How I Do It

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Laparoscopic Approach for Rectosigmoidian Resection in Children

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Rezumat

Rezecția recto-sigmoidiană pe cale laparoscopică la copil

Rezecția rectosigmoidiană pe cale abdomino-perineală, imaginată și realizată pentru prima dată de către Orwar Swenson în 1948, a fost intervenția chirurgicală care a deschis calea chirurgiei curative în megacolonul congenital (1). Cu intenția de a corecta complicațiile asociate operației Swenson, B. Duhamel (1956) și F. Soave (1964) au propus procedee chirurgicale care păstrează rectul aganglionar (2,3). În 1994, N. Bax realizează operația Duhamel pe cale laparoscopică (4). K. Georgeson efectuează în 1995 rezecția rectosigmoidiană pe cale laparoscopică, imaginată ca o reproducere prin abord minim-invaziv a operației Swenson (5). Intervenția realizată de către Georgeson s-a impus ca standard de intervenție curativă și este procedeul chirurgical cel mai des folosit în practica curentă.

Cuvinte cheie: megacolon congenital, laparoscopie

Abstract

Abdominoperineal approach for rectosigmoidian resection, first imagined and performed in 1948 by Orwar Swenson, was the surgical technique that opened the pathway in the treatment of congenital megacolon (1). B. Duhamel (1956) and F. Soave (1964) intended to correct the postoperative complications appeared after the Duhamel technique and proposed surgical procedures that keep the aganglionic rectum in transit (2,3). In 1994 K. Bax reproduces the Duhamel procedure using laparoscopic approach (4). K. Georgeson, in 1995, reproduced the Swenson technique for rectosigmoidian resection using minimal invasive surgery (5). Today, this approach represents the most frequently used procedure for the radical treatment of congenital megacolon.

Key words: congenital megacolon, laparoscopy

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Purpose

The surgical strategy of this technique is to resect the aganglionic colon and rectum and to restore the intestinal continuity through a coloanal or ileoanal anastomosis, thus preserving the anal sphincteric structures. The procedure consists of two main surgical steps: the laparoscopic large bowel and rectal dissection and the perineal one - consisting of dissection of the rectum by transanal endorectal approach, pull through of the colon to the perineum, colic resection and coloanal anastomosis. The main operative steps of the laparoscopic approach are mobilization and devascularization of the aganglionic bowel and rectal dissection to the level of the pelvic floor.

Operative technique

The rectosigmoidian dissection is performed under general anesthesia and orotracheal intubation. It is recommended to

combine epidural anesthesia with general anesthesia in order to obtain a full sphincteric relaxation and to reduce the amount of the intravenous analgesic drugs during the coloanal anastomosis.

Preoperative preparation differs according to the age of the patient and to the degree of fecal retention. Repeated evacuating enemas are recommended 2 to 3 days before the day of surgery and rectal irrigation with iodine solution just before the surgery, performed on the operating table. Oral intake is limited to clear liquids within 14 to 24 hours before surgery. It is recommended to include in the sterile area the abdomen, the perineum and the inferior members in order to realize a "total body preparation".

Positioning the patient

Laparoscopic rectosigmoidian resection is usually performed with the patient in dorsal decubitus. In neonates and very young children, we place the patient transversely on the operating table (*Fig. 1*), allowing the anesthesiologist to approach the patient from his left side. During the surgery, the operating table will be maintained at an angle of 20° to 30°, the Trendelenburg position adding a right rotation in order to keep away the small bowel from the operating field.

Position of the operating team

The surgeon stands at the patient's head, the camera assistant on the surgeon's right side and the second assistant on the left side of the patient. The monitor is placed at the feet of the patient. It is very useful to have in the operating team a second assistant handling instruments throughout the third working port placed in the left side of the abdomen, in order to facilitate the manipulation of the colon and to expose the vascular pedicles. In older children the surgeon stands on the right side of the patient and the camera assistant on the surgeon's left, sitting on a chair in order to facilitate the surgeon's movements and to obtain more space in the extra abdominal field.

