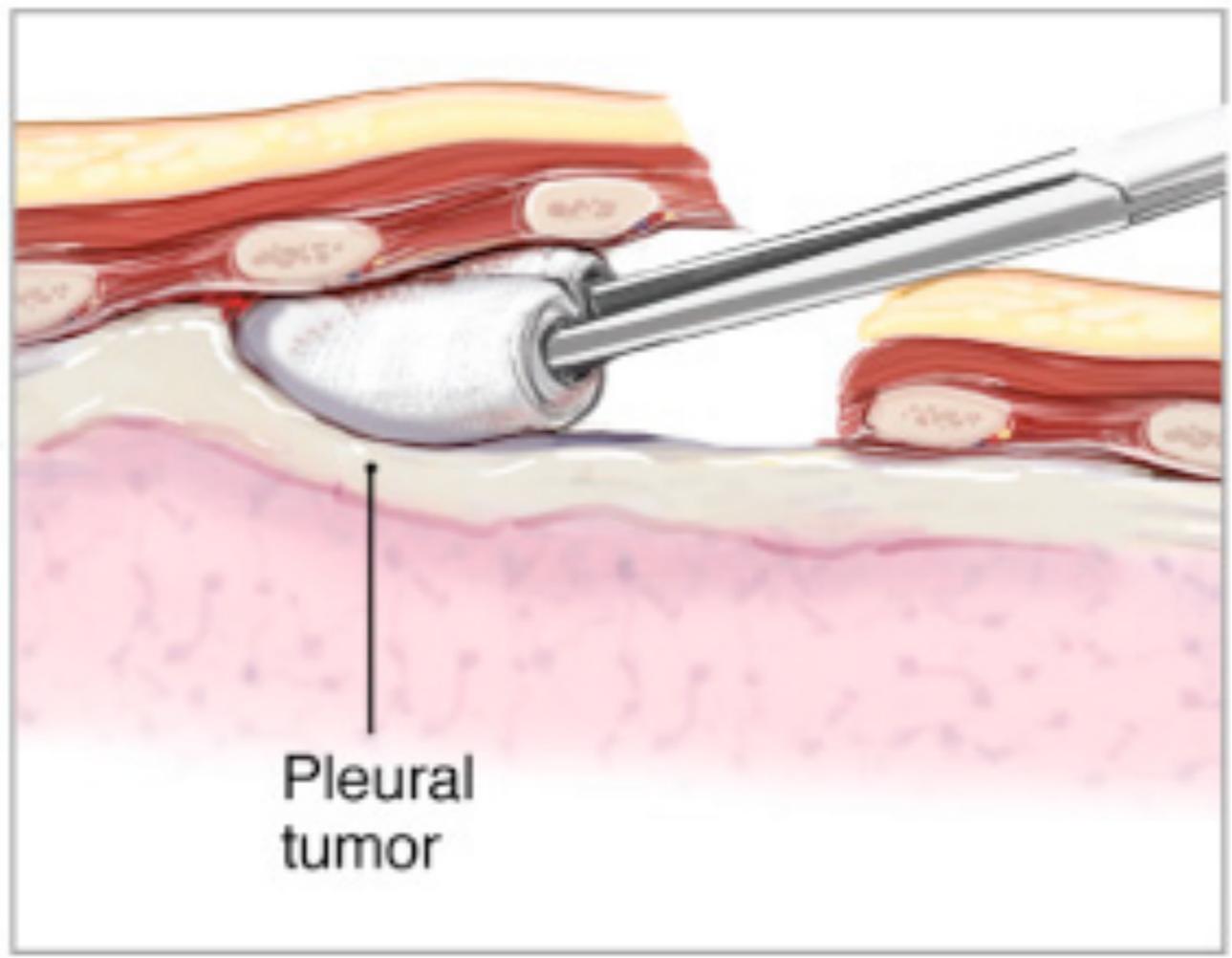
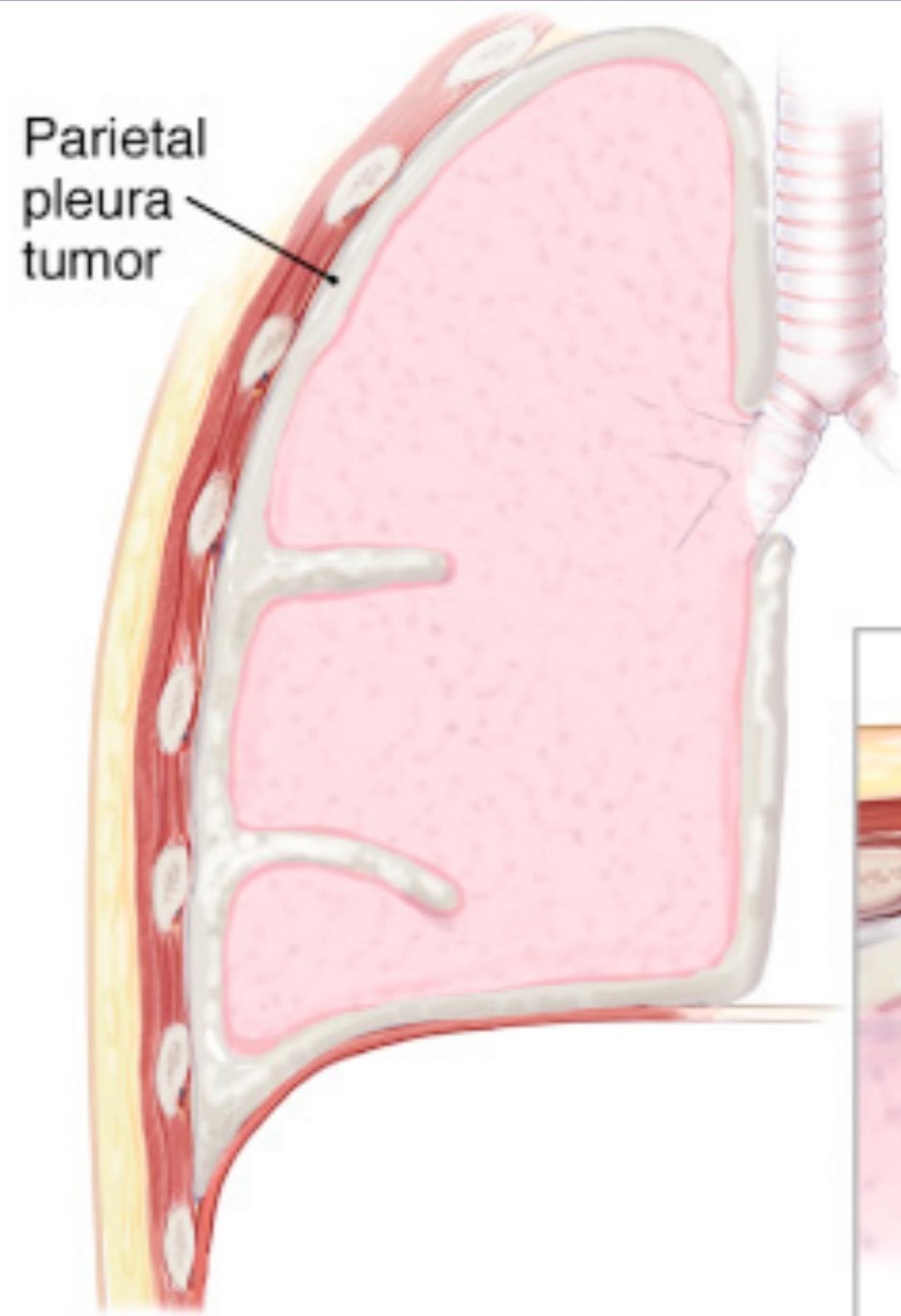
# Thoracotomy (Posterolateral)



