Discussion (4)

Hypothermic Anesthesia and Period of Arrest of the Cerebral Circulation

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Reasonableness of "brain surgery under supercooling" originated with Dr. T. Kudo was criticized and selective vulnerability of the brain in arrest of the circulation was discussed from the results obtained by the author in an isolated cat's brain in vitro and in vivo experiments.

A clear evidence of reversibility of the brain activity through hypoxic state was presented by the fact that the cat's brain which had been perfused with 15% glycerol in cold Hank-Dextran solution and stored for 6 days at -20°C , showed awaking electrocorticograms and spontaneous electrical discharges of nerve cells in an in vitro preparation perfused with warm blood after thawing and washing out glycerol below 10°C . This seems a clear proof of viability of the central nervous system in hypoxic conditions. The permanent damage of the brain following lack of circulation for a short time, therefore, should be explained from different stand point of view.

Correlations between brain activity indicated by electrocorticograms and pressure-flow relations in the circle of Willis was examined on a cat's brain, of which circulation had been isolated and controlled in situ by a small pump interposed between the internal maxillary and common carotid artery, and following assumptions were proposed.

1) Reduction of inflow volume accompanying with an elevation of blood pressure in the circle of Willis after arrest of the circulation under normo- or hypotensive perfusion suggests a mechanical obstruction of the capillaries by separation or sludging of the blood. In this case gradual recovery of artificial fluids accelerates restoration of activity.

2) On the contrary, pronounced increase of inflow volume with a fall of basilar blood pressure under hypertensive perfusion, which indicates creation of functioned shunt flow, results in permanent loss of brain activity.

The author emphasised vascular origin of the brain damage following arrest of the circulation on the basis of above statement.

The surgical procedure that the brain is perfused in vivo with a cold artificial fluid, which has been used in brain surgery by T. Kudo and in isolation of the brain in vitro by I. Suda, seems to bring the brain in a "static viable" state and to exclude vascular disturbances which are resulted inevitably from arrest of the circulation.