EVALUATION OF THE EFFECTIVENESS OF A NEW METHOD OF TRANSCRANIAL ELECTROANALGESIA FOR CLINICAL ANESTHESIOLOGY

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A regimen for transcranial electroanalgesia which had been designed on the basis of experimental findings was included for the first time into the complex of anesthesiology aid.

Transcranial electroanalgesia was used in more than 500-cases of heart surgery, including those with extracorporeal [artificial] circulation, as well as lung and gastrointestinal surgery in patients aging from 6-months to 86-years who had a severe concomitant pathology.

It should be noted that the chosen regimen of electrostimulation, while causing the marked and reproducible analgesic effect, did not display any narcotic activity. This circumstance taken into account, hypnogenic drugs were included into the complex of anesthesiology.

Electrostimulation was started immediately after patients’ delivery to the operating room, the total current value measuring from 3 mA to 4.5 mA. The moment of electrostimulation beginning was of great importance since the analgesic effect produced by transcranial electrostimulation (TES) is associated with the increase in beta-endorphin (BE) contents, which would reach the required level only after 15 to 25-min stimulation.

Narcotic induction was performed by means of intramuscular injections of seduxene (0.3 to 0.5-mg/kg), barbiturates (3 to 4-mg/kg), end calypsol (6-mg/kg; used only for children). Tracheal intubation was carried out after administration of depolarizing relaxants at usual doses; muscular relaxation was provided by antidepolarizing relaxants.

Anesthesia was supported by means of TES at the total direct current and average impulse current value measuring from 9 to 24 mA (direct current/average impulse current ratio being 2:1) combined with introduction of nitrous oxide/oxygen mixture (1:1 to 2:1) or with drop by drop infusion of calypsol at the dose of 0.8 to 1.0-mg/kg within one hour, narcotic analgesics being completely excluded. The total current value depended on patient’s age.

TES was stopped 10 to 15-minutes before the end of operation and nitrous oxide and infusion of calypsol were discontinued 5-min before the end of operation, after which patients recovered from anesthesia and the restoration of adequate breathing could be observed, in some cases, without decurarization.
Adequacy of anesthesia was evaluated by measuring the hemodynamic parameters, for which purpose catheterization of radial and pulmonary arteries was performed. Analysis of circulation parameter dynamics (arterial blood pressure, pulmonary arterial pressure, minute circulatory volume, and general peripheral resistance were measured) revealed no significant changes in these parameters throughout the operation. During the operations, which were associated with lung resection, an increase in pulmonary arterial pressure could be observed only during the treatment of the lung root.

In addition, adequacy of anesthesia was evaluated by measuring 17-oxyketosteroids (OKS), adrenalin, and no radrenalin.

During TES (stage of stable anesthesia), 17-OKS concentration out-measured its initial value by 50.4%: However, during operative interventions, including the most traumatic ones, no significant alteration of 17-OKS contents could be observed. One hour after the end of operation and TES, corticosteroid concentration began to decrease to reach the minimal value 6-hr after the end of TES, which was associated with the absence of pain syndrome early in the post-operative period or with the fact that this syndrome was only slightly pronounced.

During the stage of stable anesthesia, TES did not cause any significant increase in noradrenalin (NA) concentration, whereas adrenalin (A) concentration was significantly elevated. This could be due to the increase in blood flow through the adrenal cortex during TES. During the stage of operative intervention, A and NA concentrations became stabilized; it was only during the most traumatic stage when a tendency towards the growth of A concentration could be registered.

TES provided an 11-fold increase in plasma BE contents as compared with the initial value and a 7-fold increase in plasma BE contents as compared with the value which had been registered in the operating room before the initiation of anesthesia. During fluothane anesthesia, the growth of BE concentration was significantly less marked, plasma BE contents being not more than 3-times as great as the initial value. During the operative intervention with TES, BE concentration was maintained at a stable high level, whereas with fluothane anesthesia, this parameter was less stable and changed significantly during the traumatic stages. Discontinuation of TES led to a fall in BE contents by 54% as early as one-hour after the end of TES but it was still 6-times as great as the initial value.

The application TES provided not only the adequate course of anesthesia with complete exclusion of narcotic analgesics and the reduced doses of ataractics and neuroleptics but also the beneficial course of early postoperative period, which was characterized by the presence of residual analgesia. The latter seemed to be due to the elevated BE concentration. The presence of residual analgesia was confirmed by the fact that A and 17-OKS concentrations were relatively low throughout this period.
A direct correlation between the duration of TES and the duration of residual analgesia was revealed. At the same time, the duration of TES and the dynamics of BE concentration decrease were reverse correlated. In addition, contrary to other types of anesthesia, not only immuno-depression did not occur early in the post-operative period, but even an immuno-stimulation could be registered in some cases, which resulted in the decreased occurrence of septic complications.

In conclusion, the above data suggest that anesthesia supplemented with TES provides an adequate course of operative interventions, which are characterized by high traumaticity, and it can be recommended for application in patients at high risk.

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