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Introductory Chapter: Nuances of Surgical Technique for the Treatment of Adhesive Small Bowel Obstruction

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1. Introduction

Adhesive small bowel obstruction is one of the most formidable urgent surgical diseases of the abdominal organs [1]. Surgeons that encounter this disease are well aware of how insidious it is and how difficult it is to treat this pathology. Adhesive small bowel obstruction may often be successfully resolved conservatively. However, if conservative treatment is not effective within 72 h, and if there are signs of peritonitis, strangulation, or bowel ischemia, surgery is necessary [2]. Very often, a surgeon on call decides on the necessity of surgery. This surgeon might not have a lot of experience, but has to deal with the disease face-to-face. However, even experienced specialists may run into significant difficulties during such surgical interventions [3]. The only way to disengage from such a situation with honor is to strictly follow tactics and techniques developed by doctors involved in emergency abdominal surgery. In this chapter, I would like to share the nuances of performing surgery in patients with acute adhesive small bowel obstruction, based on more than 35-year experience of night shifts in an urgent surgical clinic.

2. Surgical access

Despite the achievements of laparoscopic surgery, in most cases of adhesive small bowel obstruction, surgery is performed via a wide incision of the anterior abdominal wall. The optimal surgical approach is midline laparotomy, which, if necessary, is extended up to the umbilicus or down to the pubic symphysis. If the patient has previously undergone midline laparotomy, it is expedient to start surgery with an incision upper or lower the scar. In any case, the scar, encapsulated non-absorbable sutures, and granulation tissue are excised, and the incision is treated with an antiseptic solution.

The parietal peritoneum in the area of the postoperative scar of the anterior abdominal wall always has gross adhesions with aponeurosis forming the *linea alba*. Moreover, as a rule, internal organs are fixed to the *linea alba* by adhesions. Therefore, the peritoneum should be lifted with tweezers and opened very carefully, since the dilated bowel loops may be easily damaged. It is better to keep the surgical site dry for a better view but achieve it without electrocauterization. When a small penetration into the abdominal cavity is achieved, the available area of the peritoneal cavity is carefully examined with a finger. Next, the abdominal wall is lifted with

a Farabeuf retractor or Maikulicz clamp applied to the aponeurosis edge, and the adhered organs are bluntly and sharply dissected; so, the aponeurosis and parietal peritoneum are prepared for the subsequent extension of the incision. When the abdominal cavity is opened, the dilated loops of the small bowel tend to slip out and should be kept with gauze pads moistened in an antiseptic solution. The gauze pads should be fixed, so as not to accidentally leave them in the peritoneal cavity.

3. Examination of the abdominal cavity

Sometimes the cause of intestinal obstruction is detected immediately, but more often an examination of the abdominal cavity is required. First of all, palpation should be performed. If it yields no result, the intestine should be moved to the left to try to isolate and examine the cecum. Obviously, the cecum is constricted in small bowel obstruction and dilated in large bowel obstruction. When the level of intestinal obstruction is determined, the next step is to search for an obstacle. To identify adhesions that obstructed the small bowel, it is necessary to examine it in the oral direction, starting from the cecum. The site of obstruction is where the constricted small bowel becomes dilated.

Such manipulations are possible only if the bowel is moderately dilated and adhesions are mild. Otherwise, a surgeon has to sort through the intestinal loops sequentially, which is difficult to do without preliminary nasointestinal intubation.

4. Technique of adhesiolysis

Adhesiolysis is started when the site of obstruction is found. The dissection of “loose” adhesions, which are more common in early adhesive bowel obstruction, is not technically difficult. Such adhesions can be destroyed with a finger, but undue force should not be exerted as it may lead to damage to the serous layer of the intestine. Otherwise, adhesions may be cut with scissors. In the latter case, scissors are used in a reverse manner. The tips of closed scissors are inserted between the adhered organs and then opened to separate them. This helps to find the “layer” between the bowel loops fixed to each other.

The greatest technical difficulties arise when the long portions of bowel loops are intimately fixed to each other and/or to the parietal peritoneum. The resulting single conglomerate is sometimes so dense that it is almost impossible to identify the borderline between the organs. In such cases, the safest way to separate the intestine is to excise it with the adjacent peritoneum.

To eliminate dense planar intestinal adhesions, space is created in the place of their least severity in the direction of the posterior abdominal wall. The index finger of the right hand is introduced into this space and the adhesions are separated along the posterior surface of the intestinal conglomerate by pendulum-like movements and without excessive force. As a rule, their density in this area is not so pronounced, so there is a chance to partially release the intestinal loops located there. After reaching some mobility, the bowel loops are rotated anteriorly, and the dissection of adhesions is completed. If it is not possible to separate the obstruction-causing conglomerate of the bowel loops, then, in the absence of signs of their non-viability, an intestinal anastomosis is performed. Otherwise, a pathologically altered portion of the small bowel is resected.

