DISTURBANCES IN AND RESTORATION OF FUNCTIONS OF VISCERA AFTER CLINICAL DEATH

PRELIMINARY COMMUNICATION. DISTURBANCE AND RESTORATION OF GASTRIC FUNCTION AFTER CLINICAL DEATH OF 2 AND 7 MINUTES DURATION

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Most of the studies made of the changes taking place in the organism of higher animals dying of acute hemorrhage, and subsequently resuscitated, have been related to biochemical and electrophysiological changes in cerebral and myocardial activity, and to basal metabolism [1, 2, 6, 7], as well as to certain aspects of higher nervous activity [3, 4, 5]. Up till now, no work has been done on the study of the changes which take place, as a result of fatally terminating blood loss, in the functioning of a number of the internal systems of the body, and in the first place in the alimentary tract and the kidneys.

We had at our disposal a dog called Malchik, 5-6 years old, a cross between an Alsatian sheepdog and a farmyard dog. This animal had been in the laboratory for a number of years, and was accustomed to staying immobile in a harness for long hours. It had been subjected to gastrotomy and esophagotomy in 1952, and had adapted well to feeding through a stomach tube inserted through an opening at the lower end of the ligated esophagus. The dog had been fed twice daily for 4 years, i.e., to the end of May 1956, during which time its weight had remained steady at about 17-18 kg. The following were examined: 1) the secretory function of the stomach, in response to 3-minute sham feeding with raw meat; 2) total acidity of the gastric juice; 3) the digestive power of the gastric juice, assessed according to Mett; 4) nature of the fasting (periodic) activity of the stomach, registered by V. N. Boldyrev's method.

EXPERIMENTAL METHODS

The experiments were started after thorough washing out of the stomach with warm water, for which purpose we used not less than 3 liters of water, after which we recorded the amount of juice secreted over a period of from 30 to 60 minutes; the dog was then sham-fed for 3 minutes. The latent period of gastric secretion was recorded, and the amount of juice secreted per 15 minute period was measured over 1-2 hours.

Peak secretion was usually observed during the first hour of the experiment. For this reason we frequently restricted our observations to one hour after sham feeding. The gastric juice collected during this hour was filtered, and its total acidity was determined by titration with N/10 NaOH, using 1% alcoholic phenolphthalein as indicator. Digestive power was assessed from the number of millimeters of protein column digested after 12 hours of incubation at 37.5°. Periodic stomach contractions were registered through air transmission on an electrokymograph, with the drum rotating at a rate of 50 cm in 15 minutes.
Volume of gastric secretion (ml)

Before resuscitation

Digestive power
1001 units

Total acidity
910

Before After After
resuscitation resuscitation resuscitation

Fig. 1. Amount of gastric secretion (1st experiment).

EXPERIMENTAL RESULTS

The dog was twice bled to death. During the preceding 3 months we performed 22 experiments involving sham feeding with subsequent determination of volume, total acidity, and digestive power of gastric juice secreted during the test hour (Fig. 1, a). The dog was first bled to death on May 31, 1956 (Protocol No. 1979). Its weight was then 17.5 kg. Before the experiment we gave the dog a 2% solution of Pantopon, at a dosage level of 2 ml per 5 kg body weight. The femoral vessels were exposed under local procaine anesthesia. The volume of blood withdrawn amounted to 980 ml.

The death agony was of short duration, lasting for 2 minutes 46 seconds. Clinical death lasted for 2 minutes. Cardiac activity returned 30 seconds after commencement of intra-arterial transfusion of blood and of artificial respiration. The first spontaneous inspiration appeared 1 1/2 minutes after commencement of resuscitation. Spinal reflexes reappeared 3 minutes 45 seconds after resuscitation began, corneal reflexes in the left eye after 6 minutes 15 seconds, and in the right eye after 7 minutes, while tendon reflexes reappeared after 7 minutes.

Fig. 2. Characteristics of "hunger" contractions.

a) experiment of April 24, 1956 (control); b1) experiment of June 3, 1956 (3 days after resuscitation); b2) continuation of the experiment of June 3, 1956; c) experiment of December 11, 1956 (4th day after second resuscitation); d) experiment of February 14, 1957 (2 months after second resuscitation); below: time signal (1 sec.).