EXPERIMENTAL DATA ON THE COMPLEX USE OF NEUROPLEGIC, VASOPRESSOR AND HORMONAL SUBSTANCES IN SHOCK THERAPY

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In earlier investigations [8, 9], we showed that the use of aminazine, noradrenalin, Pituitrin, the adrenocorticotropic hormone (ACTH) and cortisone increases the resistance of animals to shock trauma and in many cases arrests the development of shock.

The results of these observations are confirmed by the literature data. Some authors [7, 10, 14], for example, recommend aminazine for the treatment of traumatic shock; others [15, 16] believe the use of noradrenalin expedient in shock, and a third group [4, 5, 12, 18] have observed positive prophylactic and therapeutic effect under the influence of ACTH and cortisone.

We have shown [8, 9] that the efficiency of a preparation depends upon the time at which it is administered, i.e., upon the phase of shock in which it is used. This opinion that the effect of therapeutic substances depends on the phase of shock in which they are used has not yet been given sufficient attention in the literature.

The purpose of this work was to study the effect of aminazine, noradrenalin, pituitrin, ACTH and cortisone, used in complex, on the course and issue of traumatic shock.

EXPERIMENTAL METHODS

A total of 69 experiments (39 on cats, 30 on rabbits) were performed.

In the cats, shock was induced by stimulating the right paws with a pulse current with a frequency of 4 imp/sec, the duration of each stimulus being 0.08 msec and the force, 100 mA at the height of the impulse; shock was induced in the rabbits by crushing the soft tissues of the left hip by administering 200 blows with a rubber-tipped metal hammer weighing 700 g. The arterial pressure, rate of the cardiac contractions and respiration were recorded during the experiments; the rectal temperature was taken, and the condition of the animals was observed.

In order to characterize the shock produced in the cats by pulse current stimulation, we divided it into phases, as proposed by A. M. Dubinskii, and distinguished the erectile, torpid I, torpid II and terminal phases of shock. These phases were described in our previous papers [8, 9].

In order to study the complex effect of these medicinal substances on the course and issue of shock, we grouped them into two therapeutic complexes: 1) ACTH, aminazine, noradrenalin and cortisone; 2) ACTH, aminazine, Pituitrin and cortisone. The table gives the data on the methods and times of administration and the dosage of the experimental substances.

EXPERIMENTAL METHODS

The effect of the first complex of substances on the course and issue of traumatic shock in cats was studied in 13 experiments. In these experiments, we observed a considerable increase in the experimental animals' resistance to the trauma, indicated by the increased period of stimulation required to produce torpid phase II of shock. For example, the average stimulation period required to obtain torpid phase II was 40-45 minutes in the control experiments, but a stimulation period of 80-85 minutes was required to produce this phase in the experiments using the first complex of medicinal substances. There were also certain differences in the course of shock. With shock therapy, no acute

