

THE EFFECT OF PNEUMOPERITONEUM ON THE INFLAMMATORY REACTION OF RABBIT'S PINNA TO THERMAL BURN

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(Received January 18, 1958. Presented by Active Member AMN SSSR V. N. Chernigovskii)

Pneumoperitoneum is one of the measures used successfully in the treatment of a number of pathologic processes (tuberculosis of the peritoneum and the intestine, plumonary tuberculosis, specific and nonspecific lesions of the pelvic organs, peptic ulcer etc.).

There are many publications dealing chiefly with the therapeutic merit of penumoperitoneum [3, 5, 7, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22 and others]. Experimental investigations of this question are considerably less in number [2, 4, 6, 12 and others].

We have shown in our work [8, 9, 10, 11] that as the result of application of pneumoperitoneum to animals distinct changes appear in the excitability of the vasomotor and respiratory centers, as well as changes in thermoregulation and qualitative leukocyte reactions. There are references in the literature to changes in the course of inflammatory reactions under the influence of air introduced into the abdominal cavity. S. S. Laguchev [6] found that the reactivity of connective tissue and epithelium was altered in animals who had air introduced into the abdominal cavity; this alteration manifested itself in accelerated healing of cutaneous wounds.

The present communication deals with the results of observations on the effect of pneumoperitoneum on inflammatory reaction.

EXPERIMENTAL METHOD

Inflammation of the rabbit pinna, induced by thermal burn, served as model of inflammatory reaction. The burn was produced by water heated to 53°, in which the rabbit pinna was immersed for 3 minutes. The experiments were so designed that control and experimental animals were matched for weight, color and sex. Inflammation was first induced in one pinna, then, after healing (20-30 days later) in other. Thus those rabbits which were subjected to pneumoperitoneum in the first instance served as controls in the second and vice versa. The same animals thus served for the main observations (application of pneumoperitoneum) and for control (without application of pneumoperitoneum).

The inflammatory reaction was recorded by the A. S. Saliamon (cited in [1]) method.

Inflammatory edema was determined by measuring the volume of the pinna before and during the course of the inflammatory process — 2, 5, 24, 48 hours and 5 days after the burn. The volume was measured by immersing the pinna in a glass cylinder with diameter of 4 cm, filled with water. The magnitude of edema was expressed in the increase of volume of the inflamed pinna in percentage of its initial volume prior to the burn. The temperature at the focus of inflammation was measured with a thermocouple with a copper-constantan junction.

In addition to the objective recording of changes in temperature and extent of edema of the inflamed

pinna as determined visually and photographically, the third manifestation of inflammation — impairment of function of the muscular apparatus of the pinna — was also determined.

A total of 18 experiments was carried out, of these 9 served as controls. The experimental rabbits were subjected to pneumoperitoneum prior to the infliction of thermal burn.

In 6 experiments from 100 to 150 ml air was introduced into the abdominal cavity 30 minutes before the burn; refills were made after one day, then after 2 days. The gas bubble was monitored by roentgenoscopy.

In 3 experiments air was also introduced 30 minutes prior to the burn but in larger volumes — from 300- to 400 ml without refills. Observations in these investigations extended over 5 days.

EXPERIMENTAL RESULTS

In experiments in which air was introduced into the abdominal cavity of rabbits in small volumes (100-150 ml) the inflammatory reaction developed less strongly and was much less marked than in control animals. Thus, 48 hours after introduction of air the mean increase in volume of the inflamed pinna with respect to its initial volume was in control experiments equal to 135% and in animals with pneumoperitoneum to 66%. Consequently, edema in experiments with pneumoperitoneum was half that observed in control experiments (Fig. 1).

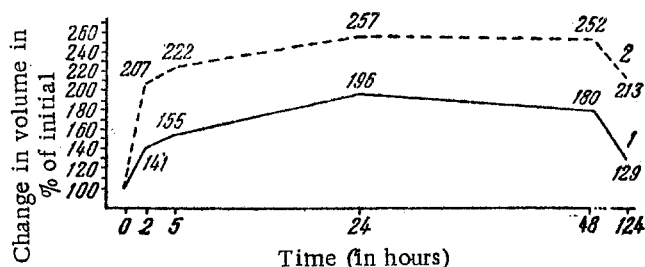


Fig. 1. Effect of pneumoperitoneum on change in volume of inflamed pinna in rabbit in percentage of the initial. 1) Experiment, 2) control.

The temperature of the inflamed pinna 48 hours after the burn was raised by an average of 3.8° in the control and by 2.3° in the experimental animal. The rise in temperature of the inflamed pinna in rabbits with pneumoperitoneum was thus 1.5° lower than in the control (Fig. 2).

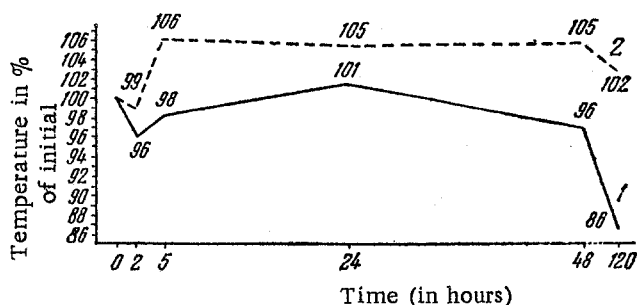


Fig. 2. Effect of pneumoperitoneum on changes in temperature of the inflamed pinna of rabbit in percentage of the initial. 1) Experiment, 2) control.

Definite differences between the experiment and control were also found with respect to the third index of inflammation, viz., impairment of the muscular apparatus of the pinna.

Unlike the results of experiments with introduction of a small amount of air, observations on cases in which a large amount of air (300-400 ml) was introduced into the abdominal cavity showed that the

inflammatory reaction was considerably more pronounced in the experimental rabbits compared with the controls. The mean increase in volume of the inflamed pinna in these experiments was 38% higher in animals with pneumoperitoneum than in the control ones.

No clear differences in the temperature of the pinna in experimental and control animals were observed.

Studies on the effect of pneumoperitoneum showed, as did our previous observations, that introduction of small volumes of air into the abdominal cavity exerted a normalizing effect on a number of physiologic mechanisms including those participating in the formation of inflammatory reaction. Relatively small volumes of introduced air inhibited the development of inflammation; its onset was delayed and the process was less pronounced than that in controls. The effect of large volumes of air introduced into the abdominal cavity proved to have an entirely opposite effect which had no anti-inflammatory influence.

With inflammation serving as a model we could, therefore, find confirmation of the duration and profound extent of the influence exerted by pneumoperitoneum. It is evident that the latter could be mediated by the reflex pathway as well as by way of change in other indices studied by us earlier. The data obtained confirm the view that the leading mechanism in the therapeutic effect of pneumoperitoneum on one or other pathologic process is by no means its purely mechanical action on the organism, but a neural mechanism, as has been repeatedly pointed out by Soviet authors [2, 3, 6-19 and others].

SUMMARY

Pneumoperitoneum of small volume (100-150 ml) exerts a normalizing effect on a number of physiological mechanisms controlled by the nervous system and involved in the reaction of recovery. Large volumes of air (300 to 400 ml) injected into the abdominal cavity have no anti-inflammatory effect.

The mean effect of pneumoperitoneum is mediated by the nervous mechanism.

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