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** .