Vasogenic cerebral edema

Vasogenic cerebral edema refers to a type of cerebral edema in which the blood-brain barrier disrupted. Protein (serum) leaks out of the vascular system and therefore may enhance imaging. Extracellular space (ECS) expands. Cells are stable. Responds to corticosteroids (e.g. dexamethasone). Seen e.g. surrounding brain metastases.

In cytotoxic cerebral edema, the blood-brain barrier remains intact. It is an extracellular edema which mainly affects the white matter via leakage of fluid from capillaries.

It is most frequently seen around brain tumors (both primary and secondary) and cerebral abscesses, though some vasogenic edema may be seen around maturing cerebral contusion and cerebral hemorrhage.

Radiographic features

CT grey-white matter differentiation is maintained and the edema involves mainly white matter, extending in a finger-like fashion secondary effects of vasogenic edema are similar to cytotoxic edema, with effacement of cerebral sulci, with or without midline shift MRI hyperintense T2 and FLAIR signals, which do not show restricted diffusion 2 (cf. cytotoxic cerebral edema, which shows diffusion restriction)

This edema is due to blood brain barrier (BBB) disruption resulting in extracellular water accumulation.

Animal and clinical studies have identified MMP-9 overexpression as a key factor responsible for the development of vasogenic edema, and deletion of Matrix metalloproteinase 9 (MMP-9) is correlated with significantly less brain edema and better neurological recovery in SAH mice models [1)].

1)
Egashira Y, Hua Y, Keep RF, Xi G. Acute white matter injury after experimental subarachnoid hemorrhage: potential role of lipocalin 2. Stroke. 2014;45(7):2141–2143.