Internal mammary vessels

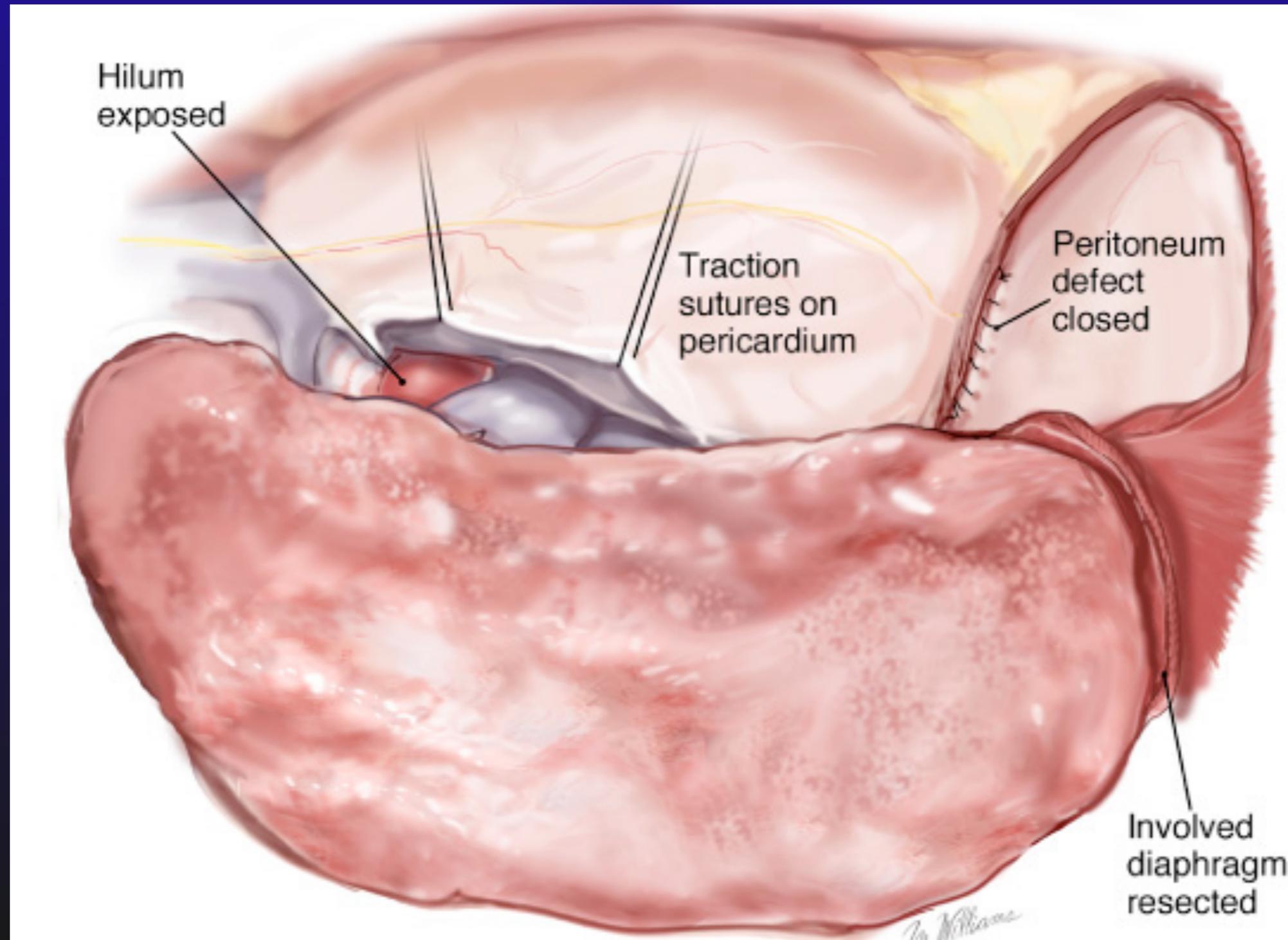


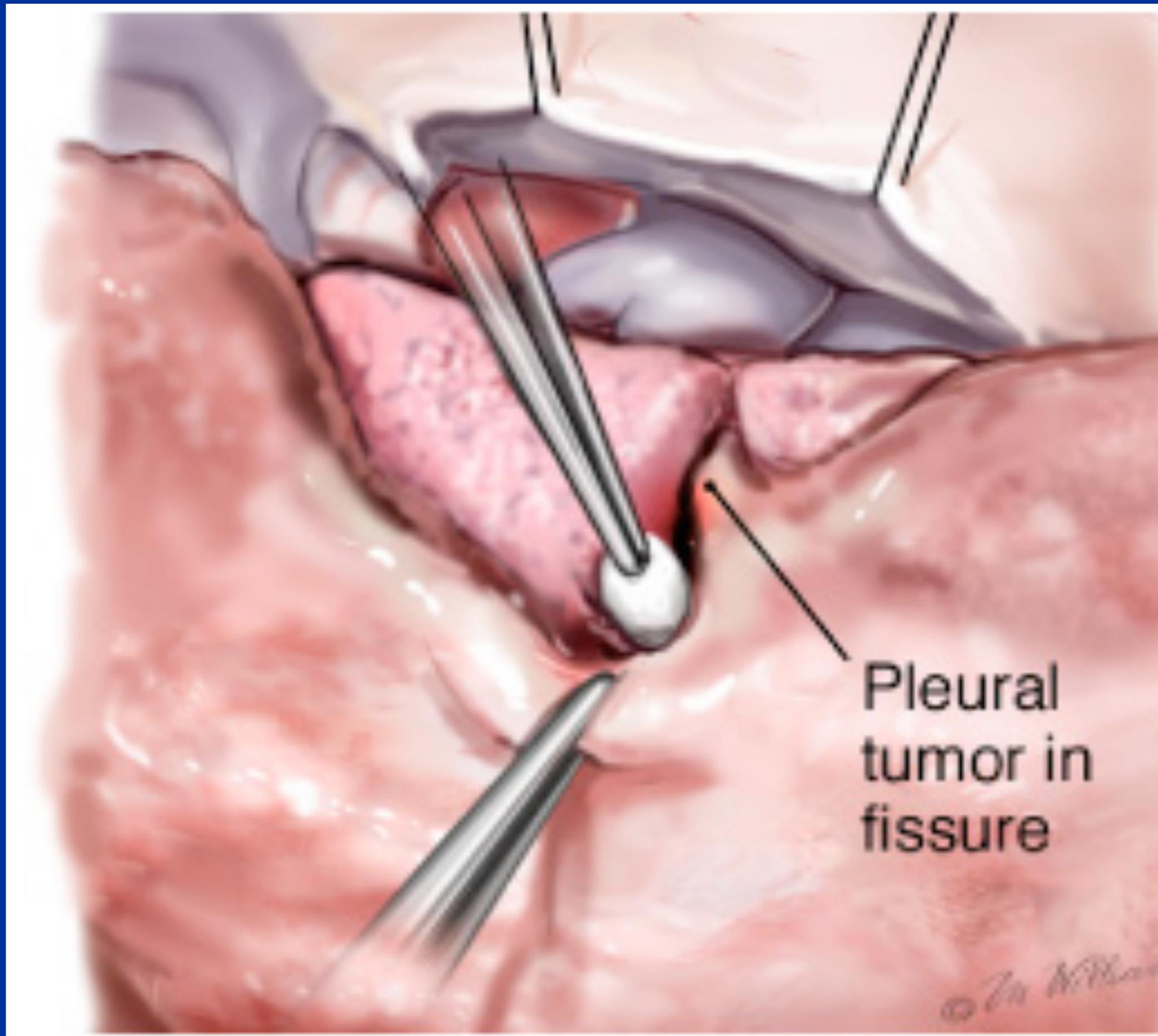
# Dissection



A

# Diaphragm and hilum

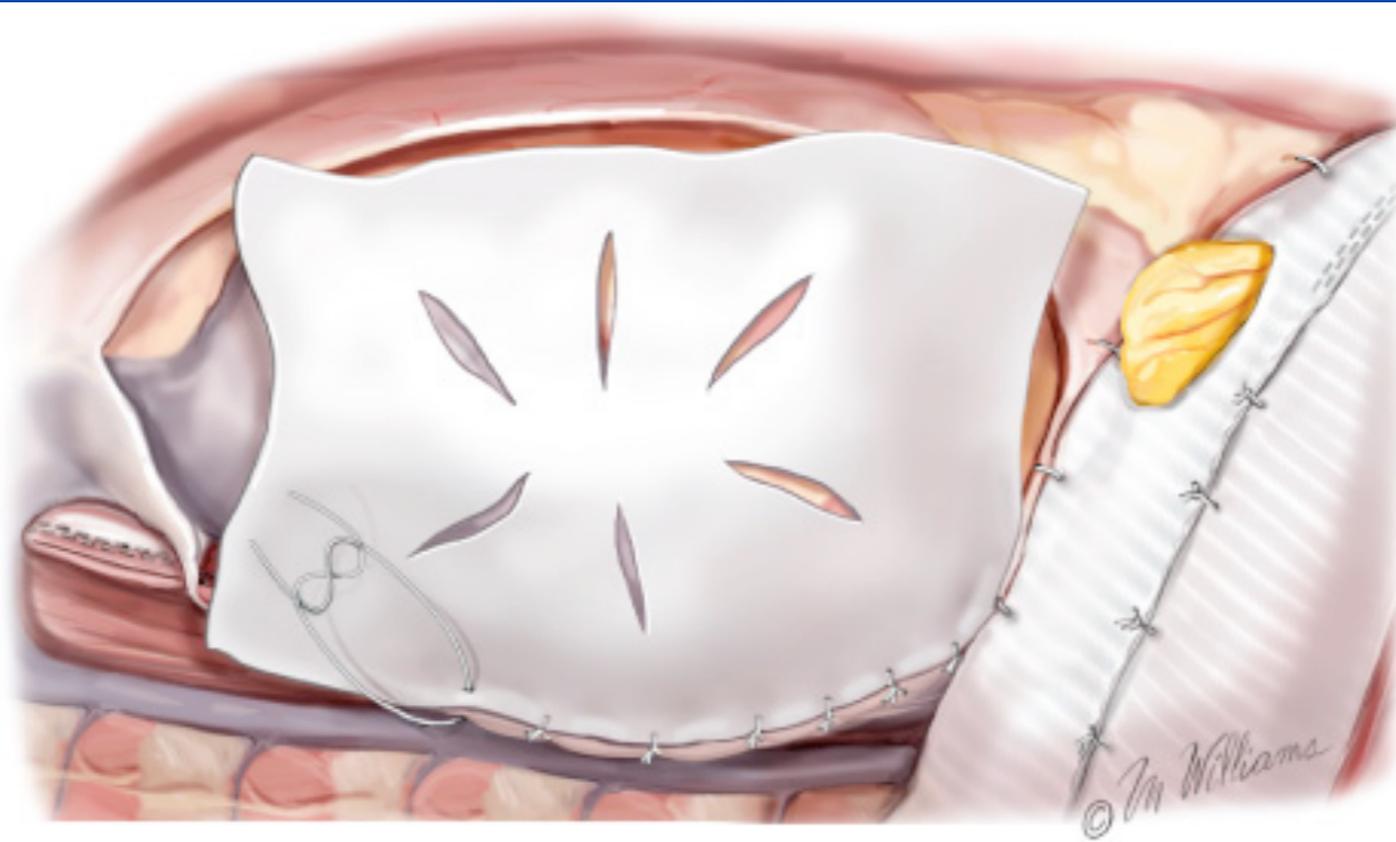




Pleural  
tumor in  
fissure

© J. W. Wilson

# Pericardial and diaphragmatic reconstruction



A



B

# Resected Specimen





“The surgery went well. It had spread, but I’m quite confident we got it all.”



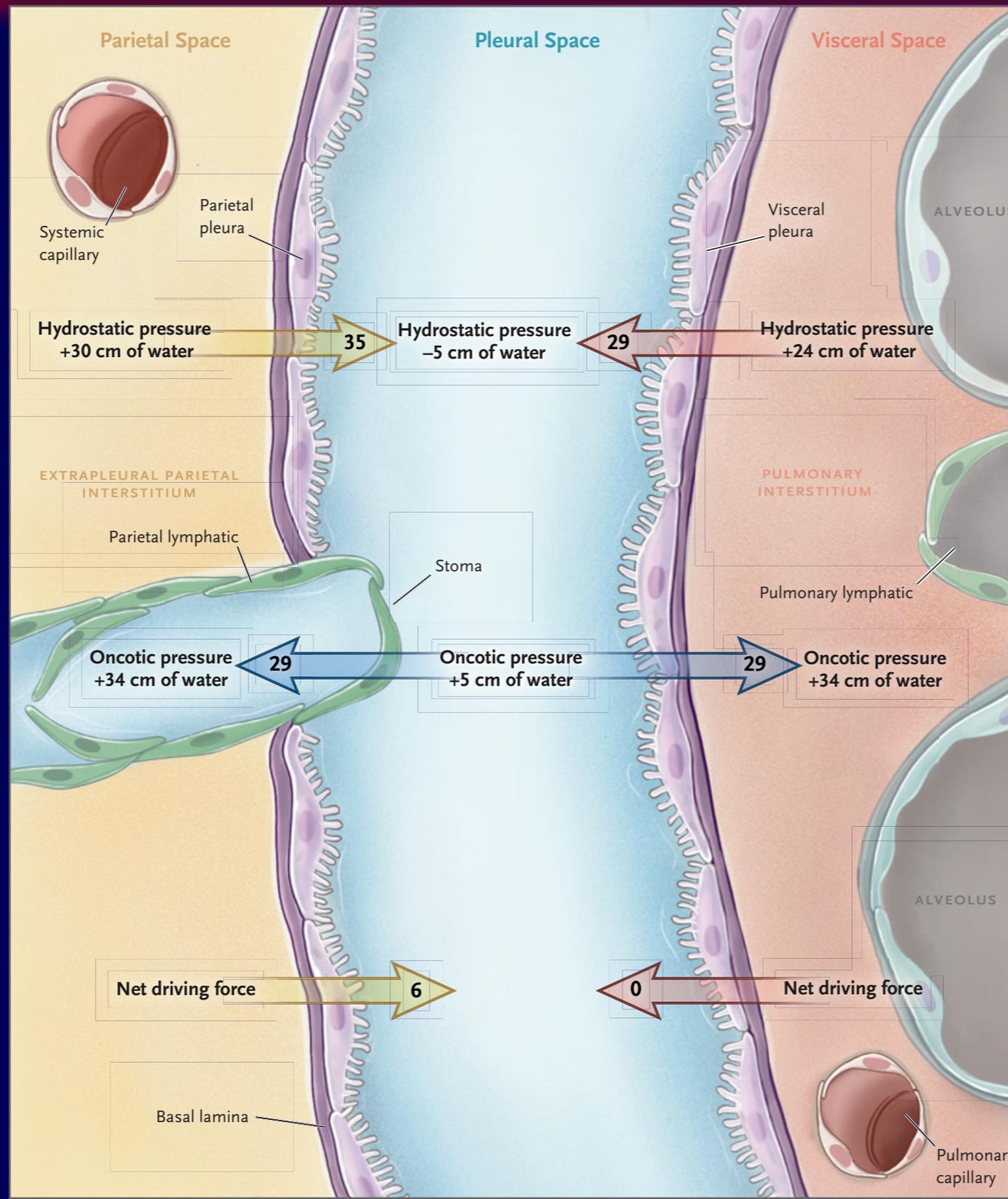
**Bertrand PICCARD**  @bert... · 11sa 

Each time we want to change something - we must observe what is the paradigm that prevents us from moving ahead, and change that paradigm. Because the impossible is only in the head of the people, not in the reality of what we are trying to achieve. [#9EIS](#) [#EUtop50](#)  
[#1000solutions](#)

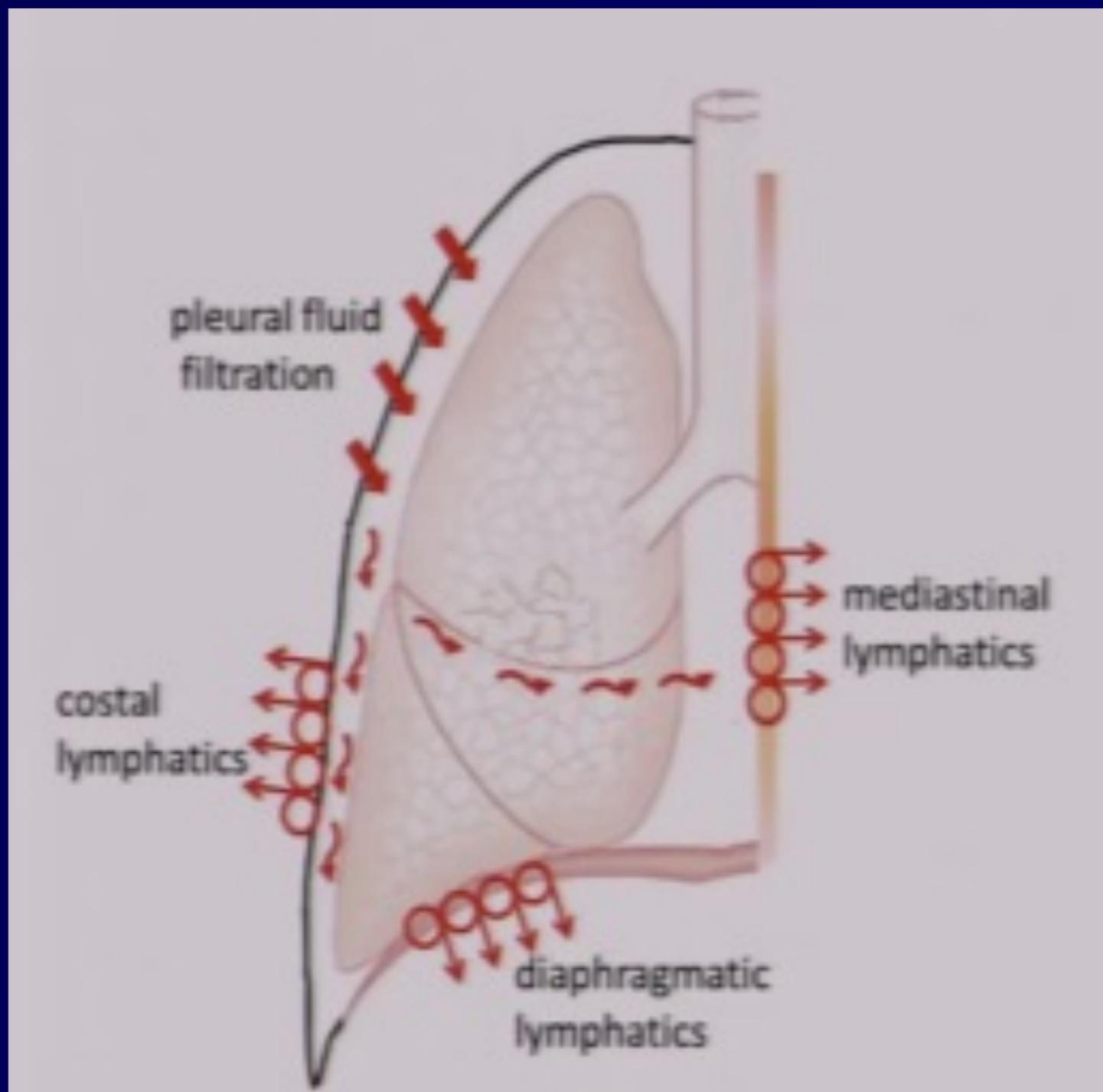
# Pleural Effusions

- Pleural effusion, the abnormal accumulation of liquid in the pleural space
- The most common causes are **congestive heart failure (38%), malignancy, pneumonia, and pulmonary embolus**

# Pleural Fluid Dynamics



# Pleural Fluid Dynamics





R. Kennicutt (Steward Obs.) et al., SSC, JPL

# Pathogenesis-1

- ★ Altered permeability of the pleural membranes;
- ★ Decreased intravascular oncotic pressure and, once a pleural effusion has formed, increased pleural liquid oncotic pressure;
- ★ Increased hydrostatic pressure in the pleural capillaries as a result of heart failure;

# Pathogenesis-2

- ★ Greater negativity of pressure in the pleural space (e.g., if the lung is unable to expand normally);
- ★ Lymphatic obstruction;
- ★ Migration of ascitic liquid across the diaphragm;  
and
- ★ Migration of pulmonary edema liquid across the visceral pleura

# Classification

- \* Accumulation of serous liquid is referred to as a **hydrothorax**.
- \* If blood accumulates, the condition is referred to as a **hemothorax**.
- \* An effusion composed of lipids is known as a **chylothorax**.
- \* Accumulation of pus is known as a **pyothorax**, or **empyema**.

