OPERATIVE OPTION FOR ADHESIVE INTESTINAL OBSTRUCTION: ISOPERISTALTIC DUPLICATION OF THE SMALL INTESTINE.

L.M. Mirolyubov

Kazan State Medical University, Kazan, Russia

Abstract. Adhesive intestinal obstruction remains one of the most complex and unresolved problems in abdominal surgery, characterized by a high recurrence rate after standard surgical interventions. Despite the widespread use of visceral adhesiolysis and Noble's plication of the small intestine, these methods do not provide reliable prevention of recurrent obstruction due to the progressive nature of the adhesive process.

The article presents an original approach to the surgical treatment of recurrent forms of adhesive small bowel obstruction, based on the principle of longitudinal isoperistaltic duplication of the small intestine with the formation of several side-to-side anastomoses. The proposed method aims to preserve the total absorption area, provide alternative pathways for intestinal content passage, and reduce the risk of recurrent obstruction.

The theoretical foundations of the method, specifics of the surgical technique, and results of experimental modeling of the operation on laboratory animals are presented. The obtained data indicate the preservation of digestive function and the absence of critical disturbances in chyme passage. The proposed approach can be considered a promising direction in the surgical treatment of recurrent adhesive disease of the abdominal cavity.

Key words: *Adhesive intestinal obstruction; adhesive disease of the abdominal cavity; small intestine; viscerolysis; isoperistaltic intestinal duplication; intestinal anastomoses; recurrent obstruction.*

For citation: Mirolyubov L.M. A surgical technique for adhesive intestinal obstruction: isoperistaltic duplication of the small intestine.

Relevance. The development of surgery in the 20th and 21st centuries has been and continues to be facilitated by the advancement of anesthesiology and intensive care, asepsis and antisepsis, methods of mechanical ventilation and artificial circulation, methods of extracorporeal detoxification, and the fight against bacterial and viral infections. All these achievements have made surgical interventions, even the most complex ones, sufficiently safe and have contributed to their widespread use in patients ranging from the neonatal period to extreme old age. Thanks to this progress, it became possible to operate on patients previously considered incurable; that is, surgery significantly expanded its range and had a major impact on increasing the average life expectancy of people in the 20th century.

Abdominal operations remain very common, and despite the widespread introduction of endoscopic techniques, the rate of complications in the form of adhesive intestinal obstruction continues to be high across all age groups. Adhesive disease can develop at any age. The adhesive process in the abdominal cavity after surgical interventions develops in 20–80% of patients. Of these, 2–8% subsequently develop adhesive disease with characteristic symptoms [1, 2, 3, 4].

To combat this terrible ailment, standard operations exist and are widely replicated: viscerolysis (releasing the bowel from compression by adhesions) (fig. 1) and Noble's plication, which involves placing the small intestine in the form of a radiator-style coil (fig. 2). These surgical methods have long been firmly established as the "gold standard" in the surgery of adhesive disease; however, they do not guarantee the patient against a recurrence of intestinal obstruction.

Since the adhesive process itself has a progressive course, this operation is often not the last. Adhesive disease is as terrifying as a battle with a mythical dragon: you cut off one "head" (adhesion), and 2–3 more grow in its place. The same adhesive process that led to the intestinal obstruction continues after the Noble operation, and in the areas where the intestine bends, so-called "double-barrels" form, partially or completely obstructing intestinal patency [1, 2, 3, 4].

Thus, the challenge of managing adhesive bowel obstruction through surgical or therapeutic means remains highly relevant and awaits a definitive solution. The vast amount of literature on this subject confirms both the urgency and the unresolved nature of many issues surrounding adhesive disease. To date, the most comprehensive guide remains the work of Professor V.V. Plechev and co-authors; across 748 pages, they detail modern perspectives on the etiology, clinical presentation, diagnosis, and current treatment methods, while also highlighting outstanding problems. Adhesive disease primarily affects the small intestine, which is located intraperitoneally within the abdominal cavity. Adhesions develop between intestinal loops and involve only the peritoneal layer. The Noble

procedure (1937) involves 180-degree plication (folding) of the intestine during its placement. However, the continuation or intensification of the adhesive process at these bends contributes to disease recurrence.

Following adhesiolysis, "free placement" – the physiological distribution of the intestines within the abdominal cavity – is a common surgical choice. Nevertheless, due to the lack of reliable therapeutic methods to prevent adhesion formation, the disease often progresses, leading to further disruption of intestinal transit.

Consequently, there is currently no foolproof surgical method for adhesive intestinal obstruction, which necessitates further development of both surgical techniques and conservative treatments [1, 2, 3, 4]. It should be noted separately that the adhesive process often develops as a consequence of peritonitis, where the extent of peritoneal damage depends on the spread and stage of inflammation. To prevent adhesions during peritonitis, it is particularly crucial to establish early, active intestinal peristalsis. Managing intestinal paresis is a fundamental therapeutic measure that determines the overall success of the treatment. Theoretical foundations and clinical observations show that adhesions form at sites of peritoneal injury. Healthy mesothelium prevents intestinal loops from sticking together, while a small physiological amount of fluid in the abdominal cavity reduces friction during peristalsis. Based on these principles, numerous methods have been proposed to prevent adhesion formation: postoperative intraperitoneal administration of hormonal solutions, dextrans (intravenous plasma substitutes), and, more recently, the use of Mesogel.

