

# Hypoperfusion Intensity Ratio (HIR)

**Hypoperfusion Intensity Ratio (HIR)** is a cerebral perfusion imaging biomarker used in acute ischemic stroke to quantify the severity of hypoperfusion and assess collateral blood flow.

## Definition

**HIR = Volume of tissue with Tmax >10 seconds / Volume of tissue with Tmax >6 seconds**

- **Tmax >6 sec:** represents all hypoperfused tissue (potentially salvageable penumbra).
- **Tmax >10 sec:** represents severely hypoperfused tissue (more likely to become infarct core).

## Interpretation

- **High HIR (~1):**
  - A large portion of hypoperfused tissue is severely delayed.
  - Indicates poor collateral flow.
  - Associated with greater infarct growth and worse clinical outcome.
- **Low HIR (~0):**
  - Most of the hypoperfused tissue has only moderate delay.
  - Suggests good collateral circulation.
  - Associated with better response to reperfusion therapies.

## Clinical Relevance

HIR is used alongside other imaging parameters (CBF, CBV, core/penumbra mismatch) to:

- Predict infarct growth and clinical outcomes.
- Select patients for endovascular therapy in extended time windows (e.g., DEFUSE 3, DAWN).
- Guide treatment decisions when standard time-based criteria are insufficient.

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