Chiangrai Internal medicine conference – 21th June 2025

Exploring the GAP: Common pleural diseases

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1

Disclosures and disclaimer

- None

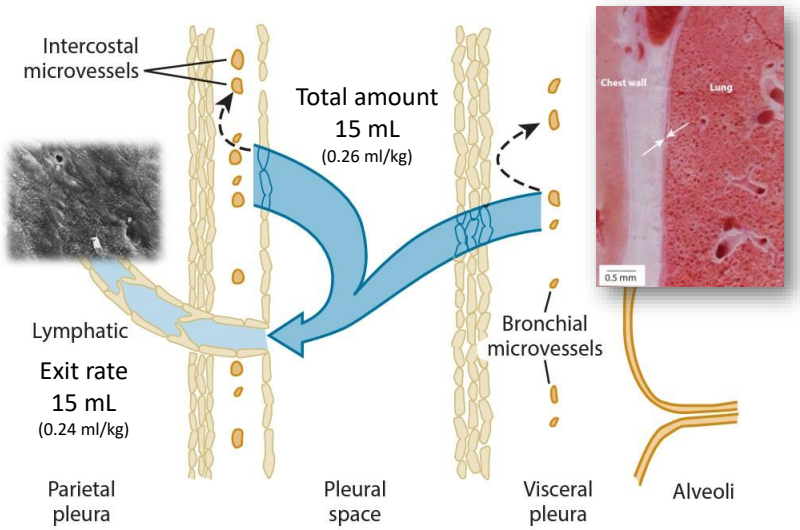
2

Content

- Pleural anatomy
- Exploring the gap between lung and chest wall
  - Air – Pneumothorax
  - Pus – Pleural infection and tuberculosis
  - Cancer – Malignant pleural effusion

3

Pleural anatomy



Light RW, Lee, YCG. Textbook of Pleural Diseases. 3rd ed. Boca Raton (FL): CRC Press; 2016.

4

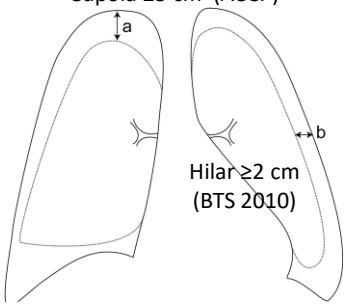
Pneumothorax

5

Diagnosis

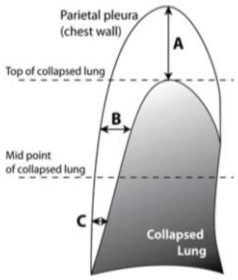
CXR
(upright + full inspiration)

Cupola ≥3 cm (ACCP)



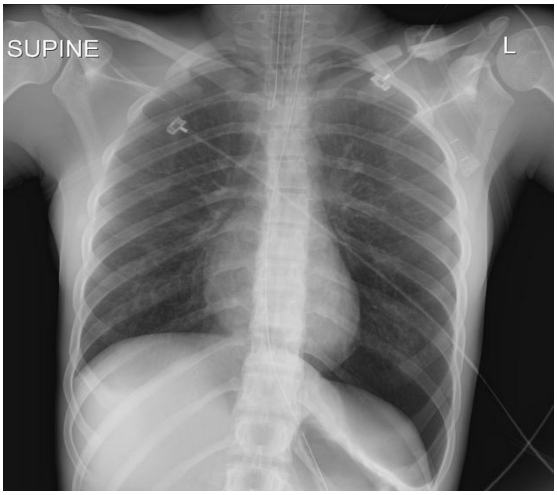
Hilar ≥2 cm
(BTS 2010)

Collin's: 4.2+[4.7x(A+B+C)



Light's: [1 - (lung/hemithorax)^3] x 100 (cut-off 15%)

Large size: >20%

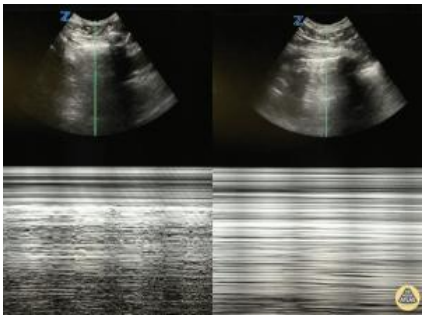


6

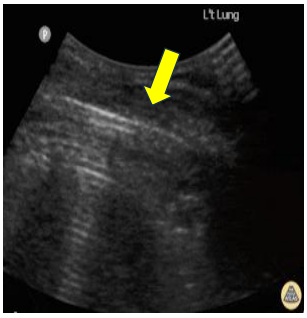
Diagnosis

Ultrasound
(Linear probe)

B-mode
Lung sliding
(normal)



M-mode
Left: Seashore sign
Right: Barcode sign



B-mode
Lung point
(pneumothorax)

med.upenn.edu/POCUS/pneumothorax.html

7

Classification

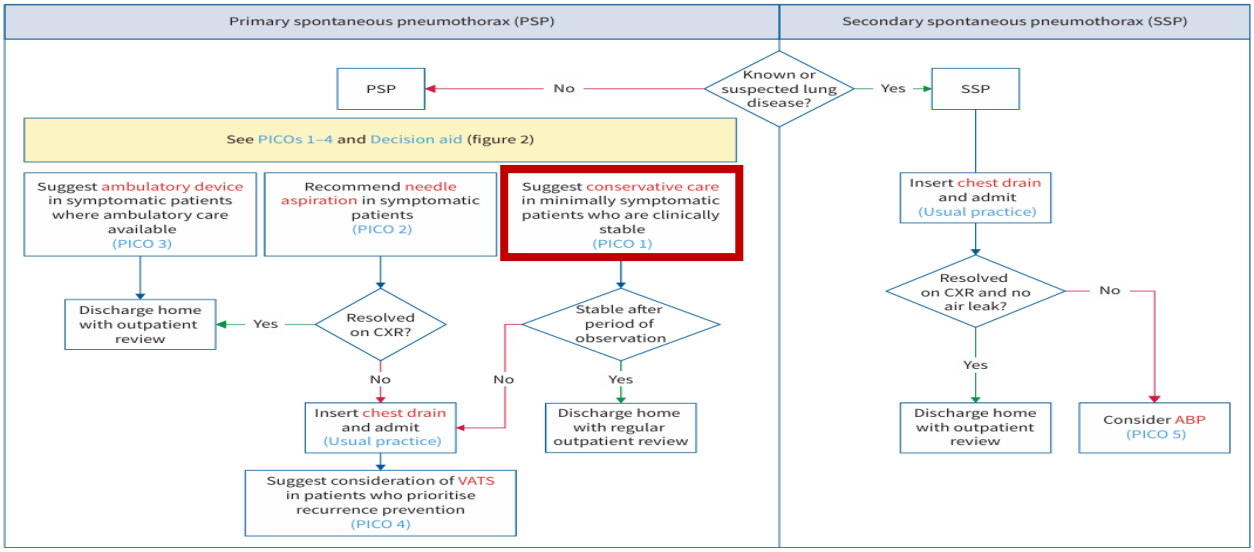
- PSP
  - Age ~35 yo
  - M:F 76:24
  - Marfanoid habitus
  - Smoking
    - 1-12 cig/d → 7x
    - 13-22 cig/d → 21x
    - >22 cig/d → 102x
  - Emphysema-like changes, apical bleb, pleural porosity
- SSP
  - Age ~50 yo
  - M:F 80:20
  - Underlying lung diseases
  - Higher *recurrence*
  - Higher *mortality*
  - Required specific rx

PSP – Primary Spontaneous Pneumothorax, SSP – Secondary Spontaneous Pneumothorax

Schnell J, Beer M, Eggeling S, et al. Management of Spontaneous Pneumothorax and Post-Interventional Pneumothorax: German S3 Guideline. Respiration. 2019;97(4):370-402.

