

Pneumothorax and Tension Pneumothorax

If the pneumothorax is small, watch and wait. If it is large, put in a chest tube to let the air out. If it is a tension pneumothorax, decompress it right now—do not wait for an X-ray—or the patient will die.

THE ONE-LINE TRUTH

A pneumothorax is air inside the chest that does not belong there, and it squeezes the lung so the lung cannot fill with air the way it should.

The chain — how it unfolds

1. Air leaks into the pleural space — why: A bleb bursts, a rib fractures and punctures the lung, a procedure nicks the pleura, or diseased lung tissue tears—any of these breaks the airtight seal and lets air into the space between lung and chest wall.
2. Negative pressure is lost and the lung starts to collapse — why: The pleural space normally has negative pressure (like a vacuum) that holds the lung open. Once air enters, pressure equalizes and the lung's natural elasticity makes it recoil inward, like a deflating balloon.
3. You feel sudden, sharp chest pain and shortness of breath — why: The pleura has pain nerves; tearing or stretching it hurts. The collapsed lung cannot take in air, so less oxygen reaches your blood and carbon dioxide builds up—your brainstem senses this and screams for more air.
4. Breath sounds become quiet or absent on the affected side — why: A stethoscope picks up the sound of air moving in and out of the lung. When the lung is collapsed, no air is moving through it, so you hear nothing—or much less than the other side.
5. In tension pneumothorax, air keeps entering but cannot escape — why: The tear in the lung acts like a one-way flap valve: it opens when pressure inside the lung is high (during exhalation or a ventilator breath) and lets air out into the pleural space, but it seals shut when pleural pressure tries to push air back—so air is trapped and pressure builds with every breath.

6. Pressure in the pleural space rises above atmospheric pressure — why: Normally the pleural space is below atmospheric pressure. With a one-way valve, each breath pumps in more air. The space fills like a balloon being blown up inside the chest, and pressure climbs higher and higher.
7. The mediastinum (heart, aorta, vena cava, trachea) is shoved to the opposite side — why: The high-pressure air acts like a growing mass, physically pushing everything in the middle of the chest toward the other side. You can see the trachea shift away from the pneumothorax on exam, and the heart and great vessels are pushed over on imaging.
8. The superior and inferior vena cava get kinked — why: These are the large veins that bring blood back to the right side of the heart. When the mediastinum is shoved sideways, the veins are stretched and compressed—like kinking a garden hose—so blood cannot flow through them easily.

Spot it — what you see, and why

- Sudden sharp chest pain on one side: Air escapes into the space between the lung and chest wall (the pleural space), irritating the pleura (the thin membrane wrapping the lung), which has pain nerves. The sudden stretch and pressure cause a stabbing feeling.
- Shortness of breath: The leaked air takes up room in the chest and squeezes the lung so it cannot fill all the way. Less lung surface means less oxygen gets into the blood, so you feel hungry for air.
- Fast breathing: The body senses low oxygen and tries to fix it by breathing faster and harder, pulling in more air to make up for the collapsed part of the lung.
- Decreased or absent breath sounds on one side (heard with a stethoscope): Air is not moving in and out of the collapsed lung, so the doctor hears silence or very faint sounds when listening to that side of the chest.
- Fast heart rate: Low oxygen triggers the sympathetic nervous system (the body's alarm mode), which tells the heart to pump faster to push more blood and deliver whatever oxygen is left to the organs.
- One side of the chest does not move as much when breathing: The collapsed lung cannot expand, so that side of the rib cage stays still or moves less than the healthy side during each breath.

Red flags — act now

- Very low blood pressure or shock (systolic below 90 mmHg)
- Bulging neck veins with respiratory distress
- Trachea visibly or palpably shifted away from the affected side

- Severe trouble breathing or unable to speak in full sentences
- Confusion, dizziness, or fainting

Treat it — in this order

1. Immediate needle decompression (14- or 16-gauge needle at the 2nd intercostal space, midclavicular line) for tension pneumothorax → Puncturing the chest wall with a needle releases the trapped air under pressure. This instantly stops the one-way valve effect and restores blood flow back to the heart. Blood pressure comes back up and the heart can fill again.
2. Chest tube (tube thoracostomy) or small-bore pigtail catheter for large pneumothorax (>2 cm) or any symptomatic pneumothorax → A tube drains trapped air continuously and restores the normal negative pressure in the pleural space. Once pressure is restored, the lung re-expands against the chest wall. The pleura can then seal the leak on its own. The tube stays in until the lung stays up and no more air leaks out (usually 24–48 hours of no bubbling in the water seal).
3. Observation and supplemental oxygen (or room air) for small (<2 cm), stable, primary spontaneous pneumothorax → Giving 100% oxygen speeds up resorption of trapped air. Normally air in the pleural space is absorbed at about 1.25% of the volume per day. High-flow oxygen replaces nitrogen in the air pocket with oxygen, which dissolves into the blood much faster—up to four times as fast. Small leaks seal on their own if you give the body time and oxygen.
4. Video-assisted thoracoscopic surgery (VATS) with pleurodesis (scarring the pleura) or bleb resection (cutting out the weak air sac) → Surgery finds and removes the bleb that burst. Pleurodesis scars the visceral pleura (lung lining) to the parietal pleura (chest wall lining) so the two surfaces stick together permanently. This prevents future air from collecting in the pleural space at that spot. It is recommended after a second pneumothorax on the same side, or after the first one if the person has a high-risk job (pilot, diver) or lives far from a hospital.
5. Smoking cessation and activity restriction (no flying, no scuba diving, no heavy lifting) until healed → Stopping smoking restores the elasticity of lung tissue and reduces inflammation that weakens alveoli (air sacs). Over time it lowers the risk of new blebs forming. Avoiding pressure changes (flying, diving) and heavy lifting prevents stress on the healing pleura while it seals.

Your top priorities at the bedside

1. Check for tension pneumothorax signs every 15 minutes: blood pressure dropping, heart rate above 120, oxygen saturation falling, neck veins bulging, and if the windpipe (trachea) looks shifted to one side when you look at the neck. — why: Tension pneumothorax kills in minutes because trapped air squeezes the heart so blood cannot fill it. The heart rate goes up trying to compensate but blood pressure crashes. Tracheal deviation (windpipe pushed sideways) is a late sign meaning the mediastinum (middle chest) is crushed.
2. Place patient sitting upright at 45 to 90 degrees and keep the affected side (collapsed lung side) up if they lie down. — why: Upright position uses gravity to pull the diaphragm (breathing muscle) down so the lung has more room to expand. The affected side up prevents the good lung from being compressed by body weight.
3. Give high-flow oxygen by non-rebreather mask at 10 to 15 liters per minute if oxygen saturation is below 94 percent or patient has underlying lung disease. — why: High-flow oxygen washes nitrogen out of the blood and replaces it in the pleural space (area between lung and chest wall). This creates a bigger concentration difference so the trapped air absorbs into blood four times faster.