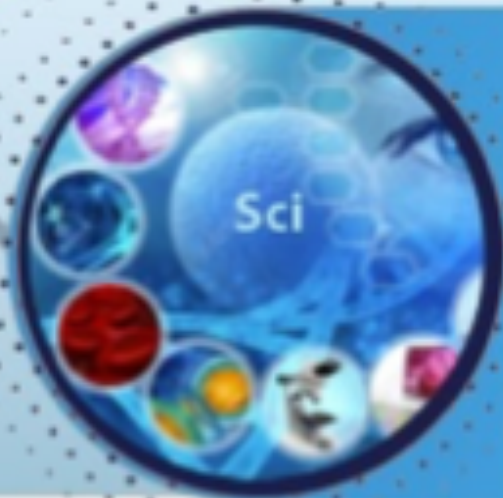




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Modern Ideas about the Development of Intestinal Paresis: principles of diagnosis and treatment

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ABSTRACT

At present, paresis of the gastrointestinal tract is considered as smooth muscle insufficiency, manifested both in individual organs and in body systems. Intestinal paresis is a frequent and dangerous complication in elderly and elderly patients with acute adhesive intestinal obstruction, affecting the mortality rate in the postoperative period, which remains high and ranges from 13 to 55%. The detection of early signs of paresis and the choice of the most effective methods of its treatment remain the determining factors for the successful treatment of such patients.

Keywords: Intestinal paresis, intestinal insufficiency, peritonitis

The main mechanisms of the development of intestinal paresis in the postoperative period in patients with acute adhesive small intestinal obstruction.

The severity of the postoperative period is very adversely affected by the so-called "enteral insufficiency" syndrome that develops in almost all patients in this category, which, in turn, gives rise to the formation of several vicious circles, which leads to an increase in the level of endogenous intoxication and the actual transformation of the small intestine into an undrainable abscess [1, 7, 8].

One of the factors in maintaining paresis of the small intestine is the inclusion of humoral mechanisms in the pathological process, first of all, this is the neurohumoral

effect of a stressful nature. The endotoxin produced in this process can directly affect nerve receptors, causing paralysis of the intestine and capillaries, as well as having a proteolytic effect on the vascular wall, increasing its permeability [2, 9, 10].

Disorders of intramural circulation are associated with both the involvement of the visceral peritoneum in the inflammatory process and the increase in intrainestinal hypertension. At the same time, there is a significant violation of microcirculation in the intestinal wall, spasm of arteries and arterioles, emptying of capillaries in the mucous membrane of the small and large intestine, dystonia of the arteries, and overflow of blood into the veins

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of the vascular plexuses of the submucosa and subserosal layers with a transition to stasis [3, 11, 12].

Impaired blood flow in the intestinal wall in endotoxemia with shunting through the choroid plexuses of the submucosa and ischemia of the mucosa can lead to the formation of acute ulcers of the intestinal tube or widespread necrosis of the intestinal mucosa, which leads to a violation of the integrity of the intestinal mucosa [4, 13, 14].

In turn, this contributes to the entry of bacterial toxins into the bloodstream and an increase in toxemia, as many authors point out. Microcirculatory disorders in the intestinal wall in acute intestinal obstruction reduce its barrier function and contribute to the penetration of microorganisms from the lumen of the intestinal tube into the abdominal cavity [5, 15, 16].

It is the local effect on the intestine of such biologically active substances as histamine and serotonin that leads to a violation of the function of the autonomic nerve plexuses that ensure the motor activity of the intestine [6, 17, 18].

At the same time, an increase in the level of serotonin in the blood and its increased secretion by saliva probably lead to its leaching from the intestinal wall, which reduces its excitability and contributes to the preservation of paresis. Hypoxia, dehydration and electrolyte disorders also increase intestinal paresis, which, accompanied by fluid sequestration, increases hypovolemia, and an increase in intra-abdominal pressure causes a deepening of respiratory and cardiovascular disorders.

Many authors point out that the development of intestinal paresis and the delay in the passage of intestinal contents causes a violation of the ecology of the intestinal flora with a predominance of endotoxin-producing bacteria. As the pathological process develops, dysbacteriosis develops in the intestine, which contributes to the replacement of cavity and parietal digestion with symbiotic digestion, when favorable conditions are created for putrefaction and fermentation processes [19, 20].

As a result of these processes, such poisonous products as skatol, indole, phenol, histamine, etc. are formed. The loss of protective functions by the intestinal wall activates the exudation of products from the lumen of the intestine into the abdominal cavity, which leads to its reautoinfection [21, 22].

Intestinal dysfunction is one of the leading links in the pathogenesis of acute intestinal obstruction [23, 24].

At the same time, despite the searches of numerous researchers, the pathogenesis of postoperative paresis and intestinal paralysis has not yet been finally elucidat-

ed, as a result of which the differential diagnosis and treatment of the disease is a difficult problem. The most significant reasons for making a decision in practical surgery are still clinical signs of the progression of peritonitis and intestinal obstruction of unknown origin, inclining surgeons to repeat surgery.

In the literature, there are cases when repeated operations, which naturally contribute to the development of newly formed adhesions, were performed on the same patient repeatedly, which contributed to either disability or death.

As is known, paresis and paralysis of the gastrointestinal tract are a characteristic manifestation of acute adhesive intestinal obstruction, the timely resolution of which often depends on the outcome of the disease. Today, along with traditional methods of diagnosing gastrointestinal tract paresis, various methods of recording the motor function of the intestine play a crucial role [25, 26].

