

Besides neurological examinations EEG and arteriography are the decisive auxiliaries for the determination of brain death.

66. Clinical and pathophysiological aspects of the intravital brain death. — K. Ibe (Berlin, W. Germany).

Based on 72 cases of intravital brain death, which were diagnosed in the inter-disciplinary reanimation centre, some clinical and pathophysiological observations are reported. The aetiology of the irreversible loss of brain functions was extremely diverse. The longest survival time after manifestation to final brain death was 7 days. It was made possible by artificial respiration, parenteral fluid and electrolyte substitution as well as intensive care. The clinical picture was in all cases marked by continuous loss of consciousness and persisting respiratory paralysis. The brain function was constantly extinguished. The primary spinal areflexia, on the other hand, as well as the disorders of pulse and blood pressure after overcoming the spinal shock (about 24–36 h after the accident), showed a clear tendency to recovery, possibly to complete restitution.

The body temperature varied in the follow-up according to the situation of the process (supra- or infratentorial) and the speed of manifestation of intravital brain death: hypothermia, swinging, after overcoming the spinal shock, to 33–34° C (rectal); normothermia with final steep rise (maximum 43° C) and persisting normothermia.

In all cases there was a considerable polyuria about 1–2 h after the start of the respiratory arrest. It reached its maximum after 4–6 h and terminated after 24–36 h. Urea excretion had 2 culmination points. A metabolic acidosis was often initially found in the arterial blood. Whether infusion treatment is of influence on the cerebrum is questionable in the conditions of intracranial circulatory arrest. Observation of the serum potassium concentration showed, in spite of a zero balance, peculiar unmeasurable rapid oscillations from 1.5 mval/l to about 6.0 mval/l. They could not be related to the degree of hypothermia or to the pH shifts in the arterial blood. Disturbances of sugar metabolism were only seen in 2 cases. Generally, there is a situation comparable to diabetogenic metabolism.

During the critical phase of intracranial circulatory arrest cardiac dysrhythmias of various kinds appeared. Auriculo-ventricular automatisms were not invariable. The ECG changes must be interpreted within the frame of the body temperature, the metabolic acidosis and the fluctuations of the serum potassium.

Finally the difficulty of making the differential diagnosis between intravital brain death and severe intoxication by sleeping pills (especially barbiturates) with isoelectric EEG is pointed out.

67. The clinical picture of brain death after serious brain injuries. — C. H. Lücking and F. Gerstenbrand (Munich, W. Germany and Vienna, Austria).

The picture of brain death is characterized by irreversible

loss of cerebral and brain-stem function including that of the medulla oblongata. The retention or reappearance of spinal functions does not exclude brain death. Its cardinal symptoms are loss of consciousness, complete absence of motor activity, respiratory arrest, flaccid muscle tone and extinction of all cerebral reflexes integrated in the brain-stem, as well as absent vagal influence on cardiac activity. In some cases there is no maximal mydriasis. If only one of these functions is retained the diagnosis of brain death cannot be made.

Cerebral and spinal function have to be differentiated. The circulation may be regulated spinally, as also the temperature which is, however, mostly dependent upon surrounding temperature. Retained circulatory and temperature regulation, therefore, do not contradict brain death. Intestinal, renal and vesicular functions may be maintained. Areflexia is no obligatory symptom of brain death. We, like others, often observed that monosynaptic proprioceptive muscle reflexes and polysynaptic tendon reflexes could be elicited. Tendon reflexes often show an enormous spread across many segments. This stresses the loss of modifying supraspinal influences. We were never able to observe a return of muscle tone in man, probably because of the short survival time—in most cases a few days. If retained it should be connected to sustained brain-stem functions.

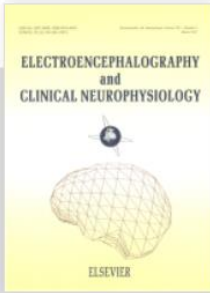
A case with several cerebral projectile injuries is demonstrated in detail. Eleven days after the diagnosis of brain death had been made, filling of the basal cerebral vessels could be demonstrated in an arteriogram. The possibility of a returned circulation due to intravital autolysis is discussed.

68. EEG and cerebral circulation in the apallic syndrome and akinetic mutism. — D. H. Ingvar (Lund, Sweden).

The EEG and the cerebral circulation were measured in 4 cases (2 with advanced apallic syndromes and 2 with akinetic mutism). The findings were compared with the results of investigations of cases of coma and so-called brain death. In cerebral death it is known that cerebral circulation, brain reflexes (and brain-stem reflexes) as well as the EEG have disappeared. No EEG could be recorded in the 2 apallic patients. The brain-stem reflexes (including respiration) were, however, brisk and the supratentorial brain circulation was 9 ml/100 g/min (normal value 50). In a case of long lasting coma because of a mesencephalic (reticular) lesion the EEG presented a permanent delta pattern and the cerebral circulation was 14–16 ml/100 g/min. The oxygen uptake was 0.7 ml/100 g/min (normal value 3.3). In both cases of akinetic mutism the EEG was normal (also the sleep EEG in 1 case) and the average cerebral circulation amounted to 34–35 ml/100 g/min. The findings show that, even in coma of long duration and similar states, it is possible to demonstrate the correlation between EEG and cerebral circulation (as well as brain metabolism). At the lowest level the EEG has disappeared completely and the cerebral circulation, if present, is extremely low. At the highest levels (akinetic mutism) a normal EEG may be recorded, as well as hardly reduced values of brain circulation.



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