# Hydrothorax

- Transudative Pleural Effusion
- When there is disruption of the hydrostatic and oncotic forces operating across the pleural membranes.
  - Congestive heart failure.
  - Constrictive pericarditis,
  - Superior vena cava obstruction,
  - Hypoalbuminemia (e.g., cirrhosis and the nephrotic syndrome )

# Transudative Effusions

## Transudative effusions

Congestive heart failure

Cirrhosis

Nephrotic syndrome

Glomerulonephritis

Peritoneal dialysis

Hypoalbuminemia (typical serum albumin, <1.5 mg/dl)

Atelectasis

Superior vena cava obstruction

Trapped lung

Sarcoidosis

Peritoneal dialysis

Myxedema

Cerebrospinal fluid leak or ventriculopleural shunt

Urinothorax

Pulmonary arterial hypertension

Pulmonary embolism

Pericardial disease

Extravascular migration of central venous catheter

# • Exudation

- Any process that disrupts the integrity of the endothelial membrane that lines the pleural capillaries and venules.
- Obstruction of lymphatic drainage from the pleural space is another mechanism that can cause a protein-rich effusion.
- \* **infectious, neoplastic, inflammatory, embolic, and vasculitic diseases.**
- \* Drugs

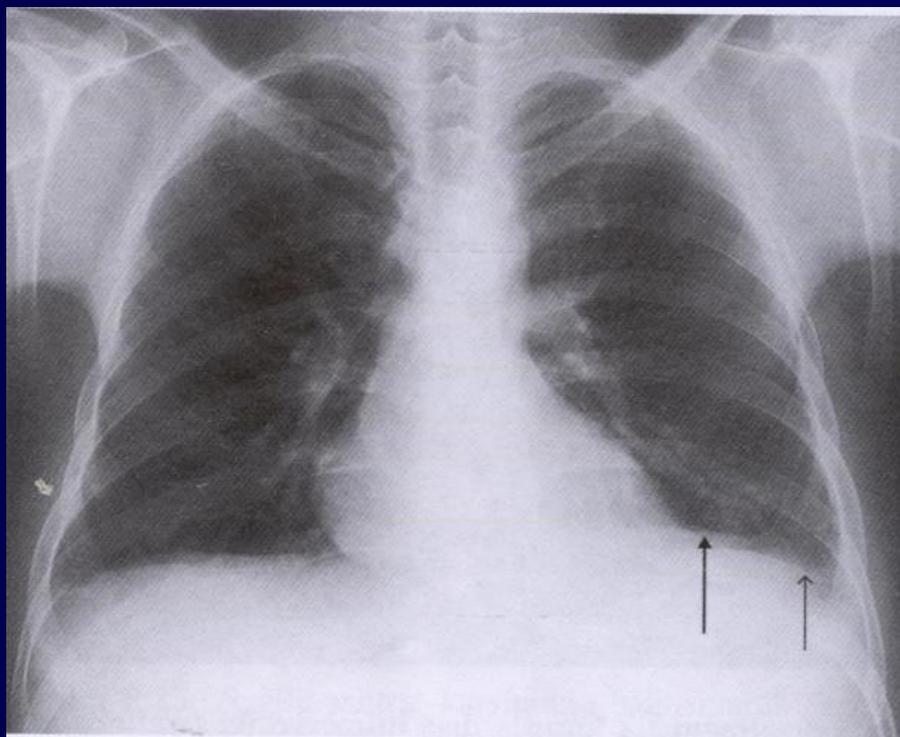
# Symptoms

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- Dyspnea
- Pleuritic Chest Pain

# Diagnosis

- ★ A pleural effusion may be suspected on the basis of physical examination.
- ★ Physical findings include dullness on percussion, diminished or absent breath sounds, decreased fremitus, and egophony at the level of the pleural liquid meniscus.

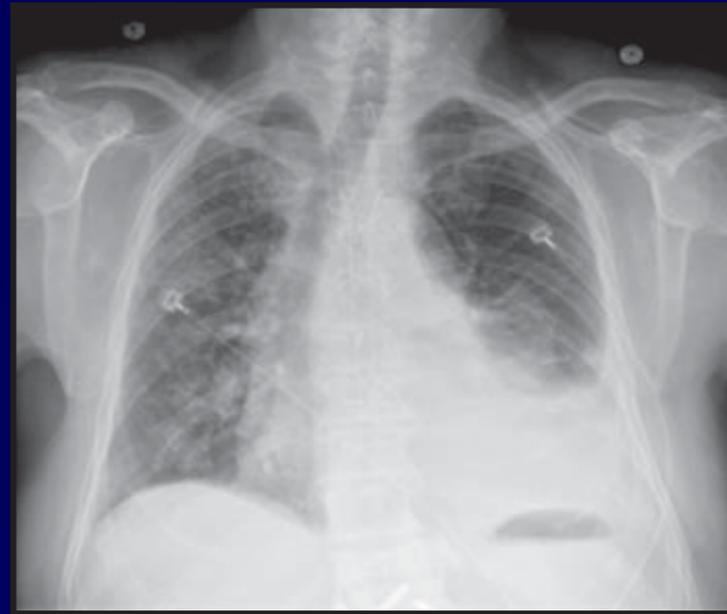


- When the patient is in the upright position, liquid collects first in the posterior sulcus, the most inferiorly located recess of the pleural space.
- Blunting of the normally sharp posterior costophrenic angle on a lateral chest radiograph indicates the presence of at least 50 to 100 ml of pleural liquid.
- As additional liquid accumulates (approximately 150 ml total), the lateral costophrenic angle on a posteroanterior radiograph becomes obliterated.

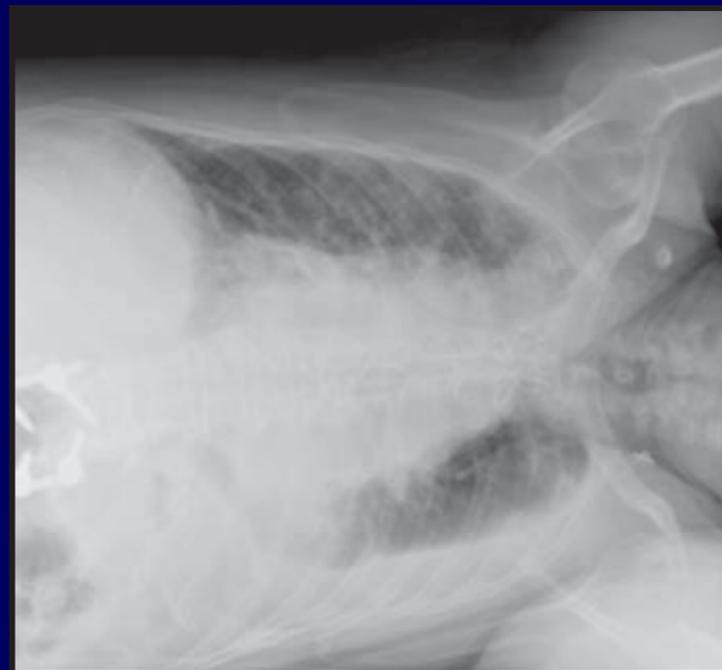
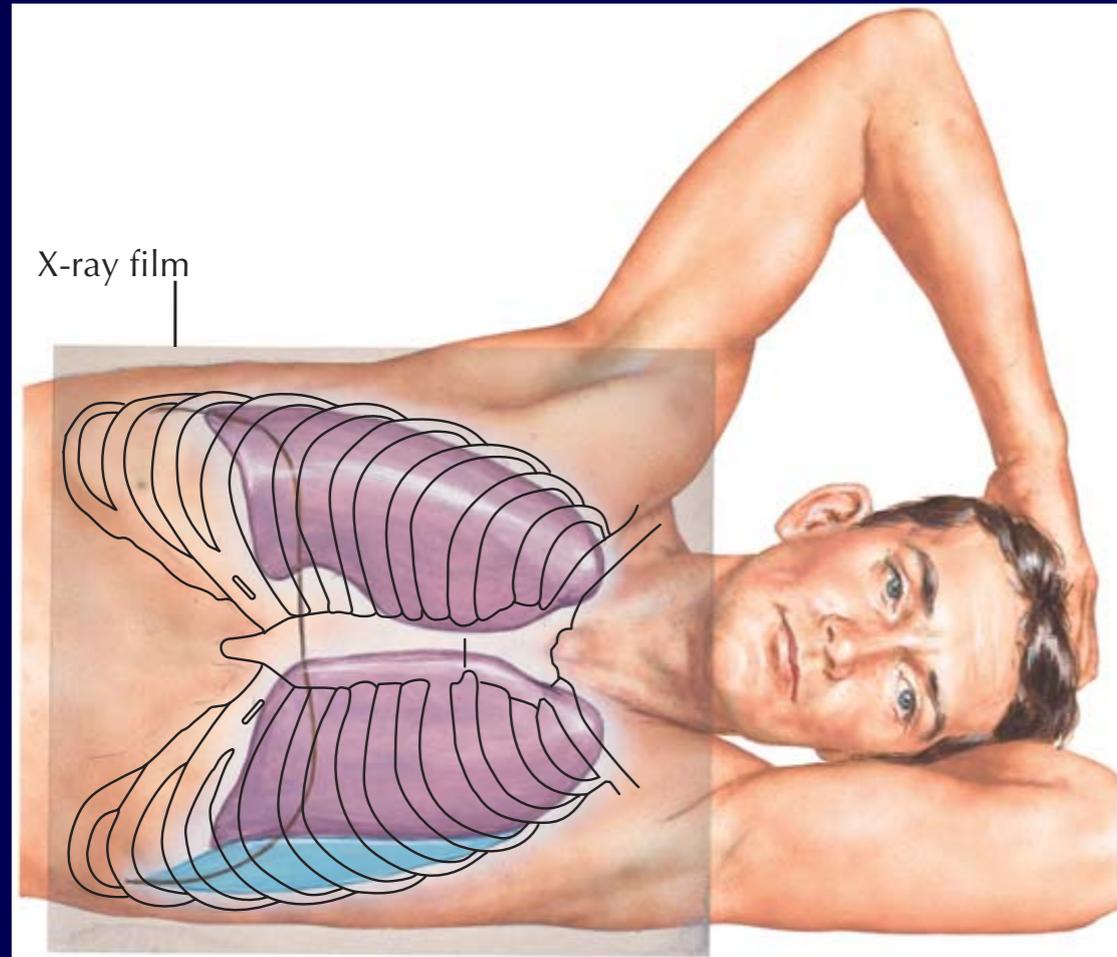
# Ultrasonography

- \* Ultrasonography is also a very sensitive test for detecting pleural effusions.
- \* It is particularly effective in cases of loculated pleural effusions because it can identify the precise site of effusion on the chest wall where a needle can be introduced to aspirate a sample

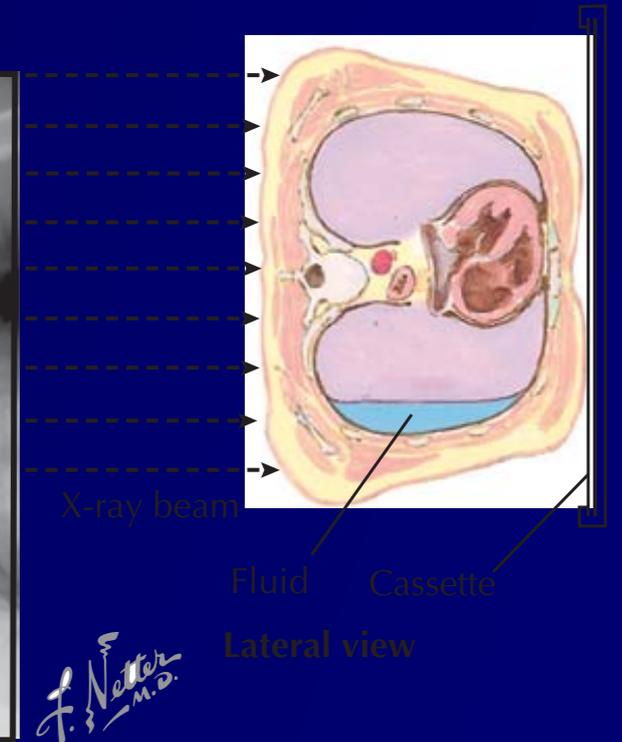
# LATERAL DECUBITUS VIEW

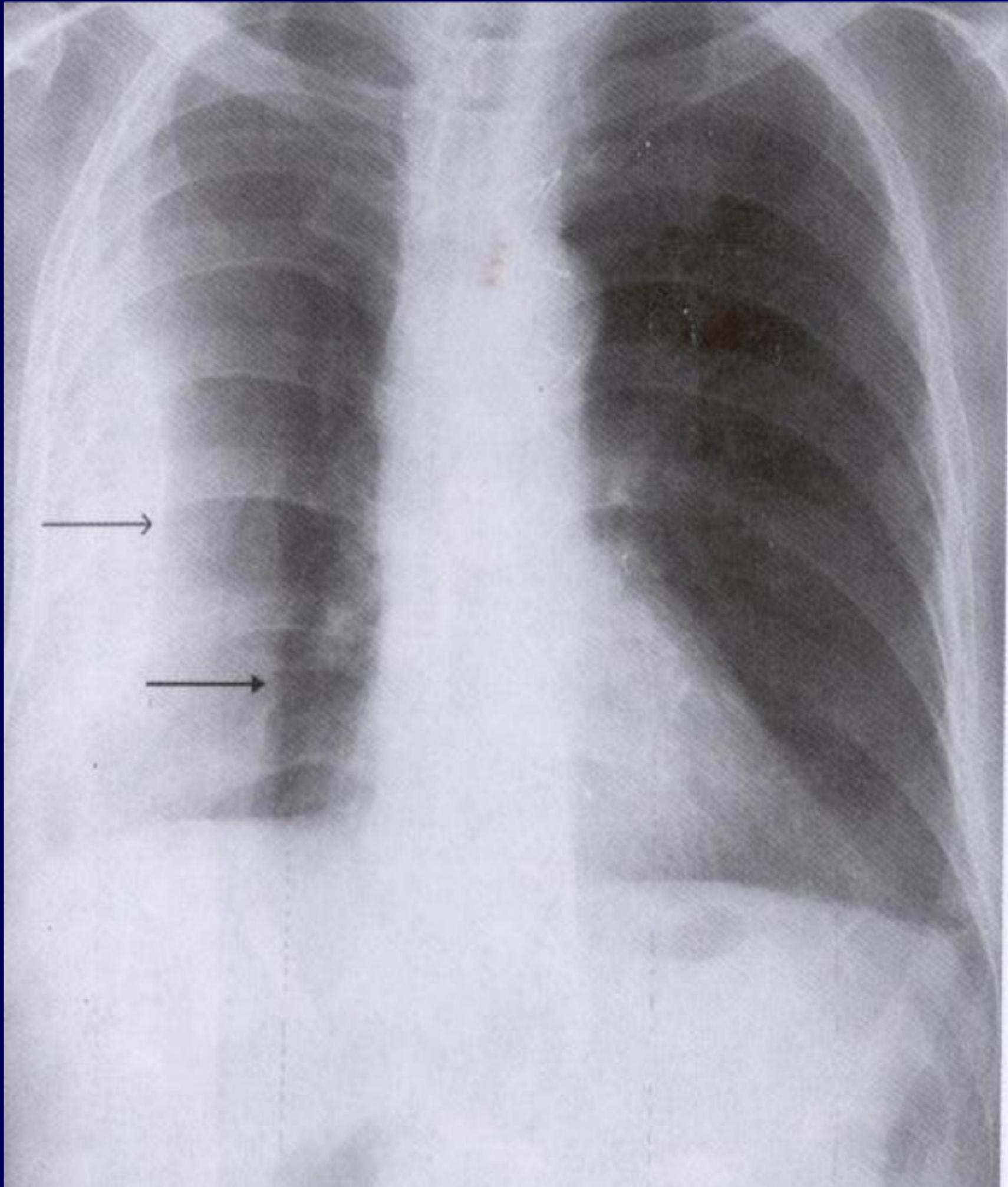


Pleural effusion. PA radiograph demonstrates blunting of the left costophrenic angle and separation of the stomach bubble from the lung base

