

## Adrenaline vasoconstrictor and local anaesthetics

Adrenaline (epinephrine) is a **potent vasoconstrictor** commonly used as an **adjuvant to local anaesthetics**. Its primary role is to **prolong the duration of anaesthesia**, **reduce systemic absorption**, and **minimize toxicity** by confining the local anaesthetic to the site of injection.

### Mechanism of Action

- **Adrenaline acts on  $\alpha$ -adrenergic receptors**, causing **vasoconstriction** of blood vessels at the injection site.
- This **reduces local blood flow**, leading to:
  - Slower absorption of the anaesthetic
  - Prolonged action at the site of injection
  - Decreased risk of systemic toxicity
  - Reduced intraoperative bleeding (relative ischemia)

### Clinical Effects of Adrenaline with Local Anaesthetics

**Prolonged local anaesthetic effect**

**Decreased rate of systemic absorption**

**Localized drug action with reduced systemic toxicity**

**Improved surgical field visibility due to reduced bleeding**

### Clinical Use

Adrenaline is commonly added to local anaesthetics in:

- **Nerve blocks**
- **Infiltration anaesthesia**
- **Dental procedures**

**Not recommended in:**

- **Spinal (intrathecal) or epidural anaesthesia with bupivacaine**
- **Anaesthesia in end-arterial areas** (e.g., fingers, toes, ears, nose, penis )

Risk of **ischemia and tissue necrosis**

### Pharmacokinetics

- **Reduced perfusion** at the injection site leads to:
  - Lower concentration gradient between endoneural space and capillaries
  - Reduced diffusion of anaesthetic into systemic circulation

## Alternative Vasoconstrictors

- **Norepinephrine** – occasionally used but less common
- **Felypressin** – a **vasopressin analogue**, used when epinephrine is contraindicated
  - **No arrhythmogenic action**
  - **Less reactive hyperemia**
  - **Higher risk of coronary artery vasoconstriction**

## Adverse Effects of Catecholamine Vasoconstrictors (e.g., Adrenaline)

- **Reactive hyperemia** after washout
- **Cardiostimulation** if systemically absorbed
  - Tachycardia
  - Hypertension
  - Arrhythmias

## Dosage and Concentration

Adrenaline concentrations in local anaesthetic solutions:

Ratio	Concentration (µg/mL)	Example Max Volume
1:80,000	12.5 µg/mL	20 mL (250 µg)
1:100,000	10 µg/mL	25 mL (250 µg)
1:200,000	5 µg/mL	50 mL (250 µg)

**Expression** : Adrenaline concentration is written as the ratio of grams per mL.  
E.g., **1:100,000** = 0.01 mg/mL or 10 µg/mL.

## Maximum Safe Dose

- **250 micrograms** of adrenaline is considered a general maximum safe dose in local anaesthesia.
- This corresponds to:
  - **20 mL of 1:80,000**, or
  - **50 mL of 1:200,000**

## High yield Points

- Always **avoid adrenaline** in **end-artery regions**.
- **Monitor cardiovascular status**, especially in cardiac patients.
- Use **lowest effective concentration** to minimize systemic effects.
- Be aware of **drug interactions** (e.g., tricyclic antidepressants, MAO inhibitors).