Port placement

The optical port is placed in the right upper quadrant, the two working ports are placed in the right and left flank and the fourth port, in the left upper quadrant (*Fig. 1B*). Port position is not very variable with the patient's age but with the length of the trocars. When the 3 mm instruments are used, the two working ports are placed in the right and left iliac fossa. The optical port will be introduced in an open manner using the Hasson method, penetrating the anterior abdominal wall layer by layer, entering the peritoneal cavity and securing the port with a purse-string suture to avoid the air leak during the procedure. After the CO2 insufflation, the rest of the ports will be placed under visual control. It is recommended to secure all the trocars to the abdominal wall to avoid the time consuming and uncomfortable gesture of their replacement during the surgery. It is possible to avoid incidents during the first port placement by using the auto protected Versaport trocar (Ethicon, Cincinatti, US) or trocars that progressively penetrate the abdominal wall under visual control like Visiport (Covidien, US) or Ternamian (Karl Storz, Germany). When insufflation is performed by using the Veress needle, it will be placed in the left flank at the point of the working trocar. The initial intra-abdominal pressure will be set up at 8-10 mmHg in neonates and infants, respectively at 10 – 12 mmHg in the rest of the children. The insufflation will be

Figure 1. *(**A**) position of the patient for the neonates or very young children; (**B**) access ports' sites*

made progressively with minimum air flow, to avoid sudden distension of the abdominal cavity. The method (open or Veress needle) used for the first trocar placement is chosen according to the degree of the abdominal distension and to the presence of intraabdominal adhesions (previous surgical procedures). The procedure is performed by using standard laparoscopic instruments for pediatric surgery. We prefer the 5 mm 30° lateral view laparoscope/rigid endoscope and we use the 3 mm or 5 mm instruments according to the patient's age. We prefer to perform the dissection by using monopolar hook, especially the 3 mm one which allows to performing a fine and precise dissection. Transection of the sigmoid vessels and the superior rectal artery may be done using metallic staples, bipolar electrocautery or modern computer-assisted electro-surgery instruments for sealing and cutting.

Abdominal surgical stage

The first step is a complete video exploration of the peritoneal cavity followed by a detailed evaluation of the colorectal morphologic aspect, identifying the transition zone, and the "normal" colic segment (*Fig. 2*). When the histopathology is not available from a preoperative biopsy specimen, a full thickness colic biopsy is performed and an intraoperative histologic examination is required. Establishing the exact level of the lesion's extension is essential for the surgical success. One must have in mind that in the dilated colic segment there is an unequal distribution of the ganglion cells and nerve fibres which may be the source of errors in the histopathological examination (6). Taking into account the anatomical finding the resection should be performed above the dilated zone, but this may lead to an excessive colic removal. In this respect, it is recommended that the level of the resection should be at 2-10 cm above the level of the positive colic biopsy (7). Colic resection starts performing a mesosigmoid window in the area between the superior rectal artery and the last sigmoid branch.

Progressively, using the monopolar hook, the colonic segment to be resected is scheletized, protecting the vascular supply of the normal colon and assuring that this colic segment will reach the perineum without tension. When the level of the resection is settled above the left colic angle, the medium colic artery is transected and the ganglionated colon will reach the perineum after Deloyer's maneuver. The presence of a colostomy at the time of surgery will not significantly change the surgical strategy because the colic suspension at the abdominal wall facilitates the exposure of the vascular pedicles. Rectal dissection starts with the division of the lateral right sided peritoneum, it will continue on the anterior wall of the rectum and on the left side of the rectal wall, until a sufficient rectal separation from the presacral plane is achieved. The dissection is done by keeping tight contact with the rectal wall and dividing only the direct branches of the rectal artery (*Fig. 4*). The inferior level of dissection is represented by the plane of the levator muscles (*Fig. 5*). In small children, this surgical step is favoured by the lack of depth of their pelvis. In older patients, with deeper pelvic structures, this difficult/ delicate dissection is facilitated by placing a new suprapubic port (port no. 5) and/or by the suspension of the prerectal peritoneal reflection to the anterior abdominal wall.

By the end of this operating stage, the exact level of the colonic transection will be marked using electrocautery or by placing a stay- stitch. The correct position of the colic segment is checked, avoiding torsion of the bowel at the time of the pull through and exufflation is realized keeping the trocars in place for a final videoexploration.

Perineal surgical stage

A good exposure of the anal canal starts the perineal stage of the procedure. This is done placing 6-8 staying sutures just above the dentate line and anchoring them to the perianal skin. The staying sutures may be replaced by the Lonestar retractor, a special circular device with staying hooks which retract and expose the anal canal (*Fig. 6, 7*). After rectal eversion a corona of staying sutures are placed above the dentate line, marking the point where the endorectal dissection starts. In neonates and infants the sutures are placed at the 0.5-1 cm above the dentate line and at 1-2 cm in older children. These sutures allow a continuous traction of the rectal mucosa, facilitating entrance and advancement into the submucosal dissection plane.