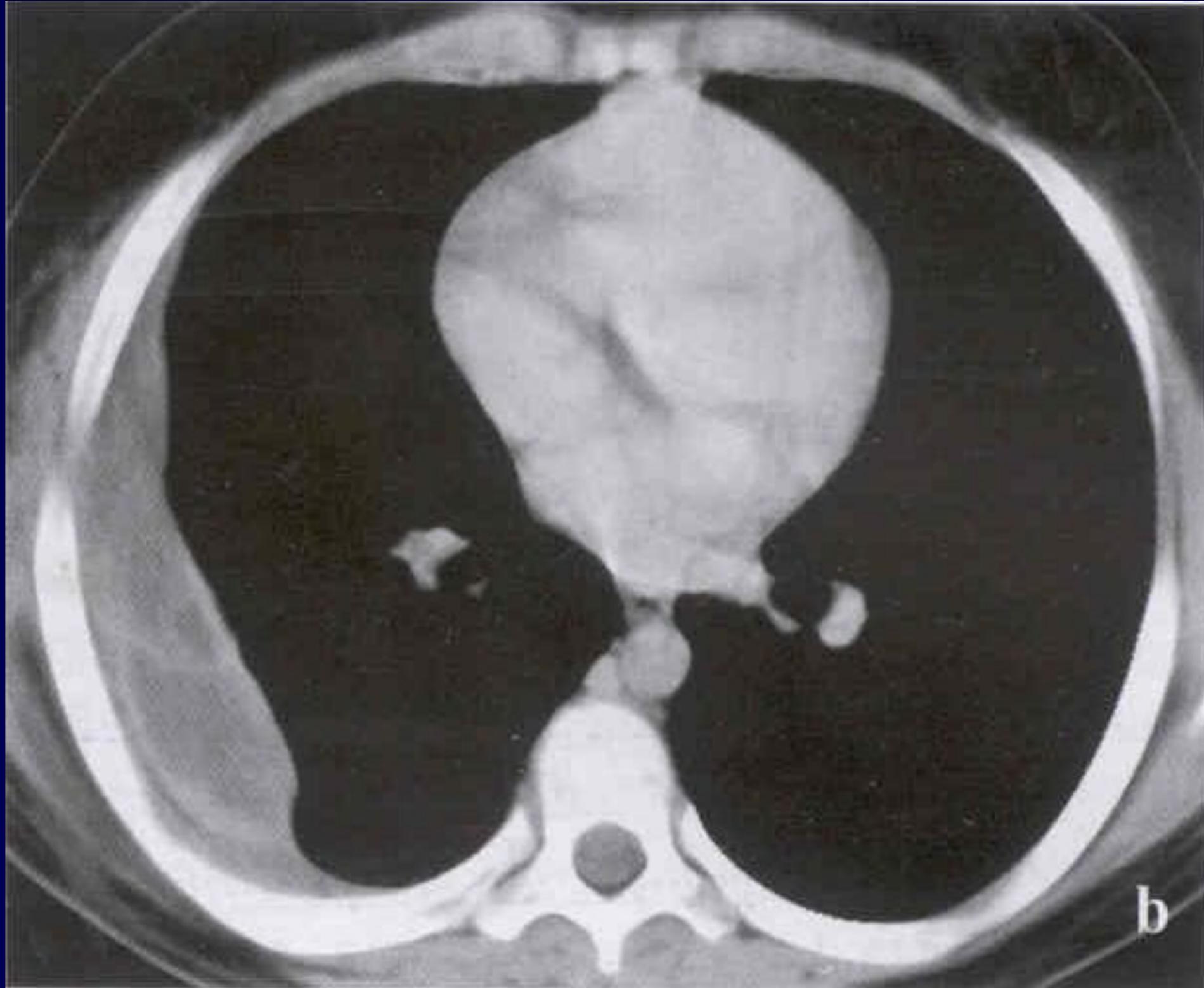


Left side down decubitus radiograph confirms free-flowing pleural fluid

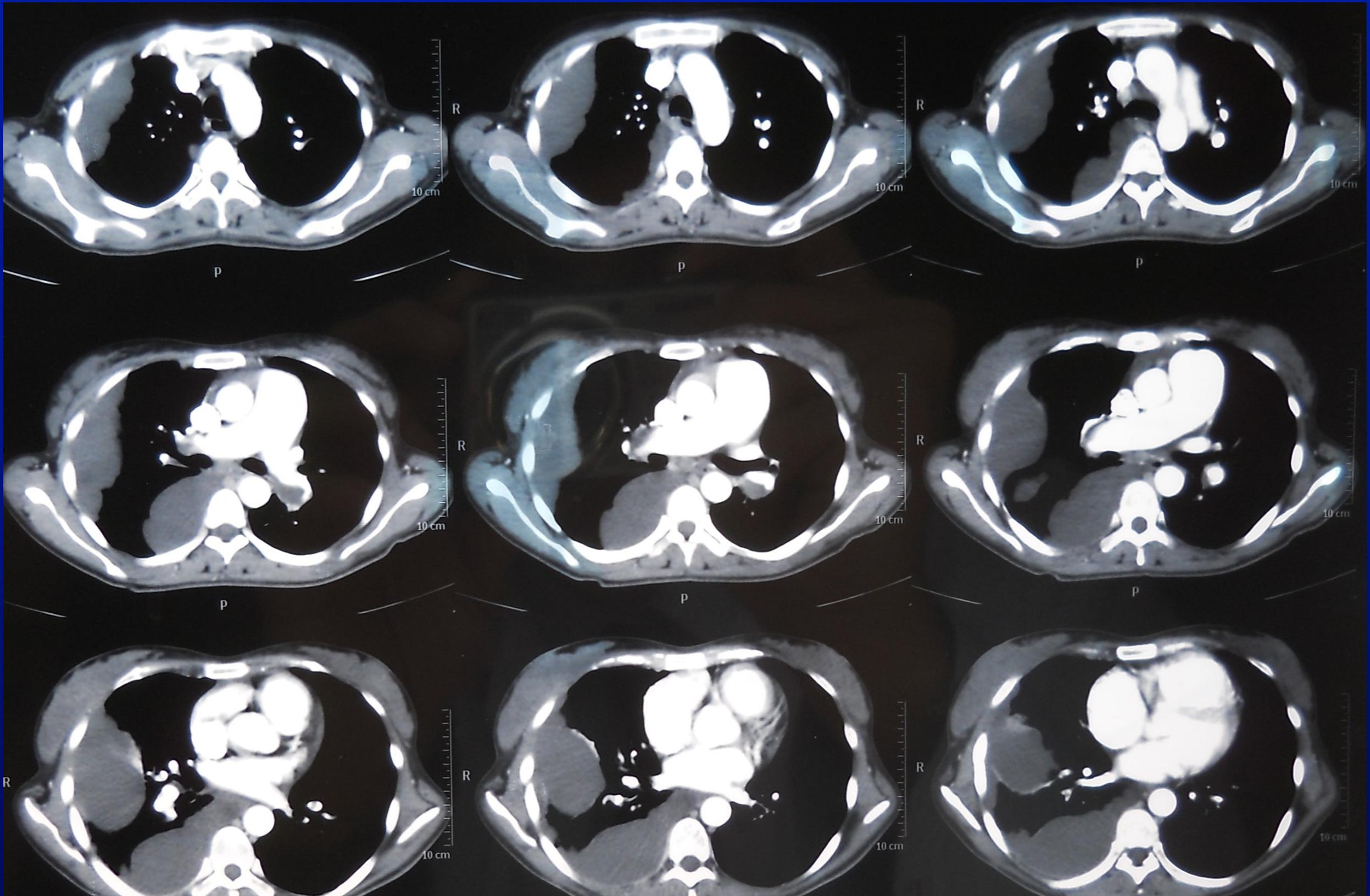




# CT

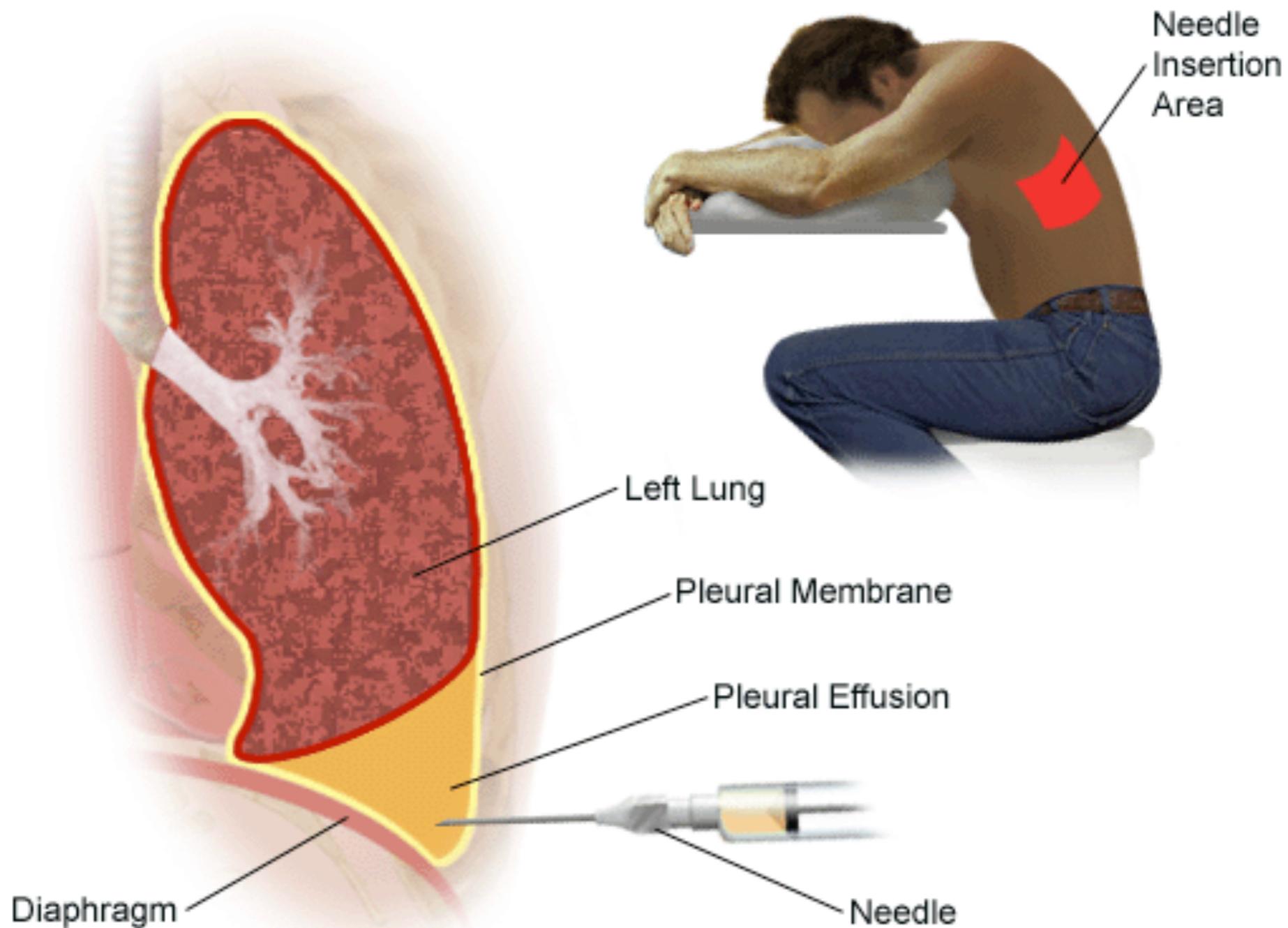


# Loculated Effusion



# Thoracentesis

Example of Thoracentesis



# Thoracentesis

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- ★ Should be performed in virtually all patients with pleural effusions of a significant size and of uncertain etiology.

# NT-ProBNP

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- ★ - **N Terminal Pro-B-Type Natriuretic Peptide**
- ★ - It has been shown to accurately identify effusions due to heart disease such as congestive heart failure

# Fluid Examination

- Positive for cytology of bacteriologic examination / culture
- Not diagnostic but suggestive:
  - Amylase
  - Glucose
  - pH
  - Tryglycerides
  - ANA
  - LDH, Cholesterol, Protein

# Exudation / Transudation

- Pleural protein / Serum protein  $> 0.5$
- Pleural LDH / Serum LDH  $> 0.6$  or
  - Pleural LDH  $> 2/3$  x Upper limit of serum LDH
- Pleural Cholesterol  $> 60$  mg/dL

- If one or more of these criteria are met, the effusion is usually exudative or caused by lymphatic obstruction.
- If none of these characteristics are present, a transudative mechanism would be expected.
- Although these criteria are extremely useful, they are not absolute, and the results must be considered in the clinical context.

# Diagnostic Findings

- **High pleural Amylase:** Pancreatitis, pancreatic pseudocysts, some malignancies
- **Low pleural glucose** (<60 mg/dL): Tuberculous empyema, parapneumonic effusion, some malignancies
- **Extremely low glucose:** Rheumatoid arthritis
- **Bloody Effusion** (>100.000 RBC/mm<sup>3</sup>): Malignancy, pulmonary embolism (Esophageal rupture, pancreatitis, benign asbestos disease)



# White Blood Cells

- WBC:  $>50.000/\text{mm}^3$  :Pyothorax / Empyema
  - Pulmonary embolism
  - Viral pleuritis
  - Benign asbestos effusion
  - Malignant disease
  - Early tuberculous pleuritis
  - $>10\%$  eosionophils: Tbc, malignancy

# pH

- 7.35 - 7.45 : Congestive heart failure
- <7.0 : Empyema
- <6.0 : Esophageal rupture
- 7.0 < pH < 7.3:
  - Vascular disease
  - Tuberculosis
  - Hemothorax
  - Collagen vascular disease