One of the main functions of the stomach and colon is motility - a very complex and easily vulnerable process. The motility of the small intestine is simpler, resorption is in the first place in the functional hierarchy of the small intestine. About 90% of the motor activity of the large intestine is aimed at simply mixing the contents into the next part [27].

The direct cause of translational motion is contractile waves going in the aboral direction. The condition for free movement is the adaptive relaxation of tone before the coming wave (the state of eukinesia). If motor coordination is impaired, then the forward wave stops, the movement of the contents does not occur, and discoordination occurs. Gastrointestinal motility disorders are manifested by both hyperkinesia and hypokinesia. These disorders are commonly referred to as dyskinesias [28].

All disorders of the motor-evacuation function of the gastrointestinal tract, from paralysis and paresis to discoordination of motor function, are far from indifferent to the patient's body. Often they become the leading cause of complications and pathological conditions in the clinic of various diseases. Therefore, timely diagnosis and targeted impact on the motor-evacuation function of the digestive tract, and control over the dynamics of restoration of this function are of paramount practical importance.

Assessment of the functional state of the gastrointestinal tract in patients with intestinal paresis.

Auscultation of the abdomen has long been widespread among surgeons in various diseases of the gas-

traintestinal tract, as one of the methods for assessing the functional state of the intestine. The appearance of intestinal murmurs in the first days after operations on the abdominal organs is considered a favorable symptom, and their disappearance is a poor prognostic sign and signals developing complications.

Assessment of the activity of intestinal peristalsis is carried out by direct listening to the sound phenomena of the abdominal cavity by each doctor separately and is evaluated on the basis of personal experience, i.e. very subjectively. Since intestinal peristalsis is a random process, the short-term nature of the study determines the study of intestinal murmurs at the time of greatest activity or, conversely, at the time of relative rest. That is why quite often there is a difference of opinion when assessing the state of the motor-evacuation function by different doctors. Objective methods of recording intestinal murmurs began to develop only in the last 10-15 years. Naturally, the literature on this issue is extremely poor and contradictory.

The need to assess the motor-evacuation function of the gastrointestinal tract most often arises not only in the diagnosis of acute surgical diseases of the abdominal cavity, but also in order to monitor the restoration of intestinal function after operations on it, in the conservative or surgical treatment of diseases and injuries of the spinal cord, in the diagnosis of various intestinal diseases in gastroenterological departments, in the functional diagnostics rooms of polyclinics. When observing patients who have undergone operations on the abdominal organs, spinal cord, etc. [2].

Clinical practice sets certain requirements for the methods of studying the motor-evacuation function of the intestine: the possibility of long-term dynamic observation and complete harmlessness for the patient.

Methods for studying the motor and evacuation function of the digestive tract, currently used in clinical practice, are based on the following principles: 1) registration of changes in intraintestinal pressure; 2) X-ray observation of the movement of the contrast agent through the intestine; 3) registration of sound phenomena that occur during intestinal movement; 4) registration of electrical potentials associated with the motor activity of the intestine [17].

There are several methods for measuring intraintestinal pressure: balloon kymography, balloonless using open catheters, and radio telemetry.

The balloon kymographic method is based on measuring the pressure in the balloon placed in the lumen of the studied part of the gastrointestinal tract. The pressure

measuring device consists of a thin-walled elastic balloon with a volume of 1 to 250 ml, connected by a catheter with a water manometer and a Marey capsule [21].

The balloonography method allows you to measure pressure in the intestinal segment and indirectly assess the motor activity of the intestine. The works of a number of authors [13, 16, 19, 24] have shown that the use of large balloons is not physiological, since they irritate the mechanoreceptors of the intestinal wall and cause an increase in motility activity. The use of cans with a volume of no more than 2 ml is considered mandatory, but such canisters allow you to measure pressure within no more than 100-150 mm of water. st., which is significantly less than the range of pressures developed in the gastrointestinal tract [7, 13].

The balloonotensographic method is devoid of these disadvantages [15]. In this method, the water pressure gauge is replaced by a rigid capsule, the movement of the wall of which under the influence of pressure changes is measured by a strain gauge device. With the simultaneous use of several balloons, it becomes possible to assess the work of several parts of the digestive tract and monitor the propagation of the peristaltic wave. However, the balloon method has not become widespread due to the disadvantages associated with the labor intensity of inserting a rubber balloon and the negative reactions of patients to it.

The method of an open catheter involves the introduction of a thin catheter filled with fluid and connected to a recording device into the examined part of the digestive tract. The catheter is a receiver of pressure present in the intestinal segment and changes with rapid oscillations of the intestinal wall. The data obtained make it possible to judge the value of the average pressure in the lumen of the segment in which the open end of the catheter is located, and thereby indirectly judge the motor activity of the intestinal area. If contractions of the intestinal muscles lead to free movement of the contents, then the confined space in the intestinal segment disappears, and the open catheter does not register increased pressure. Therefore, it is advisable to record simultaneously using a balloon and an open catheter, which makes it possible to judge the strength of bowel contraction and the pressure developed in the lumen.

The limited use of the open catheter method in the clinic is due to its disadvantages inherent in all probe methods of examination (discomfort during the insertion and stay of the probe in the digestive tract, gagging, increased intra-abdominal pressure, the danger of sutures

dehiscing with the development of peritonitis, etc.). It is allowed to use it in cases where there are indications for aspiration of gastric and intestinal contents - this mainly applies to patients after surgery for acute intestinal obstruction.

