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LIVE INVESTIGATION OF THE INTESTINAL LYMPHATIC SYSTEM FOLLOWING GASTRIC RESECTION

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Annotation: This study explores the impact of gastric resection on the lymphatic system of the small intestine with respect to fat absorption. The authors conducted a vital investigation of intestinal lymphatic vessels in 34 dogs using a biological injection method. It was found that under normal conditions, fat absorption occurs predominantly in the duodenum and proximal small intestine. However, after gastric resection, this process is disrupted and shifts to the terminal sections of the small intestine and, in some cases, even to the large intestine.

This displacement was particularly pronounced after gastroenterostomy procedures performed using the Polya–Reichel method. Under such conditions, the lymphatic system of the large intestine acquired the ability to absorb fats—an uncharacteristic function under normal physiological conditions. These findings highlight the high compensatory and adaptive capacity of the intestinal lymphatic system during the postoperative period.

Keywords: gastric resection, lymphatic vessels, small intestine, fat absorption, biological injection, chyle, Polya–Reichel anastomosis, terminal intestine, compensatory mechanisms, absorptive function.

Relevance: The relevance of this study lies in the fact that gastrectomy, regardless of the method by which it is performed, primarily affects the condition of the intestinal lymphatic system. It is well known that the lymphatic system plays an important role in the absorption and transport of food components. Complications observed after gastrectomy are associated with disturbances in the motor-evacuatory, secretory, and absorptive functions of the gastrointestinal tract. Therefore, studying this system is appropriate for identifying the dependence of certain pathological conditions on the intestinal lymphatic network.

The aim of the study is to determine the role of the lymphatic vessels of the small intestine in fat absorption after gastrectomy.

Materials and Methods: To study fat absorption in the small intestine prior to resection, a lifetime investigation of the lymphatic system was carried out on 34 dogs using the method of biological injection. For a more thorough understanding of fat absorption in the lymphatic system from a clinical perspective, experiments were conducted on 34 dogs: 10 were studied under normal conditions, and 24 were examined on the 7th, 15th, and 30th days after gastric surgery. To identify the fat absorption process in the intestine during life, the method of biological injection was used with preliminary special feeding of the dogs.

Results and Discussion: Biological injections performed before gastrectomy revealed that lymphatic vessels in the duodenum and the initial part of the small intestine were most intensely filled with chyle (fat). The lymphatic vessels of the middle part were weakly contrasted, and those in the terminal sections were almost not filled and not detected, even at later stages of feeding. Under normal conditions, in dogs during peak digestion, fat absorption occurs in the duodenum, the initial, and the middle parts of the small intestine. Consequently, fat absorption decreases toward the terminal direction and ceases before reaching the very end of the ileum.

Lifetime examination of the small intestine's lymphatic system after gastrectomy is of particular interest in experiments. It provides insight into the absorptive function of the intestine. In the first 7 days after gastrectomy, no contrast in the lymphatic vessels of the duodenum and small intestine was observed. Only partial and incomplete filling of the lymphatic vessels with white chylous fluid occurred in some animals at later stages. Early signs of fat absorption in the initial days after resection are explained by postoperative changes in the gastric stump due to damage of the vascular and nervous apparatus during the removal of part of the stomach. Paralysis of the gastric stump and the entire intestine leads to prolonged food retention in the stump and delayed evacuation of intestinal contents. This is exacerbated by gastrointestinal tract edema, which is observed in the early postoperative days.

By the 15th day after gastrectomy, the absorption process begins to recover. However, the filling of lymphatic vessels with white chylous fluid occurred in the middle sections of the serous and subserous lymphatic network and was distinctly observed only in the terminal loops near the end of the intestine. As distance increased in the terminal direction, the intensity of chyle filling in intra-organ and extra-organ lymphatic formations increased, reaching its peak at the loops of the terminal part of the small intestine. Lymphatic vessels of the duodenum contained no chyle and were not detectable. Only in two dogs at a later stage of resection (30 days) was weak contrast observed in some large sections of the large intestine, where rather large subserous and serous lymphatic vessels with a white appearance were found.

Lymphatic collectors of the cecal mesentery and the lymph nodes of the ileocecal angle were distinctly contoured. The results of in vivo biological injections of lymphatic vessels show that gastrectomy significantly disrupts the fat absorption process in the intestine. The disruption is manifested in the terminal displacement of absorption along the gastrointestinal tract. This displacement is even more pronounced in dogs where gastrectomy was completed with Polya–Reichel gastroenterostomy. In these animals, the process continued in the loops of the terminal part of the small intestine. In some cases, fat absorption did not end in the small intestine but continued into the cecum and even the ascending colon.

This pronounced displacement during the Polya–Reichel operation accelerated intestinal transit significantly. Sometimes, due to a large anastomosis corresponding to the size of the resected stomach, food rapidly entered the intestine and moved quickly in the distal direction. Under these conditions, the intestinal chyle was not prepared for absorption in the initial or even middle parts of the small intestine. Along with the absorption displacement, another interesting fact was discovered during experiments on animals operated on by the Polya–Reichel method. Under normal conditions, fat absorption ends in the small intestine and does not contrast in the large intestine during biological injection.

However, in dogs after Polya–Reichel resection, the process of fat absorption continued in the cecum and sometimes even in the ascending part of the colon. These experiments revealed additional compensatory and adaptive capabilities of the lymphatic system of the large intestine, which acquired the ability to absorb fats—something never observed under normal conditions.

Conclusion: Thus, under the conditions of pronounced terminal displacement of digestion after gastrectomy by the Polya–Reichel method, a new function was revealed for the lymphatic vessels of the large intestine — the ability to absorb fats, which indicates the significant compensatory and adaptive capabilities of the lymphatic system.

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