# ANA, RF

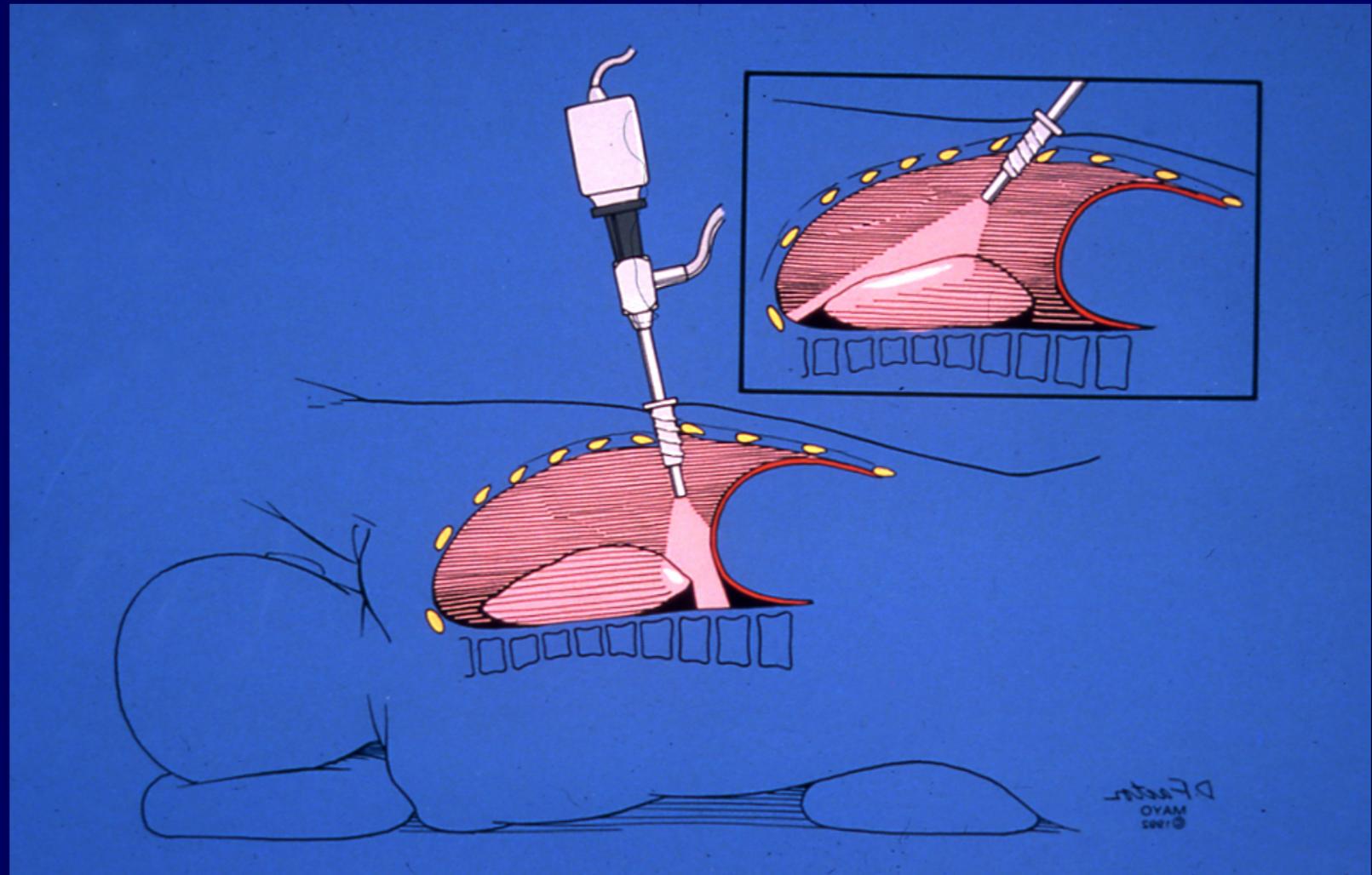
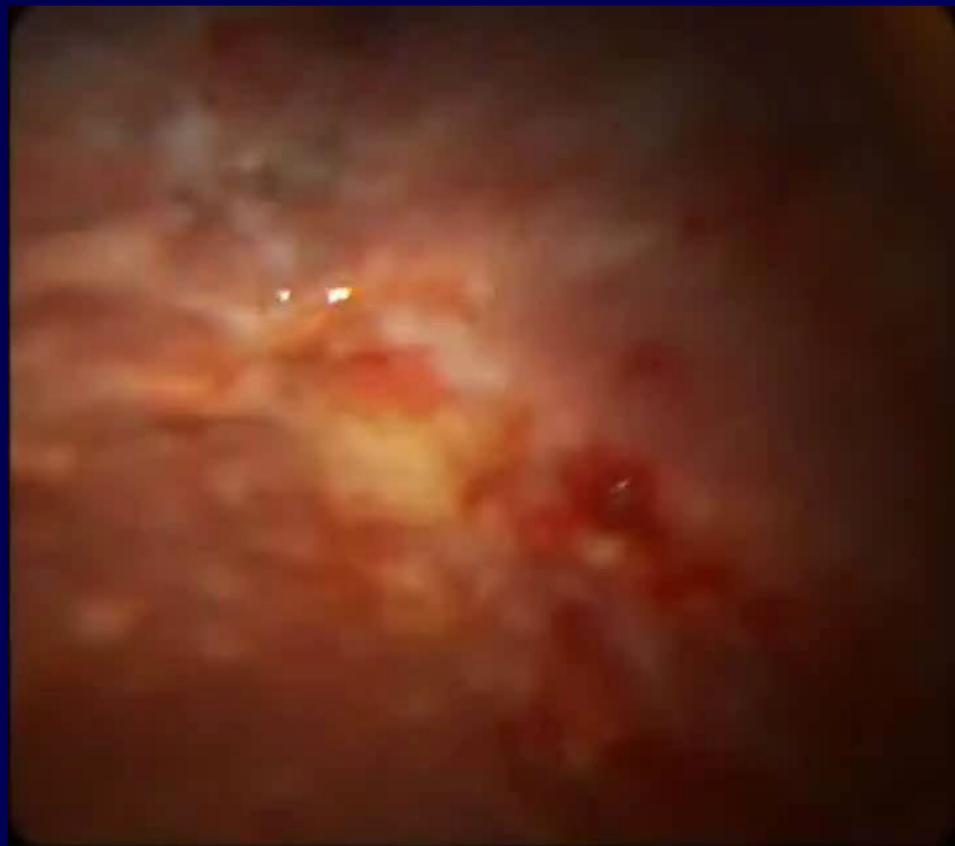
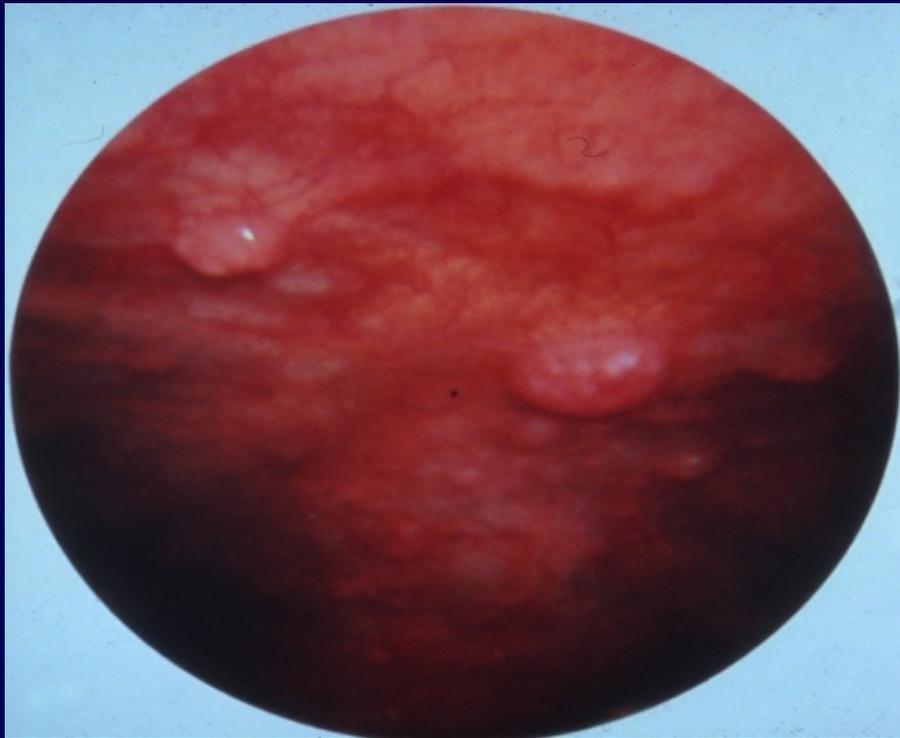
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- Pleural ANA > Serum ANA : SLE
- RF > 1/160 : RA

# Diagnostic Pathway

- Pleural fluid analysis
- Trans-thoracic Needle Aspiration
- Tru-Cut biopsy
- (Bronchoscopy)
- Video-thoracoscopic biopsy
- Thoracotomy

# VATS





# Summary: Leading Causes

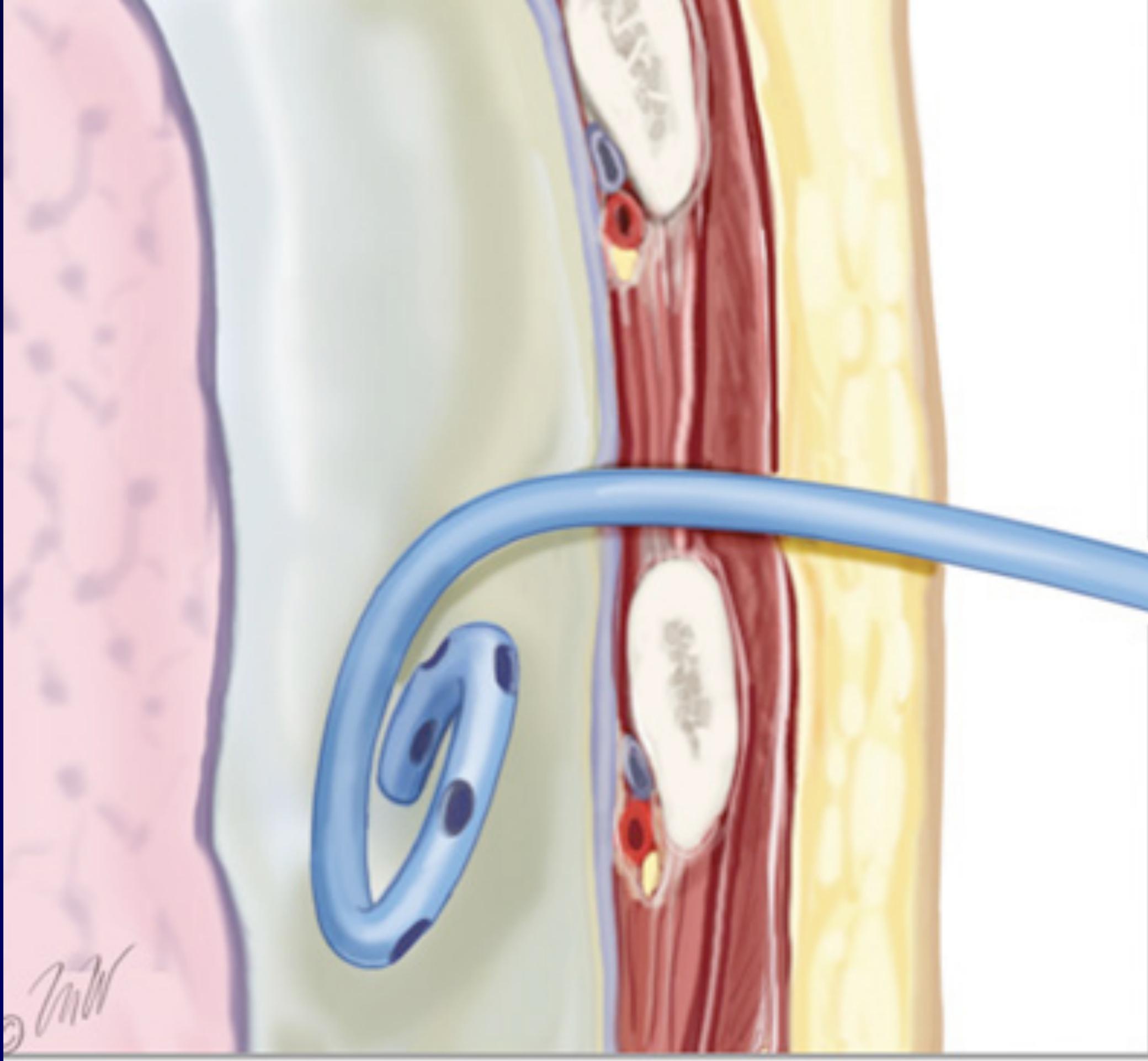
- ★ Congestive Heart Failure
  - ★ Pneumonia
  - ★ Cancer
  - ★ Pulmonary embolus
- 
- ★ Usually 5-10 liters/d normally flows through pleural space
  - ★ 10-15 ml is present at any given time

# Malignant Pleural Effusion

- ★ Most common with
  - ★ Lung cancer
  - ★ Breast cancer
  - ★ Lymphoma
- ★ Usually exudative and blood tinged
- ★ Tx: chest tube placement, Pigtail catheter placement, VATS followed by instillation of sclerosing agent