During adhesiolysis, a surgeon may inadvertently damage the wall of the intestine, especially the dilated proximal portion. In this case, superficial slit-like defects of the serous layer should not be sutured, since after emptying the intestines

their edges, as a rule, are converged by themselves. If not only the serous but also the muscle layer is damaged, seromuscular sutures should be applied with absorbable suture material on an atraumatic needle 4/0 or 5/0. If the intestinal lumen is accidentally opened, the perforated area is immediately plugged to prevent the release of contents. Strict adherence to the rules of aseptic technique is extremely important since the microflora located in the proximal dilated loop is always highly virulent. Therefore, in the case of abdominal contamination, there is a high risk of infectious postoperative complications. Before suturing, the damaged portion of the bowel should be separated from the surrounding adhesions and isolated from the abdominal cavity with gauze pads. Then, intestinal clamps are applied above and below the wound and the gauze pads are removed, the remnants of the intestinal contents are aspirated, and the site of perforation and adjacent tissues are treated with an antiseptic solution. The wound is sutured in the transverse direction with a double-row interrupted suture by using an absorbable suture material on an atraumatic needle 4/0–5/0.

After eliminating the obstruction, it is necessary to assess the viability of the portion of the small bowel involved in the pathological process. Absolute signs of its necrosis are a change in color to dark purple or black, absence of tone, peristalsis, pulsation of the mesenteric vessels and arteries of the intestinal wall, and specific putrefactive odor.

In doubtful cases, the altered bowel loop is immersed in the abdominal cavity and after 15–20 min its viability is checked. During this time, a surgeon may perform hemostasis, nasointestinal intubation, and aspirate intestinal contents. A more aggressive way is to warm a doubtful area with gauze pads moistened with hot saline. If these measures are not effective, the bowel is recognized as non-viable, which serves as an indication for its resection.

5. Resection of the gangrenous small bowel

Resection of the necrotic small intestine should be performed within healthy tissues to be sure that circulatory disturbances at the point of a cut are minimal. Considering more pronounced microcirculatory changes in the proximal loop, the cut should be 30–40 cm above and 15–20 cm below the site of visible necrosis. From a practical point of view, it should be noted that, due to the significant extensibility of the small bowel, it is impossible to determine the indicated length. Therefore, it is necessary to visually assess the condition of the mucous layer of the remaining bowel loops (color, bleeding, etc.). After resection, a side to side bowel anastomosis is the most appropriate. A two-row interrupted suture is applied with absorbable suture material on an atraumatic needle 4/0 or 5/0.

6. Nasointestinal intubation

The main indications for nasointestinal intubation in acute adhesive bowel obstruction are the dilation of the small bowel lumen for more than 5 cm and the need for its resection. An anesthetist in the operating room usually helps in installing the nasointestinal tube through the nose into the stomach. After this, the surgeon fixes the pylorus with the left hand and moves the tube tip through the stomach into the duodenal bulb with the right hand. Next, the tube is advanced through the duodenum by pushing its portion in the stomach. If the anatomy of the duodenum is normal, this maneuver may be done quite simply and quickly. However, if the duodenum is significantly deformed, the tube tip is slowly moved

from the bulb into the vertical part of the duodenum. Then, the tube is advanced to the lower horizontal part of the duodenum with the right hand placed under the mesentery of the transverse colon. As a rule, from there the tube is easily moved beyond the Treitz ligament into the jejunum. This may not work out due to the deformation of the duodenojejunal transition, which should be eliminated. Forced tube advancement is unacceptable due to the danger of intestinal wall perforation.

When the nasointestinal tube tip passed the Treitz ligament, the tube is advanced through the small intestine, which is the easiest step of intubation. The operating surgeon moves the tube through the proximal part of the bowel, while the assistant straightens the bowel loops and directs the tube tip towards the ileocecal transition. At this step, it is necessary to avoid the formation of excessive tube loops in the stomach, which occur in the absence of synchronous actions of the surgeon and the anesthetist advancing the tube into the stomach. The tube tip should not be inserted into the cecum. The destruction of the ileocecal flap may cause colonic contents reflux and colonization of the small intestine by fecal microflora.

If the small intestine was resected, the tube tip is installed 30–50 cm distal to the intestinal anastomosis.

Intestinal aspiration is performed after intubation is completed. Next, it is necessary to verify the correct location of the nasointestinal tube, since the presence of loops, flexures, and deformations makes decompression ineffective. It is very important to determine the location of the last lateral perforation of the tube, which should be in the middle part of the stomach. Its displacement into the esophagus is strictly unacceptable, because it may lead to aspiration of the gastric contents into the respiratory tract in the postoperative period. A less dangerous mistake is to leave the last lateral perforation in the duodenum. In this case, patients may experience vomiting, as the cavity of the stomach is undrained. The tube may be marked with a narrow strip of adhesive tape near the last lateral perforation to facilitate its search.

At the end of the surgery, a surgeon should check hemostasis and remove the fluid from the abdominal cavity. The drainage tube is installed through a contraperature and placed in the pelvic cavity. The anterior abdominal wall layers are sutured with absorbable suture material.

I do not doubt that each experienced surgeon may offer personal original techniques that he or she uses during surgery for acute adhesive small bowel obstruction. Nevertheless, I would like to hope that the small nuances of the surgical technique described in this modest essay may help to avoid big problems during such surgical interventions.

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