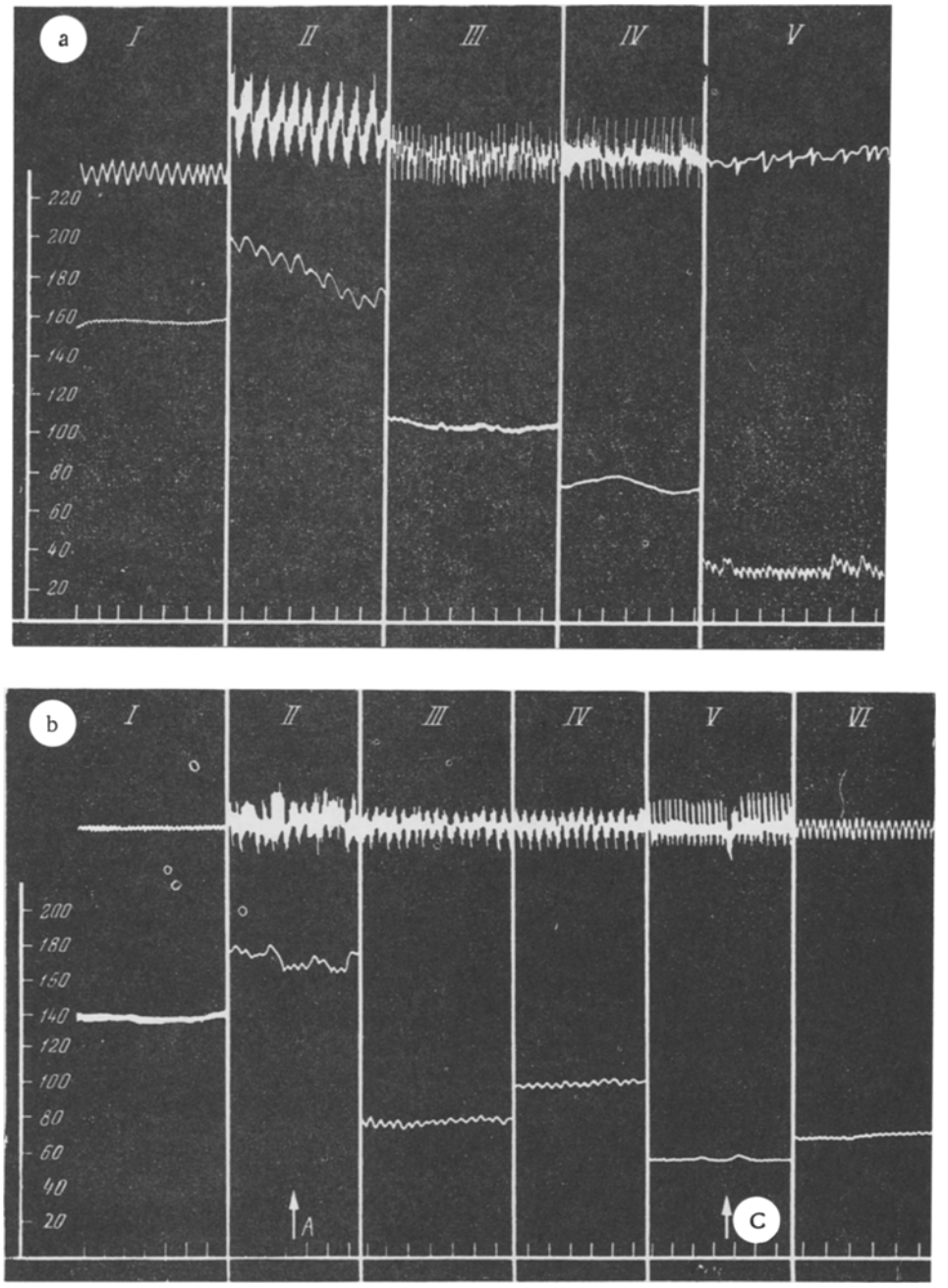

Fig. 1. Respiration and arterial pressure during different phases of shock in control experiments (a) and in experiments using the first complex of medicinal substances (b). a) I) Original indices; II) erectile phase; III) torpid phase I; IV) torpid phase II; V) terminal phase; b) I) original indices; II) erectile phase; III) torpid phase I before noradrenalin administration; IV) same after noradrenalin administration; V) torpid phase II; VI) shock 10 min after cortisone was administered and stimulation stopped: A) aminazine administered; C) cortisone administered. Curves in Fig. 1 and 2 show from top to bottom: respiration, arterial pressure, time in 3-second marks.

acceleration of respiration or pulse was observed, and the arterial pressure remained at a high level longer than in the control experiments (Fig. 1). Only 1 of the 16 control animals in which shock reached the torpid phase II survived, while 7 of the 13 animals given the first medicinal complex survived.