# Catheter (8F or 14F) Drainage



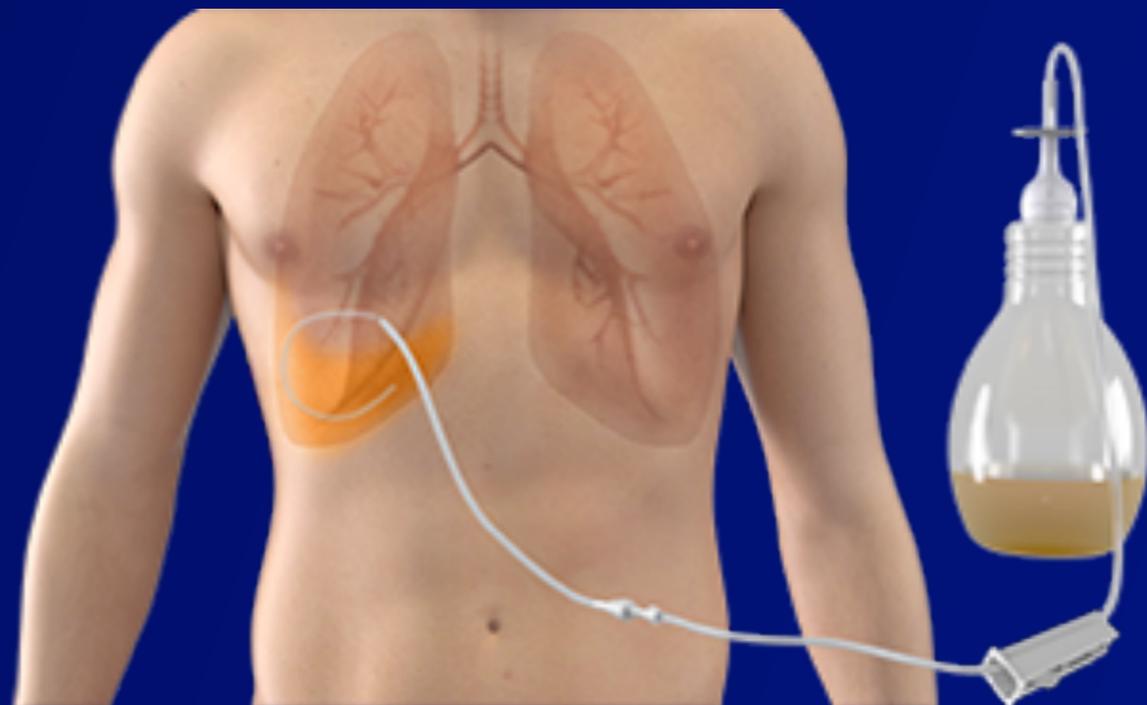


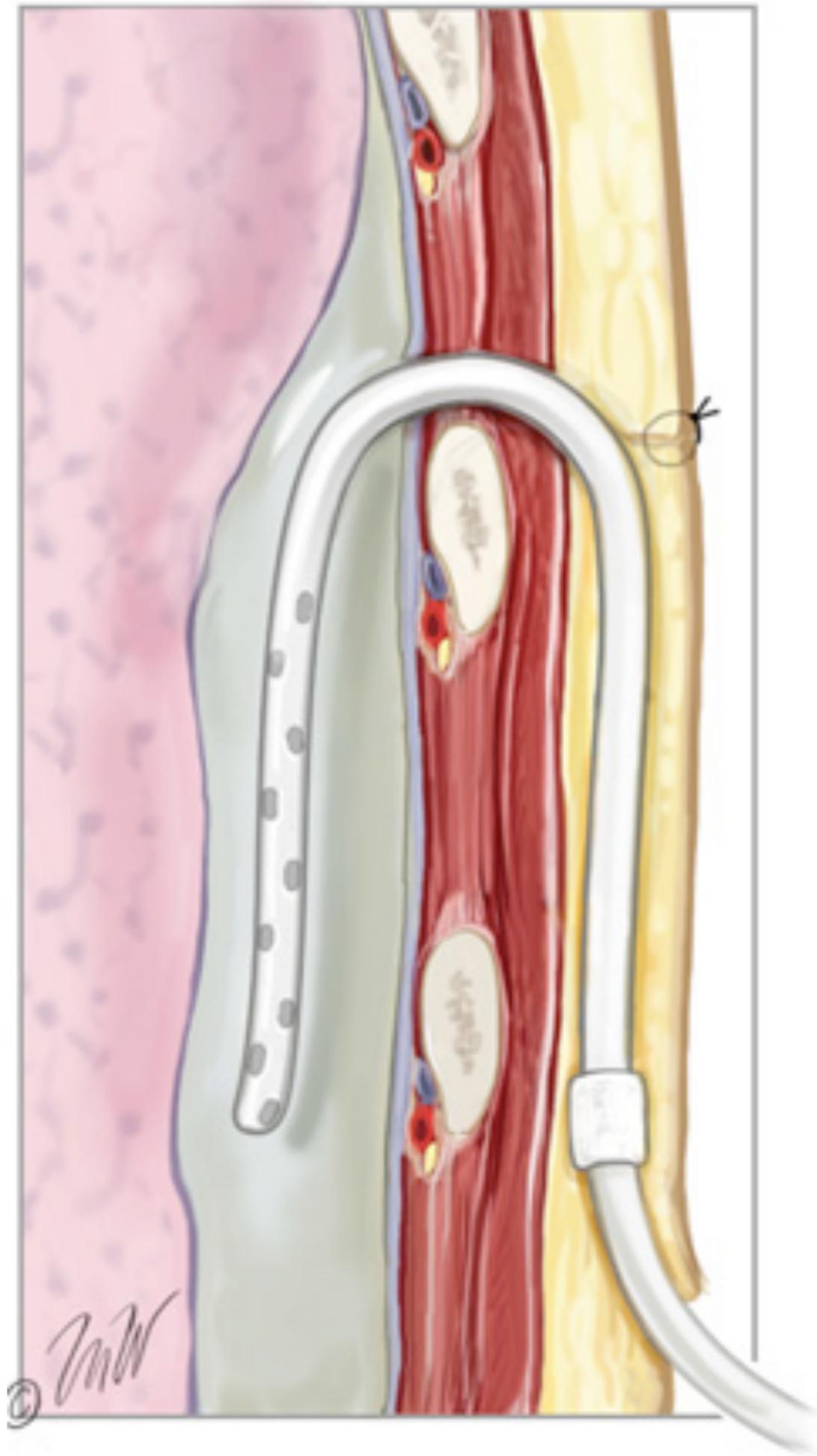




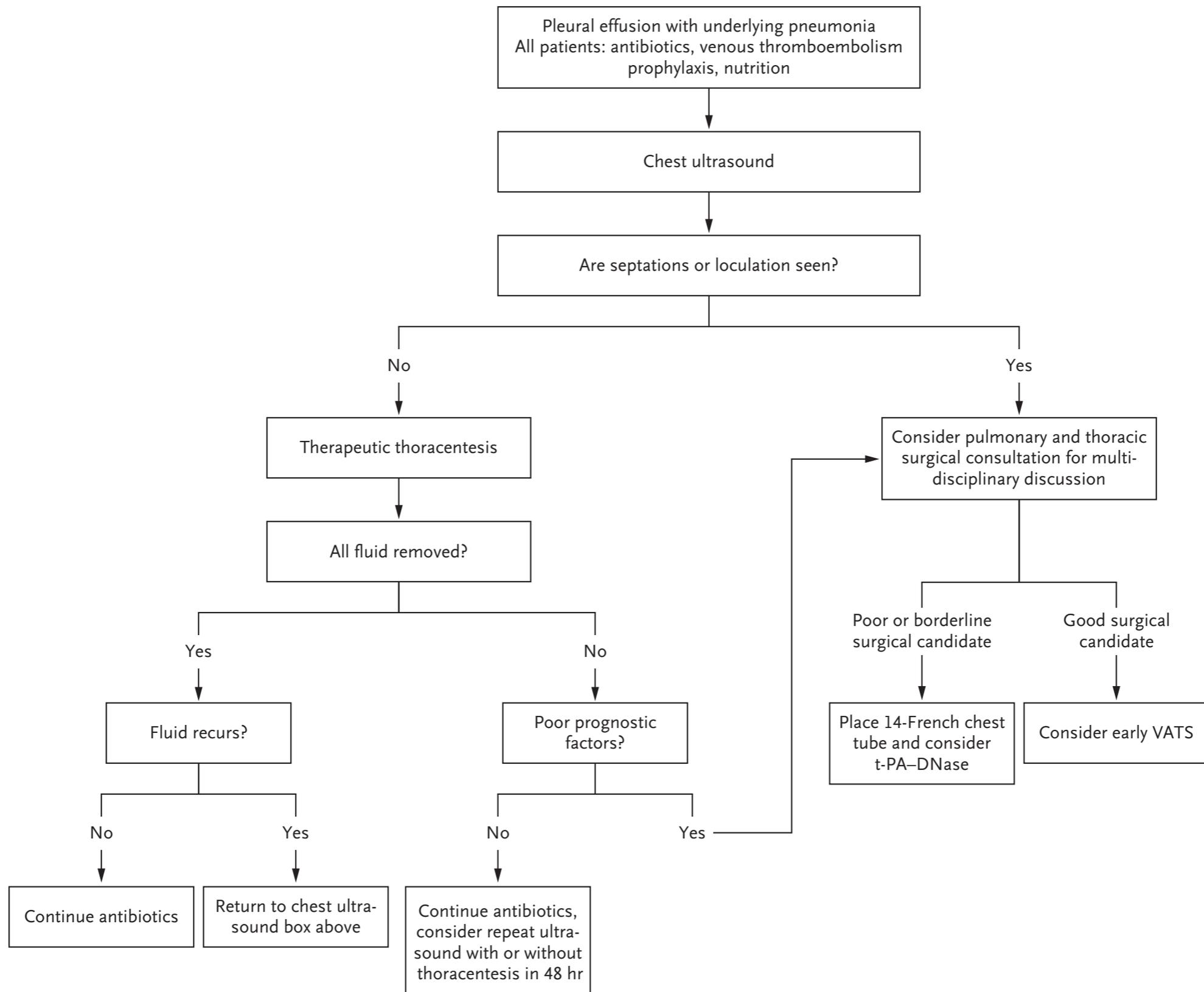
# Tunneled Catheter for Long Term Effusions

- ★ For patients with malignant pleural effusion and trapped lung
- ★ May provide pleurodesis in long term





# How to manage?



# Rapid Pleurodesis

Original Article

## Rapid pleurodesis is an outpatient alternative in patients with malignant pleural effusions: a prospective randomized controlled trial

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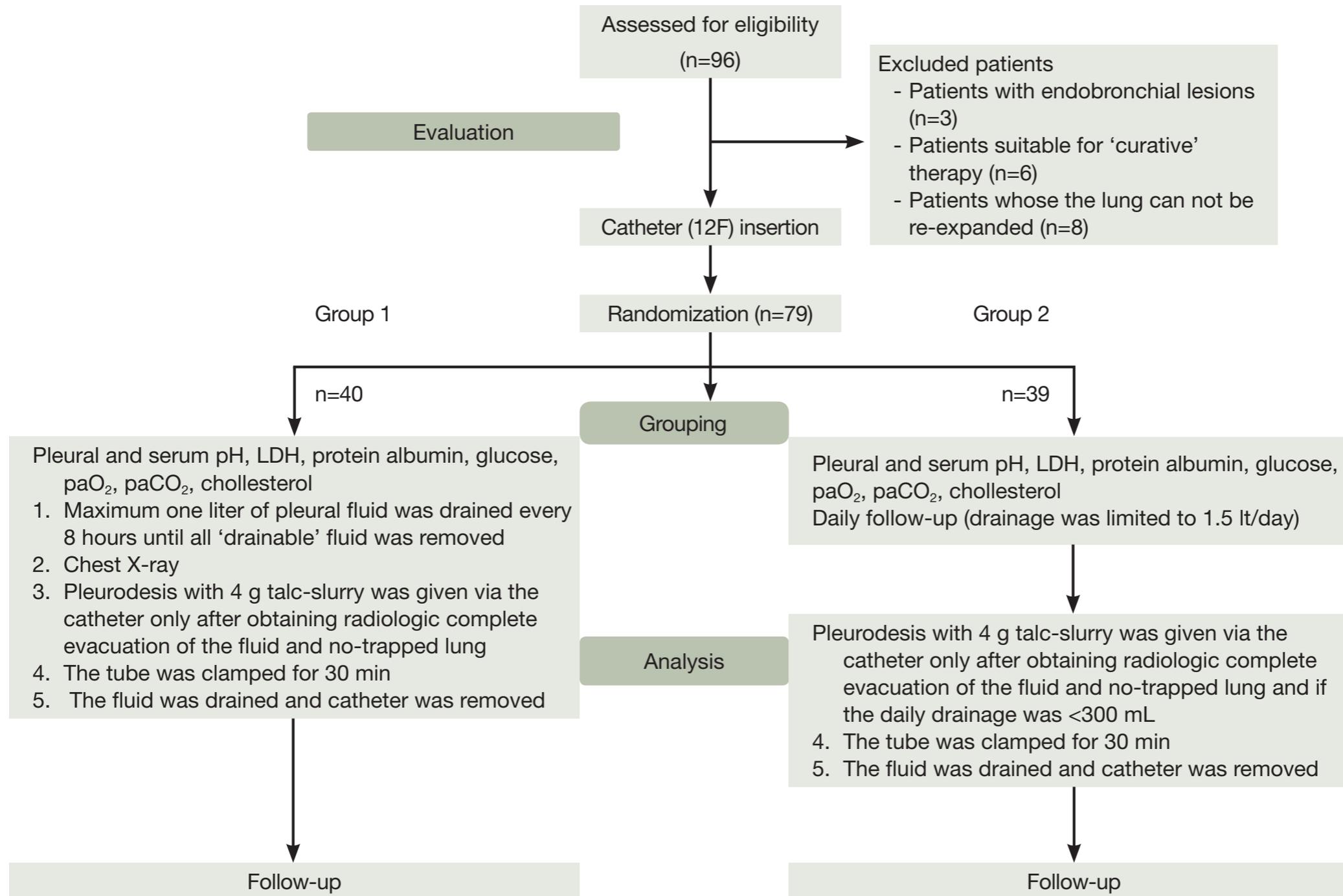
**Background:** Chemical pleurodesis can be palliative for recurrent, symptomatic pleural effusions in patients who are not candidate for a thoracic surgical procedure. We hypothesized that effective pleurodesis could be accomplished with a rapid method of pleurodesis as effective as the standard method.

**Methods:** A prospective randomized 'non-inferiority' trial was conducted in 96 patients with malignant pleural effusion (MPE) who are not potentially curable and/or not amenable to any other surgical intervention. They were randomly allocated to group 1 (rapid pleurodesis) and to group 2 (standard protocol). In group 1, following complete fluid evacuation, talc slurry was instilled into the pleural space. This was accomplished within 2 h of thoracic catheter insertion, unless the drained fluid was more than 1,500 mL. After clamping the tube for 30 min, the pleural space was drained for 1 h, after which the thoracic catheter was removed. In group 2, talc-slurry was administered when the daily drainage was lower than 300 mL/day.

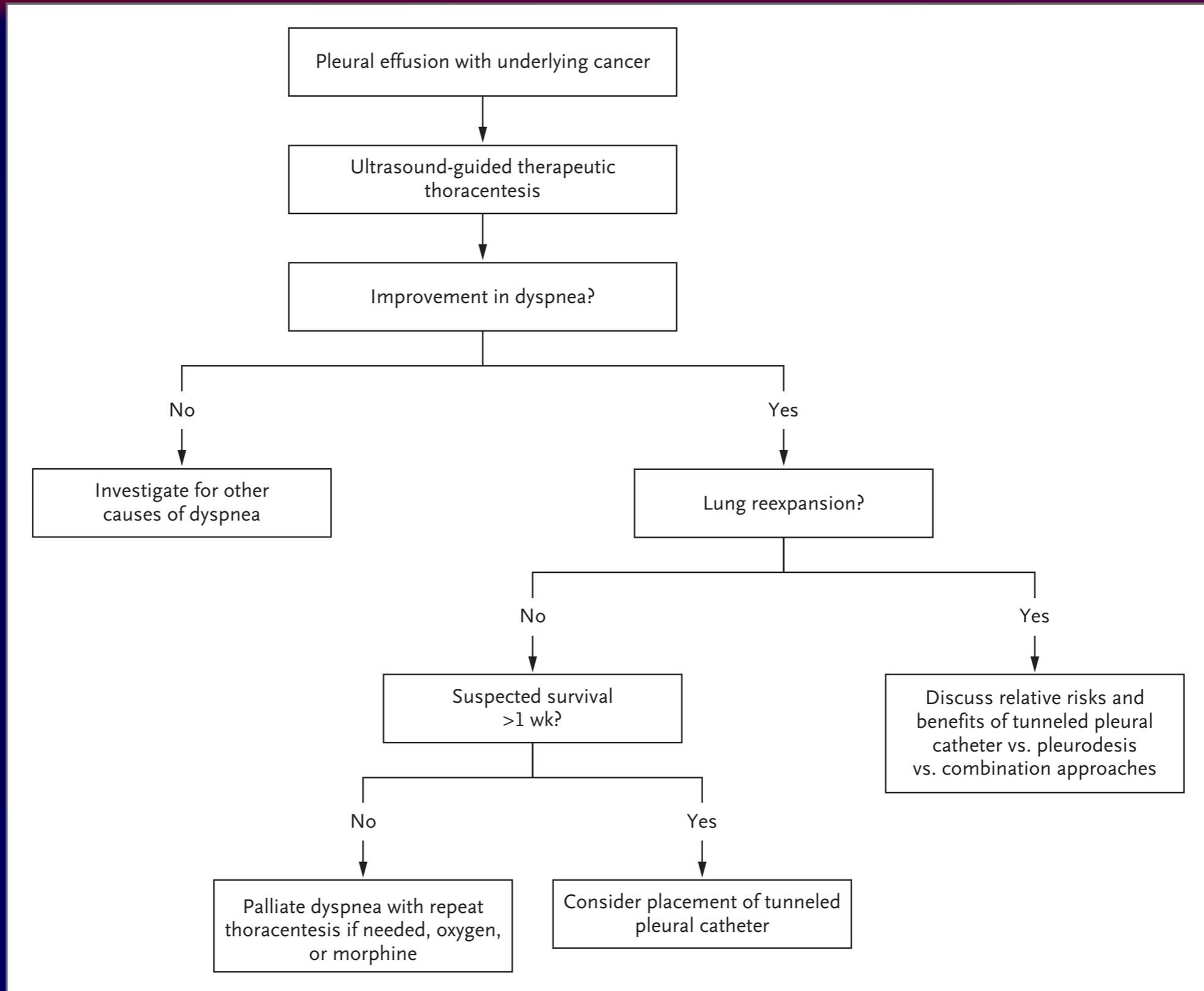
**Results:** No-complication developed due to talc-slurry in two groups. Complete or partial response was achieved in 35 (87.5%) and 33 (84.6%) patients in group 1 and group 2 respectively (P=0.670). The mean drainage time was 40.7 and 165.2 h in group 1 and group 2 respectively (P<0.001).