8

Management: ERS/EACTS/ESTS



Walker S, Hallifax R, Ricciardi S, et al. Joint ERS/EACTS/ESTS clinical practice guidelines on adults with spontaneous pneumothorax. Eur Respir J. 2024;63(5):2300797. Published 2024 May 28.

9

Conservative management

- Multicenter RCT
- 14-50 Y
- Large PSP (>32% by Collin's)
- Minimal symptoms
  - Able to walk around ED
  - No significant dyspnea/chest pain
  - SBP ≥90 mmHg (SBP > HR)
  - RR <30/min, SpO_2 ≥90% at RA
- Conservative (observe 4 hours at ED) vs. ICD (<12 Fr)

"PSP trial"

Brown SGA, Ball EL, Perrin K, et al. Conservative versus Interventional Treatment for Spontaneous Pneumothorax. N Engl J Med. 2020;382(5):405-415.

10

Conservative management

Outcome	ICD	Conservative	Relative risk (95% CI)
CXR resolution at 8 weeks	94.4%	98.5%	-4.1% (-8.5, 0.5) inferior margin 9%*
CXR resolution	16 days	30 days	0.49 (0.39, 0.63)
Further procedure needed	94.2%	15.4%	6.10 (4.24, 9.77)
Number of surgery	0.3 per patient	0.1 per patient	4.21 (2.10, 8.41)
LOS in 8 weeks	6.1 day	1.6 day	2.8 (1.8, 3.6)
Revisit rate	26.6%	17.2%	1.54 (1.01, 2.36)
Recurrent in 12 months	16.8%	8.8%	1.90 (1.03, 3.52)

*Risk difference

Brown SGA, Ball EL, Perrin K, et al. Conservative versus Interventional Treatment for Spontaneous Pneumothorax. N Engl J Med. 2020;382(5):405-415.

11

Ambulatory device

8-Fr Ambulatory device (Pleural Vent)

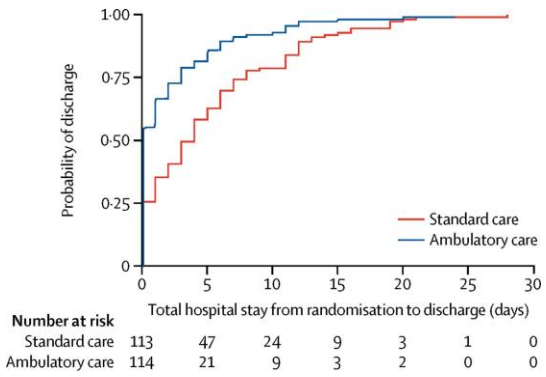
One-way valve

Jones L, Johnston R, Aujayeb A. Ambulatory management of pneumothorax using a novel device: Rocket Pleural Vent. BMJ Case Rep. 2019;12(5):e229408. Published 2019 May 6.

12

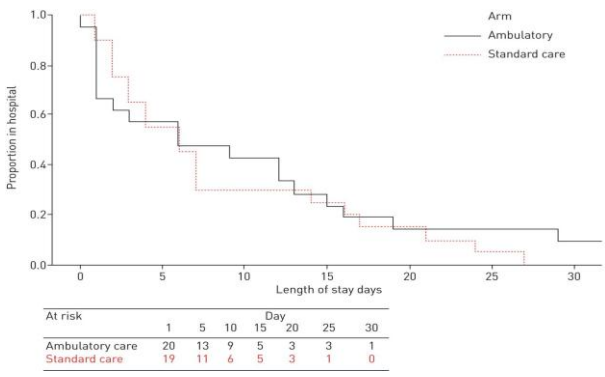
Ambulatory device

PSP (RAMPP trial)



Ambulatory group: shorter total hospital stay in 30 days, lower total number of procedures per patient

SSP



Higher early treatment failure rate in Ambulatory group (46%) vs. standard of care (15%), p=0.11

Walker SP, Keenan E, Bintcliffe O, et al. Ambulatory management of secondary spontaneous pneumothorax: a randomised controlled trial. Eur Respir J. 2021;57(6):2003375. Published 2021 Jun 24.
Hallifax RJ, McKeown E, Sivakumar P, et al. Ambulatory management of primary spontaneous pneumothorax: an open-label, randomised controlled trial. Lancet. 2020;396(10243):39-49.

13

Surgery

- Tension pneumothorax
- SSP with significantly physiologic compromise
- Recurrent pneumothorax (ipsi- or contralateral)
- Bilateral pneumothorax
- Persistent air leak or failure of lung re-expansion
- Professional at risk
- Pregnancy

Roberts ME, Rahman NM, Maskell NA, et al. British Thoracic Society Guideline for pleural disease. Thorax. 2023;78(11):1143-1156.
MacDuff A, Arnold A, Harvey J; BTS Pleural Disease Guideline Group. Management of spontaneous pneumothorax: British Thoracic Society Pleural Disease Guideline 2010. Thorax. 2010;65 Suppl 2:ii18-ii31.

14

Medical pleurodesis

- Consider in inoperable SSP or persistent air leak
- Hooked over method is recommended

Agent	Standard dose	Success rate (%)
Talc	2.5-10 mg	70-100 (22-25)
Tetracycline	20 mg/kg	50-92 (26-30)
Bleomycin	60 U in 100 mL, NaCl 0.9%	58-85 (25,26,31-35)
Mitoxantrone	0.4 mg/kg or 25-60 mg	73-88 (36-38)
Cisplatin	100 mg/m²	65-83 (39-42)
Doxycycline	500 mg in 30mL, NaCl 0.9%	60-89 (39,43-45)
Taxol	120 mg/m²	85-93 (46,47)
Erythromycin	1 g in 30 mL, 5% glucose	85-88 (48-50)
Corynebacterium parvum	4-14 mg	65-92 (51)
Interferon alpha-2b	3×10^6 IU	62-100 (26)
Iodopovidone	20 mL of 10% iodopovidone	64-96 (52)

Roberts ME, Rahman NM, Maskell NA, et al. British Thoracic Society Guideline for pleural disease. Thorax. 2023;78(11):1143-1156.
MacDuff A, Arnold A, Harvey J; BTS Pleural Disease Guideline Group. Management of spontaneous pneumothorax: British Thoracic Society Pleural Disease Guideline 2010. Thorax. 2010;65 Suppl 2:ii18-ii31.

15

Persistent air leak

- Air leak last longer than 5-7 days (48 hours in SSP)
- Evaluate circuit function
- Operable: Consider VATS
- Inoperable
  - With pleural approximation
    - Chemical pleurodesis, autologous blood pleurodesis, endobronchial therapy
  - Without pleural approximation
    - Autologous blood pleurodesis, endobronchial therapy
- No data to support suctioning or large-bore catheter

Roberts ME, Rahman NM, Maskell NA, et al. British Thoracic Society Guideline for pleural disease. Thorax. 2023;78(11):1143-1156.
MacDuff A, Arnold A, Harvey J; BTS Pleural Disease Guideline Group. Management of spontaneous pneumothorax: British Thoracic Society Pleural Disease Guideline 2010. Thorax. 2010;65 Suppl 2:ii18-ii31.

