

## The Laparoscopic Approach of Small Bowel Obstruction – The Experience of a Primary Center

Adrian Miron, Cosmin Giulea, Mihai Nadragea, Octavian Enciu

“Carol Davila” University of Medicine and Pharmacy, Department 10 – Surgery, Elias University Emergency Hospital, Bucharest

### Rezumat

#### **Abordul laparoscopic al ocluziilor de intestin subțire - experiența unui centru primar**

**Introducere:** Ocluziile de intestin subțire reprezintă până la 16% din urgențele chirurgicale. Mortalitatea și morbiditatea depind de recunoașterea precoce, diagnosticul corect și momentul operator optim. Cauzele cele mai frecvente ale ocluziilor intestinale subțiri sunt reprezentate de: sindrom aderențial, tumori maligne, hernii, volvulus. Deși chirurgia laparoscopică nu este promovată în tratamentul ocluziilor de intestin subțire, poate rezolva în siguranță multe dintre situațiile menționate. În același timp, poate reprezenta un mijloc diagnostic util care nu afectează integritatea peretelui abdominal.

**Material și metodă:** Studiul cuprinde experiența unui centru primar. Între martie 2010 și octombrie 2015, 38 de pacienți au fost diagnosticați cu ocluzie de intestin subțire și au suferit intervenții laparoscopice. În 7 cazuri a fost necesară conversia la chirurgie deschisă.

**Rezultate:** Mortalitatea a fost 0% iar morbiditatea specifică a fost 12%. Timpul operator mediu a fost de 87,2 de minute cu variații largi în funcție de etiologie iar durata medie de spitalizare postoperatorie a fost 4,7 zile.

**Concluzii:** Abordul laparoscopic al ocluziilor de intestin subțire este fezabil și sigur în cazuri selecționate iar în aceste cazuri

aduce beneficii certe în ceea ce privește integritatea peretelui abdominal, reluarea rapidă a tranzitului și spitalizarea scurtă.

**Cuvinte cheie:** ocluzie de intestin subțire, chirurgie laparoscopică

### Abstract

**Introduction:** Small bowel obstruction represents up to 16% of surgical emergencies. Mortality and morbidity depend on early recognition, correct diagnosis and timely surgical management. The most frequent causes of small bowel obstruction are adhesions, malignant tumors, hernias and volvulus. Although laparoscopic surgery is not promoted for the management of small bowel obstruction, it may address many of the mentioned causes. In the same time, it represents a useful diagnostic tool that does not affect the integrity of the abdominal wall.

**Materials and Methods:** The current study resumes the experience of a medium volume primary center. Between March 2010 and October 2015, 38 patients were diagnosed with small bowel obstruction and suffered laparoscopic interventions. In 7 cases conversion to open surgery was necessary. **Results:** Mortality was 0% and specific morbidity was 12%. The mean operating time was 87.2 minutes with wide variations depending on etiology and the mean postoperative hospital stay was 4.7 days.

**Conclusion:** The laparoscopic approach of small bowel disease is feasible and safe in selected cases and offers evident benefits regarding to the integrity of the abdominal wall, rapid return of bowel function and shorter hospital stay.

**Key words:** small bowel obstruction, laparoscopic surgery

### Corresponding author:

Prof. Dr. Adrian Miron  
Department of Surgery  
Elias University Emergency Hospital  
Mărăști Blvd., no. 17, 011461, District 1  
București, Romania  
E-mail: dramiron@yahoo.com