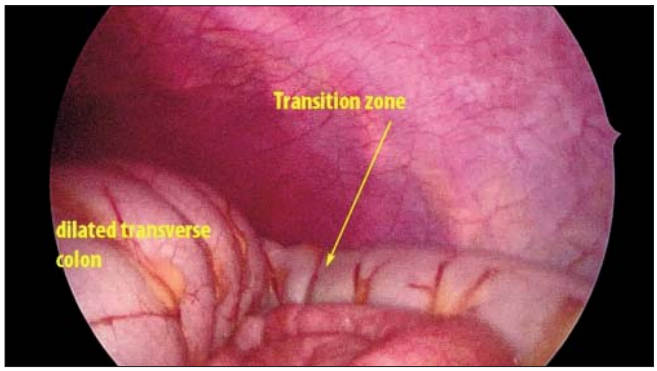

Figure 2. *Initial exploration with the identification of the transitional zone*

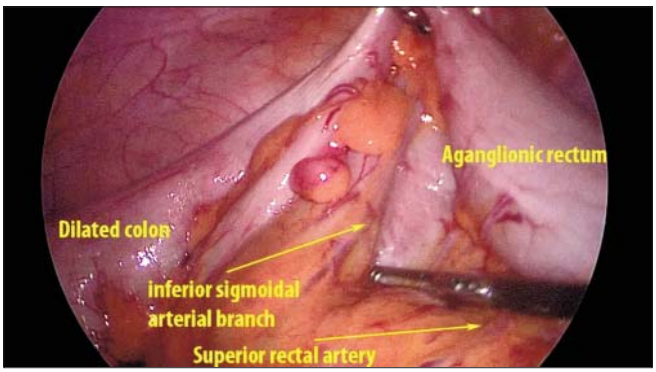

Figure 3. *Mesocolic window is created above the level of the superior rectal artery*

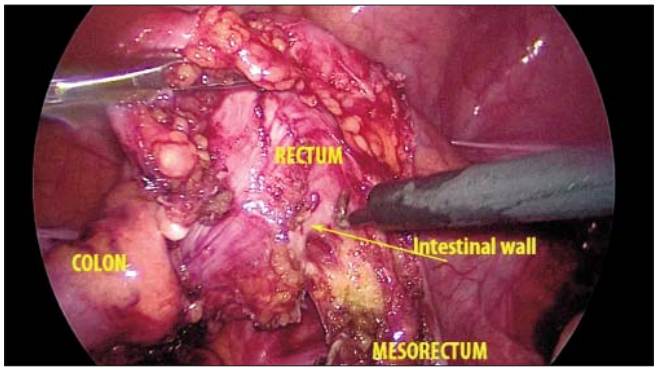

Figure 4. *Rectal dissection performed with monopolar hook in tight contact with the bowel wall*

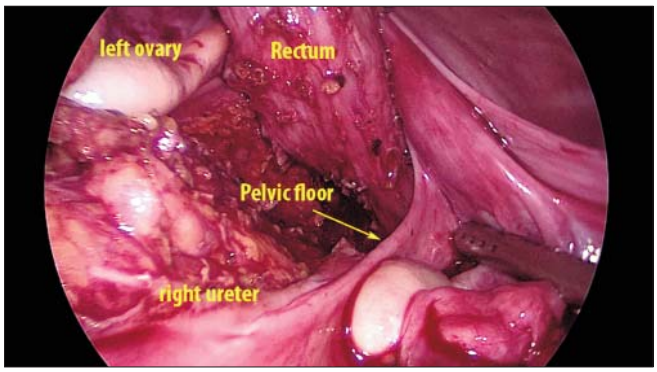

Figure 5. *Final aspect of the laparoscopic dissection of the rectum*

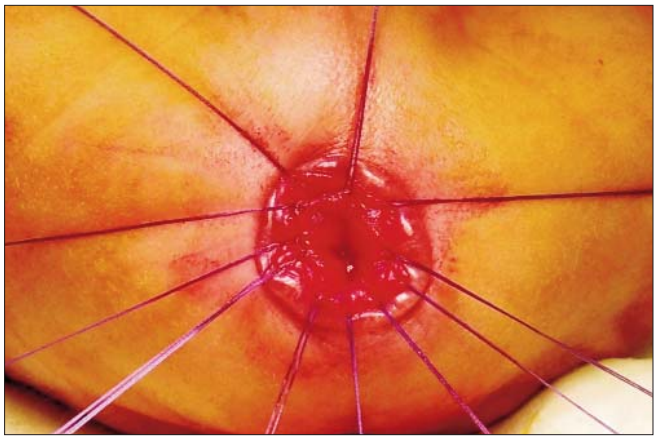

Figure 6. *Exposure of the anal canal with stay-suture placed above the dentate line*