The introduction of radiotelemetry equipment in medicine made it possible to carry out remote measurements and record the parameters of physiological processes. The principle of the radiotelemetry method for studying the motor function of the intestine is to transmit information using a sensor passing through the stomach and intestines. The sensor (generator of electromagnetic oscillations of high frequencies) and the electrical power source are located in a radio capsule. Changes occurring in the sensor under the influence of the phenomenon under study cause changes in the frequency of electromagnetic oscillations emitted by the generator. The latter are perceived by a special antenna located near the examined patient and connected to a radio receiver and recording equipment. When using a radio capsule with a pressure sensor, pressure fluctuations in organs associated with their motor activity are recorded. Certain regularities of this parameter are noted in diseases of the gastrointestinal tract: an increase in peptic ulcer disease, a decrease in ulcerative colitis, etc.

Possessing the indisputable advantages of the probeless method of examination, providing a sufficiently accurate measurement of pressure in the lumen of the digestive tract, radiotelemetry is very promising for clinical medicine. However, it should be borne in mind that the capsule, being a foreign body, causes a reaction of the intestinal wall, which inevitably affects the measurement results. The disadvantages of the radiotelemetry method also include the complexity of the equipment and great difficulties in monitoring the dynamics of pressure changes in any part of the gastrointestinal tract, since the radio capsule moves along with the contents of the intestine, and in the case of fixation of the capsule, all the inconveniences of the probe method arise.

X-ray examination is in the first place among special methods of examination of persons with diseases of the digestive system. It makes it possible to widely study the anatomical and functional changes in these organs in various pathological conditions. The modern arsenal of X-ray techniques is large. Their capabilities have increased with the advent of electron-optical converters, which increase the brightness of the X-ray image by 1000 times (the radiation dose decreases accordingly) and make it possible to make films. The use of X-ray kinography with an electron-optical converter made it

possible to study the nature of the propagation of peristaltic waves of the stomach and intestines, as well as to establish the ratio of motor and evacuation activity of parts of the gastrointestinal tract. The disadvantages of the X-ray method of examination include the use of a contrast agent, the traumatism of repeated examinations, especially in the postoperative period, and the undesirability of repeated radiation exposures. In addition, X-ray methods usually give only qualitative characteristics of the motor activity of the gastrointestinal tract. Such assessments of peristalsis as "alive", "sluggish", etc. are generally accepted.

For all the usefulness of the information obtained using the method of auscultation of the abdominal cavity, this method remains purely subjective. The same sound phenomena are evaluated differently by different researchers, as a result of which the diagnostic value of abdominal auscultation is sharply reduced. All this necessitated the objectivization of the auscultation method in order to document the information obtained, its subsequent analysis and comparative study. For the first time, this problem was solved by I. Farrar and F. Ingelfinger (1955) with the help of a sound recording device created by them. At the same time, the sounds of the abdominal cavity were picked up by a microphone installed on the anterior abdominal wall, amplified and demonstrated on an oscilloscope to determine their general configuration. At the same time, it was possible to record sounds on magnetic tape in order to replay the recording for listening and analysis, as well as to record sounds on continuous recording equipment and integrate them in a discrete period of time (30 seconds). The amplitude-frequency characteristic of peristaltic noise was used, but no comparison of signal changes was made. A certain correlation was revealed between peristaltic murmurs and balloonokymographic recordings of intestinal movements under the influence of motility-stimulating pharmacological agents. It was concluded that the method of recording peristaltic murmurs is a valuable method for assessing the motor activity of the gastrointestinal tract in health and pathology [13].

In solving the problem of improving the quality and informative value of abdominal phonograms in order to suppress acoustic interference (heart sounds, wheezing in the lungs, external noises, etc.), the principle of interference based on the attenuation of coherent oscillations with a phase difference of 180° was used. The implementation of this principle was carried out by installing an additional channel for acoustic interference suppression, consisting of a preamplifier, a bass reflex, an atten-

uator and a mixer. As a result, it was possible to eliminate the main obstacles, which increased the ability to quantify.

In order to further develop the method of quantitative assessment of abdominal phonograms from the standpoint of probability theory, a mathematical model was developed that allows for an accurate quantitative analysis of peristaltic murmurs for a discrete period of time equal to 15 minutes. However, due to the complexity of mathematical formulas and the laborious nature of calculations, such an analysis of abdominal phonograms is of little use for everyday practical work.

At present, electrophysiological methods of research are becoming more and more recognized, which make it possible to obtain quantitative and objective information. Among these methods, electrogastro-, electroentero- and electrocolography are usually distinguished. A whole line of research has developed that studies the biopotentials generated by the organs of the gastrointestinal tract from the surface of the body in the projection of the organs under study.

It is known that the smooth muscles of the gastrointestinal tract have the ability to continuously contract in a certain rhythm. The frequency of slow potential recorded from smooth muscle coincides with the frequency of contractions; Slow waves have a frequency and configuration characteristic of each organ. Special studies have revealed and confirmed the dependence of the electrical potentials of an organ on its motor function. Taking into account the quantitative and qualitative characteristics of this function, the adequacy of its and the electrical activity recorded from the surface of the body is shown. However, this activity reflects the motor activity of the part of the organ in the projection of which the active electrode is fixed.