16

Autologous blood pleurodesis

- Whole blood 50-100 mL in nonheparinized tube
- Inject into chest tube through 3-way stopcock
- Followed by NSS 10 mL
- Hooked over method for 1-3 hours
- Resolution of PAL: 78-82% (RCTs in SSP)
- Predictor of failure: large continuous leak during gentle respiration
- Complications: tension pneumothorax, ICD malfunction, fever, infection (9%)

Walker S, Hallifax R, Ricciardi S, et al. Joint ERS/EACTS/ESTS clinical practice guidelines on adults with spontaneous pneumothorax. Eur Respir J. 2024;63(5):2300797. Published 2024 May 28.

17

Summary of therapeutic options

Decision aid for initial management pathways for primary spontaneous pneumothorax
Note: this figure is to aid discussions with patients and should be done in conjunction with guidance within the text. The studies referenced used different designs and may not be directly comparable.

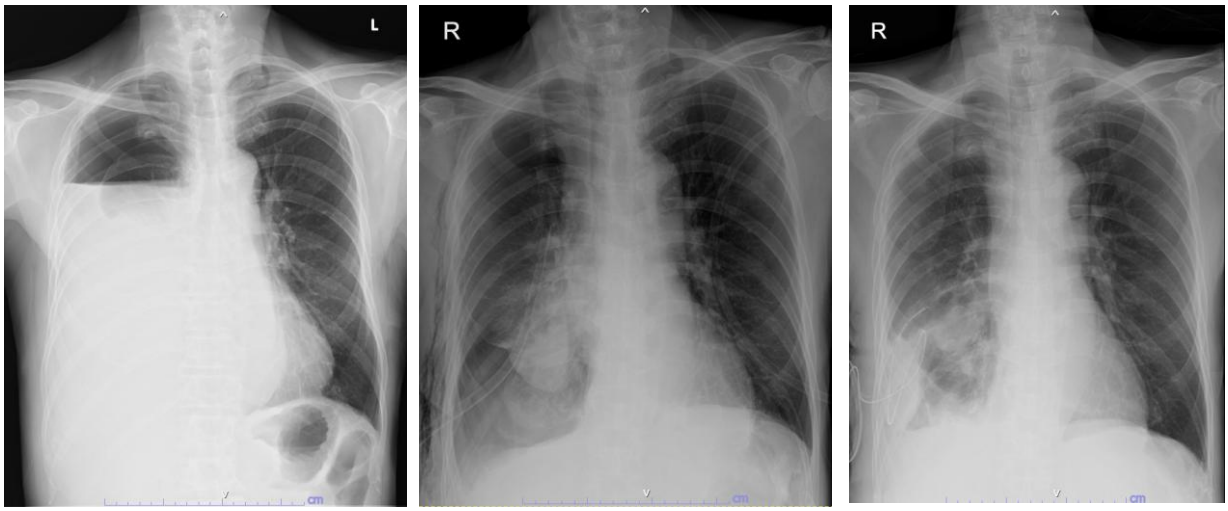
The treatment options: from least invasive (left) to most (right)	Observational care (conservative)	Needle aspiration	Ambulatory care	Chest drain	Surgery
How long is the average (mean) initial hospital stay?	1.0 days[#]	2.6 days	0 days	4.8 days	4 days[¶]
What is the chance of a pneumothorax recurrence within a year?	9 patients in 100	25 patients in 100	24 patients in 100	21 patients in 100	6 patients in 100[+]
How often is a further pleural procedure required?	15 patients in 100 Note: no initial procedure with observational care	22 patients in 100	21 patients in 100	25 patients in 100	3 patients in 100 (Further video-assisted thoracic surgery)
What are the complication rates (%)					
Skin infection	1	0	1	3	0
Local bleeding	0	0	7	3	0
Surgical emphysema	0	1	6	6	0
Haemothorax	3[§]	1	3	6	3
Tube blockage or displacement	0	0	5	11	0
Number of studies	1	6	1	6	1[ƒ]
Study reference(s)	[13]	[20–25]	[27]	[20–25]	[33]

[#]: initial length of stay obtained from supplementary appendix [13].
[¶]: does not include readmission for elective surgery, which increases hospital stay to 7.1 days [33].
[+]: 1-year recurrence rates obtained from communication from authors [33].
[§]: the three instances of haemothorax in the conservative management group were noted as a pleural effusion on the chest radiograph, before insertion of any chest tube [13].
[ƒ]: the Al-Mourgi and Alshehri [31] study was not included in the decision aid as listed outcomes were non-comparable.

Walker S, Hallifax R, Ricciardi S, et al. Joint ERS/EACTS/ESTS clinical practice guidelines on adults with spontaneous pneumothorax. Eur Respir J. 2024;63(5):2300797. Published 2024 May 28.

18

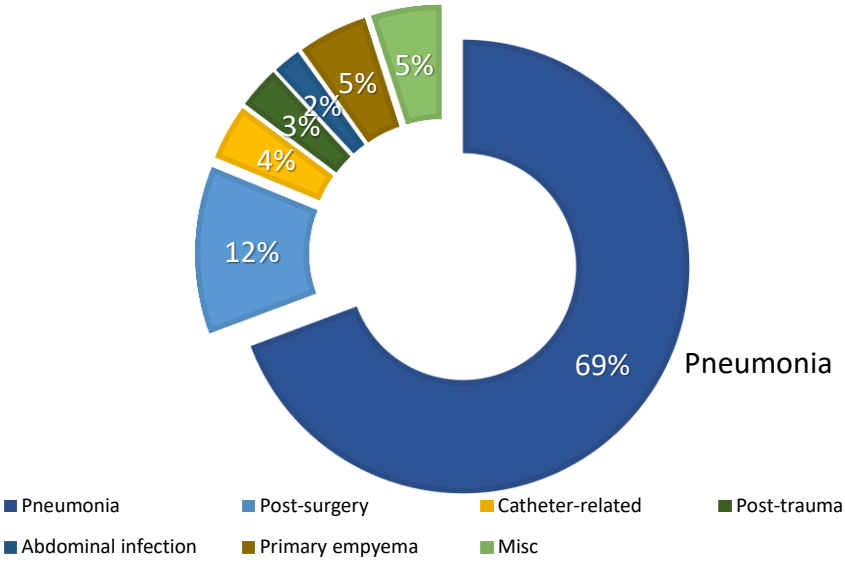
Indwelling pleural catheter



19

20

Etiology

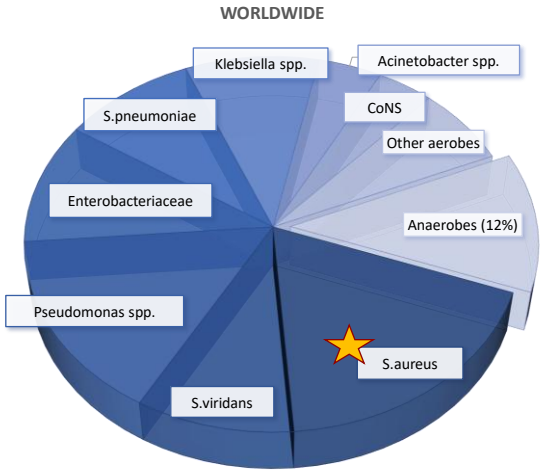


Chest. 2000;118:1158-71.

21

Microbiology

Polymicrobial 13%



Culture negative 44%

"Very few atypical pathogens"

Eur Respir J. 2019;54.

