

Pheochromocytoma

Pheochromocytoma is a tumor that makes adrenaline-type chemicals. How well you block those chemicals before surgery decides if the patient lives.

THE ONE-LINE TRUTH

A tumor of chromaffin cells (usually in the adrenal gland) dumps bursts of adrenaline and noradrenaline into the blood.

The chain — how it unfolds

1. Chromaffin tumor cells dump norepinephrine (and sometimes epinephrine) into the bloodstream in uncontrolled surges. — why: The tumor has lost normal feedback control, so it releases catecholamines randomly or in response to physical triggers like abdominal pressure, bending, or urination.
2. Norepinephrine binds to alpha-1 receptors on blood vessel walls, squeezing them tight (vasoconstriction). — why: The squeeze raises resistance in the arteries, shooting blood pressure up—sometimes to 200, 250, even 300 mmHg systolic—in seconds.
3. Epinephrine (if the tumor makes it) binds to beta-1 receptors in the heart, making it beat faster and harder. — why: The heart pounds (palpitations) and races (tachycardia, often 120–160 bpm), pumping more blood into the already-squeezed vessels, driving pressure even higher.
4. The patient feels sudden severe headache (pounding, throbbing), profuse sweating (soaking clothes), tremor, chest pain or pressure, and intense anxiety or sense of doom. — why: High pressure stretches pain receptors in blood vessel walls (headache). Catecholamines activate sweat glands all over the body (diaphoresis). Beta stimulation causes muscle tremor. The brain's amygdala senses the body's alarm state and generates fear, even though there is no real danger.
5. Over weeks to months, chronic catecholamine exposure downregulates alpha and beta receptors and shrinks blood volume. — why: The body tries to protect itself from constant overstimulation by reducing the number and sensitivity of receptors. Blood vessels leak fluid into tissues, lowering total blood volume.

6. The patient develops orthostatic low blood pressure (hypotension) (pressure drops ≥ 20 mmHg when standing, causing dizziness or near-fainting). — why: When the patient stands, gravity pulls blood to the legs. Normally, vessels squeeze to push it back up. But downregulated receptors and low blood volume mean the vessels cannot squeeze well, so brain blood flow drops and the patient feels faint.
7. Blood pressure becomes resistant to standard medicines; only alpha-blockers (phenoxybenzamine, doxazosin) and sometimes calcium blockers work. — why: The tumor keeps flooding receptors with catecholamines, overpowering ACE inhibitors, ARBs, and diuretics. Alpha-blockers compete directly at the receptor and win.
8. If the patient goes to surgery without alpha-blockade first, anesthesia or tumor manipulation triggers a catecholamine storm, spiking pressure to stroke or heart-attack levels and causing lethal arrhythmias. — why: The tumor releases a massive bolus of catecholamines all at once. Without alpha-blockers on board to buffer the surge, blood vessels squeeze violently, and the heart's electrical system can spiral into ventricular a fast heart rate (tachycardia) or fibrillation.

Spot it — what you see, and why

- Sudden episodes of pounding headache: The tumor dumps huge bursts of adrenaline and noradrenaline (chemicals that rev up the heart and squeeze blood vessels) into the blood, spiking blood pressure so hard and fast that the vessels in the head throb and ache.
- Heavy sweating that comes in waves: The flood of adrenaline and noradrenaline triggers the sweat glands all over the body as part of the fight-or-flight alarm, even though there is no real danger.
- Fast, pounding heartbeat (palpitations): Adrenaline and noradrenaline make the heart beat harder and faster, like flooring the gas pedal on a car, so you feel every thump in your chest.
- Sudden spikes in blood pressure (hypertensive crisis): The tumor releases huge doses of adrenaline and noradrenaline in bursts, clamping down blood vessels so tightly that pressure can shoot sky-high in seconds.
- Pale skin during an attack: Adrenaline and noradrenaline squeeze the small blood vessels in the skin shut, shunting blood away from the surface and toward the heart and muscles, making the skin look white or gray.
- Shaking or tremor: High levels of adrenaline overstimulate the muscles, causing the fine shake you see when someone is very scared or jittery.