In clinical practice, the mass-produced electrogastrograph EGS-4M is widely used. The device is easy to use, quite stable in operation, has good sensitivity and frequency selectivity (0.02-0.2 Hz). This device made it possible to obtain a large amount of factual material that has not only theoretical but also important practical importance in the study of the pathogenesis of acute and chronic diseases of the stomach. It provides significant assistance in diagnosing and determining the effectiveness of the treatment.

The principles of gastric biopotential diversion have been used, with some modification, to study the electrical activity of the small and large intestines. For these purposes, a three-channel device has been developed for the simultaneous registration of biopotentials of the

stomach, small intestine and large intestine. A comprehensive study of the electrical activity of the stomach, small intestine and large intestine allows you to get an idea of the functional interconnectedness of the digestive tract, which, in combination with the clinical picture, makes it possible to establish the degree and location of the lesion, and also allows the clinician to orient himself in the effectiveness of the treatment.

The so-called peripheral electrogastrography, based on the registration of changes in the biopotentials of the stomach and intestines from the extremities, seems promising, especially in patients after surgical interventions on the abdominal cavity organs.

Despite the widespread use of electrogastrography, its diagnostic value is limited mainly to functional pathology. The generally accepted amplitude-frequency assessment of electrogastrography makes it possible to differentiate hyper- and hypomotor dyskinesias of the stomach without giving their quantitative characteristics. The removal of biopotentials of the small intestine and especially the large intestine, taking into account their complex and diverse motor activity, has not yet been sufficiently developed. In addition, in recent years it has been established that there is no complete correspondence between the registered biopotentials and the coordinated contractions of the stomach: during the period of rest, there are no mechanical movements of the stomach, but biopotentials continue to be registered.

Thus, with the help of registration of biopotentials, it is possible to obtain valuable information about the level of metabolism in the wall of the stomach, but this is not enough for an accurate characterization of motor activity. To increase the effectiveness of the method, it is considered necessary to develop a strict physiological and technical basis for the creation of a system for the removal of local biopotentials from the surface of the abdominal wall and distant from the extremities. This makes it possible to calculate the electrical vectors of the stomach and different parts of the intestine, and subsequently to detect organic pathology.

Modern electrophysiological equipment for gastroenterological studies cannot isolate the signal of one part of the gastrointestinal tract from the general bioelectrical activity of the body. It is obvious that in integral clinical and physiological methods, the problem of extracting signals from a specific organ of the gastrointestinal tract can be solved with the help of new technical equipment, which became possible due to the appearance of a selective electrogastroenterocolonograph and a set of stimulators, with the help of which it became possible to correct

disorders of the motor-evacuation function simultaneously of all parts of the gastrointestinal tract and individual organs (stomach, 12 denum). intestine, small intestine, large intestine).

A selective electrogastroenterocolonograph allows you to assess motor activity by the parameters of bioelectrical activity of individual organs of the gastrointestinal tract. From the general information flow of biopotentials of the abdominal cavity organs, he selects only those biopotentials that characterize the motor activity of the stomach, duodenum, small intestine, and large intestine and separately registers their graphic image on the recorder channels.

As you know, a healthy person has 3 discharges per minute in the stomach, and the frequency is 0.05 Hz. In the duodenum, 12 discharges per minute (0.2 Hz) are formed, 7 discharges per minute occur in the small intestine (0.117 Hz) and 5 discharges in the large intestine (0.1 Hz). Registration of the bioelectrical activity of organs on different channels simultaneously dramatically expands the possibilities of the new method in diagnostics.

With the help of an electrical stimulator, it became possible to purposefully affect the motility of individual organs of the gastrointestinal tract either by stimulating reduced bioelectrical activity, or by extinguishing the increased and chaotic amplitude of biopotentials with the subsequent restoration of normal amplitude and rhythm. In order to eliminate the influence of parasitic circuits that inevitably arise when connecting various devices powered by the industrial network to the patient, the authors abandoned standard stimulators with mains power from the very beginning. A new model of a small-sized device powered by a battery or accumulators was used. The frequency of oscillation at the outputs can be smoothly or fixedly changed in the range from 0.01 to 0.06 Hz.

Therefore, with the help of this device, it is possible to affect all the main organs and digestive systems in any order in resonance ways. The main information indicator of the obtained curves is the amplitude, rhythmicity, and shape of biopotentials, which are recorded graphically and evaluated visually. Various types of stimulators have been proposed, which, according to the parameters of the supplied electrical action, are the most physiological in terms of the frequency and amplitude of their own oscillations of the organs of the gastrointestinal tract.

The resulting resonance interaction between the supplied electric current and the biopotentials of the excited organ itself allows both excitation and suppression of abnormally increased bioelectrical activity, which makes

it possible to purposefully control the function of smooth muscles of the gastrointestinal tract.

Selective proximal vagotomy, cholecystectomy, gastric resection, extended operations in the gastropancreaticoduodenal zone, hernia repair, liposuction. Unfortunately, it should be noted that there are practically no works on acute adhesions of small intestinal obstruction, where the characteristic of the functional state of the gastrointestinal tract is of particular importance, both in the diagnosis and for the control of treatment.

Electrogastroenterography has long been of interest to researchers, but the latter has not become widespread. This is due to the fact that one part of the methods was invasive, the other was either difficult to conduct and evaluate, or insufficiently informative. In addition, most of the techniques did not meet the needs of surgical clinics due to the impossibility of their use in intensive care units, while motility disorders most often occur just in the early postoperative period. From all of the above, it follows that the most acceptable technique should combine a number of conditions: firstly, it should be non-invasive, secondly, it is necessary to simultaneously monitor all parts of the gastrointestinal tract, thereby contributing to a more accurate diagnosis of its function, and thirdly, this technique should be simple and economically viable.