22

Microbiology in KKU

Microbiology	2018	2019	2020	2021	2022	2023
Number	619	610	672	834	874	772
Positive cultures (%)	89 (14)	67 (11)	57 (8)	67 (8)	87 (10)	56 (7)
• Gram-positive	24	20	25	22	27	29
• Gram-negative	61	41	31	38	55	18
• Anaerobe	0	3	0	2	2	2
• Fungus	4	3	1	5	3	7
• TB	0	0	0	0	0	0

Suewanichsakul C., Arunsurat I., et al. Microbiology of complicated parapneumonic effusion and empyema thoracis in Srinagarind hospital (unpublished data)

23

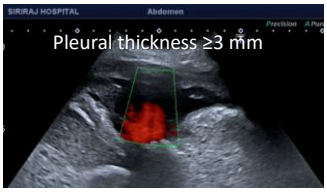
Radiology

Transudate

27% of anechoic are "Exudate"

Exudate to Fibropulurent

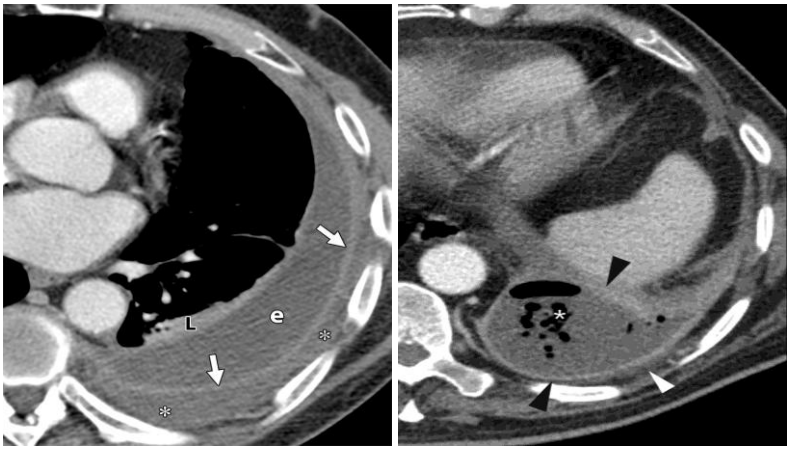
Organized pleural peel



อิทธิพัทธ์ อรุณสุรัตน์, กมลทิพย์ กุลวิภากร, ศุภฤกษ์ ดิษยบุตร, แจ่มศักดิ์ ไชยคุนา. ความก้าวหน้าในการรักษาภาวะติดเชื้อในโพรงเยื่อหุ้มปอด. วารสารวัณโรค โรคทรวงอกและเวชบำบัดวิกฤต 2566;42(2):41-59.

24

Radiology



CT signs of empyema

- Pleural split sign
- Extrapleural fat >3 mm
- Microbubbles sign
- Volume ≥400 mL

Santamarina MG, Beddings I, Lermanda Holmgren GV, Opazo Sanchez H, Volpacchio MM. Multidetector CT for Evaluation of the Extrapleural Space. Radiographics. 2017;37(5):1352-1370.
Porcel JM, Pardina M, Alemán C, Pallisa E, Light RW, Bielsa S. Computed tomography scoring system for discriminating between parapneumonic effusions eventually drained and those cured only with antibiotics. Respirology. 2017;22(6):1199-1204.

25

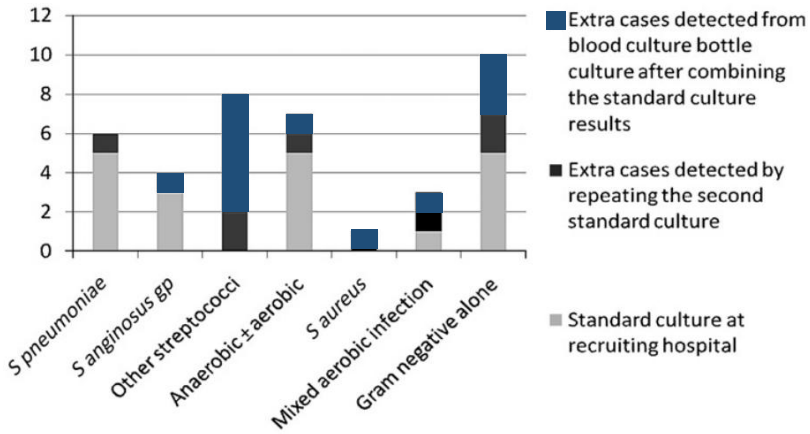
Pleural fluid analysis

- Cell count and differentiation
- Pleural fluid culture
- Pleural fluid chemistry
- Vulnerable of pleural pH during pre-analytic phase
  - Delayed >1 hour → False high
  - Bubble in syringe → False high
  - Lidocaine contamination → False low
  - Heparin contamination → False low
- Pleural glucose is less vulnerable

Rahman NM, Mishra EK, Davies HE, Davies RJ, Lee YC. Clinically important factors influencing the diagnostic measurement of pleural fluid pH and glucose. Am J Respir Crit Care Med. 2008;178(5):483-490.

26

Pleural fluid in hemoculture bottle



Fluid: 2-10 mL

↑Diagnostic yield 20%

Menzies SM, Rahman NM, Wrightson JM, et al. Blood culture bottle culture of pleural fluid in pleural infection. Thorax. 2011;66(8):658-662.

27

Classification

Characteristics	SPPE	CPPE	Empyema
Morphology	Clear	Turbid	Pus
Pleural pH	>7.30	≤7.20	Organism found
Pleural glucose	>72 mg/dL	≤72 mg/dL[a]	
Pleural LDH	<3x ULN	≥900 IU/L[a]	
PF PMN (cell/µL)	<10,000	>10,000	
Gram stain & Culture	Negative	May be positive	
US findings	Simple	Complex (septate or non-septate)	Homogenous echoic, Suspended microbubble
Risk of poor outcome	Low	Moderate	High
Management	ATBs ± ICD*	ATBs + ICD*	ATBs + ICD* ± Sx

SPPE – Simple parapneumonic effusion, CPPE – Complicated parapneumonic effusion, [a] – High discriminative power only if pH ≥7.20
*ICD – Large volume, Septation, Pleural contrast enhancement on CT, Poor clinical response
ATBs should cover anaerobe and duration more than 4 weeks (IV at least 5-7 days)

28

Risk stratification

RAPID score

ปัจจัยเสี่ยง	0 คะแนน	1 คะแนน	2 คะแนน
Renal	BUN <14 mg/dL	BUN 14-23 mg/dL	BUN >23 mg/dL
Age	<50 ปี	50-70 ปี	>70 ปี
Purulent fluid	ใช่	ไม่ใช่	
Infection source	ในชุมชน	ในโรงพยาบาล	
Dietary factor	albumin ≥2.7 g/L	albumin <2.7 g/L	