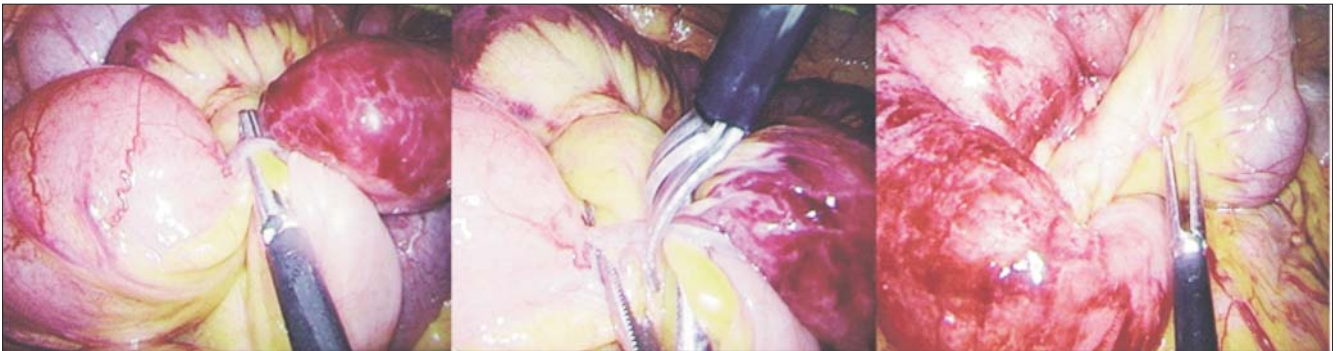
## Introduction

Small bowel obstruction (SBO) is the most frequent surgical disorder of the small intestine and accounts for up to 16% of surgical admissions in the United States with important health care expenditures. (1,2) With increasing prevalence of abdominal and more important pelvic surgery, adhesions are the most frequent cause of SBO while malignant tumors, hernias and volvulus account for less than 30% of cases. (3)

Adhesions are related with prior laparotomy and the number of prior laparotomies is correlated with the grade of

adherential syndrome. (4) Single band adhesions (Fig. 1 and Fig. 2) are related more often with complete obstructions and strangulation while multiple adhesions are noted to cause simple, nonstrangulated obstructions that might benefit from non-surgical treatment. (5) Adhesions occur most frequently after appendectomy (23%), colorectal resections (21%) and gynecological procedures (12%) but most important with multiple laparotomies (24%), anterior visceroparietal and anterior visceroparietal associated to viscerovisceral adhesions being the most common (over 70% of cases). (Fig. 3) (5)

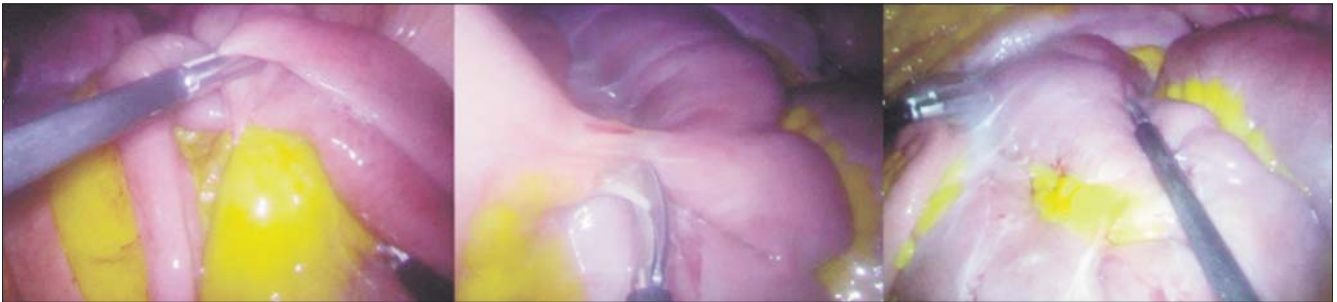
Hernias (inguinal, femoral and internal) account for



**Figure 1.** SBO - single band adhesion in a 34 year old female patient after open appendectomy



**Figure 2.** SBO - single band adhesion in a 67 year old male patient after open right hemicolectomy



**Figure 3.** SBO - complex multiband adhesions in a 67 year old female patient after open rectosigmoid resection

approximately 10% of SBO (Fig. 4) and are often associated with strangulation. (6)

The evaluation of SBO begins with an accurate physical exam. The initial diagnostic step for SBO is plain abdominal X-ray that can reveal air-fluid levels, distension of small bowel loops and absence of gas in the colon. (7) The abdominal ultrasound has a limited value in diagnosing SBO because air may obstruct underlying pathological processes but may notice distension, peristalsis and signs of ischemia - differences in mucosal folds and free fluid. (8) CT scan more often confirms the diagnosis and the cause of the obstruction but should not be routinely performed except when the history, physical exam and plain films are ambiguous. (9) CT scan is very useful for excluding non-adhesional pathology and strangulation with sensitivity and specificity higher than 90%. (10,11)