**Conclusions:** Rapid pleurodesis with talc slurry is safe and effective and it can be performed in an outpatient basis.

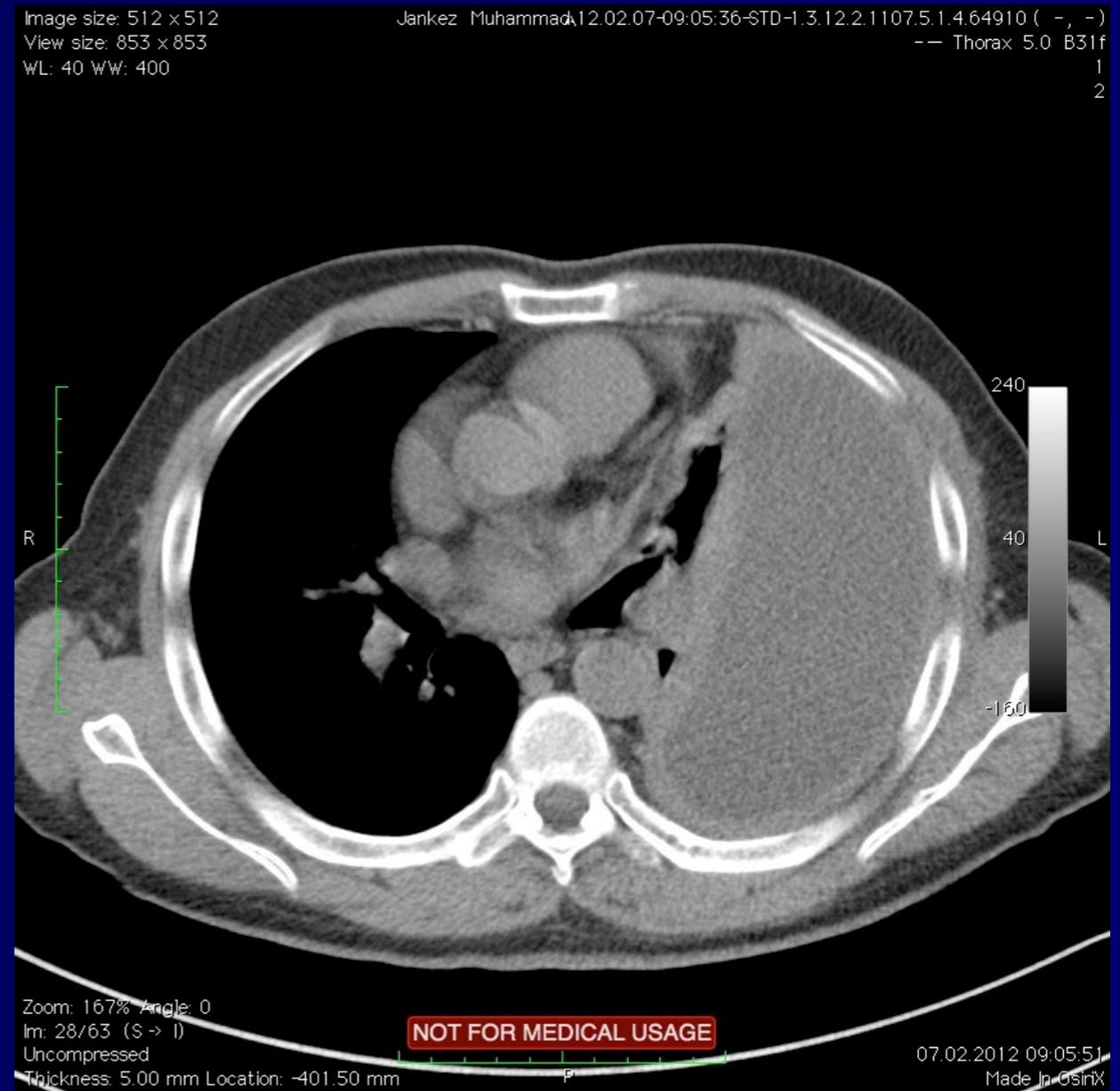
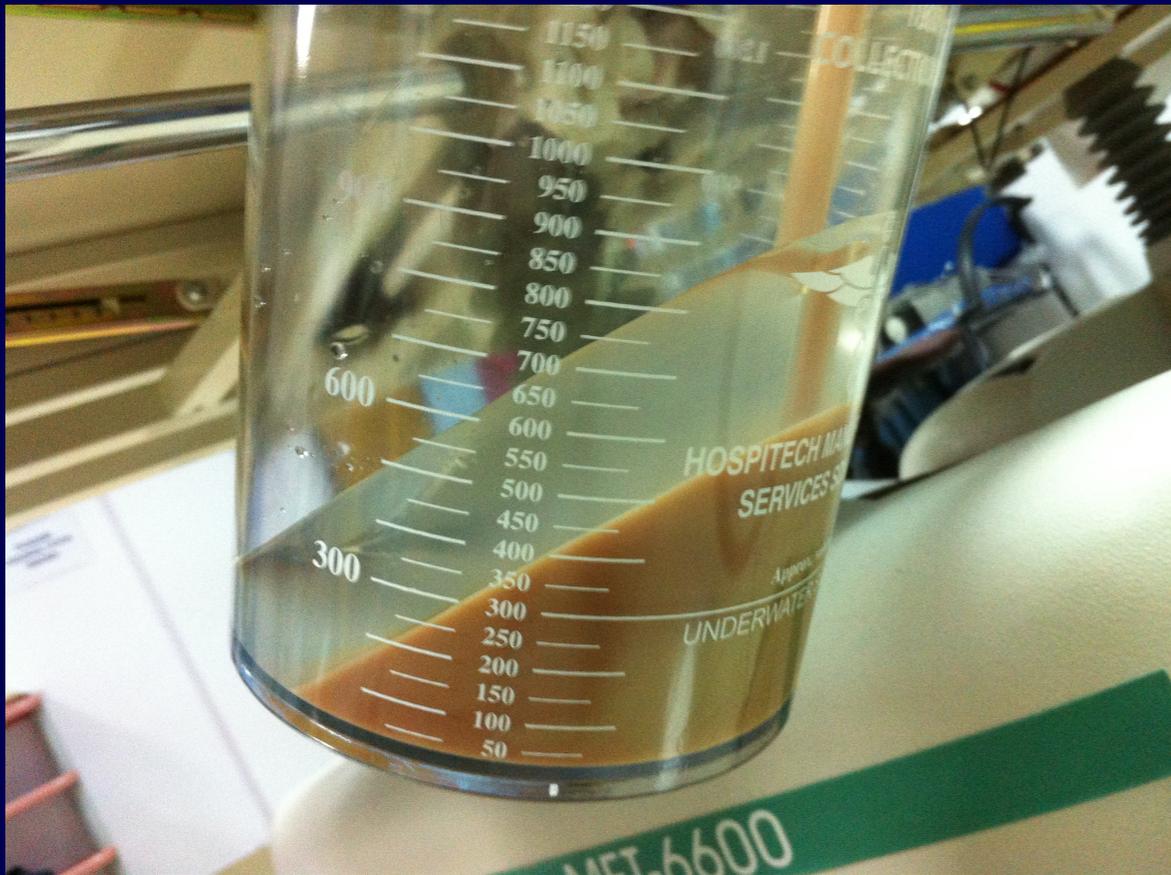
# Randomization (Consort Diagram)



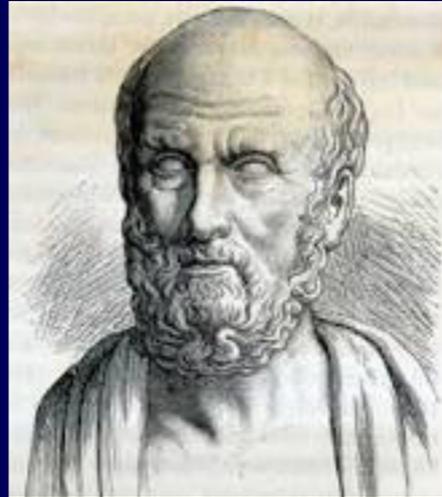
# Malignant Pleural Effusion



# Empyema



# Empyema

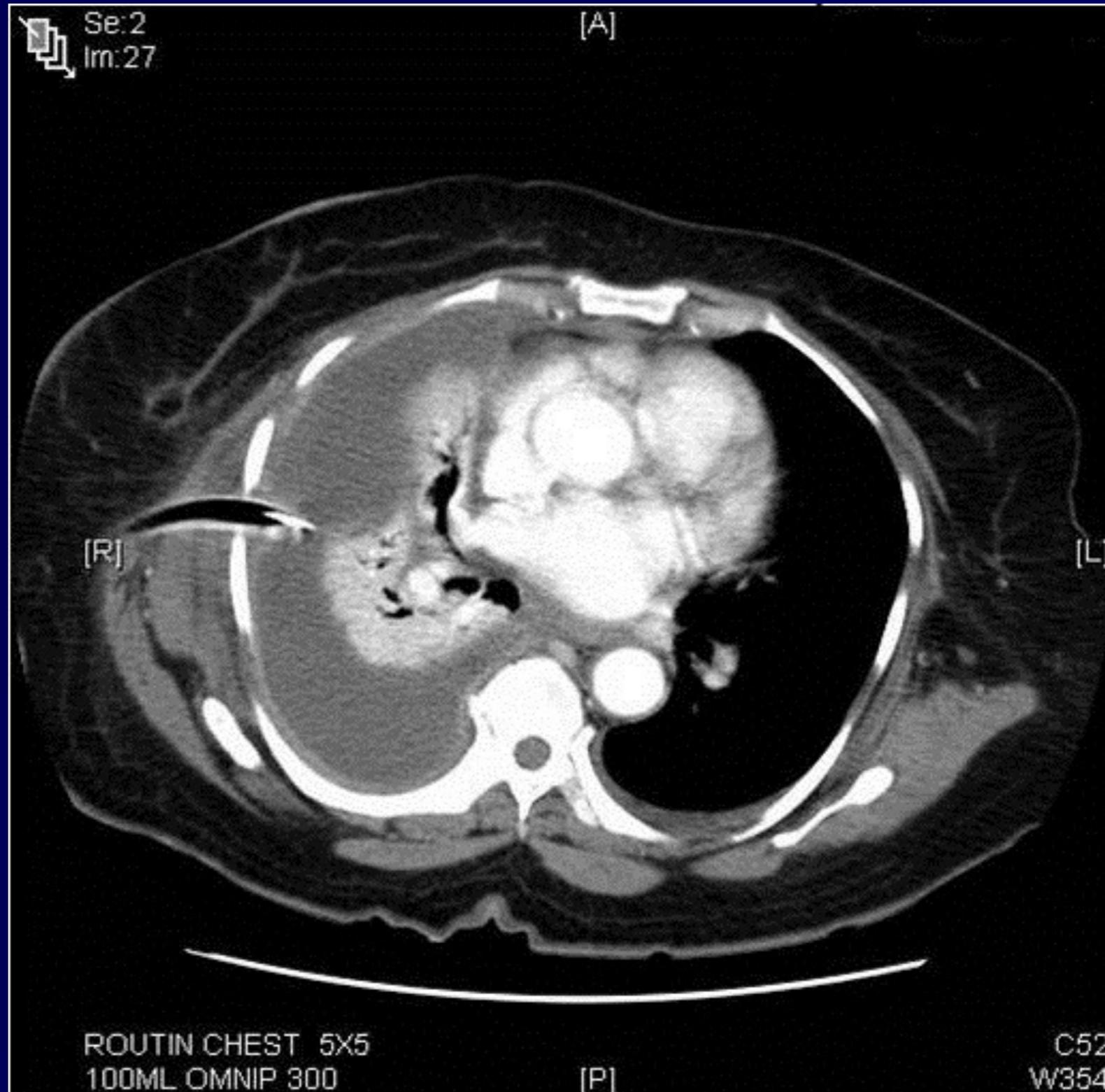


**Hippocrates:** “Persons who become affected with empyema after pleurisy, if they get clear of it in forty days from the breaking of it, escape the disease; but if not, it passes into phthisis“

# Empyema

- ★ Purulent pleural effusion
- ★ Most common cause
  - ★ Pneumonia
- ★ Needs chest tube drainage if:
  - ★ Pleural pH < 7.2
  - ★ Pleural Glucose less than 40 mg/dl
- ★ Causing Bacteria:
  - ★ Pneumococcus
  - ★ Staphylococcus

# Inserted Chest Tube



# Empyema

- ★ Multiple organisms seen- 50 %
- ★ Common gram negatives include
  - ★ E.coli
  - ★ Klebsiella
  - ★ Pseudomonas
- ★ Anaerobes may be difficult to culture
- ★ Therapy: Chest tube+antibiotic
  - ★ VATS Decortication/debridement
  - ★ Open (thoracotomy) decortication

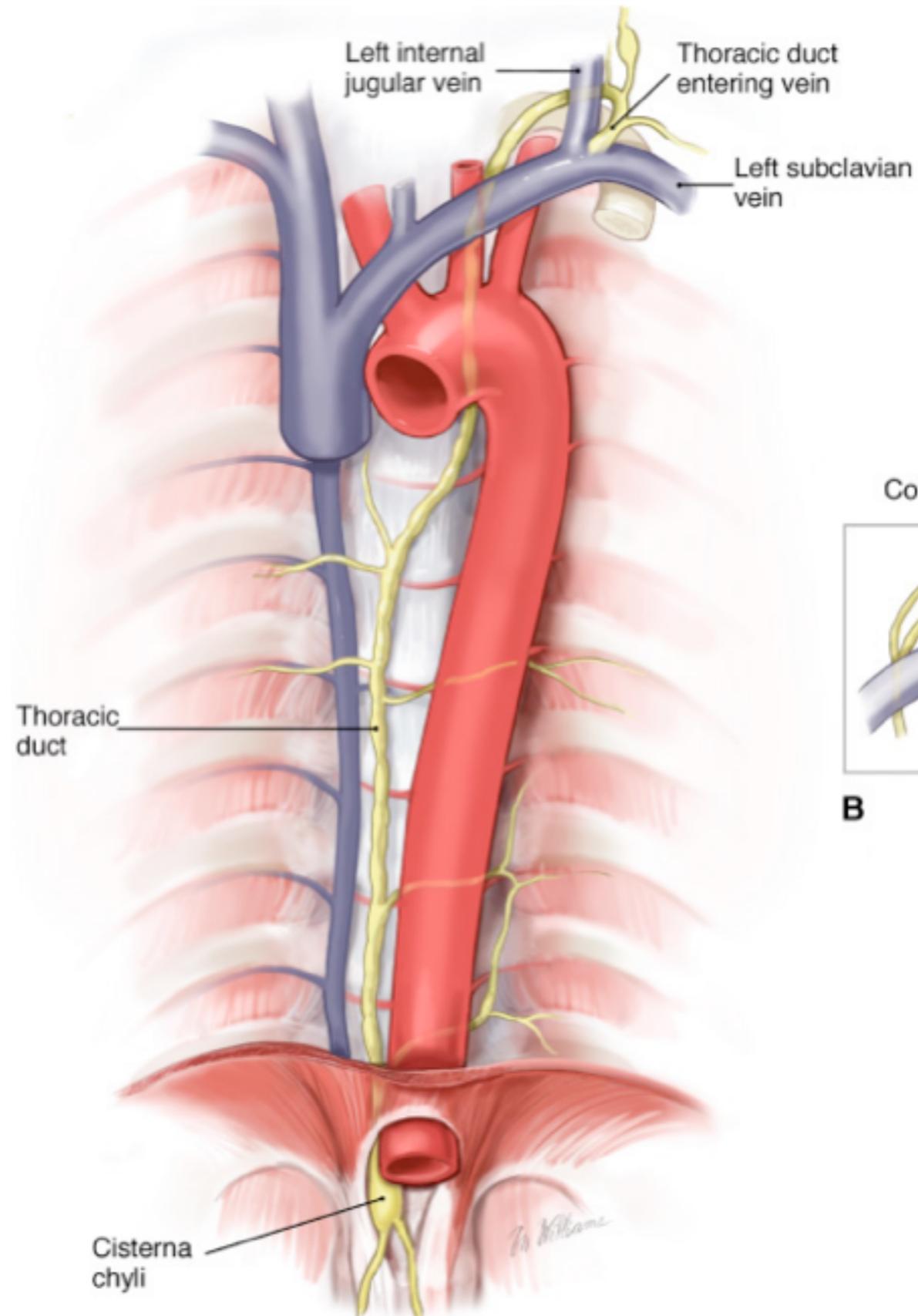
# Ductus Thoracicus

- Thoracic duct originates at cisterna chyli (near midline-2<sup>nd</sup> lumbar vertebra)
- Ascends through aortic hiatus (T10-T12)
- In right chest behind esophagus between aorta and azygous vein
- At T5-T6 crosses to left posterior mediastinum
- Drains into union of subclavian and internal jugular veins
- Main function:
  - Transport absorbed fat from the digestive system
- Management of chylothorax

