EFFECT OF VAGOTOMY ON THE MICROCIRCULATION IN THE STOMACH WALL

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It was shown by intravital microscopy in transmitted light that vagotomy in rats leads to complex reorganization of all parts of the microcirculatory system of the stomach and, in particular, to slowing of the blood flow and a decrease in the number of capillaries in the mucous membrane and to the opening of arteriolo-venular anastomoses in the submucosa.

Key words: vagotomy; gastric microcirculation; intravital microscopy; intravital morphometry.

Vagotomy is used for the treatment of gastro-duodenal hemorrhage, including in hemorrhagic gastritis. The arrest of bleeding from the gastric mucous membrane after division of the vagus nerves has been shown to be connected with changes in microcirculation [12]. However, whereas the effect of vagotomy on the function of the stomach and other organs of the gastro-intestinal tract has been studied quite extensively [1, 5], the microcirculatory changes thereby produced have received little attention.

This investigation was carried out to study the effect of vagotomy on the gastric microcirculation.

EXPERIMENTAL METHOD

Wistar rats weighing 150–200 g were anesthetized with pentobarbital (5 mg/100 g body weight). The microcirculation in the stomach wall was investigated in 15 rats without preliminary vagotomy. After laparotomy through an incision below the left costal margin the stomach was brought up into the wound and a gastrotomy 1.5 cm in length performed. The animal was placed on a special transparent plastic frame fixed to the microscope table. The vessels in the stomach wall were examined under the microscope in transmitted light by the method described earlier. The state of the microcirculation was recorded by photomicrography and the frames were analyzed on a decoder. Subdiaphragmatic vagotomy, with division of the trunk of the nerve, was performed on the other 15 rats after the gastrotomy. The subsequent observations and recording the state of the microcirculation were carried out as on the control animals.

EXPERIMENTAL RESULTS

The vessels of the gastric microcirculation of the control rats were well filled with blood. The capillaries formed a diffuse, close-mesh network. From 14 to 50 capillaries could be counted in one field of vision of the microscope (on the average 500 capillaries per mm² surface of the mucous membrane). The capillaries showed little variation in length and diameter. The mean internal lumen of the capillaries was 9.6 ± 0.01 μ. The gastric mucous membrane had a transcapillary blood flow of comparatively high intensity. The submucosa contained arterioles, giving rise to the capillaries of the mucous membrane and muscular layer of the stomach wall, as well as a well-developed venous plexus, into which blood drained from the capillary networks via the postcapillary venules and veins (Fig. 1A). The diameter of the arterioles varied from 14 to 42 μ, with an average of 26.9 ± 1.0 μ. The internal diameter of the venules varied from 22 to 63 μ (mean 35.3 ± 1.2 μ). The venules of the submucosa, like the arterioles, anastomosed widely with each other. Arteriolo-venular anastomoses (AVAs) were found extremely rarely. They lay in the submucosa and, according to Kupriyanov's classification [3], they must be classed as shunts with controllable blood flow.


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Fig. 1. State of gastric microcirculation in rats before (A) and 15 min after vagotomy (B). Intravital photomicrographs, 180 ×.

Fig. 2. Mean diameters (in μ) of vessels of gastric microcirculation of rats before (I) and after vagotomy (II).

Fig. 3. Arterio-venular anastomosis (AVA). Reconstruction of fragment of microcirculation from intravital photomicrographs; A) arteriole; V) venule. Arrows show direction of blood flow. 180 ×.