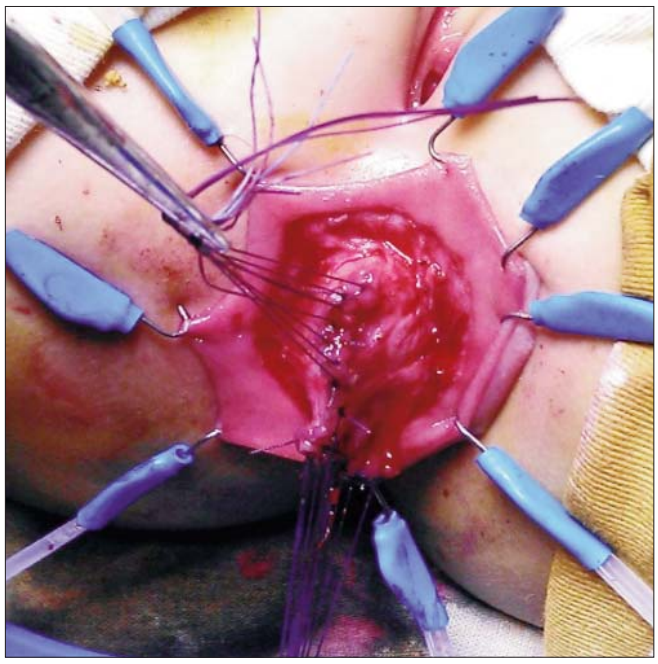

Figure 7. *Initiating the rectal dissection in the anal canal exposed by Lonestar retractor*

After progression of approximately 3-4 cm of submucosal dissection, the muscular plane is transected in order to continue the perirectal dissection until the endoabdominal perirectal dissection plane is reached. There are divergent opinions regarding the precise length of the submucosal dissection due to the impact of the restant muscular cuff over the postoperative anal continence. There are many authors who recommend short dissection segments (1-3 cm) or even avoidance of this dissection time (8). After the connection of the two dissection planes, abdominal and endoanal, the dissected colon is pulled transanally and resected, and a coloanal anastomosis is performed (*Fig.* 8).

The anastomotic step is realized after the control of the correct position of the colon and lack of tension of the pulled-through bowel. Cutting and suturing the colic segment into the perineum is performed using a quarter of circle section. We prefer a two layer anastomosis. The first anastomotic plane is realized fixing the colic segment through 4-6 lent absorbable multifilament sutures at the levator muscle plane. In the second plane the bowel is sutured to the rectal mucosa. When the bowel wall is too thick, the suture will be realized between the rectal mucosa and a colonic muco-submucosal plane in order to allow a good anastomotic connection. It is very important and delicate to correct two uneven anastomotic

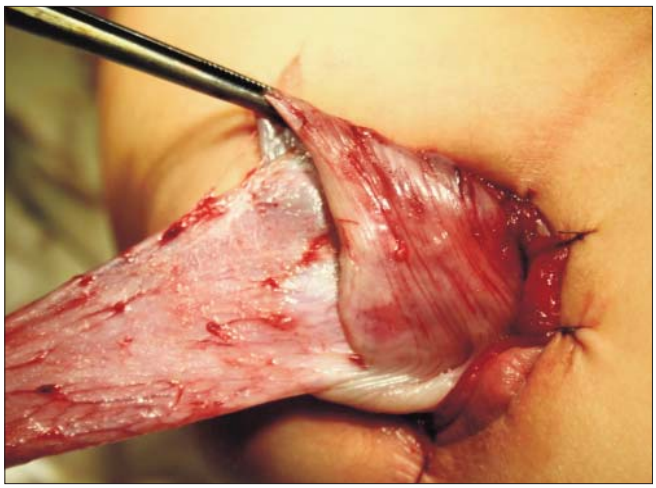

Figure 8. *Endorectal dissection performed in a submucosal plane; everted muscular cuff*