Today, selective electrogastroenterography has a number of advantages over similar methods. First, bioelectrical activity is recorded simultaneously from all parts of the gastrointestinal tract, which in turn contributes to early diagnosis and targeted correction of these disorders. Secondly, the ease of assessing the results obtained when compared with the clinical picture acquires a specific meaning. Thirdly, the simplicity of the method allows its use in postoperative wards and intensive care wards [16].

It should be noted that electrogastroenterogram indicators are often ahead of the clinical picture of gastrointestinal paresis. Functional intestinal obstruction, which occurs in the early postoperative period, is usually diagnosed only when its initial manifestations appear, i.e. when its pathological mechanism has already been launched. This period is already accompanied by such serious and deep disturbances of homeostasis that it is difficult to correct it during the first day. Therefore, a technique capable of diagnosing various motility disorders in the early postoperative period before the development of clinical signs should be especially relevant. This contributes to a change in therapeutic tactics in the early stages of functional intestinal insufficiency, when pathological links have not yet been activated. Normal-

ization of motor-evacuation activity of the gastrointestinal tract in these conditions does not yet seem to be such a difficult task. This leads to a decrease in mortality, the number of postoperative complications, and saves the clinic's efforts and resources.

Principles of treatment of intestinal paresis.

For the treatment of intestinal paresis, clinicians have been using cleansing, siphon and hypertonic enemas, intravenous administration of hypertonic solutions, which often eliminated the early manifestations of intestinal motor function disorders, both in the postoperative period and at the initial admission of patients with functional obstruction.

In the published works of a number of authors, the effectiveness of intravenous administration of hypertonic solutions of table salt was noted, when in severe paralysis in the postoperative period, the authors noted that immediately after the introduction of the solution, a distinct increase in intestinal peristaltic activity was revealed. However, the effect of this method on the intestines was often short-lived.

In recent years, great importance has been attached to the introduction of potassium chloride in the fight against postoperative paresis. Lack of potassium ions, which are necessary for the normal contractile function of the smooth muscles of internal organs, can cause the development of atonia, paresis and paralysis of the digestive tract. Maintaining the potassium balance today is considered as an effective prevention of paresis, and the normalization of the resulting shifts in the content of potassium ions as a pathogenetic treatment of postoperative motility disorders.

The data of a number of researchers indicate a significant decrease in the incidence of postoperative paresis as a result of directed maintenance of potassium balance, which determines the need for its control and the effectiveness of timely correction in case of shifts in the postoperative period [1, 5, 9, 18, 21].

With the introduction into practice of drugs that stimulate the contractile activity of the muscles of the gastrointestinal tract, pituitrin began to be widely used, the effectiveness of which was associated with the presence of vasopressin in the preparation. Against the background of the use of this drug, there was a positive trend in the treatment of early postoperative paresis, which was evaluated by many authors [2, 8, 12, 19]. The disadvantage of this drug was the short-term action. That is why, for the first time, V.G. Walter (1994) used it in combination with the cholinesterase blocker - proserin.

Later, they began to combine cholinesterase drugs, cleansing enemas, as well as various novocaine blockades (paraneural, sacrospinal, epidural) in the treatment of paresis, noting a fairly pronounced effect.

Despite certain successes in the treatment of intestinal paresis in acute intestinal obstruction in the early postoperative period, the mortality rate remained very high, which required new methods of treatment. The listed remedies can only contribute to the restoration of the motor activity of the gastrointestinal tract in combination with other therapeutic measures.

Modern treatment of peritonitis is based on the pathogenetic principle. Intestinal paresis, which develops secondarily, often aggravates the course of the disease, and its elimination requires a complex set of therapeutic measures. Particular difficulties in the treatment of peritonitis arise when the cause of the latter is the primary lesion of the small intestine. When analyzing the outcomes of their patients with peritonitis, it was assumed that one of the reasons for the unsatisfactory result was compression of the intestinal wall, which occurs due to loss of peristaltic activity and is maintained by fermentation of intestinal contents. Gross changes in microcirculation in the intestinal wall are an obstacle to the effect of drugs.

To combat this often severe complication, traditional drug complexes of stimulating action, paraneural blockades, hyperbaric oxygenation, intubation of the small intestine with a Miller-Abbott probe, etc., are used.

Surgery for acute intestinal obstruction is one of the most common and often very complex surgical interventions in emergency abdominal surgery. An important principle of eliminating intestinal obstruction should be considered the choice of a gentle, but rather radical method that reliably eliminates the mechanical obstacle to the intestinal passage.

The scope of surgical intervention for acute intestinal obstruction can be different - from extensive resection of the intestine if it is not viable to the imposition of a discharge intestinal fistula or bypass interintestinal anastomy. The implementation of surgical assistance in patients with acute intestinal obstruction in the late stages, in the conditions of developed peritonitis, pronounced intestinal paresis in combination with intestinal insufficiency syndrome has its own characteristics. Indications for surgical treatment of acute intestinal obstruction are determined differentially depending on the form of obstruction and the timing of its development.

The most complex surgical interventions are performed in patients with acute intestinal obstruction - in cases where there is an extensive adhesion process after

repeated operations for adhesive intestinal obstruction. One of the most common operations for acute adhesive intestinal obstruction is dissection of adhesions. At the beginning of the 20th century, enterotomy was proposed to unload the intestinal tract from stagnant contents. But simple enterotomy was subjected to quite harsh criticism. Indications for it were initially narrowed, and then completely excluded, especially due to the fact that another, more advanced operation appeared - enterostomy, which was offered not only to unload the affected obstruction, but also to prevent sutures of the intestinal joints.

