Vascular wall tension

The vascular wall tension (WT) of small cerebral vessels can be quantitatively estimated through the concept of critical closing pressure (CrCP).

WT can be expressed as the difference between CrCP and intracranial pressure (ICP) and represent active vasomotor tone.

Varsos et a., retrospectively analysed recordings of arterial blood pressure (ABP), ICP and transcranial Doppler (TCD) blood flow velocity from 280 traumatic brain injury (TBI) patients (median age: 29 years; interquartile range: 20-43). CrCP and WT were calculated using the cerebrovascular impedance methodology. Autoregulation was assessed based on TCD-based indices, mean velocity index, Mx and autoregulation index (ARI).

Low values of WT were found to be associated with an impaired autoregulatory capacity, signified by its correlation to FV-based indices Mx ($R = -0.138$; $p = 0.021$) and ARI ($R = 0.118$; $p = 0.048$). No relationship could be established between CrCP and any of the autoregulatory indices. Neither CrCP nor WT was found to correlate with outcome.

Impaired autoregulation was found to be associated with a lower WT supporting the role of vasoparalysis in the loss of autoregulatory capacity. In contrast, no links between CrCP and autoregulation could be identified [1)].

1)
Varsos GV, Budohoski KP, Kolias AG, Liu X, Smielewski P, Varsos VG, Hutchinson PJ, Pickard JD, Czosnyka M. Relationship of Vascular Wall Tension and Autoregulation Following Traumatic Brain Injury. Neurocrit Care. 2014 Mar 29. [Epub ahead of print] PubMed PMID: 24682849.