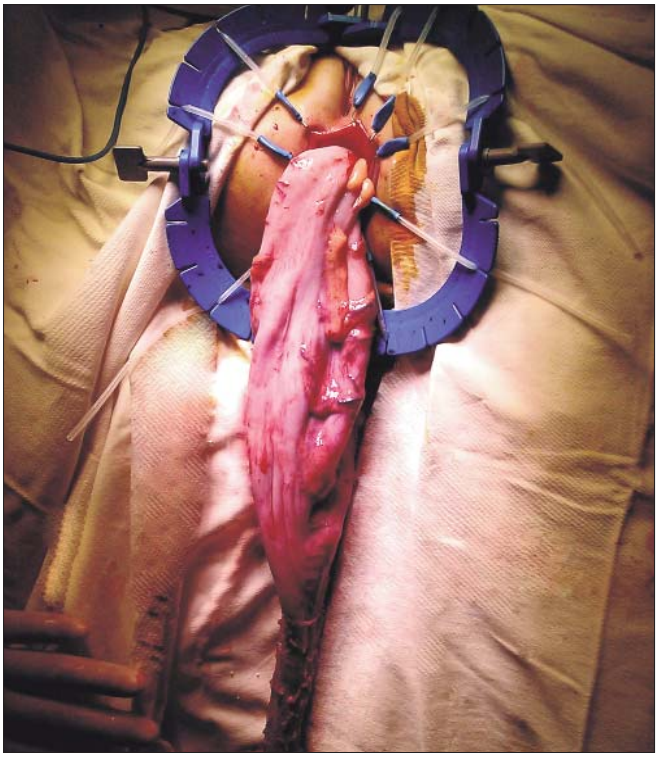

Figure 9. *Laparoscopically dissected colon pulled through transanally*

segments. Plication of the colonic segment will lead to anastomotic leak, so it is very important to expose the whole circumferential colic area. Once the perineal stage is finished, the pneumoperitoneum is restored for laparoscopic visual final control: eventually bleeding sources, viability, correct position and lack of tension of the pulled through bowel segment are evaluated. One must also verify if a small bowel segment is herniated under the colic pedicle. We recommend drainage of the peritoneal cavity for 24-48 hours.

Postoperative course

Patients are transferred in the intensive care unit for 1-3 postoperative days, depending on the age of the patient, the preoperative clinical status, the length of the operative time and post anaesthetic clinical status. Usually, there is no need for nasogastric decompression tube. The patient is allowed to drink clear liquids for the next 12-24 hours. Oral intake is progressively allowed to a complete diet within 3-4 days. In neonates and infants, natural alimentation is allowed within 24 hours postoperatively. The restoration of the bowel movement is noted within 24-48 hours. Rectal examinations, intrarectal medication, or intrarectal temperature measurement. The patients are discharged from the hospital within 3-4 days. We recommend the first follow-up visit to be established in 14 days, when the calibre of the coloanal anastomosis will be checked. The next control examinations are settled monthly in the first 3 months and then once every three months in the first postoperative year.

Results

The mean operative time of the laparoscopic rectosigmoidian resection is between 150-180 minutes and varies with the length of the aganglionic bowel, the age of the patient and the operating team expertise (9). The surgical success in the treatment of congenital megacolon is evaluated according to two clinical parameters: spontaneous bowel movement and anal continence. There are published comparative studies between the results of open surgery and of laparoscopic approach for Hirschsprung's disease and all of them note the superiority of the postoperative outcome following laparoscopic surgery, even though some of these studies report initial clinical series (10). Postoperative death is unusual after the surgical treatment of congenital megacolon. This is reported in some studies with a frequency of 1-3% in laparoscopic series compared to 7.1% in open technique. Postoperative death was noted after a severe postoperative enterocolitis (11,12).

Intraoperative complications and complicated postoperative outcome

Intraoperative bleeding is insignificant during laparoscopic rectosigmoidian resection. This is counted to 10-20 ml of blood even if the procedure is performed only with the monopolar hook (12). Modern and miniaturized technology, consisting of special energy devices (ex. LigaSure, Harmonic Scalpel, Thunderbeat) which seal and divide the vessels transform the laparoscopic approach for congenital megacolon into a surgery without bleeding. Postoperative anastomotic complications occur with a frequency of 2.5% and they are considered technical intraoperative errors (13). The two layered anastomosis limits the effect of postoperative anastomotic leakage (14,15).

Long term postoperative outcome

The most severe complication is postoperative enterocolitis, due to its frequency and its gravity. After the laparoscopic pull through this complication is noted with a frequency of 8%, an inferior percentage in comparison to open surgery (16). Chronic postoperative constipation appears in those cases with insufficient colic resection or anastomosis performed at the limit of the transitional zone.

Conclusions

Today, laparoscopic rectosigmoidian resection represents the recommended method for the surgical treatment of congenital megacolon. This is a safe and effective surgical technique with a high complexity level, requiring a good surgical and anaesthesiologic expertise in laparoscopic surgery.

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