But dissection of adhesions and ileostomy did not guarantee a cure for adhesions, and recurrent acute adhesions of the small intestine, and since the danger of obstruction remained, there were proposals to apply anastomoses bypassing the adhesions, between the adjacent loops of the small intestine. These proposals have been criticized by a number of authors. Their objections boiled down to the fact that anastomosis, as a method of preventing acute attacks of adhesions, does not always eliminate stasis of intestinal contents, contributes to the occurrence of enterocolitis and does not eliminate the need for a second operation.

By crossing the compressive cords, separating the interintestinal adhesions at the height of intestinal obstruction, the surgeon saves the patient's life, but by his manipulations he inevitably provokes the formation of adhesions in even greater numbers, dooming the patient to the risk of a second operation, which occurs with each intervention, reaching 47% after the 5th operation. An attempt to break this vicious adhesion circle was the proposal of Noble (1937) to plicate the small intestine with the help of serous-muscular sutures, designed to prevent disordered arrangement of intestinal loops and obstruction. Noble T.V. recommended 2 types of plication depending on the prevalence of peritonitis. In case of limited peritonitis, he resorted to stitching together only those loops that are involved in the inflammatory process. With widespread peritonitis, he performed complete plication. However, due to the large number of complications and poor results, the operation has now been practically stopped. Wilson (1964), analyzing the results of 127 operations, gives it a negative assessment, motivating it by the fact that 6 patients died from the operation itself due to intestinal fistulas and peritonitis, 2/3 of the patients had the most acute postoperative intestinal paresis, and 16 required a second operation.

In recent years, the transmesenteric intestinal intestinopectomy proposed by Childs and Phillips (1978) has

become widespread in some Western European countries. However, this operation also gives poor results in 14%. A new rise in enthusiasm for the prevention of adhesions is associated with the name of the Washington surgeon Baker, who proposed internal splinting of the small intestine with a probe passed through its jejunostomy to the cecum. After the removal of the probe, after 2 weeks, the intestinal loops remain fixed by the already formed adhesions in the correct position given to them by the splinting tube. None of the 50 patients operated on by the author in this way was subjected to repeated intervention in the long term.

A significant number of authors have abandoned the methods of "open" decompression of the small intestine (intubation through gastro, entero- or cecostoma, etc.), since they consider their use to be much more traumatic and dangerous in terms of possible complications. Opening of the intestinal lumen is accompanied by contamination of the surrounding tissues with intestinal microflora, which significantly increases the total number of complications and adverse outcomes in the postoperative period. However, as before, the main point in the treatment of gastrointestinal paresis is the elimination of compression of the intestinal wall.

W.J. Westerman (1910) developed and applied a method of transnasal decompression of the stomach and 12 duodenum, and T.G. Miller and W.O. Abbott (1934) proposed special double-lumen probes for suction of intestinal contents.

A significant contribution to solving the problem of decompression of the gastrointestinal tract was made by domestic surgeons. Especially close attention was paid to this issue in the 60-80s of the XX century. At this time, new methods of decompression of the digestive tract were developed, the main indications for their implementation were determined, and experience was accumulated confirming the need for bowel movement during surgery for acute surgical diseases and injuries of the abdominal cavity, since it is the evacuation of intestinal contents that becomes one of the most important means of preventing postoperative complications.

At present, long-term intestinal decompression is an effective, pathogenetically substantiated method of treatment and prevention of intestinal disorders. This is evidenced by the fact of a decrease in mortality in acute surgical diseases of the abdominal cavity complicated by peritonitis and intestinal obstruction, in the group of patients with the use of prolonged intestinal decompression in comparison with those patients whose treatment in such a situation decompression is not applied. The key

to the successful use of long-term intestinal decompression is its performance according to strict indications in compliance with all the technical details of the surgical intervention, since errors in their execution, as a rule, serve as a source of severe postoperative complications.^{13'}

Intubation of the small intestine with a long probe is one of the important methods of modern treatment of patients with peritonitis and intestinal obstruction. The tasks of intubation are decompression of the small intestine, evacuation of its toxic contents, injection of drugs and nutrients into the lumen of the intestine. In some cases, the inserted probe is used as a framework to prevent adhesions of intestinal loops in a position that contributes to the occurrence of obstruction. These tasks are determined by the pathomorphological changes that occur in the intestine during its paresis. The accumulation of a large amount of fluid in the lumen of the small intestine leads to an increase in intrainestinal pressure with impaired microcirculation and to ischemia of the intestinal wall. In addition, an increase in pressure in the lumen of the intestine helps to increase the absorption of toxic contents. The need to evacuate the contents of the parietic colon is primarily due to its toxicity. It is more toxic than blood from the femoral and portal veins, lymph from the thoracic duct, and exudate from the abdominal cavity [7, 20].

Of great importance is the introduction of drugs into the lumen of the intestine through a tube, which is usually done during or after lavage of the intestine. It is more advisable to prescribe nutrients after the appearance of peristalsis. According to E.A. Nechaev et al. (1993), drainage of the small intestine in 69.8% of patients solved the decompression-detoxification problem, in 5.2% - decompression, in 22.3% of patients it was carried out for prophylactic purposes, and in 2.3% - to create a frame.