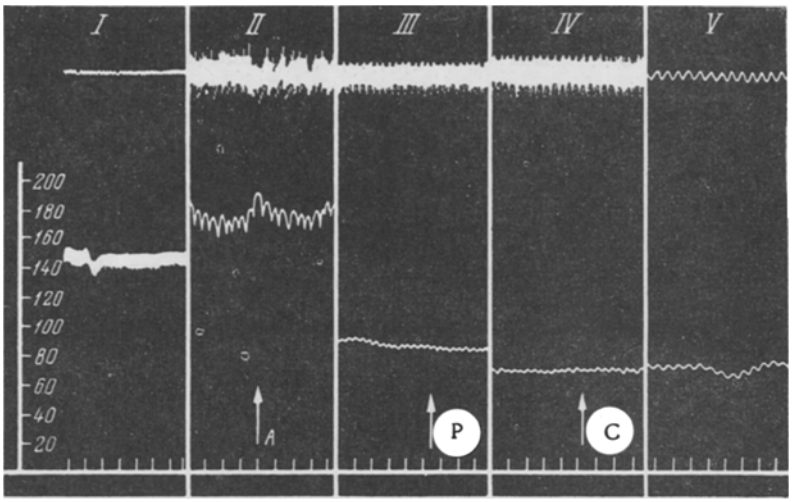

Fig. 2. Respiration and arterial pressure during shock in experiments using the second complex of medicinal substances. I-V) Same as in Fig. 1, a: A, C) same as in Fig. 1, b; P) Pituitrin administered.

Indications have recently begun to appear in the literature to the effect that massive intravenous infusions are not advisable in certain cases of traumatic shock without great loss of blood [11, 17], because they promote the development of venous polyemia in systemic and pulmonary circulation and cardiac overstrain. In the next experimental series, therefore, we abandoned the intravenous infusion of large quantities of fluid required by the use of noradrenalin and used Pituitrin instead in the second therapeutic complex.

The second complex of substances was used in 10 experiments; as in the preceding experiments, we observed an increase in the experimental animals' resistance to the shock, indicated by prolongation of the period of stimulation required to produce torpid phase II of shock, reduced disturbance of respiration, arterial pressure and pulse (Fig. 2) and in the survival of a greater number of cats than in the control or in the experiments with the first complex of therapeutic substances. Nine out of the ten animals given the second complex survived.

In order to determine the universality of the data obtained, we performed a series of experiments on rabbits, under conditions of shock induced by crushing the soft tissues of the left hip. Ten control experiments were performed to observe the characteristic features of the course of shock induced by this method. In these experiments, shock also developed physically, and we were able to identify the phases with those observed in the shock induced by pulse current.

In the experiments of this series, the administration of the medicinal substances was slightly altered in both the first and the second complexes to adapt to the species characteristics of the animals and to the different method of inducing shock; ACTH was not administered, and aminazine was given 5-10 minutes before the trauma. Also, when the trauma had been inflicted, we blocked the left hip with Novocain to stop the inflow of painful impulses from the injured leg and applied an elastic bandage to prevent the development of hematoma on it.

The effect of the first complex of substances on the course and issue of traumatic shock was observed in 10 experiments. The animals' resistance to the trauma inflicted increased in all 10 cases; the arterial pressure maintained an adequately high level, and the respiratory rate varied only slightly. Despite the administration of aminazine, the animals' body temperature fell considerably below the level observed in the control experiments. Survival increased: 6 out of the 10 animals administered the first complex of therapeutic substances survived as against 4 out of 10 in the control.

Another 10 experiments were performed to observe the effect of the second complex of medicinal substances. The results obtained with this complex were analogous to those obtained with the first, except that the survival of the experimental animals given the second complex was somewhat higher (8 out of 10). This would seem to be connected with the substitution of Pituitrin for the noradrenalin administered in a 5% glucose solution, as the latter called for the intravenous infusion of a large quantity of fluid which can promote further intensification of the hemodynamic disturbances present in shock.

Comparison of the data obtained with the data of previous investigations studying isolated use of the experimental substances in the treatment of traumatic shock shows the complex administration of ACTH, aminazine, noradrenalin, Pituitrin and cortisone to be more expedient, as it effects a much greater increase in the resistance of the organism. This probably has to do with the fact that manifold disturbances occur during the development of traumatic shock in many different systems of the organism – the nervous, endocrine and cardiovascular system particularly. Therefore, complex therapy designed to eliminate all these disturbances is the most rational treatment of shock [1, 3, 4, 5, 8, 13].

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