

Aortic Regurgitation

A plain-English guide for you and your family

WHAT IS HAPPENING

Normally, the aortic valve acts like a one-way door between your heart's left ventricle (the main pumping chamber) and the aorta (the giant artery that carries oxygen-rich blood to your whole body). When the ventricle squeezes, the door opens and blood rushes out to feed your body. When the ventricle relaxes to refill, the door slams shut so blood cannot leak backward and the pressure in the aorta stays high enough to feed the heart muscle's own arteries. In aortic regurgitation, that door does not close all the way anymore. The leak can start in two ways: either the valve leaflets (the three thin flaps that make up the door) are damaged by rheumatic heart disease (scarring from untreated strep throat years ago), a bacterial infection on the valve (endocarditis), being born with only two leaflets instead of three (bicuspid aortic valve), or wear and tear from aging, or the aortic root (the ring the valve sits in) stretches or tears from conditions like Marfan syndrome (a genetic weakness in connective tissue), aortic dissection (a tear in the aorta's inner wall), uncontrolled high blood pressure, or late-stage syphilis. Once the seal breaks, blood flows backward into the left ventricle every time the heart relaxes. If the leak happens suddenly—say from a bad infection or a tear—the ventricle cannot stretch fast enough to handle the extra blood, so pressure inside climbs, fluid backs up into the lungs (pulmonary swelling (edema)), and the heart cannot pump enough blood forward, causing cardiogenic shock (shock from pump failure). If the leak grows slowly over months or years, the ventricle stretches to hold all the extra blood, which makes your pulse feel very strong and bounding and your blood pressure shows a huge gap between the top and bottom numbers. Eventually, the overstretched muscle gets tired and weak, and heart failure sets in. Every sign you see—the wide pulse pressure, the bounding pulse, the breathlessness—is the body trying to cope with the leak and keep blood flowing to your organs. The only cure is fixing or replacing the valve before the pump stretches too far to recover.

What you might feel

- Shortness of breath during activity, getting worse until it happens even at rest in severe cases
- Shortness of breath when lying flat, or waking up at night gasping for air

- Feeling your heart pound or thump in your chest, especially when lying on your left side
- Chest pain or pressure during exercise (angina)
- High-pitched blowing sound heard through a stethoscope during diastole, loudest along the left side of the breastbone
- Very wide gap between the top and bottom blood-pressure numbers, and a pulse that feels like a quick hammer strike then disappears (bounding or water-hammer pulse)
- Very soft or missing first heart sound (S1) when aortic regurgitation happens suddenly and severely
- Low blood pressure, fast heart rate, and crackling sounds (rales) in the lungs when aortic regurgitation happens suddenly and severely

Call the doctor right away if...

- Sudden severe shortness of breath with low blood pressure and fast heart rate—this means the heart can no longer keep up with a large sudden leak, a surgical emergency requiring immediate valve replacement
- New or changing heart murmur with fever and bacteria growing in blood cultures—this suggests infection on the valve (infective endocarditis) that is destroying the leaflets and needs urgent antibiotics and often surgery
- Sudden loss of consciousness (syncope) or chest pain at rest—this means the heart is not pumping enough blood forward to supply the brain or its own muscle, signaling imminent heart failure
- Pumping strength (ejection fraction) dropping below 50 percent or the left ventricle stretching wider than 50 millimeters at the end of contraction on an ultrasound—these are guideline thresholds that tell doctors the heart is starting to fail permanently and surgery should happen now even if you feel okay
- Sudden tearing chest or back pain with a widened shadow in the center of the chest on X-ray—this suggests the aorta is tearing apart (aortic dissection), which is immediately life-threatening and requires emergency imaging and surgery

What the care team will do

- Monitor oxygen saturation continuously and apply supplemental oxygen to keep saturation above 92 percent, positioning the patient upright at 45 to 90 degrees.
- Establish large-bore intravenous access immediately and prepare for urgent transfer to the cardiac catheterization lab or operating room if acute severe aortic regurgitation is suspected.

- Monitor blood pressure, heart rate, and rhythm every 15 minutes in acute cases, watching for low blood pressure (hypotension) (systolic blood pressure below 90), a fast heart rate (tachycardia) (heart rate above 100), or new arrhythmias (irregular heartbeats).
- Prepare and administer intravenous vasodilators like sodium nitroprusside or nitroglycerin as ordered, monitoring blood pressure closely and titrating to maintain systolic pressure between 100 and 110.
- Assess lung sounds every 2 to 4 hours, listening for crackles (rales) starting at the bases and moving upward, and monitor daily weights and intake and output strictly.
- Avoid administering beta-blockers (metoprolol, carvedilol, atenolol), calcium channel blockers (diltiazem, verapamil), or digoxin without clarifying the order with the provider in acute aortic regurgitation.
- Draw blood cultures before any antibiotics if fever or infection is suspected, then start broad-spectrum intravenous antibiotics as ordered without delay.
- Educate the patient to report any new chest pain, worsening shortness of breath, dizziness, or feeling faint immediately, and keep the call bell within reach at all times.