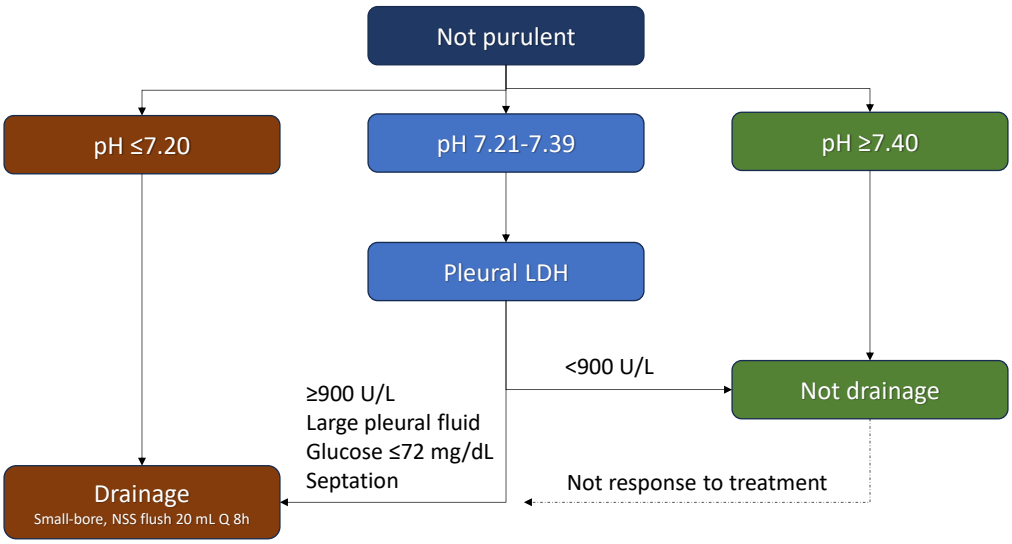
↑loculation → inadequate drain

ระดับความเสี่ยง	Original: Mortality at 3 mo.	PILOT: Mortality at 3 mo.
เสี่ยงต่ำ (0-2 คะแนน)	3%	2.3%
เสี่ยงปานกลาง (3-4)	9%	9.2%
เสี่ยงสูง (5-7)	31%	29.3%

[RAPID] Chest. 2014;145(4):848-55.
[PILOT] The European respiratory journal. 2020;56(5).

29

Pleural drainage



Roberts ME, Rahman NM, Maskell NA, et al. British Thoracic Society Guideline for pleural disease. Thorax. 2023;78(Suppl 3):s1-s42.

30

Refractory pleural infection

- Failed clinical response in 48 hours
  - Operable → VATS, thoracotomy
  - Inoperable
    - Intrapleural fibrinolytic and enzyme therapy
    - Intrapleural NSS irrigation
    - Medical thoracoscopy
    - Iterative thoracentesis, prolonged antibiotics, indwelling pleural catheter

31

Intrapleural therapy

Clinical outcomes	Summary of evidence review (fibrinolytic treatment vs standard care*) (95% CI)					
(Fibrinolytic treatment)	Streptokinase	Urokinase	TPA plus DNAse	TPA	DNAse	Saline irrigation
Length of hospital stay	No difference	3.9 days shorter (5.9 to 13.7) with urokinase	Shorter with TPA plus DNAse	No difference†	No difference†	No difference†
Need for repeat intervention	No difference†	Not reported	Not enough evidence	Not reported	Not reported	Not reported
Need for thoracic surgery	No difference	Reduced need with urokinase (230/1000 (123 to 435) compared with 512/1000)¶	Reduced need with TPA plus DNAse†	Reduced need with TPA†	No difference†	Reduced need with saline irrigation†
Patient symptoms‡	Reduced symptoms with streptokinase†	Defervesence achieved 4.2 days faster (0.4 to 7.9) with urokinase	Reduced symptoms with TPA plus DNAse†	No difference†	No difference†	No difference†
Complications§	Increased with streptokinase (114/1000 (64 to 205) compared with 46/1000)¶	Not reported	Inconclusive results	Inconclusive results	Inconclusive results	No difference†
Quality of life	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported
Mortality	No difference	Not reported	No difference†	No difference†	No difference†	No difference†
Radiological opacification	Inconclusive results	Increased resolution with urokinase†	Increased resolution with TPA plus DNAse†	No difference†	No difference†	Increased resolution with saline irrigation†
Radiographic resolution of effusion	No difference	Greater resolution with urokinase†	Greater resolution with TPA plus DNAse†	Greater resolution with TPA†	Not reported	Not reported
Pleural thickening	No difference†	Potential reduced pleural thickening with urokinase†	Not reported	Not reported	Not reported	Not reported

Roberts ME, Rahman NM, Maskell NA, et al. British Thoracic Society Guideline for pleural disease. Thorax. 2023;78(11):1143-1156.

32

Medical thoracoscopy

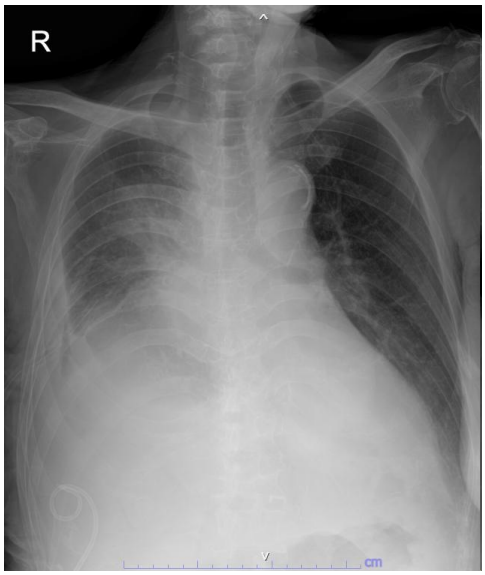
- MT can be performing bedside under conscious sedation
- No need of single lung ventilation
- Success rate 76-85%
- Shorter hospital stay compared to intrapleural fibrinolysis alone
- Suitable for inoperable patient

Overall complications 9%, mortality 0.3%

Breathe Dec 2011, 8 (2) 156-167.
Am Thorac Soc. 2020;17(8):958-964.