Due to the variety of tasks of bowel intubation, there is no reason to talk about this procedure only as a decompression or drainage procedure. Lowering the pressure (decompression) and removing the contents (drainage) is only part of the goals of this manipulation, so it is more correct to call it intubation of the small intestine.

Among the large number of intubations, nasogastrintestinal intubation has recently become widespread. The Dutch surgeon Westermann was the first to use a thin gastric tube through the nose in patients with peritonitis in 1910. Wangenstein (1931, 1935).

For the purpose of intubation of the small intestine, in 1934 T. Miller and W. Abbott developed a double-lumen probe with an inflatable balloon at the end for its independent distalsis with peristalsis, although, as they noted, the first successful intubation of the intestine for decompression was performed by G. Scheltema (1908). To make the probe more rigid, W. Abbott (1941) used a stainless steel stiletto, A. Leonard and O. Wangenstein (1965) used a metal string.

In 1945, it was reported that a probe with a pouch with 4 ml of mercury at the distal end was developed for transgastric intubation of the small intestine (Harris F.J.), although, as M. Cantor (1947) points out, mercury was first used to weigh down the distal end of the probe by J. Wilkins (1928).

Subsequently, retrograde drainage of the small intestine, including the duodenum, was used by V.A. Kostovsky (1976). In 1971, N.S. Androsov described the technique of intraoperative transoral intubation of the jejunum along the proximal end of the probe outward through the nasal passages, which was improved by A.A. Shcherbakov (1974), J. Schumann and H. Wehling (1974), R. Nelson and L. Nyhus (1979).

R.Chang and L.Denbesten (1976), F.Johnson et al. (1976), D. Douglas and J. Morrissey (1978) intubated the duodenum using an endoscope, which made it possible to perform effective intestinal decompression for 10 days. K. Eikenberg and H. Brummerstedt (1975) patented a probe with two inflatable balloons for controlled modification of the curvature of the distal part of the probe. T.S. Popova et al. (1979), N.S. Uteshev et al. (1985), using an endoscope, a probe was inserted into the initial part of the jejunum and not only decompression, but also lavage and enteral nutrition were performed.

In 1977, Y.A. Gegechkori and R.S. Popovyants described a method of retrograde drainage of the small intestine through a suspended enterostomy 20-25 cm above the ileocecal angle. The same method was proposed by A. Munro and R. Jones in 1978, but an inflatable balloon was fixed at the end of the probe to accelerate the intubation process, Z. Weinstein (1978) made several thickenings on the probe for this purpose.

The original design of the tube for intestinal intubation was proposed by D. Jung et al. (1983), the material for it was a slow-soluble protein (gelatin with glycerin and water).

R.I. Mehdiyev (1988), N.P. Kondratiev and A.A. Shine (1990), V.M. Buyanov et al. (1997) successfully used long-term nasointestinal intubation to combat intestinal paresis and paralytic intestinal obstruction in pa-

tients with postoperative peritonitis, including cancer patients.

N.I. Veligotsky et al. (1990), a long probe with a plugged distal end was used for peritonitis, which was inserted through the nasal passage during surgery, the surgeon passed it without opening the lumen of the hollow organ to the ileocecal angle, where it was brought out through the appendicostoma (thus, the proximal end of the probe drains the stomach, the distal end drains the duodenum and small intestine). 8 patients were operated on without fatal outcomes.

B.K. Shurkalin et al. (1999) used the method of nasointestinal intubation to combat persistent intestinal paresis occurring in patients with intestinal obstruction and peritonitis in the postoperative period, while completely abandoning the methods of "open" decompression of the small intestine, since they consider their use to be much more traumatic and dangerous in terms of possible complications. The authors give preference to single-channel probes. A double-lumen probe turned out to be more effective for lavage.

V.V. Kirkovsky et al. (2000), three-lumen probes of the original design were used for intestinal decompression. One channel of this probe drains the stomach and duodenum, the second drains the jejunum, and the third drains the ileum. The device provides adequate decompression of all parts of the small intestine, contributes to the even distribution of drugs administered through it. Recently, a fibrogastroscope has been used to insert a thin probe into the upper jejunum.

Shalkov Yu.L. and Koblandin S.N. (1986) used intestinal intubation with a long elastic polyvinyl chloride probe for decompensated motility disorders, including gastrointestinal paralysis, which provided full and long-term decompression. Under these conditions, in their opinion, the most rational method is the method of transnasal probe insertion, since it more fully provides decompression of the intestine, freeing it from accumulated gases and fluid. In elderly patients, retrograde insertion of the probe through the cecostoma is more reasonable, while trying to bring the end of the probe to the level of the trian ligament. Active aspiration of the contents with lavage of the intestinal lumen through a probe makes it possible to restore peristalsis in 90% of patients within the next 2-3 days.

At present, the best option for long-term decompression of the gastrointestinal tract is often recognized as total intestinal intubation by the nasogastric method, using the probe described above with an olive at the end and perforated holes along its distal parts.

The method is technically simple, it makes it possible not only to empty the intestine on the operating table, but also to carry out therapeutic lavage in the postoperative period, which contributes to the restoration of intestinal peristalsis at an earlier date. In addition, performing a frame role, the probe prevents the formation of bowel kinks in the form of a double-barreled shotgun and the development of adhesions in the postoperative period. This method of intestinal intubation attracts with its simplicity of execution and the absence of the need to open the lumen of the gastrointestinal tract.

The listed methods of enterocompression have a number of positive properties, as well as a number of significant disadvantages.

