

Baroreceptor reflex physiology

The **baroreceptor reflex** is a rapid negative feedback loop that helps maintain **blood pressure homeostasis** on a moment-to-moment basis by adjusting heart rate, contractility, and vascular tone.

Baroreceptors Location and Function

Location	Description	Cranial Nerve Involved
Carotid sinus	At the bifurcation of the common carotid artery (near C3–C4 vertebral level)	Glossopharyngeal nerve (CN IX)
Aortic arch	Within the wall of the aortic arch	Vagus nerve (CN X)

High-Yield :

The **carotid sinus** is more sensitive to pressure changes and plays a more dominant role in **minute-to-minute blood pressure control** .

Mechanism of Action

When Mean Arterial Pressure (MAP) Increases:

1. **Increased arterial stretch** ? more firing of baroreceptors.
2. **Afferent signals** :
 - From carotid sinus via **CN IX**
 - From aortic arch via **CN X**
3. Signal reaches the **nucleus tractus solitarius (NTS)** in the **medulla oblongata** .
4. The NTS:
 - **Inhibits sympathetic outflow** (? HR, ? contractility, vasodilation)
 - **Activates parasympathetic (vagal) output** (? vagal tone ? ? HR)

When MAP Decreases:

1. **Reduced stretch** ? decreased baroreceptor firing.
2. Leads to:
 - **Disinhibition of sympathetic outflow**
 - **Reduced vagal tone**
3. Result: ? HR, ? contractility, **vasoconstriction** , ? TPR ? restores BP.

Clinical Correlation

- **Carotid massage** : Increases stretch ? mimics ? BP ? enhances vagal tone ? can treat supraventricular tachycardia (SVT)
- **Cushing's triad** : Hypertension, bradycardia, and irregular respirations due to increased ICP ? baroreceptor-mediated response to cerebral ischemia
- **Orthostatic hypotension** : Impaired baroreceptor reflex in elderly or autonomic dysfunction (e.g., diabetes)

High yield Notes

- Baroreceptors are **mechanoreceptors (stretch receptors)** .
- Reflex operates on a **second-to-second** basis **acute compensation** , not long-term regulation (the kidneys handle that via RAAS).
- **Cranial Nerve IX** (glossopharyngeal) is the afferent pathway from the **carotid sinus** .
- **Cranial Nerve X** (vagus) is the afferent pathway from the **aortic arch** .