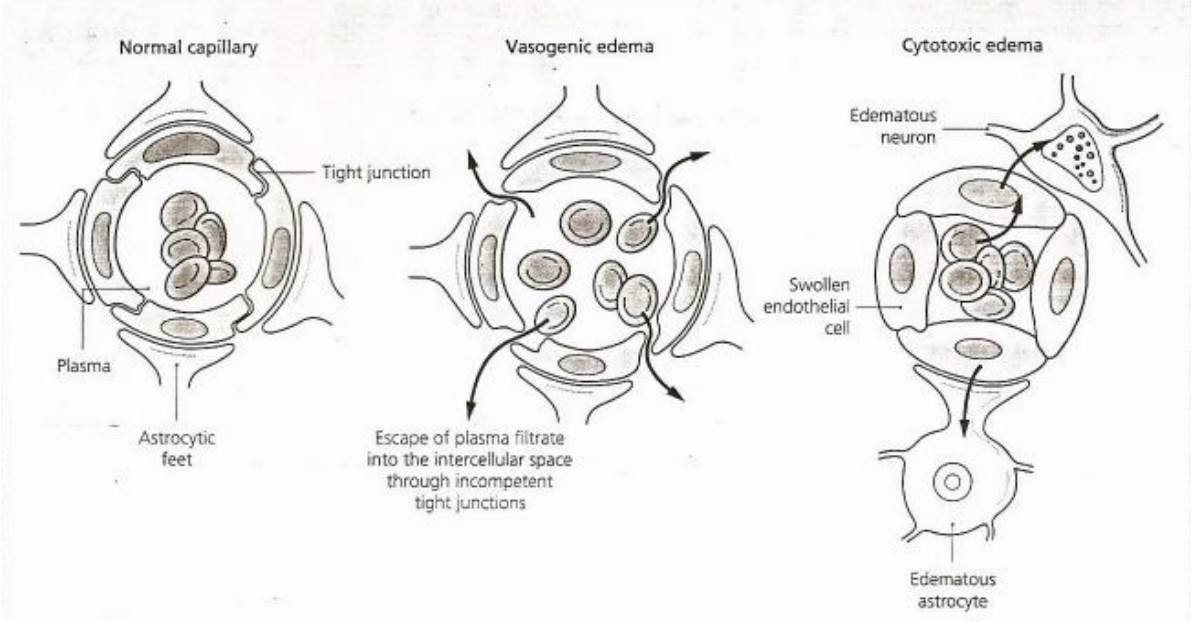
Cerebral Edema

It is an excess accumulation of water in the intra- and /or extracellular spaces of the .brain resulting in state of increase brain volume



Classifications

(1)Vasogenic edema: Disruption of BBB provides the underlying mechanism for development of vasogenic edema with exudation of a plasma-like fluid into the extracellular space. This fluid spreads into adjacent tissue by bulk flow and has a predilection for white matter. Nearly all focal lesions, including primary and metastatic tumors, abscesses and radionecrosis produce vasogenic edema. Vasogenic edema can also occur in the later stages of ischemia and trauma.

(2)Cytotoxic edema: This is due to failure of Na+/K+ ATPase pump system and intracellular accumulation of sodium. This form an osmotic gradient, along which water moves from the extracellular to the intracellular compartment causing a net intracellular accumulation of water and sodium. This occur in anoxia, ischemia and hypothermia.

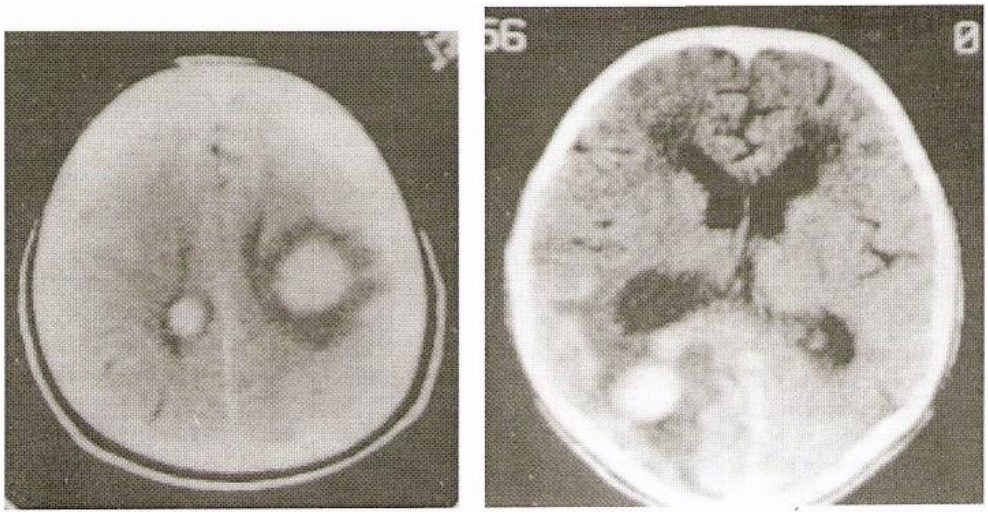
(3)Interstitial edema: This results from increase pressure in the ventricles and flow of water and solutes transependymally into the periventricular extracellular space.

(4)Osmotic edema: In this type of edema, the brain is hyperosmolar with respect to plasma, allowing the brain to swell with water moving along the osmotic gradient. This can be occur in syndrome of inappropriate ADH secretion and water intoxication.

(5)Hydrostatic edema: The increased intravascular pressure is responsible for stretching of the vessel wall which results in widening of tight junction and disruption of BBB as in hypertension.

Imaging

Edematous brain tissue is usually hypodense on CT scan when compared to the tumor or normal surrounding brain tissue. Edema is usually hyperintense on T2 MRI scan. Newer MRI sequences such as FLAIR separates edema from normal brain water such as CSF, however, the border between tumor and edema is still best delineated by Tl MRI contrast enhanced studies which shows hypointense edema surround the hyperintense contrast-enhancing tumor.



(1) (2)

(1)Brain CT scan at parietal level with contrast enhancement; shows two rounded masses homogenously enhanced at Rt. and Lt. parietal regions surrounded by hypodense areas (vasogenic cerebral edema). The edema involved the white matter only (no involvement of gray matter as the hypodense area did not reach the surrounding skull bone (the area between skull and edema occupied .((by gray matter tissue

(2)Brain CT scan at temporal level with contrast enhancement; shows rounded mass homogenously enhanced at Rt. occipital region surrounded by hypodense area (vasogenic cerebral edema). In addition, there are hypodense areas at frontal horns of Rt. and Lt. lateral ventricles (which are also slightly dilated); represents the interstitial edema that associate the presence of mild hydrocephalus

Treatment

(1)Steroids: Although glucocorticoid therapy is ineffective in the treatment of cytotoxic edema and has only limited effect on interstitial edema, it is very effective in the treatment of vasogenic edema.

(2)Osmotherapy:When edema is vasogenic , osmotherapy is less effective; because the edematous regions with increased capillary permeability can not maintain an osmotic gradient. Mannitol has some utility to decrease ICP in patient with local disruption of BBB because normal areas of the brain with intact BBB shrink transiently to decrease total brain mass. Osmotherapy can be used in acute management of other types of edemas.

(3)Diuretics

(4)Acetazolamide (Carbonic anhydrase inhibitor): This drug will decrease the production of CSF and it is therefore, effective in the treatment of interstitial edema. However, it is not effective in the treatment of vasogenic or cytotoxic edemas.