The timing of surgery in the case of diagnosed SBO remains challenging. Strangulation leading to ischemia, necrosis and perforation with subsequent sepsis is a dreadful complication of SBO. In the setting of continuous pain, fever, peritoneal irritation and leukocytosis or complete bowel obstruction, immediate operation is warranted. In these cases, the open approach is more than justifiable, resections being required in up to 31% of cases. (12) Conservative management of incomplete but also for complete SBO with close observation of the patient may be successful in 41% to 80% of cases. (13) Failure to regain bowel function within 5 days of conservative management indicates the need for surgery. (14) The surgical management of both complete and incomplete SBO is associated with lower recurrence and longer disease-free time when compared to conservative management. (15, 16)

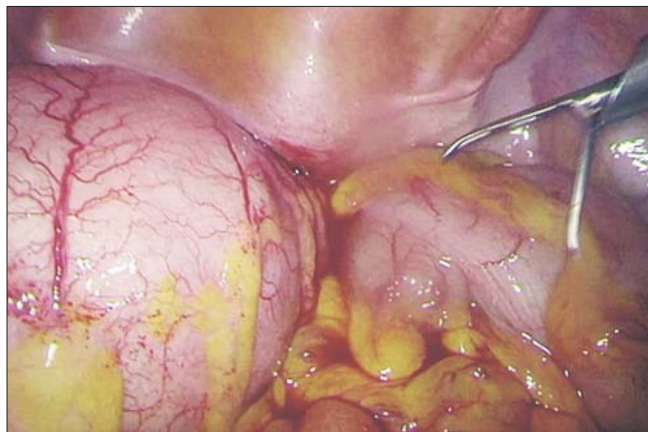
Open surgery has been the traditional way to manage SBO, laparoscopic adhesiolysis not being recommended (EL 4) as an alternative to the laparotomic approach for SBO (C Grade), not as far a decade ago. (17) Several studies have demonstrated since then that laparoscopic surgery is a safe and acceptable alternative even for complex SBO. (18) A review of over 2000 cases revealed a conversion rate of 29% and an enterotomy rate of 7%. (19)

With the majority of interventions for SBO being successful, the benefits of laparoscopy are transferred to these patients otherwise treated by open surgery: shorter postoperative ileus, less postoperative pain, less estimated blood loss, shorter postoperative hospital stay, fewer surgical site infections and most importantly, fewer postoperative adhesions. (20,21)

## Materials and Methods

The current study resumes the experience of a medium volume primary center. The aim is to determine the outcome of the laparoscopic approach of SBO and discuss patient considerations.

Thirty eight cases admitted between March 2010 and October 2015 that underwent laparoscopic surgery for diagnosed SBO are retrospectively analyzed. This cohort represents 36% from a total of 105 cases with SBO diagnosed and operated in the same period by open and laparoscopic approach. Surveyed data includes demographics, clinical and



**Figure 4.** SBO - left inguinal hernia in a 78 year old patient

radiological presentation, intra-operative and postoperative course.

The standard surgical technique used achievement of pneumoperitoneum with the Hasson technique, in the left upper quadrant or as far as possible from the surgical wound in cases with previous abdominal interventions and with the Veress needle in cases without previous surgeries. (22) After achievement of pneumoperitoneum, the optic port is placed and the peritoneal cavity is inspected. The second trocar is placed under direct vision and dissection of adhesions commences leading the way for the placement of the third trocar, thus achieving triangulation. The camera may be inserted in either trocar for the inspection of the entire peritoneal cavity. Vascularized adhesions are dissected with electrocautery while sharp dissection is used for simple adhesions. Traction and countertraction is very important to avoid incidental injuries. If simple single or double band adhesions are found causing an obvious obstruction there is no need to explore the entire small bowel. For complex multiband adhesions the exploration of the entire small bowel is mandatory to avoid early post-operative obstruction. Only pathologic adhesions are lysed, and additional adhesiolysis is avoided. The segments of small bowel freed from adhesions are carefully inspected for bleeding and most importantly for injury. Peritoneal drainage is seldom used.

