

Bradycardia

A plain-English guide for you and your family

WHAT IS HAPPENING

Your heart beats because of electricity. At the top of your heart sits a tiny cluster of cells called the SA node (the heart's natural pacemaker). It fires an electrical spark about 60 to 100 times every minute. That spark travels down through a relay station called the AV node, then races along wires to squeeze the bottom pumping chambers (the ventricles) so blood shoots out to your body. When everything works, you never notice it. A slow heart rate (Bradycardia) means the heart is beating slower than 60 times per minute. Sometimes that is fine — athletes and people who are very fit often have slow, strong heartbeats. But if the slow rate makes you dizzy, causes you to faint, gives you chest pain, or makes you confused, that is a problem. It means your body is not getting enough blood. The most common causes are medicines that slow the heart on purpose (like beta-blockers, calcium-channel blockers, or digoxin), a heart attack that damages the pacemaker or wiring (especially on the bottom wall of the heart), low thyroid hormone, too much potassium in the blood, or pressure inside the skull pushing on the brain's control center. Sometimes the SA node just wears out with age (sick sinus syndrome), or the relay station (AV node) starts blocking signals so they never reach the ventricles. When the heart beats too slowly, less blood gets pumped out every minute. Your brain is the first to complain — it needs a steady flow of oxygen-rich blood, so you feel lightheaded, your vision goes gray, or you pass out. Your blood pressure drops. If it goes on long enough, your organs start to suffer. The good news is we can often fix it quickly: if a medicine caused it, we stop the medicine; if the heart's wiring is broken, a temporary pacemaker (a small wire that delivers electrical sparks from outside) can take over until we put in a permanent one. The key is recognizing the symptoms early and acting fast, because a heart that beats too slowly can suddenly stop.

What you might feel

- Slow heart rate (below 60 beats per minute at rest)
- Feeling dizzy or lightheaded
- Extreme tiredness or weakness
- Shortness of breath, especially with activity

- Chest discomfort or pressure
- Fainting or near-fainting spells
- Confusion or trouble concentrating
- Cannon A waves seen in the neck veins (during complete heart block)

Call the doctor right away if...

- Fainting or blackout spells
- Chest pain or pressure
- Severe shortness of breath at rest
- Sudden confusion or slurred speech
- Heart rate below 40 beats per minute with symptoms

What the care team will do

- Place patient on continuous cardiac monitor and pulse oximetry, and obtain a 12-lead ECG immediately.
- Establish large-bore IV access in at least one arm and draw blood for troponin and electrolytes.
- Assess mental status, skin color, and capillary refill every 5 minutes and document findings.
- Keep atropine 1 mg syringes at bedside and apply transcutaneous pacing pads to chest and back if heart rate is below 50 with symptoms.
- Hold scheduled beta-blockers, calcium channel blockers, and digoxin doses, and notify the provider immediately.
- Position patient flat or in Trendelenburg (head down) if blood pressure is dropping or patient feels faint.
- Prepare for transvenous pacemaker insertion if transcutaneous pacing is needed for more than 30 minutes.
- Reassure patient and explain each intervention in simple terms before performing it.

Medicines you may be given — and why

Atropine

Atropine blocks acetylcholine (the chemical the vagus nerve uses to slow your heart). When you block that brake signal, the heart can speed up. It works best when the problem is at the SA node (your heart's natural pacemaker) or the AV node (the gate between the top and bottom chambers).

Epinephrine infusion

Epinephrine mimics adrenaline. It lands on beta-1 receptors in the heart and tells pacemaker cells to fire faster and heart-muscle cells to squeeze harder. It is used when atropine fails or the block is below the AV node.

Dopamine infusion

Dopamine acts on different receptors depending on the dose. At low-to-moderate doses it mainly hits beta-1 receptors in the heart to speed the rate and strengthen contractions. At higher doses it also squeezes blood vessels (alpha effect), raising blood pressure. It is an alternative to epinephrine when atropine fails.

Glucagon

Glucagon works through its own receptor (not the blocked beta receptor) to raise cyclic AMP inside heart cells. This speeds the SA node and strengthens contraction even when beta-blockers or calcium-channel blockers are on board. It is the antidote for overdose of those drugs when they cause severe a slow heart rate (bradycardia).

Calcium chloride or calcium gluconate

Calcium-channel blockers work by blocking calcium from entering heart and vessel cells. Giving IV calcium floods the area with so much calcium that some gets through despite the blockade, helping the heart contract and conduct signals again. It is the first antidote for calcium-channel-blocker overdose.

Transcutaneous pacing

Large sticky pads on the chest and back deliver electrical shocks strong enough to pass through skin and chest wall and capture the heart muscle, making it contract. This is the fastest way to pace when atropine fails or the block is infranodal (below the AV node). It buys time while you arrange transvenous pacing.

Transvenous pacing

A pacing wire is inserted through a central vein (internal jugular, subclavian, or femoral) and advanced under fluoroscopy or echo guidance until the tip sits against the inside wall of the right ventricle. Electrical pulses sent down the wire depolarize the ventricle directly, guaranteeing a heartbeat. This is more reliable and comfortable than transcutaneous pacing and is used when a slow heart rate (bradycardia) persists despite drugs or transcutaneous pacing.

Permanent pacemaker

A small computer (pulse generator) is implanted under the skin, usually below the collarbone. Insulated wires (leads) run through veins into the right atrium and/or right ventricle. The device senses the heart's own electrical activity and delivers a pacing pulse whenever the natural rate drops below a programmed threshold. This provides a permanent, reliable backup pacemaker.

Where this information comes from

- AHA/ACC/HRS 2018 Guideline on the Evaluation and Management of Patients With Bradycardia and Cardiac Conduction Delay
- American College of Cardiology
- American Heart Association
- European Society of Cardiology 2021 Pacing Guidelines

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