With prolonged intubation of the small intestine, infection of the stomach and esophagus with intestinal microflora is possible. Duodenogastric and gastroesophageal refluxes, hypersecretion of the stomach and an increase in congestive content occur, which leads to the development of erosive-ulcerative gastroduodenitis and esophagitis. When a nasogastric probe is inserted through the paretic colon along its entire length, the same authors described dystrophic and necrobiotic changes in the mucous membrane, tears of the mucous membrane with damage to the vessels of the submucosa and hemorrhagic impregnation of the wall.

B.K. Shurkalin et al. (1999) do not share the opinions of other surgeons who consider transnasal intubation of the small intestine to be technically difficult and traumatic. With the acquisition of certain skills, this procedure is performed quickly enough and does not lead to significant trauma to the intestinal wall. The authors provide indications for nasointestinal intubation:

- 1) increase in the diameter of the small intestine to 5-6 cm, regardless of whether gas or sequestered fluid prevails in its lumen;
- 2) application of interintestinal anastomoses or suturing of perforated openings of the gastrointestinal tract in conditions of peritonitis and intestinal obstruction;
- 3) application of the method of programmed revisions and sanations of the abdominal cavity;
- 4) abrupt infiltration of the wall of the small intestine, when the need for nasointestinal intubation is caused by the prevention of possible complications, the creation of functional rest of the inflamed organ;
- 5) the risk of developing early adhesive intestinal obstruction in the postoperative period.

According to the authors, there are no absolute contraindications. Relative contraindications are anatomical anomalies of the gastrointestinal tract, a pronounced ad-

hesion process in the upper abdominal cavity, which makes it difficult to insert a probe, and chronic pulmonary diseases in the decompensation stage.

In such cases, some surgeons prefer open methods of drainage of the small intestine.

As a result of these reasons, many surgeons consider the use of nasogastrintestinal probing of the small intestine to be a contraindication when there is a disease of the nasopharynx, oesophagus, cardiovascular and respiratory systems, varicose veins in cirrhosis of the liver, severe general condition of the patient, advanced age, obesity, inactivity. It was found that the prolonged presence of the probe in the nasopharyngeal cavity leads to the development or exacerbation of diseases such as sinusitis, tracheitis, pneumonia. This was especially common in the elderly. The complexity of the probe was increased in patients who had previously undergone operations on the abdominal organs. A pronounced adhesion process, the presence of adhesions of the transverse colon with the anterior abdominal wall make it difficult to insert the probe into the distal gastrointestinal tract.

To flush the small intestine, you can use a physiological and hypertonic solution of sodium chloride, Ringer's solutions, chamomile, oxygenated 5% glucose solution, a weak solution of hydrogen peroxide, potassium permanganate and even tap water. Since anaerobic infection prevails in the intestine during paresis, it is advisable to use a liquid with oxidants for lavage. V.P. Petrov et al. (1999) used sodium hydrochloride at a concentration of 300 mg/L.

The microflora of the gastrointestinal tract is subject to great fluctuations, both quantitatively and qualitatively. According to E.A. Beul and N.I. Ekshenina (1975), in healthy people, the upper part of the small intestine is practically free of microbes. M. Kaiser (1964) believes that 50% of healthy people do not have microbes in the ileum. At the same time, many researchers found from 5.6×10^3 to 10^4 microorganisms per 1 ml of contents in the small intestine, and up to 10^7 in the ileum. The concentration of microbes increases in old age. In case of paresis, the small intestine intensively develops its own, autochthonous microflora from the distal parts of the small intestine and from the large intestine. In his research, V.P. Petrov et al. (1999) showed a decrease in both the number of types of isolated microbes and their number in cultures of the contents taken after lavage of the intestine through a nasogastrintestinal tube. V.S. Savelyev et al. (1993) noted a decrease in bacteremia in the general and portal bloodstream.

Judging by the literature, the importance of enterosorption in the detoxification of the body in intestinal

paresis is currently increasing. If initially it was used mainly for the treatment of dyspepsia and poisoning, now the scope of use of drugs has expanded significantly, especially in surgery.

In many pathological processes, enterosorption has become one of the main methods of treatment, against the background of which pharmacotherapy and extracorporeal methods of detoxification are used. One of the effective methods of combating endogenous intoxication today is the combination of gastroenterosorption with monitor colonic sorption dialysis.

He proves that the use of monitor colonic sorption dialysis makes gastroenterosorption through the intubated colon more effective. With the elimination of biologically active substances from the intestine, its paresis is eliminated, the movement of enterosorbents from the stomach and duodenum to all parts of the small intestine improves, which sharply increases the ability of enterosorbents to bind and evacuate biologically active substances in the lumen of the intestinal tube, and helps to reduce intoxication of the whole body.

CONCLUSION

Based on the literature review, it can be assumed that in patients with gastrointestinal paresis in the elderly and elderly, a beneficial effect on the function of the small intestine due to decompression intubation of its upper parts can dramatically increase the effectiveness of monitoring colonic sorption dialysis by improving intestinal motility, thereby contributing to the overall detoxification of the body.

All this should be proven by a minimally invasive method of monitoring different parts of the gastrointestinal tract. Such a non-invasive method of studying the motor function of the intestine is selective electrogastroenterocolonography, which, if its curves are translated into the language of numbers with the help of computer technology, can contribute to the objectification of control over the intestinal function and, in particular, in the process of treating intestinal paresis in the pre- and post-operative period.

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