THE EFFECT OF PANCREATIC DENERVATION ON THE BLOOD SYSTEM

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The stimulation of different receptor fields or the exclusion of receptor zones leads to marked changes in
the blood system.

Methods of denervating various internal organs were worked out in the laboratory of V. N. Chernigovsky.
These methods made it possible to study the reaction of the blood system to the denervation of the carotid sin-
uses and the arch of the aorta [1,5,6,10,12], the spleen [2,3,4,9], the liver [7,8], and different sections of the
stomach and intestines. Rather profound and lasting anemia was obtained in all of the experiments, which ori-
ginated from erythropoiesis disturbance, with a disturbance of the erythroblastic maturing processes which de-
veloped long after the operation.

Therefore, the organs of the blood system are connected with the central nervous system by a bilateral
nerve link. V. N. Chernigovsky and A. Ya. Yaroshenky [11] advanced the possibility that there are two me-
chanisms regulating the activity of the blood system organs.

On the one hand, the activity of the blood system organs can be stimulated by impulses coming from the
peripheral blood (in connection with the change in its chemical composition and physicochemical properties)
into the central nervous system, from which place centrifugal impulses proceed to the executive organs - the
blood system organs.

On the other hand, the activity of the blood system organs can also be stimulated reflexively, but the
reflex originates from the receptor fields of the various organs sending impulses to the central nervous system,
from which signals proceed to the blood system organs.

Therefore, on the basis of many factual data, many researchers have concluded that the exclusion of indi-
vidual blood system organs and, also, of other receptor fields is reflected in the peripheral blood picture.

The effect of pancreatic denervation on the blood system has not yet been treated in the literature.

The purpose of our work was to trace the hematological changes occurring due to denervation of the
pancreas.

EXPERIMENTAL METHODS

Seven healthy dogs with good hematological indices were used for the experiment. The pancreas
was denervated in three of the dogs, and the other dogs were used as the control.

Denervation was done by carefully separating the organ from the surrounding tissues. The adventitia
was carefully scraped from the main large 5-6 vascular trunks feeding the pancreas and were then coated with
a 10% phenol solution over a section 1-1.5 cm long. The pancreatic ducts were processed in the same manner.
The small vessels were ligated from two directions and transected.
For two weeks before the operation, the background blood composition was examined for hemoglobin content and number of erythrocytes, reticulocytes and leukocytes; myelograms and hemograms were examined, and the erythrocyte diameter and blood sugar content on an empty stomach were determined. After the operation, all the blood indices were examined after 3-4 days, and then every 7-10 days; every 15 days, a bone marrow punctate was studied, and the erythrocyte diameter was measured. The final stage was a microscopic study of the denervated pancreas.

EXPERIMENTAL RESULTS

After the operation, anemia developed in the dogs, with a maximal hemoglobin decrease of 13-20% by the 8th-24th day. After the 3rd day, the hemoglobin content began to increase in all of the animals and, in Maryak, reached the original level on the 84th day, in Bars, on the 47th day and, in Laska, on the 66th day. Analogous changes were observed in the erythrocytes: the maximal decrease was 1.8-2.3 millions on the 8th-24th day of the experiment, then they began to gradually increase and reached their normal level on the 40th-66th day. The reticulocyte reaction was absent in all cases, and the white blood picture was essentially unchanged.

The study of bone marrow hematopoiesis showed that the principal changes in the myelogram concerned the polychromatophilic normoblasts, which increased 5-14% in number; the leuko-erythroblast ratio consequently decreased from 1.2-1.5 to 0.8-0.9. These changes indicated hyperplasia of the erythropoietic tissue and some disturbance of the maturing process of the cellular elements.

The average erythrocyte diameter was slightly changed; only in one dog was there an increase of some 0.25 micron. No shift of the peak in the Price-Jones curve was observed.

![Fig. 1. Dynamics and time of Hemoglobin restoration in Maryak and Malchik. 1) pancreas denervated Maryak; 2) pancreatic duct ligated (Malchik).](image1)

![Fig. 2. Dynamics and time of erythrocyte quantity restoration in Maryak and Malchik. The symbols are the same as in Fig. 1.](image2)

At first, the blood sugar stayed within the limits of physiological fluctuations, but, after the 13th-27th day, there was a short period (10-14 days) in which its level decreased to 58-64 mg%, after which the sugar content returned to normal.

In the control group of dogs, the gland was totally resected (depancreatization), the pancreatic ducts were ligated or only laparotomy was done, with canterization of the peritoneum by a 10% phenol solution.

Comparative analysis of the data obtained showed that the hematological indices were more quickly restored in the control than in the experimental group: maximal hemoglobin reduction was 8-20% on the 8th-15th day and maximal erythrocyte reduction, 0.8-1.5 million; the indices were restored on the 18th-21st day, but they were not restored in the experiment until the 47th-84th day (Fig. 1, 2). In the control with the laparotomy, the reduction of the indices was extraordinarily weak (hemoglobin: 2-3% erythrocytes: 0.2-0.3 million), and restoration was observed only after a week.

During the operation, the vessels were not carefully separated nor the adventitia scraped off in the dog Bars; it is interesting to note that the vessels were coated with phenol while still covered by cellular tissue. Restoration of the hematological indices occurred earlier in this dog (on the 47th day) than in the other two (on the 66th-84th day), but much later, however, than in the control animals (on the 18th-21st day) (Fig. 3, 4 and Table).