



Pleural Effusion

Transudate or exudate · Light's criteria, then decide whether it needs a drain

pH < 7.2 = DRAIN
in parapneumonic effusion

TAP IT *ultrasound-guided, and send the right bottles*

WHO NEEDS A TAP

Any new effusion of uncertain cause. You can reasonably defer in **clear-cut bilateral effusions with obvious heart failure** that respond to diuresis — but tap it if it is unilateral, febrile, painful, large, or fails to improve.

DO IT SAFELY

Ultrasound guidance is standard and substantially reduces pneumothorax and organ injury. Mark and puncture in real time rather than using a remote "X marks the spot". Correct significant coagulopathy where practical, though a diagnostic tap is low risk.

SEND EVERY TIME

Protein, LDH, pH (in a blood gas syringe, on ice), **glucose, cell count and differential, Gram stain and culture** including blood culture bottles, and **cytology**. Send paired **serum protein and LDH** at the same time, or Light's criteria cannot be applied.

CLASSIFY IT *Light's criteria — and the one situation where they mislead*

Criterion	Exudate if ANY one is met
Protein ratio	Pleural fluid protein / serum protein > 0.5
LDH ratio	Pleural fluid LDH / serum LDH > 0.6
Absolute LDH	Pleural fluid LDH > two-thirds of the upper limit of normal serum LDH
The diuretic trap	Light's criteria misclassify a proportion of transudates as exudates in heart failure patients who have been diuresed , because diuresis concentrates protein and LDH in the fluid. If the clinical picture is clearly heart failure, calculate the serum-to-pleural albumin gradient — a gradient > 1.2 g/dL indicates a transudate regardless of what Light's says.

WORK OUT THE CAUSE *the fluid tells you more than the chest film*

TRANSUDATE

Heart failure (commonest overall, usually bilateral) · **cirrhosis** with hepatic hydrothorax · **nephrotic syndrome** · peritoneal dialysis · constrictive pericarditis · severe hypoalbuminemia. **Treat the underlying disease** — these rarely need a drain.

EXUDATE

Parapneumonic effusion and empyema · **malignancy** · **pulmonary embolism** (which can be either, and is the classic missed cause) · tuberculosis · pancreatitis · **rheumatoid arthritis and lupus** · chylothorax · esophageal rupture · drug-induced.

THE DISCRIMINATING NUMBERS

Very low glucose — empyema, **rheumatoid** (often strikingly low), TB, malignancy, lupus. **Lymphocyte predominance** — TB, malignancy, chronic disease. **Neutrophil predominance** — acute parapneumonic, PE, pancreatitis. **Raised amylase** — pancreatitis or esophageal rupture. **Triglycerides > 110 mg/dL** — chylothorax.

PARAPNEUMONIC EFFUSION *the decision that must be made the same day*

Stage	Findings and action
Simple (uncomplicated)	Free-flowing, pH ≥ 7.2 , glucose normal, sterile. Antibiotics alone , with close observation and repeat imaging.
Complicated	pH < 7.2 , glucose < 60 mg/dL , LDH markedly raised, or positive Gram stain or culture. Needs chest tube drainage plus antibiotics — antibiotics alone will fail.
Empyema	Frank pus . Drain immediately; no need to wait for biochemistry. Prolonged antibiotic course.
Loculated / failing to drain	Intrapleural fibrinolytics (tPA plus DNase) improve drainage and reduce surgical referral. Persistent sepsis or a trapped lung needs surgical referral for VATS decortication . Do not let a septic patient sit for days with an undrained collection .

MALIGNANT PLEURAL EFFUSION *diagnosis is only half of it — the other half is symptom control*

Issue	Detail
Getting the diagnosis	Cytology is positive in only around 60% on a first sample, and yield varies sharply by tumor type — good in adenocarcinoma, poor in mesothelioma and lymphoma. Send a large volume , repeat once if negative, and proceed to local anesthetic thoracoscopy or image-guided pleural biopsy if suspicion persists.
Assess for trapped lung	After therapeutic drainage, check whether the lung re-expands . A trapped lung that will not expand cannot be pleurodesed successfully — the pleural surfaces never appose. This single assessment determines which definitive option is possible.
Definitive options	Talc pleurodesis where the lung re-expands, or an indwelling pleural catheter for trapped lung, recurrence after pleurodesis, or where the patient prefers avoiding admission. Both are reasonable first choices — the decision turns on lung re-expansion, prognosis and patient preference.
Do not just keep tapping	Repeated therapeutic thoracenteses cause protein loss, infection risk, loculation and repeated hospital visits in patients with limited time. Move to a definitive strategy early, and involve palliative care for breathlessness.

TWO EFFUSIONS THAT NEED A DIFFERENT PATHWAY *easy to mislabel*

TUBERCULOUS EFFUSION

Lymphocyte-predominant exudate with a very low glucose and few mesothelial cells. **Fluid AFB smear and culture have poor yield** — **adenosine deaminase** is a useful adjunct where TB is prevalent, and **pleural biopsy** substantially raises the diagnostic rate. Do not exclude TB on a negative fluid smear.

CHYLOTHORAX

Milky fluid with triglycerides above about 110 mg/dL, or chylomicrons present. Caused by **thoracic duct injury** after surgery or trauma, or by **lymphoma**. Management includes a **low-fat or medium-chain triglyceride diet**, treating the cause, and duct embolization or ligation if it persists. **Repeated large-volume drainage causes severe nutritional and immune depletion**.

PEARLS & PITFALLS

- **Send paired serum protein and LDH.** Without them Light's criteria cannot be calculated and the tap is half wasted.
- **pH must go in a blood gas syringe**, on ice, and not through the air — a delayed or exposed sample gives a falsely high value and can wrongly avert a needed drain.
- **A diuresed heart failure patient can look exudative.** Use the albumin gradient before launching a malignancy workup.
- **Cytology on a single sample misses many malignant effusions.** Send a good volume, repeat it, and consider thoracoscopy if suspicion persists.
- **Pulmonary embolism causes effusions** and is regularly missed because the fluid looks non-specific. Ask whether the story fits.
- **Drain large effusions gradually** — removing very large volumes in one sitting risks re-expansion pulmonary edema.