33

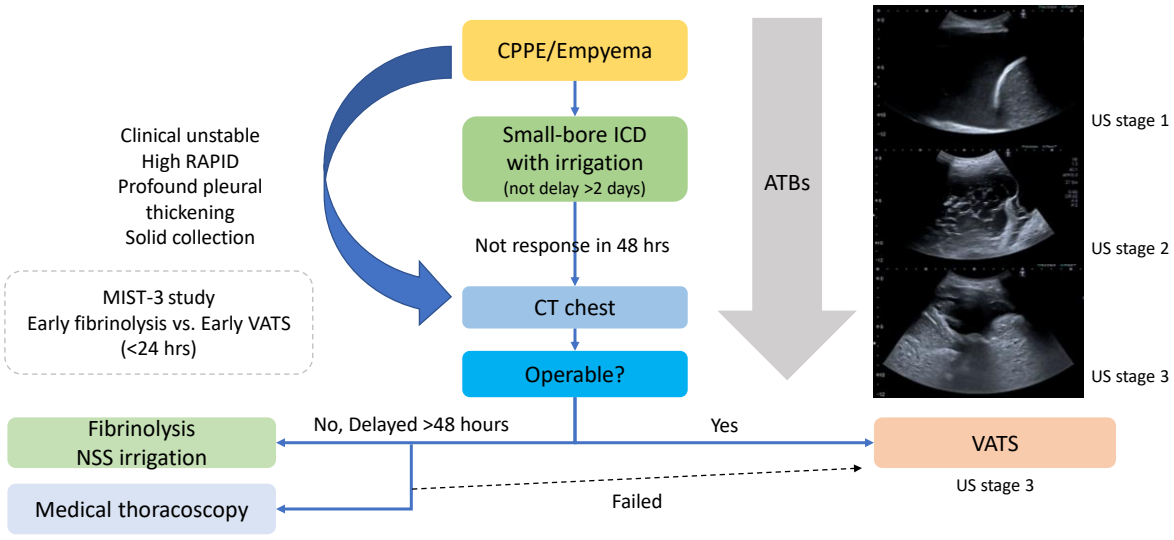
Medical thoracoscopy



Medical thoracoscopy

34

Management in 2025



Alternatives: Prolonged ATBs, Rib resection, IPC

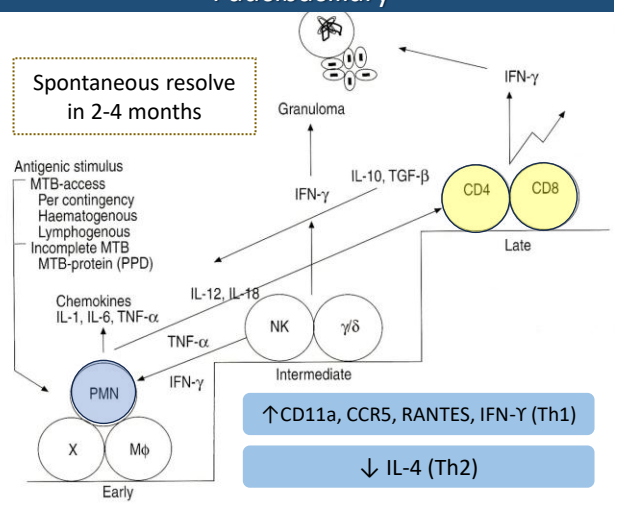
35

Tuberculous pleuritis

36

Spectrum of disease

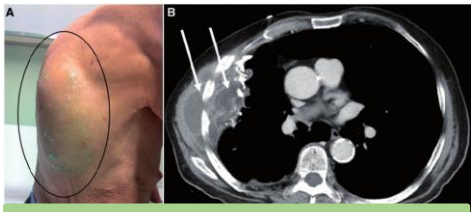
Paucibacillary



↑CD11a, CCR5, RANTES, IFN-Ɣ (Th1)

↓ IL-4 (Th2)

Complicated/TB empyema



Empyema necessitans

Release of cholesterol from degenerating cells

Pseudochylothorax

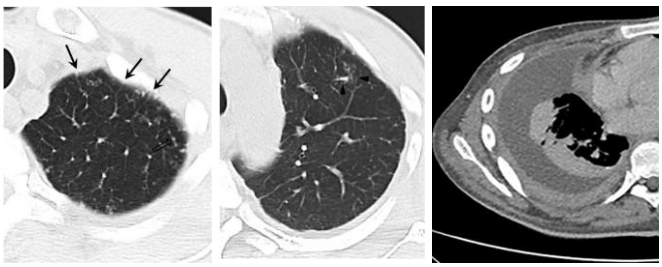
McNally E, Ross C, Gleeson LE. The tuberculous pleural effusion. Breathe (Sheff). 2023;19(4):230143.
Schluger NW, Rom WN. The host immune response to tuberculosis. Am J Respir Crit Care Med. 1998;157(3 Pt 1):679-691.

37

Clinical characteristic

Characteristics in KKU	
Onset of symptoms in weeks	3
Cough Fever Dyspnea Weight loss Pleuritic chest pain	65% 51% 43% 37% 24%
Prescence of DM	16%
Location - Right - Left - Bilateral	 49% 43% 8%
Size >3/4 of hemithorax	27%
Straw colour	67%
Exudative lymphocytic predominant	84%

CT characteristics (coexisting 47-85%)



Micronodules along subpleural, peribronchovascular, and subpleural thickening

Empyema: Pleural split sign

Ko JM, Park HJ, Kim CH. Chest. 2014;146(6):1604-1611.
Arunsurat I, Reechaipichitkul W, So-ngern A, Ratanawatkul P, Chumpangern W. Southeast Asian J Trop Med Public Health. 2021;52(1):77-85.

38

Diagnosis

Diagnostic tools	Diagnostic yield
Pleural fluid ADA >40 U/L	Sensitivity 92%, specificity 90%
Pleural fluid L:N >0.75 + ADA	Sensitivity 88%, specificity 95%
Pleural fluid GeneXpert	Sensitivity 50%, specificity 99%
Pleural fluid GeneXpert (Ultra)	Sensitivity 68%, specificity 97%
Pleural fluid culture	Sensitivity 7-75%, specificity 100%
Closed pleural biopsy (6 pieces)	Yield 60-80%
Thoracoscopy with biopsy	Yield 90%
Pleural fluid IGRA	Sensitivity 72%, specificity 78%
Pleural fluid IL-27	Sensitivity 93%, specificity 97% (vs. malignant)
Serum Mtb HspX ALISA	Sensitivity 93%, specificity 98% (vs. other pleural effusion)

McNally E, Ross C, Gleeson LE. The tuberculous pleural effusion. Breathe (Sheff). 2023;19(4):230143.

39

Management

- Airborne-precaution: coexisting pulmonary TB
- Anti-TB: as pulmonary TB (longer regimen in TB empyema/complicated)
- Drainage: Not routinely use (no clear benefit)
- Surgery: Not routinely use (↑risk of empyema necessitans, persistent air leak)
- Corticosteroids: Not routinely use (↓residual pleural thickening but ↑adverse events such as KS in HIV)
- Others: 75% residual pleural thickening (>2 mm), 26% paradoxical response (mean 76 days; risk factors: young man, no comorbid)

Ko JM, Park HJ, Kim CH. Chest. 2014;146(6):1604-1611.
McNally E, Ross C, Gleeson LE. The tuberculous pleural effusion. Breathe (Sheff). 2023;19(4):230143.
Arunsurat I, Reechaipichitkul W, So-ngern A, Ratanawatkul P, Chumpangern W. Southeast Asian J Trop Med Public Health. 2021;52(1):77-85.

40

Pleural drainage

Randomised controlled trial: Anti-TB alone vs. Anti-TB + Pigtail catheter

Table 1 Characteristics of the study population

	Drainage group (n=30)	No drainage group (n=31)
M/F	19/11	18/13
Mean (SD) age (years)	61.5 (17.7)	56.6 (22.4)
Median time from onset of symptoms to treatment days (IQR)	11 (9–30)	8 (7–14)
Patients with risk factors*	11 (36%)	7 (23%)
Pleuritis combined with pulmonary tuberculosis (%)	9 (30%)	11 (35%)
Initial amount of pleural effusion		
Small	2	2
Moderate	15	16
Large	13	13

IQR=interquartile range.
*Risk factors including oral steroid, diabetes mellitus, liver cirrhosis, subtotal gastrectomy and alcoholism.

