

Calculation of intrathecal κ -FLC synthesis

Different approaches that consider serum κ -FLC concentrations and/ or blood-CSF-barrier function have been used to calculate an intrathecal κ -FLC synthesis. Blood-CSF-barrier function was assessed by the CSF/ serum albumin quotient (Q_{alb}).

(1) κ -FLC quotient

$$Q_{\kappa-FLC} = \frac{CSF \ \kappa-FLC}{Serum \ \kappa-FLC} \quad \text{Eq. (1)}$$

The presence of an intrathecal κ -FLC synthesis is determined by referring each patient's $Q_{\kappa-FLC}$ to a pre-defined cut-off. The extent of the κ -FLC synthesis is reflected by the exact $Q_{\kappa-FLC}$ value.

(2) κ -FLC index

$$\kappa - FLC \ index = \frac{\kappa-FLC_{CSF} / \kappa-FLC_{Serum}}{Q_{alb}} \quad \text{Eq.(2)}$$

The presence of an intrathecal κ -FLC synthesis is determined by referring each patient's κ -FLC index to a pre-defined cut-off. The extent of the κ -FLC synthesis is reflected by the exact index value.

(3) Intrathecal κ -FLC fraction

The presence and extent of an intrathecal κ -FLC synthesis is calculated by a non-linear function relating each $Q_{\kappa-FLC}$ to its corresponding Q_{alb} -dependent upper normal limit ($Q_{lim \ \kappa-FLC}$). $Q_{lim \ \kappa-FLC}$ has been previously defined by different formulae:

$$\text{Presslauer 2014} \quad Q_{lim \ \kappa-FLC} = 0.9357 \cdot Q_{alb}^{0.6687} \quad \text{Eq. (3)}$$

$$\text{Hegen 2019} \quad Q_{lim \ \kappa-FLC} = 3.1276 \cdot Q_{alb}^{0.8001} \quad \text{Eq. (4)}$$

$$\text{Senel 2019} \quad Q_{lim \ \kappa-FLC} = 9.50 + 2.08 \cdot Q_{alb} \quad \text{Eq. (5)}$$

$$\text{Reiber 2019} \quad Q_{lim \ \kappa-FLC} = 3.27 \cdot (Q_{alb}^2 + 33)^{0.5} - 8.2 \cdot 10^{-3} \quad \text{Eq. (6)}$$

Locally produced κ -FLC concentration in CSF is calculated as the difference of $Q_{\kappa\text{-FLC}}$ to $Q_{\text{lim } \kappa\text{-FLC}}$ and corrected for absolute κ -FLC serum concentration:

$$\kappa\text{-FLC}_{Loc} = (Q_{\kappa\text{-FLC}} - Q_{\text{lim } \kappa\text{-FLC}}) \cdot \kappa\text{-FLC}_{Serum} \quad \text{Eq. (7)}$$

Finally, the relative intrathecal κ -FLC fraction ($IF_{\kappa\text{-FLC}}$) is displayed as percentage according to following formula:

$$IF_{\kappa\text{-FLC}} = \frac{\kappa\text{-FLC}_{Loc}}{\kappa\text{-FLC}_{CSF}} \cdot 100 \quad \text{Eq. (8)}$$