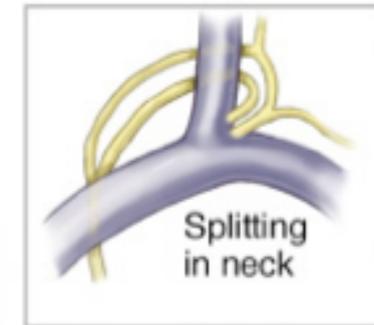
# Chylothorax



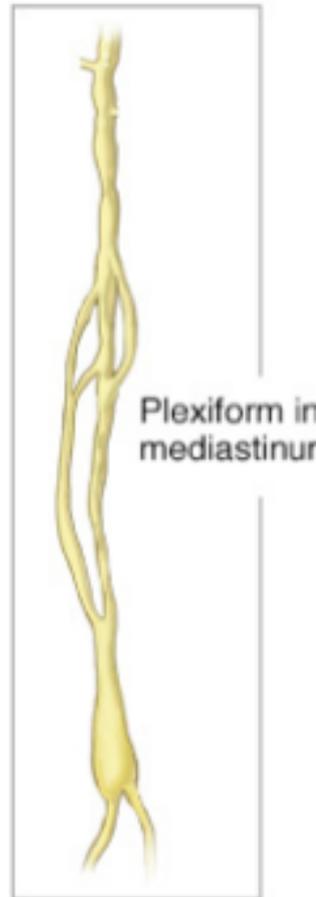
- Thoracic duct originates from cisterna chyli (Level of L2)
- Passes aortic hiatus (T10-T12)
- At the level of the fifth or sixth thoracic vertebra, the duct crosses to the left hemithorax and continues cephalad along the left side of the esophagus into the superior mediastinum behind the aortic arch and posterior to the left subclavian artery
- The duct terminates at the angle formed by the left internal jugular and left subclavian veins



Common sites of variant anatomy:



B



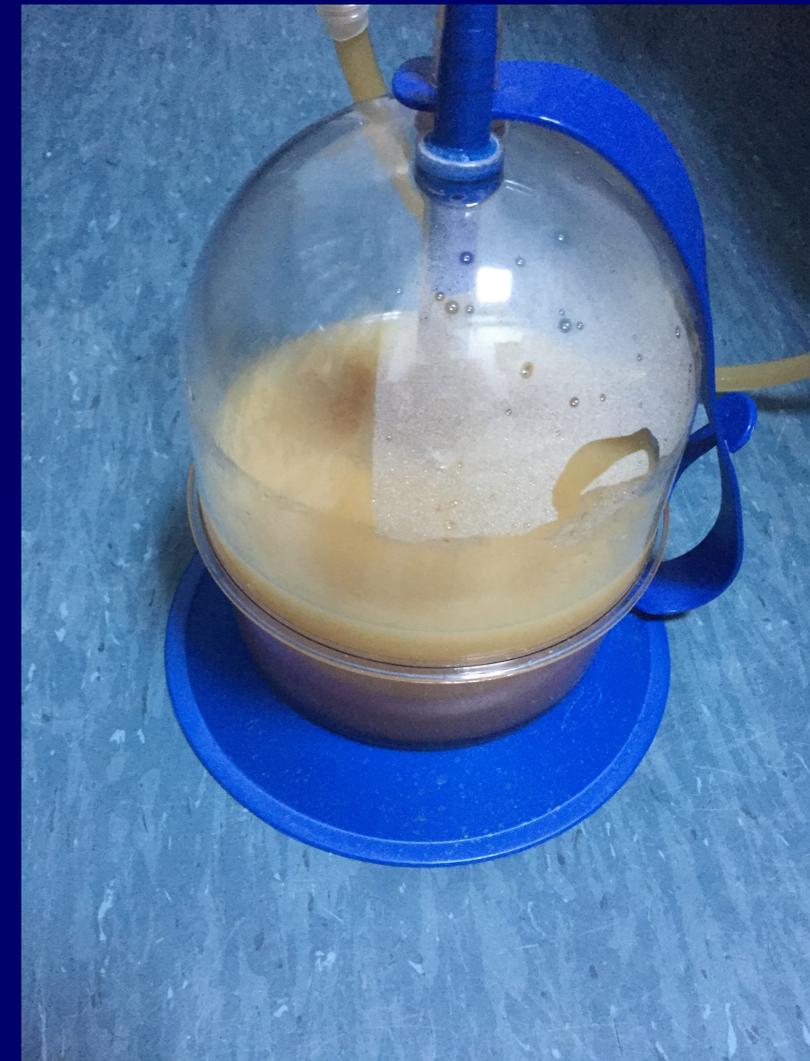
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# Causes of Chylothorax

- **Most common:** Surgical damage of Ductus toracicus
- **Spontaneous Chylothorax:** Lymphoma, kongenital ductus anomalies, ovary carcinoma

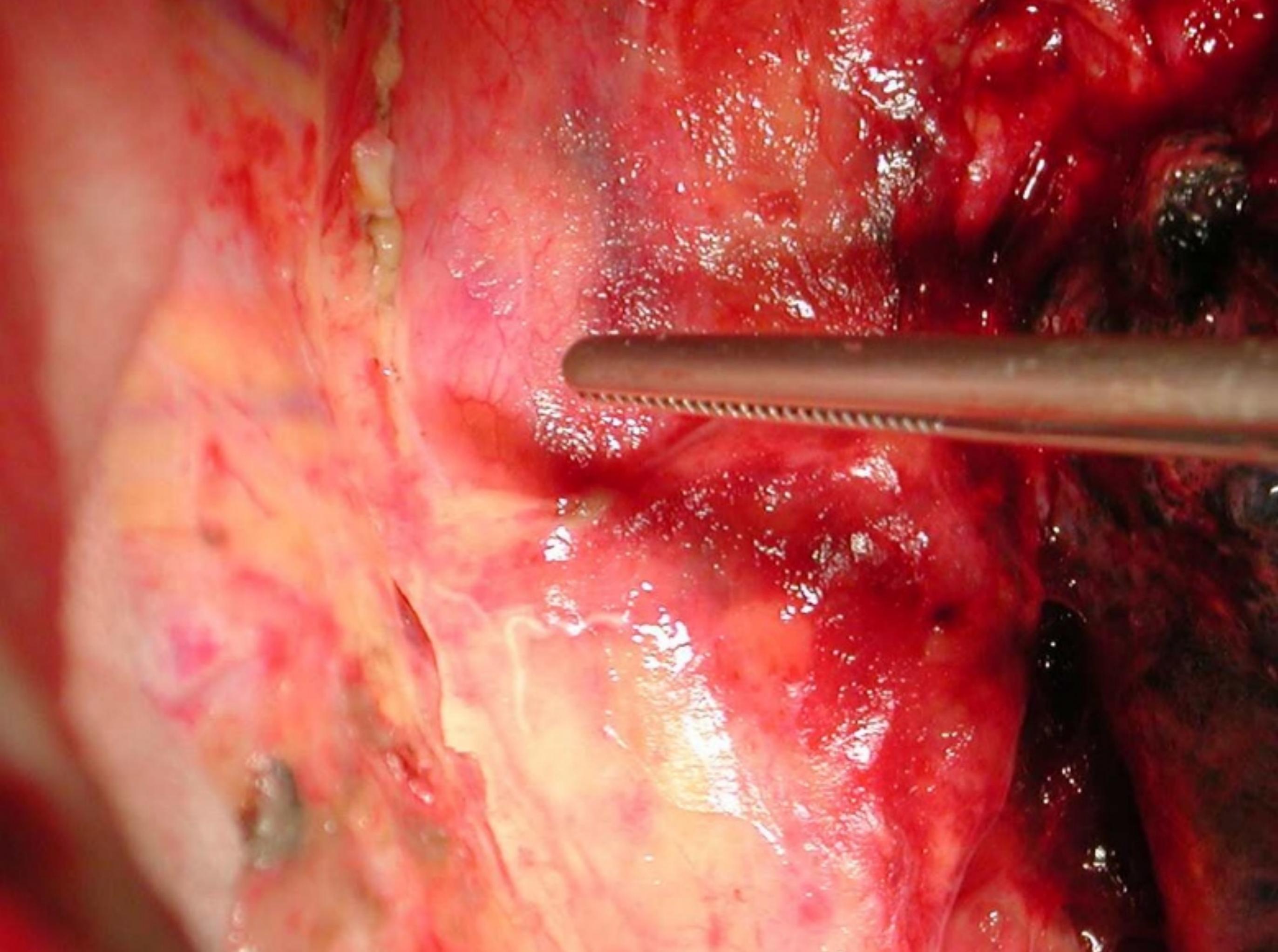
# Diagnosis of Chylothorax

- Milky drainage
- Pleural triglycerides > serum triglycerides or
- Pleural triglycerides > 110 mg/dL
- Fat Globules on microscopic examination
- Sudan III staining
- Most common cause of chylothorax:
- Surgical trauma to thoracic duct.
- Pseudochylothorax: Pleural cholesterol > 200 mg/dL and absence of chylomicrons



# Management

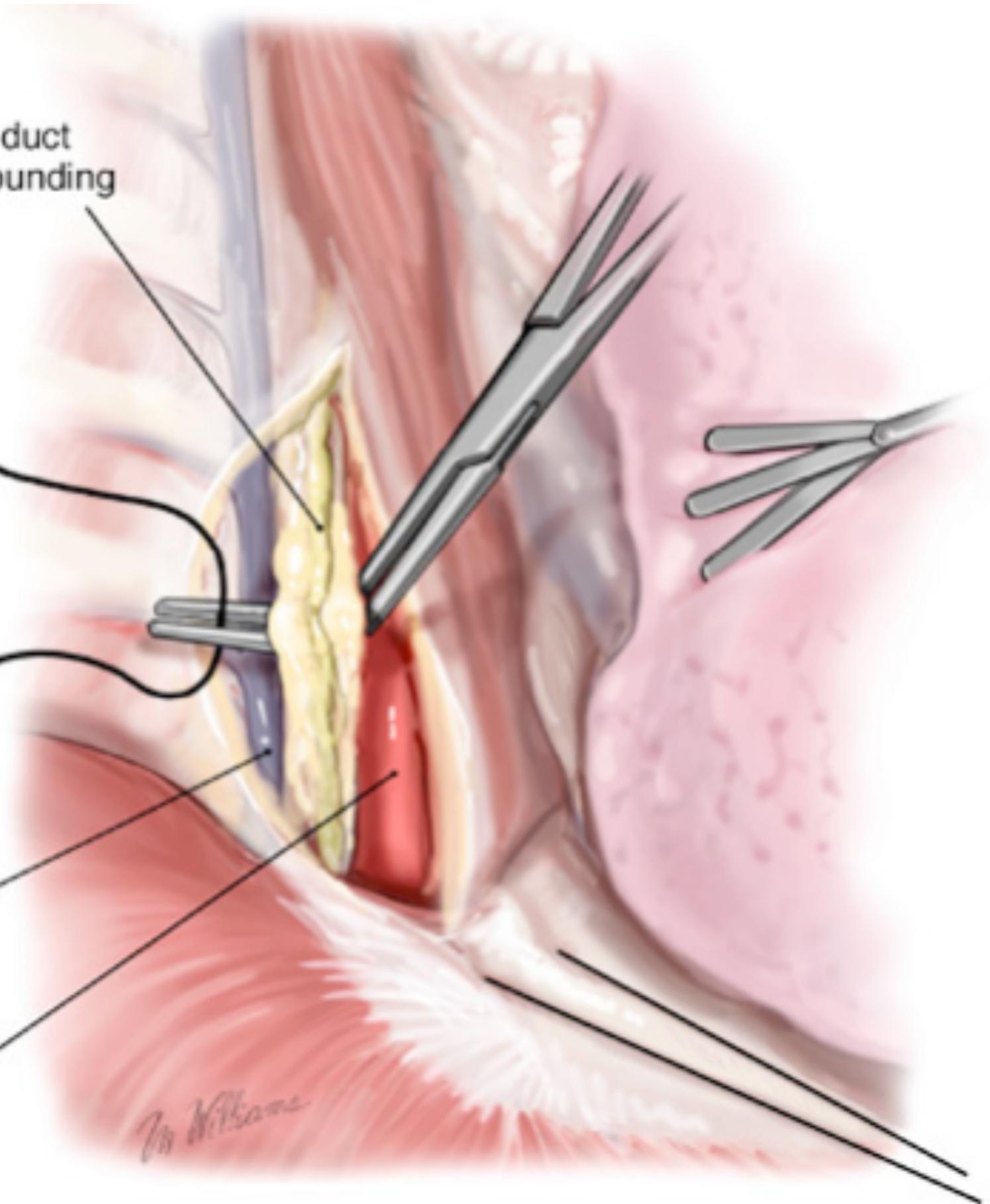
- ★ Chest tube placement
- ★ NPO
- ★ TPN
- ★ Observation
- ★ Surgical correction –only if significant chyle drainage (>500 ml/d adult, > 100 ml/d infant) with non-op management
  - ★ Right thoracotomy and ligation of ductus.



Thoracic duct  
and surrounding  
tissue

Azygos vein

Aorta



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A Surgeon's Notes on Performance



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