Table 2 Outcome of pigtail drainage in patients with tuberculous pleurisy

	Drainage group (n=30)	No drainage group (n=31)	p value
Median (IQR) days of fever	0 (0–6)	0 (0–5)	0.769*
Median (IQR) days of dyspnoea	4 (4–5)	8 (7–16)	<0.001*
Pleural thickening >2 mm (%)	16 (53)	16 (51)	0.893†
Pleural thickening >10 mm (%)	8 (26)	8 (25)	0.939†
Median (IQR) FVC % predicted	85.5 (69–94)	88 (78–96)	0.568*

IQR=interquartile range; FVC=forced vital capacity.
*Mann-Whitney U test. †χ^2 test

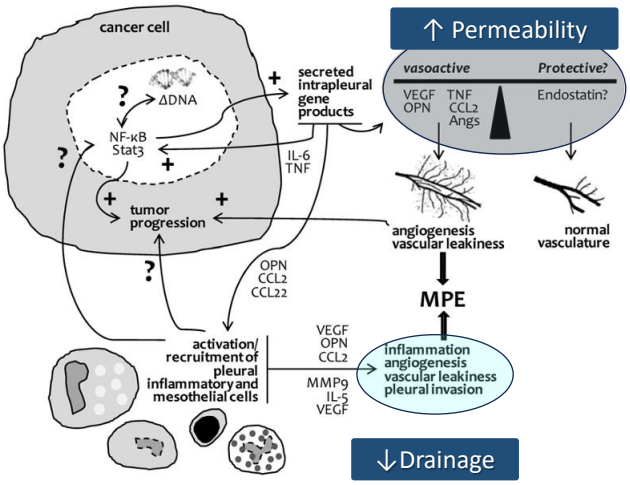
Pleural fluid drainage in TPE improved dyspnea
No benefit in lung function or pleural thickening

Ko ai YF, Chao TY, Wang YH, Lin AS. Pigtail drainage in the treatment of tuberculous pleural effusions: a randomised study. Thorax. 2003;58(2):149-151.

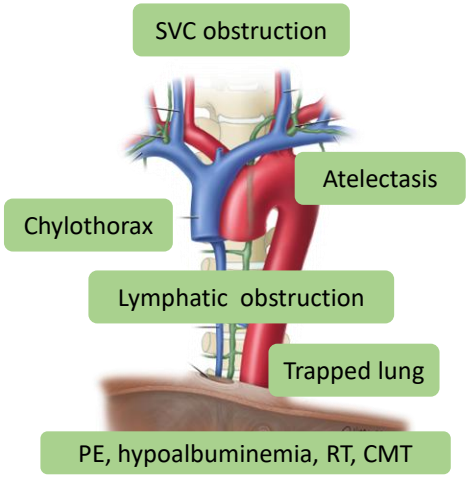
41

42

Malignant pleural effusion



"Malignant effusion"

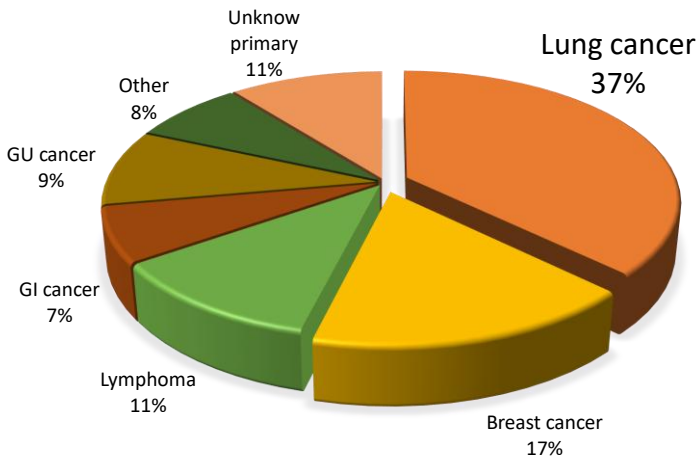


"Paramalignant effusion"

Am J Respir Crit Care Med. 2012;186(6):487-492.
Am J Respir Crit Care Med. 2000;162(5):1987-2001.

43

Etiology



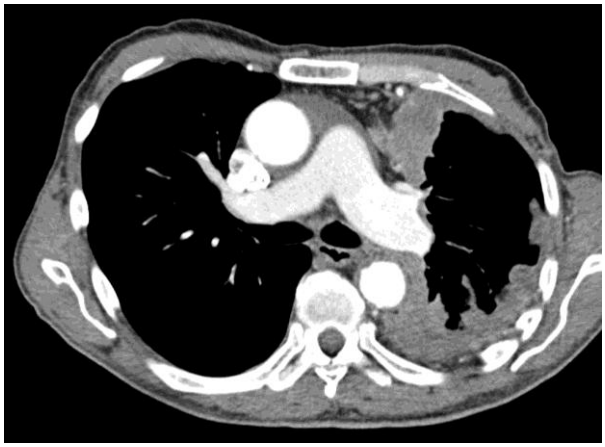
Cancer	Median survival (days)
Mesothelioma	339
Hematologic	218
Gynecologic	203
Breast	192
RCC	114
Adenocarcinoma of unknown primary	87
Lung	74
Gastrointestinal	61
Sarcoma	44
Melanoma	43
Genitourinary	33
Overall	136

Malignant pleura effusion is associated with poor prognosis

Thorax. 2014;69(12):1098-1104.
Dtsch Arztebl Int. 2019;116(21):377-386.

44

Radiology



- Suggestive MPE
  - Circumferential pleura thickening
  - Mediastinal pleural involvement
  - Pleural thickening >10 mm
  - Nodular pleural thickening

Presence of one of the findings has sensitivity 72%, specificity 83% for malignant pleural effusion

Leung AN, Müller NL, Miller RR. CT in differential diagnosis of diffuse pleural disease. *AJR Am J Roentgenol.* 1990;154(3):487-492.

45

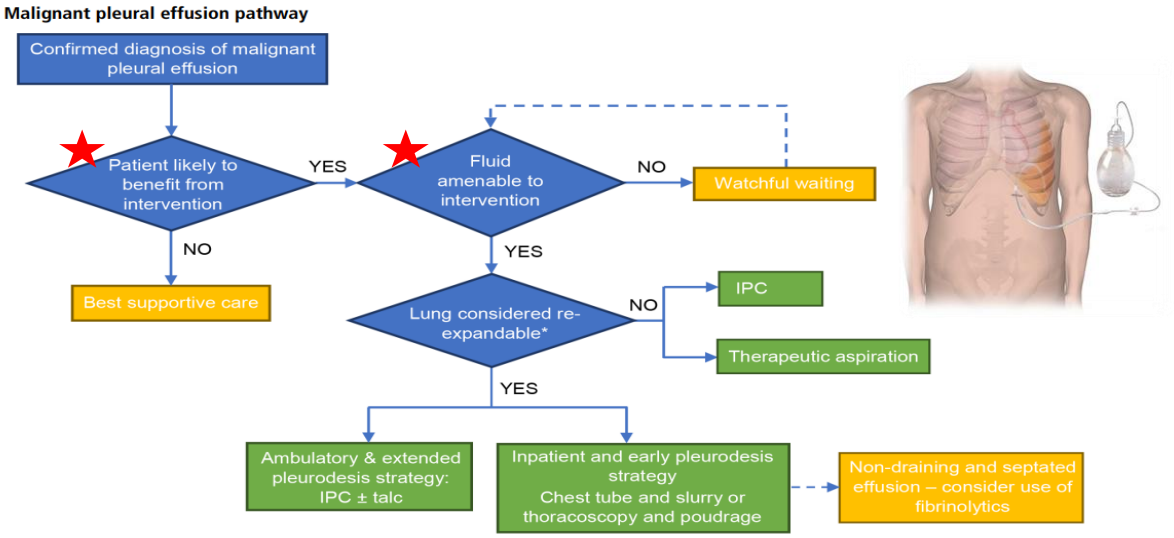
Diagnosis

Diagnostic tools	Comments
Exudative pleural effusion	95% (lymphocytic predominant)
1st Pleural fluid cytology	Diagnostic yield 62%; 25-50 mL
2nd Pleural fluid cytology ★	↑Yield 27%
Random closed pleural biopsy	↑Yield 7% over pleural fluid cytology
Imaged-guided closed pleural biopsy ★	Yield 77-84% Higher yield (88%) if pleural thickening >10 mm
Medical thoracoscopy	Yield 95%
Pleural fluid flow cytometry	Yield 97.5% in DLBCL

McNally E, Ross C, Gleeson LE. The tuberculous pleural effusion. Breathe (Sheff). 2023;19(4):230143.

