EFFECT OF GENERAL ANESTHETICS ON MICE AFTER MICROWAVE IRRADIATION

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General anesthetics — chloroform, halothane, thiopental sodium, and sodium hydroxybutyrate (500 mg/kg) — lower the survival rate of mice irradiated with microwaves. Under the influence of ether, halothane, hexobarbital, or thiopental sodium, given immediately after irradiation, the time before the animals adopt the side position is reduced by 8-14% and the duration of the period in the side position is increased by 15-48% compared with the control.

KEY WORDS: general anesthetics; microwave irradiation.

In clinical practice the possibility cannot be ruled out that persons who have been irradiated by microwaves, during surgical operations, for example, may be given general anesthetics, but the effect of these substances on the irradiated organism is unknown.

The object of the investigation described below was to study the effect of certain general anesthetics on the survival rate of mice irradiated with microwaves and also to determine the time of onset and the duration of general anesthesia when anesthetics were given at different times after irradiation.

EXPERIMENTAL METHOD

In the experiments of series I albino mice (474) of both sexes (about 75% males), weighing 22-26 g, were irradiated with microwaves by the method described previously [1] until the terminal state. Immediately after irradiation the mice were given a single injection of 60 mg/kg thiopental sodium, 10, 50, or 500 mg/kg sodium hydroxybutyrate, 60 mg/kg hexobarbital, or 800 mg/kg urethane intraperitoneally in the form of aqueous solutions in a volume of 1 ml/100 g body weight, or inhalation anesthetics were administered with the inspired air by means of a special chamber with a capacity of 1 liter, in which a mixture of the anesthetic with atmospheric air was formed in the following proportions: 1 : 10,000 for halothane, 1 : 5,000 for chloroform, and 1 : 1,000 for diethyl ether, after which the animal was placed in the chamber and kept for 60 or 90 sec. The survival rate of the mice was determined during the 3 weeks after irradiation.

TABLE 1. Survival Rate of Mice Receiving a Single Dose of General Anesthetic Immediately After Microwave Irradiation (M ± m)

Experimental conditions	Survival rate, %	P
Control (67)	48±6	—
Halothane, 90 sec (8)	30±14	0,042
Chloroform, 90 sec (10)	30±14	0,042
Thiopental sodium (12)	33±14	0,036
Sodium hydroxybutyrate, mg/kg		
10 (16)	43±12	0,485
50 (8)	37±17	0,310
500 (6)	33±19	0,048
Ether, 60 sec (10)	40±16	0,421
Hexobarbital (10)	40±16	0,274
Urethane (12)	41±14	0,319

Legend. Number of mice in parentheses.

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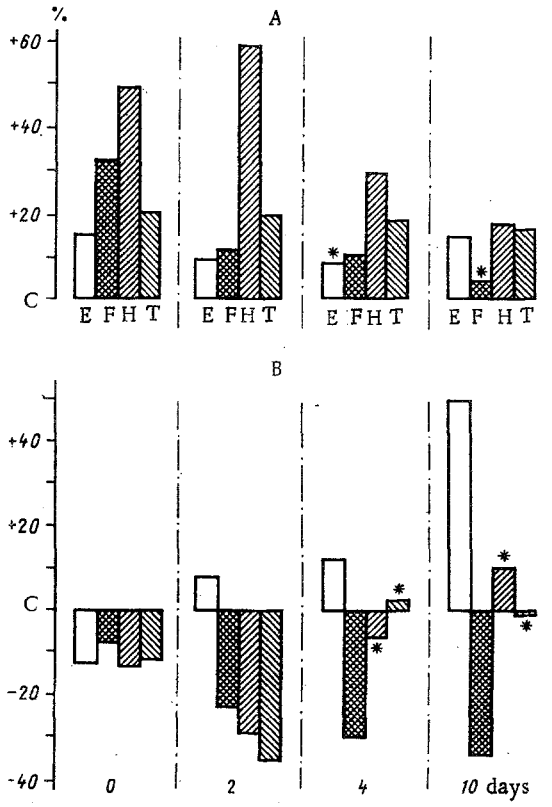

Fig. 1. Increase (in % relative to control) in duration (A) and time before adoption of (B) side position by irradiated mice receiving ether (E), halothane (F), hexobarbital (H), and thiopental sodium (T) at different times after irradiation. Abscissa, time after irradiation (in days); ordinate, percentage of control (C). *P > 0.05 compared with control.