None of these options have fully lived up to expectations.

We propose a shift in the surgical concept as follows. Our target group consists of patients who have already undergone 1–2–3 previous surgeries for adhesive disease.

Surgical Technique. Laparotomy and adhesiolysis are mandatory elements of the intervention. Next, the small intestine is transected at its midpoint; the proximal end is brought toward the ileum, and the distal end toward the ligament of Treitz. We perform end-to-side or side-to-side anastomosis on both sides. The parietal peritoneum is then incised to "hide" the anastomoses and a portion of the intestine within the retroperitoneal space. By positioning both sections of the intestine in parallel–preferably in arcs without sharp bends–we perform an additional 2, 3, or 4 side-to-side anastomoses, also submerging them into the retroperitoneal space whenever possible. In this manner, we create an artificial doubling of the intestine, allowing for the potential shunting of chyme from one section to another and the simultaneous filling of all segments, while preserving the total absorptive surface area (fig. 3).

There are known cases where a dense adhesive conglomerate consisting of the small intestine cannot be straightened due to extremely firm, cartilaginous adhesions. In such instances, a small-to-small bowel bypass anastomosis is typically performed (fig. 4). However, leaving such a conglomerate

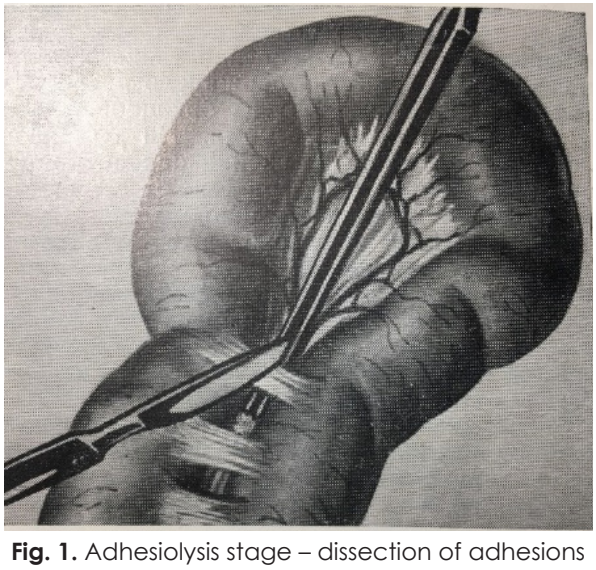

Fig. 1. Adhesiolysis stage – dissection of adhesions

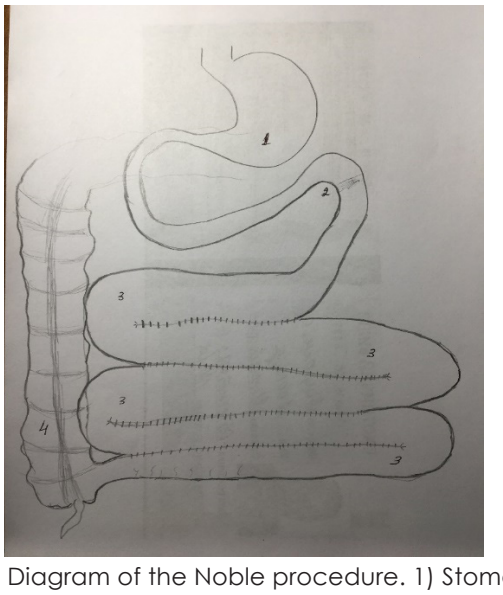

Fig. 2. Diagram of the Noble procedure. 1) Stomach; 2) Proximal small intestine; 3) Loops of the small intestine arranged according to the Noble technique and fixed with sutures; 4) Cecum and ascending colon

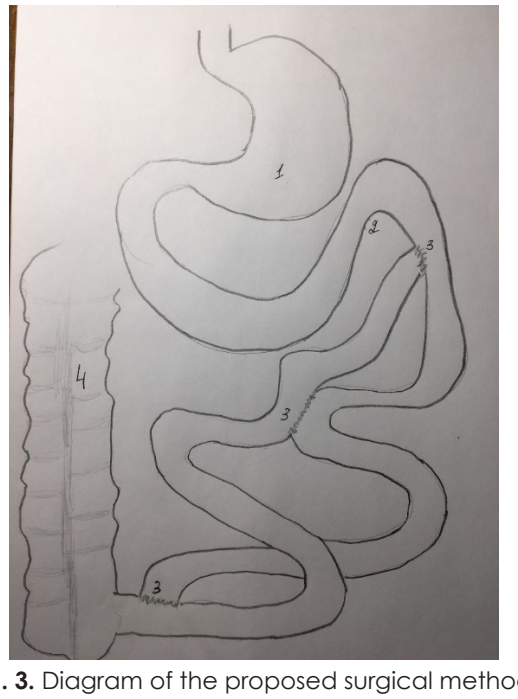

Fig. 3. Diagram of the proposed surgical method: Isoperistaltic doubling of the small intestine.
1. Stomach; 2. Proximal small intestine; 3. Entero-enteral (small-to-small bowel) anastomoses; 4. Cecum