46

Management: BTS guideline 2023



British Thoracic Society Guideline for pleural disease. Thorax. 2023 Nov;78(11):1143-1156.

47

Intervention in MPE

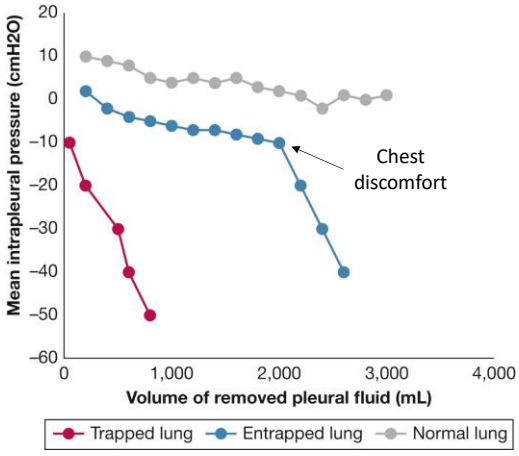
- Therapeutic thoracentesis
- Fluid drainage:
  - Volume <1500 mL
  - Manometry-guided
- Determines
  - Symptomatic response
  - Ability of the lung to re-expand
  - Rate of re-accumulation

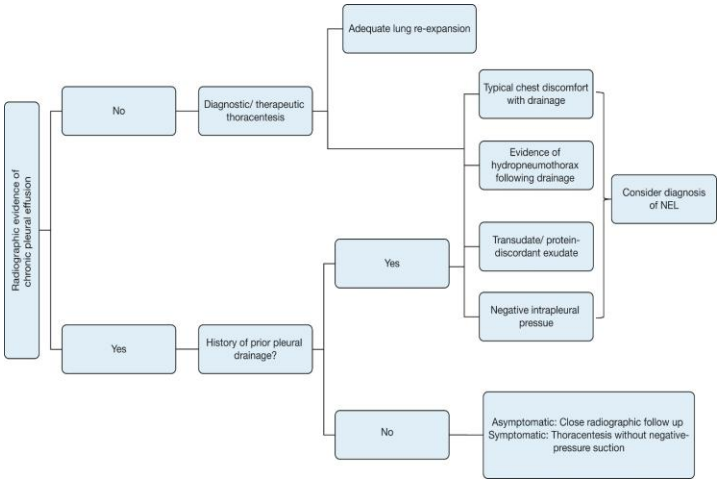
- Factors to consider
  - Functional status
  - Symptoms of MPE
  - Re-expandable lung
  - Rate of fluid re-accumulation
  - Respond to cancer treatment
  - Disease prognosis
  - Healthcare resources
  - Patient preferences

British Thoracic Society Guideline for pleural disease. Thorax. 2023 Nov;78(11):1143-1156.

48

Expandable or non-expandable





Gillett D, Mitchell MA, Dhaliwal I. Avoid the Trap: Nonexpanding Lung. Chest. 2021 Sep;160(3):1131-1136..

49

Expandable lung

- Chest tube
  - Small bore catheter
  - Pleurodesis
    - Pleural approximation >75%
    - Talc slurry = poudrage
- Indwelling pleural catheter
  - Shorter hospital stay (↓3 days)
  - Pleurodesis
    - Talc slurry: higher pleurodesis rate at 5 weeks (43 vs. 23%)

British Thoracic Society Guideline for pleural disease. Thorax. 2023 Nov;78(11):1143-1156.

50

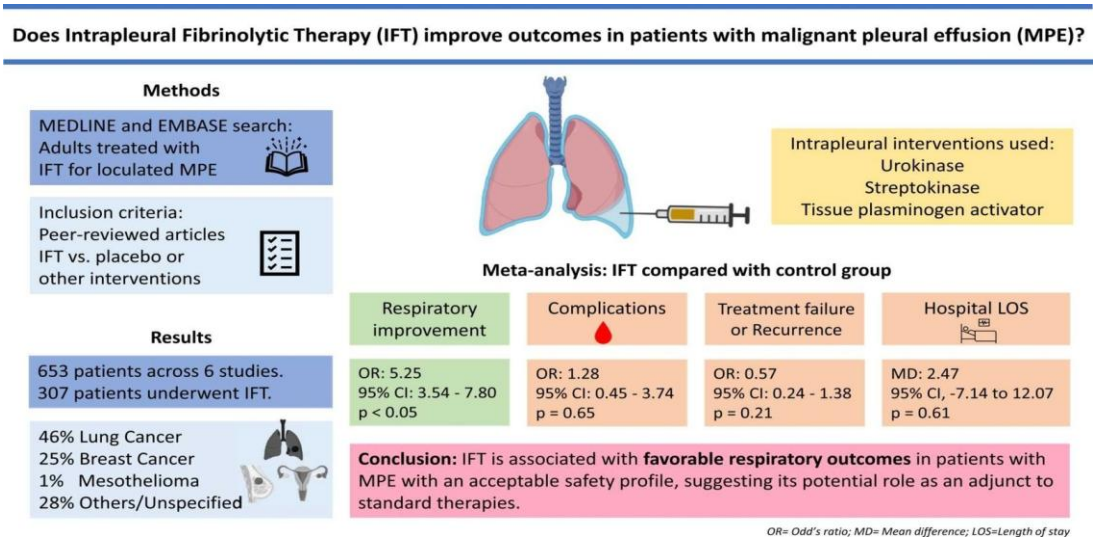
Non-expandable lungs

- Indwelling pleural catheter in non-expandable lung
- Daily drainage vs. symptom-driven
  - Higher autopleurodesis (37 vs. 12% at 60 days)
  - Better symptom control
  - Cost?

British Thoracic Society Guideline for pleural disease. Thorax. 2023 Nov;78(11):1143-1156.

51

Loculated MPE



Intrapleural fibrinolytic therapy for loculated malignant pleural effusion: A systematic review and meta-analysis. Crit Rev Oncol Hematol. 2025 Jul;211:104749.

52

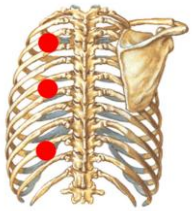
ICD removal after pleurodesis

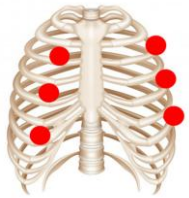
Volume-guided

BTS2023: <200-250 mL in 24 hours

Ultrasound-guided

Score >20: Shorter LOS, ↔ success rate





Lung sliding = 1 point
No lung sliding = 3 points

Psallidas I, Hassan M, Yousuf A, et al. Role of thoracic ultrasonography in pleurodesis pathways for malignant pleural effusions (SIMPLE): an open-label, randomised controlled trial. *Lancet Respir Med*. 2022;10(2):139-148.

53

Summary

- Pneumothorax
  - ERS 2024 updates favor conservative management for small PSP.
  - Ambulatory treatment gaining traction.
  - Minimally invasive pleurodesis and VATS for recurrence prevention.
- Empyema thoracis
  - Early vs. delayed intervention: Timing of fibrinolytic and surgical referral
  - Role of medical thoracoscopy in inoperable patients
- Malignant pleural effusion
  - Daily IPC drainage in non-expandable lung is associated with higher autopleurodesis in non-expandable lung

54

55