## Results

Between May 2010 and October 2015, 38 patients suffered laparoscopic interventions for SBO. Mean age was 57.1 years (range 27 – 78 years) and 23 (60.5%) were female. Mean body mass index was 27.7 kg/m<sup>2</sup> (range 24 – 32 kg/m<sup>2</sup>). Twenty one patients (55%) had undergone between one and three abdominal surgeries and two (5.2%) had a previous episode of SBO. There was no patient with signs of peritoneal irritation.

Diagnosis was achieved by complete physical exam, blood workup and plain abdominal x-rays in all patients. Abdominal CT scan was performed in 25 patients (65%). The site of obstruction was diagnosed by laparoscopy in 35 cases (92%). In 21 cases with previous surgical interventions, the intervention

was carried out after nasogastric tube decompression and gastrointestinal rest for 24 to 48 hours with no signs of clinical resolution. For the remaining 6 cases with surgical history and for the cases without previous surgeries the intervention was carried out in the first 24 hours. The causes of SBO are resumed in *Table 1*.

There were no accidents while achieving pneumoperitoneum and incidental enterotomies were encountered in 3 cases (7.9%) and in 2 cases, due to important peritoneal contamination, conversion to open surgery was necessary. In other 5 cases conversion was necessary due to important pelvic adhesions after pelvic surgery (2 cases), small bowel necrosis (2 cases) and small bowel tumor (1 case).

Mean operative time was 87.2 min (range 42.8 – 133.3 min). When conversion was necessary due to peritoneal contamination, lack of visibility in the pelvis or mandatory enterectomy the mean operative time was 112.3 min (range 78.3 – 167.9 min).

None of the patients manifested signs of obstruction after surgery. The nasogastric tube was removed in the in second postoperative day. Return of bowel movement was obtained in the second postoperative day after laparoscopic surgery and in the fourth postoperative day after conversion. Mortality was nil and morbidity was observed in the patients that required conversion, two of the patients developing wound infections that required in hospital treatment. The mean hospital stay was 4.2 days for the patients that benefitted from laparoscopic surgery and 5.8 days for the patients that required conversion to open surgery.

## Discussion

Although in its infancy, laparoscopic surgery was informally banned in cases of intestinal obstruction, the modern surgeon tends to use the minimally invasive surgery for more complex pathology. Since more than 60% of cases of SBO are caused by postoperative adhesions the main focus in contemporary literature has been on laparoscopic adhesiolysis. Traditionally, laparotomy and adhesiolysis has been the standard surgical management for SBO caused by adhesions, but open surgery is likely to cause further adhesions, with up to 30% of patients requiring another laparotomy for recurrent SBO. (23) By administering a questionnaire about the laparoscopic approach of SBO caused by adhesions to general surgeons in the State of Connecticut, Tolutopeand and Scott concluded that surgeons with recent training and interest or membership in minimally invasive surgery associations favored laparoscopic adhesiolysis. (24) Many studies have concluded that laparoscopy is feasible for SBO but there is no consensus on selection of patients for laparoscopic or open surgery. A consensus conference on laparoscopic adhesiolysis recommended intraoperative selection of patients after exploratory laparoscopy allowing more patients to benefit from the minimal invasive approach, the only absolute contraindications being those related to pneumoperitoneum. (25) Preoperative selection of patients is troublesome. In cases without peritonitis and failure of non-operative management that are considered for laparoscopic surgery,

