

Interstitial Fluid Volume (ISF Volume)

Definition: 'Interstitial Fluid Volume' refers to the total volume of fluid occupying the 'extracellular space' between cells within a tissue. In the central nervous system (CNS), it is the fluid that lies between neurons, glia, and capillaries—distinct from [cerebrospinal fluid](#) (CSF) and intracellular fluid.

Physiological Role:

- Serves as a medium for:
 1. **Nutrient transport**
 2. **Waste removal**
 3. **Ion exchange**
 4. **Intercellular signaling**
 - Provides mechanical support and maintains the extracellular matrix (ECM) environment.
 - Interfaces dynamically with [CSF](#) through the [glymphatic system](#) and perivascular pathways.
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Brain-Specific Characteristics:

- Estimated to occupy ~15–20% of total brain tissue volume under physiological conditions.
 - Closely regulated by:
 1. Capillary filtration through the [blood-brain barrier](#) (BBB)
 2. Aquaporin-4 channels on astrocytic endfeet
 3. Arterial pulsatility and sleep-wake cycles (via glymphatic function)
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Alterations in ISF Volume: ↑ ISF Volume:

- [Idiopathic normal pressure hydrocephalus](#) (iNPH)
- [Vasogenic edema](#)
- Aging-related extracellular matrix degradation

↓ ISF Volume:

- [Cytotoxic edema](#) (e.g., ischemic stroke)
 - Cellular swelling or inflammation
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Measurement Techniques:

- [Spectral diffusion analysis](#) ($\rightarrow F_{int}$)
- [Diffusion MRI](#) (indirect estimation via ADC)
- Tracer-based imaging in experimental models
- Optical or microdialysis methods in animal studies

Distinction from Related Terms:

- **Interstitial fluid volume fraction (F_{int}):**

Dimensionless ratio of ISF volume to total tissue volume.

- **CSF volume:** Located in ventricles and subarachnoid space; not part of ISF.
- **Extracellular volume:** Includes ISF + CSF + intravascular space (context-dependent).

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