In the experiments of series II the mice were given a single dose of ether, halothane, hexobarbital, or thiopental sodium immediately or 2, 4, and 10 days after microwave irradiation. The time when the animals adopted the side position and the duration of the period in the side position were determined.

In the experiments to determine the survival rate, the control consisted of irradiated mice which were not given the anesthetics, whereas for the experiments to determine the time of onset and duration of anesthesia the control consisted of unirradiated mice which received the anesthetics. Each experiment was performed on 8-12 mice. Statistical analysis was carried out by a variance method for qualitative data [2].

EXPERIMENTAL RESULTS

The survival rate of the mice irradiated with microwaves was reduced after administration of chloroform, halothane, thiopental sodium, and sodium hydroxybutyrate in a dose of 500 mg/kg by 1.6-1.45 times ($P < 0.05$) compared with the control, but after administration of ether, hexobarbital, urethane, and sodium hydroxybutyrate in doses of 10 and 50 mg/kg the decrease was not significant ($P < 0.05$; Table 1).

The time elapsing before the animals adopted the side position was reduced by 8-14% when ether, halothane, hexobarbital, and thiopental sodium were given immediately after irradiation; in the case of later administration, when ether was given the time gradually increased by 48% compared with the control, whereas when halothane was given 10 days after irradiation it was reduced by 34%. The time before adoption of the side position was reduced by 28-36% if hexobarbital and thiopental sodium were given on the second day after irradiation, but if they were given on the fourth day the time reached the control level; the duration of the period in the side position was increased by 15-48% when these anesthetics were given immediately after irradiation, but it was gradually reduced when they were given later (Fig. 1).

These experiments thus showed that the sensitivity of mice irradiated with microwaves to general anesthetics is evidently changed, and this must be taken into account in the practice of anesthesiology when patients who have been or are being exposed to the action of microwaves are anesthetized.

LITERATURE CITED

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EFFECT OF ORNID ON REGULATION OF THE CEREBRAL CIRCULATION

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An investigation by radioisotope, electromagnetic, and resistographic methods showed that Ornid reduces the cerebral blood flow. At the same time it completely inhibits constrictor reactions of the cerebral vessels to stimulation of sympathetic and somatic nerves. Ornid also has a protective action against experimental disturbances of the cerebral circulation of adrenergic nature.

KEY WORDS: Ornid; cerebral blood flow; regulation of the cerebral circulation.

To elucidate the role of the sympathico-adrenal system in the control of the cerebral circulation [1, 6-8] it is interesting to study the effect of the sympatholytic Ornid (orthobromobenzyl-N-ethyl-N,N-dimethylammonium bromide) on the cerebral circulation and its nervous control. No information on the cerebrovascular effects of Ornid could be found in the literature.

EXPERIMENTAL METHOD

Experiments were carried out on 33 cats anesthetized with urethane and chloralose and artificially ventilated.

In the experiments of series I the cerebral blood flow was determined by means of ^{133}Xe on the UAU-100 apparatus. The results were subjected to mathematical analysis on the Minsk-22 computer. The cerebral blood flow was determined by successive derivation of indicator functions [2, 5]. The state of the cerebral circulation also was judged from the inflow of blood into the brain through the internal maxillary artery, recorded by means of an electromagnetic blood flowmeter. The EEG was recorded simultaneously in the parietal region and the EEG in lead II; the blood pressure was measured in the femoral artery.

The vascular component of the action of the drug on the cerebral hemodynamics was differentiated by separate bilateral perfusion of the carotid and vertebral arteries [3]. The acid–base balance and the partial oxygen pressure in samples of arterial blood and CSF were determined by the ABC-1 apparatus.

EXPERIMENTAL RESULTS

Ornid was given in a dose of 10 mg/kg, at which its sympatholytic properties are clearly manifested. Experiments in which the volume velocity of the cerebral blood flow was recorded with the aid of ^{133}Xe showed that, after intravenous injection of Ornid in the above dose, the blood supply to the brain was reduced. Consistent results were obtained in experiments with electromagnetic recording of the inflow of blood into the brain through the carotid artery. Under the influence of Ornid, the intracranial blood flow was reduced on average by 38 ± 5.2%. This effect of Ornid came on immediately after its administration (Fig. 1). Restoration of

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