Red flags — act now

- Blood pressure spiking suddenly to dangerously high levels (hypertensive crisis), which can cause stroke or heart attack
- Chest pain or trouble breathing during an attack, suggesting the heart is being overworked
- Severe headache with confusion, vision changes, or weakness, which can mean bleeding in the brain from very high pressure
- Episodes triggered by pressing on the belly, surgery, or certain medicines (beta blockers alone), which can provoke a life-threatening surge

Treat it — in this order

1. Alpha-blocker (phenoxybenzamine 10 mg twice daily, increased every 2-3 days to 20-40 mg twice daily, or doxazosin 2-8 mg daily) started at least 7-14 days before surgery → Blocks adrenaline and noradrenaline from squeezing blood vessels. Blood pressure stops spiking into dangerous ranges, and the heart does not have to fight against tight pipes. This prevents a with high blood pressure (hypertensive) crisis when the surgeon touches the tumor.
2. Beta-blocker (propranolol 10-40 mg three times daily or metoprolol 25-100 mg twice daily) started only AFTER alpha-blockade is working well → Slows the heart rate and makes each beat gentler, so the heart does not burn out from racing all day. Giving beta-blockers first would leave vessels squeezed with no outlet, causing a stroke or heart attack, so alpha MUST come first.
3. Surgical removal of the tumor (laparoscopic adrenalectomy for small single tumors under 6 cm; open surgery for larger, bilateral, or malignant tumors) → Cuts out the cells that are leaking adrenaline and noradrenaline. Once the tumor is gone, chemical surges stop, blood pressure normalizes, sweating and headaches disappear, and the patient is cured if the tumor was benign.
4. Generous IV normal saline (1-2 liters before surgery and continued after tumor removal) to expand blood volume → Refills the blood volume that was squeezed down by months of high chemical levels. This prevents a dangerous blood pressure crash when the tumor is removed and the squeezing suddenly stops.
5. Calcium channel blocker (nifedipine extended-release 30-90 mg daily or amlodipine 5-10 mg daily) added if blood pressure stays high despite alpha- and beta-blockade → Relaxes blood vessel muscle through a different chemical door (blocks calcium entry into vessel walls). Brings down stubborn high pressure when adrenaline blockade alone is not enough.

Your top priorities at the bedside

1. Monitor blood pressure every 15 to 30 minutes during with high blood pressure (hypertensive) episodes and notify the provider immediately if systolic pressure goes above 180 or diastolic above 120. — why: Catecholamine surges cause sudden, severe vasoconstriction (blood vessel narrowing) that can push systolic pressure over 200 mmHg. This level of high blood pressure (hypertension) can cause stroke (brain bleed), heart attack (myocardial infarction) (heart attack), or aortic dissection (tear in the main artery). Early detection and rapid treatment with IV phentolamine (an alpha-blocker) or nitroprusside can prevent organ damage.
2. Verify that the patient is on alpha-blocker medication like phenoxybenzamine or doxazosin for at least 7 to 14 days before any surgery is scheduled, and confirm beta-blockers were started only after alpha-blockade. — why: Alpha-blockade must happen first to prevent unopposed alpha-receptor stimulation. If you give a beta-blocker first, it blocks the beta-2 receptors (which cause blood vessel relaxation), leaving only alpha receptors active. This causes extreme vasoconstriction and with high blood pressure (hypertensive) crisis. Adequate preoperative alpha-blockade prevents intraoperative (during surgery) blood pressure swings that can be fatal.
3. Keep the patient in a calm, quiet environment and avoid sudden position changes, abdominal examining by touch (palpation), or any procedure that puts pressure on the abdomen. — why: Physical pressure or manipulation of the tumor causes mechanical catecholamine release, triggering a with high blood pressure (hypertensive) spell. The adrenal glands sit on top of the kidneys in the back of the abdomen, so even deep examining by touch (palpation) (pressing) during an exam can squeeze the tumor. Sudden position changes can also shift abdominal organs and compress the mass. Keeping the environment calm reduces endogenous (internal) catecholamine surges from stress.