Medicines you may be given — and why

Nitroprusside

Nitroprusside relaxes the muscle layer in the walls of arteries (the tubes that carry blood away from the heart). When arteries relax, they open wider, so it's easier for the left ventricle (main pumping chamber) to push blood forward into the body instead of having it leak backward through the broken valve. Think of it like opening a second door in a crowded room—people flow out more easily. This drug works only in acute severe aortic regurgitation (AR) as a short-term bridge to emergency surgery; it does NOT fix the valve itself.

Dobutamine

Dobutamine makes the heart muscle squeeze harder and faster, so each beat pumps more blood forward. In acute severe AR, the left ventricle is suddenly flooded with extra blood leaking backward from the aorta, and the muscle cannot keep up—this causes cardiogenic shock (the pump fails and blood pressure drops). Dobutamine whips the tired muscle into working harder, like giving a flagging cyclist a burst of energy. It is a short-term emergency measure to keep blood pressure up until surgery fixes the valve.

ACE inhibitor (examples: enalapril, lisinopril, ramipril)

ACE inhibitors block an enzyme (a protein that speeds up chemical reactions) that makes angiotensin II, a powerful molecule that squeezes arteries tight and tells the kidneys to hold onto salt and water. By stopping angiotensin II, the drug relaxes arteries (lowers afterload, the

resistance the heart pumps against) and reduces the extra fluid volume that overloads the heart. In chronic aortic regurgitation, this slows the process by which the left ventricle stretches and weakens (remodeling). Think of it like lowering the weight a tired weightlifter has to lift—over months to years, the heart stays stronger longer.

ARB (angiotensin receptor blocker; examples: losartan, valsartan, candesartan)

ARBs block the receptor (docking site) where angiotensin II would normally land on artery and kidney cells. Even though angiotensin II is still floating in the blood, it cannot squeeze arteries or tell kidneys to hold onto salt and water because the receptor is locked shut. The net effect is the same as an ACE inhibitor—lower resistance, less volume overload, and slower stretching of the left ventricle in chronic AR. ARBs are used when a patient cannot tolerate an ACE inhibitor (usually because of cough).

Diuretics (loop diuretic example: furosemide; thiazide example: hydrochlorothiazide)

Diuretics make your kidneys dump extra salt and water into the urine, shrinking the total volume of blood in your circulation. In chronic AR with volume overload (the left ventricle is stretched by too much blood sloshing backward), lowering volume reduces the preload (how much the chamber fills before it squeezes). Think of it like letting air out of an over-inflated balloon—the walls are less stretched and under less strain. Loop diuretics (like furosemide) are stronger and used when fluid backs up into the lungs (pulmonary swelling (edema)); thiazides are milder and used for mild volume overload or high blood pressure.

Pathogen-directed antibiotics (for infective endocarditis; examples: nafcillin or cefazolin for *Staphylococcus aureus*; penicillin G or ceftriaxone for *Streptococcus viridans*; vancomycin for MRSA; ampicillin + gentamicin for *Enterococcus*)

Infective endocarditis is an infection on the valve, usually caused by bacteria in the bloodstream that stick to damaged valve tissue and form a clump (vegetation) of germs, clotted blood, and inflammatory cells. These vegetations destroy the valve leaflets, causing regurgitation. The antibiotic kills the bacteria by breaking their cell walls (beta-lactams like penicillin, cephalosporins) or blocking their protein-making machinery (aminoglycosides like gentamicin) or punching holes in their membranes (vancomycin). You must pick the right antibiotic based on which bug is growing in blood cultures. Treatment lasts 4–6 weeks intravenously (through a vein) because vegetations are hard for the immune system to reach.

Benzathine penicillin G (for rheumatic heart disease secondary prevention (prophylaxis))

Rheumatic heart disease is caused by the immune system attacking the heart valves weeks after a strep throat infection (group A Streptococcus). The attack scars and deforms the valves, leading to regurgitation or narrowing (stenosis) (narrowing). Once someone has had rheumatic fever, they are at high risk for another strep infection triggering another immune attack and more valve damage. Benzathine penicillin G is a slow-release shot given once every 3–4 weeks that keeps a low, steady level of penicillin in the blood, killing any strep bacteria before they cause throat infection. This prevents recurrence, not the valve damage that already happened.

Where this information comes from

- AHA/ACC 2020 Guideline for the Management of Patients With Valvular Heart Disease
- ESC/EACTS 2021 Guidelines for the Management of Valvular Heart Disease
- American Heart Association
- Cochrane Database of Systematic Reviews

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