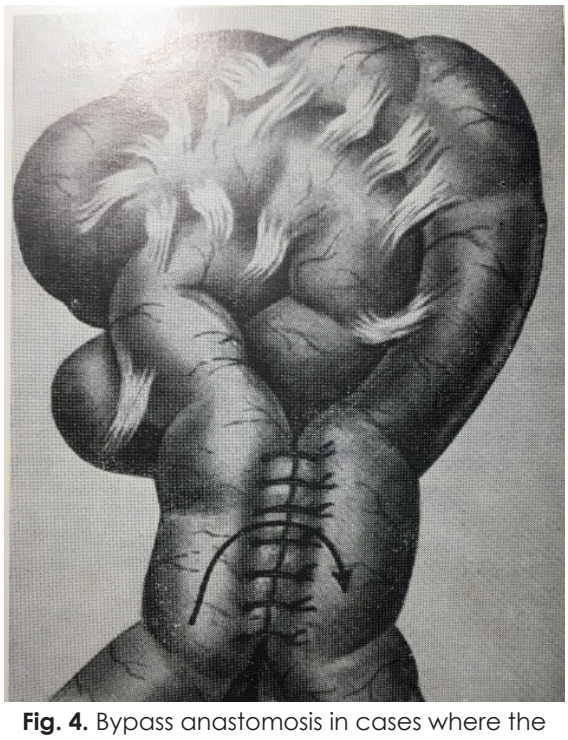

Fig. 4. Bypass anastomosis in cases where the intestine cannot be freed from adhesions

within the abdominal cavity is fraught with complications, such as the stimulation of further adhesion formation or the development of stagnant putrefactive processes within the lumen of the diseased, non-draining bowel.

We propose resecting the aforementioned conglomerate, provided it involves no more than 50% of the length of the small intestine, and concluding the operation with the previously described physiological isoperistaltic doubling along the length of the small bowel.

Claims

A method for surgical intervention in adhesive small bowel obstruction, including adhesiolysis with restoration of intestinal patency and potential bypass or resection of segments inaccessible for restoration, characterized by the final stage consisting of longitudinal isoperistaltic doubling of the small intestine with additional anastomoses to prevent recurrence of obstruction and preserve the surface area for absorption and digestion.

Experimental Results

Based on the above, we conducted a series of experimental operations on rats. Seven rats weighing 300–350 grams were operated on under intraperitoneal sodium pentobarbital anesthesia. Immediately following laparotomy, supplemental anesthesia was provided via 0,25% procaine injection into the mesentery of the small intestine.

The small intestine was transected at its midpoint. The distal end of the intestine was brought to the duodenojejunal junction, and a side-to-side anastomosis was performed. Given the 4–5 mm intestinal diameter in rats, 6/0 Prolene or PDS sutures were used. Similarly, the proximal end of the intestine was brought to the ileocecal junction, and a side-to-side anastomosis was formed. Of the 7 operated animals, 3 survived. The causes of death were attributed to the refinement of anesthesia and surgical techniques, as well as postoperative monitoring protocols. In one case, extensive suppuration of the access site was observed.

With reference to clinical practice in humans with adhesive disease, it is necessary, depending on the clinical situation, to create an additional 2–3 side-to-side anastomoses and arrange the loops in an arcuate fashion without kinking throughout the abdominal cavity to prevent potential obstruction. In cases where obstruction occurs in one segment of the bowel, chyme will continue its directed movement through the alternative segment without loss of the total absorptive surface area.

A useful maneuver is the embedding–or covering–of the upper and lower anastomoses within the retroperitoneal fat beneath the parietal peritoneum, as these junctions are of key importance for intestinal patency. Cicatricial (scarring) processes occur significantly more slowly within fatty tissue.

Fig. 5. Passage of contrast medium in an operated rat. Bifurcation of the flow is observed in the region of the superior anastomosis

Conclusions:

Experimental results demonstrate that isoperistaltic doubling of the small intestine, as a surgical variant, does not adversely affect the animal's digestive process.

The implementation of this method in clinical practice will assist surgeons in managing recurrent forms of adhesive disease.

РОССИЙСКАЯ ФЕДЕРАЦИЯ

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НА ИЗОБРЕТЕНИЕ

№ 2821135

Способ лечения рецидивирующих форм спаечной непроходимости кишечника

Патентообладатель: *Федеральное государственное бюджетное образовательное учреждение высшего образования "Казанский государственный медицинский университет" Министерства здравоохранения Российской Федерации (RU)*

Авторы: *Миролюбов Леонид Михайлович (RU), Осипов Андрей Александрович (RU)*

Заявка № 2023122321
Приоритет изобретения 28 августа 2023 г.
Дата государственной регистрации в Государственном реестре изобретений Российской Федерации 17 июня 2024 г.
Срок действия исключительного права на изобретение истекает 28 августа 2043 г.

Руководитель Федеральной службы по интеллектуальной собственности Ю.С. Зубов

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