**Table 1.** Causes of SBO

SBO Cause	Cases
<b>Postoperative adhesences</b>	<b>27</b>
Appendectomy	6
Gynecologic surgery	12
Colon surgery	6
Rectal surgery	3
<b>Volvulus</b>	<b>4</b>
<b>Inguinal hernia</b>	<b>5</b>
<b>Intestinal tumor</b>	<b>1</b>
<b>Obturator hernia</b>	<b>1</b>
<b>Total</b>	<b>38</b>

abdominal distension, bowel diameter and presumed location are to be taken into account. Bowel diameter over 4 cm, distal obstruction and persistent abdominal distention after nasogastric decompression have an increased rate of conversion and intraoperative complications. (26,27)

Operative technique and experience in laparoscopic surgery are paramount for safe and successful adhesiolysis for SBO. In our study, all interventions were carried out by a surgical team with considerable experience. The increasing experience achieved with minimal invasive treatment of incisional hernias was a promoter for laparoscopic adhesiolysis and the complexity of SBO treated laparoscopically was incremental. Safe achievement of pneumoperitoneum and trocar placement were the most important steps. Even though the first cases resolved had anticipated single band adhesion or a single previous surgical interventions, more complex cases with multiple adhesions after oncologic resections and recurrent SBO were resolved afterwards. The experience of the surgeon should compensate for the lack of haptic feedback and low visibility.

## Conclusions

The laparoscopic approach of SBO is feasible and safe, with a high success rate in experienced hands. The benefits of laparoscopic surgery should be offered to these patients that are likely to have recurrent SBO after open adhesiolysis. The selection of patients for open or laparoscopic surgery is troublesome and so far a consensus has not been reached. An honest selection may probably be achieved after exploratory laparoscopy. In our group, mortality was nil and the conversion rate was 18.42%.

## References

1. Ray NF, Denton WG, Thamer M, Henderson SC, Perry S. Abdominal adhesiolysis: inpatient care and expenditures in the United States in 1994. *Journal of the American College of Surgeons*. 1998 Jan 31;186(1):1-9.
2. Maglinte D, Heitkamp DE, Howard TJ, Kelvin FM, Lappas JC. Current concepts in imaging of small bowel obstruction. *RadiolClin North Am*. 2003;41:262-283
3. Diaz Jr JJ, Bokhari F, Mowery NT, Acosta JA, Block EF, Bromberg WJ, Collier BR, Cullinane DC, Dwyer KM, Griffen

- MM, Mayberry JC. Guidelines for management of small bowel obstruction. *Journal of Trauma and Acute Care Surgery*. 2008 Jun 1;64(6):1651-64.
4. Duron J: Laparoscopic treatment of small bowel obstruction. *Adhesion* 2002, 5:16-19
  5. Neff M, Schmidt B. Laparoscopic treatment of a postoperative small bowel obstruction. *JSL: Journal of the Society of Laparoendoscopic Surgeons*. 2010 Jan;14(1):133.
  6. Cox MR, Gunn IF, Eastman MC, Hunt RF, Heinz AW. The operative aetiology and types of adhesions causing small bowel obstruction. *Australian and New Zealand Journal of Surgery*. 1993 Nov 1;63(11):848-52.
  7. Tsumara H. Laparoscopic treatment of small bowel obstruction. *Adhesion*. 2006;9:17-9.
  8. Di Saverio S, Tugnoli G, Orlandi PE, Casali M, Catena F, Biscardi A, Pillay O, Baldoni F. A 73-year-old man with long-term immobility presenting with abdominal pain. *PLoS Med*. 2009 Jul 14;6(7):e1000092.
  9. Grassi R, Romano S, D'Amario F, Rossi AG, Romano L, Pinto F, Di Mizio R. The relevance of free fluid between intestinal loops detected by sonography in the clinical assessment of small bowel obstruction in adults. *European journal of radiology*. 2004 Apr 30;50(1):5-14.
  10. Obuz F, Terzi C, Sökmen S, Yılmaz E, Yıldız D, Füzün M. The efficacy of helical CT in the diagnosis of small bowel obstruction. *European journal of radiology*. 2003 Dec 31;48(3):299-304.
  11. Zalcmán M, Sy M, Donckier V, Closset J, Gansbeke DV. Helical CT signs in the diagnosis of intestinal ischemia in small-bowel obstruction. *American journal of roentgenology*. 2000 Dec;175(6):1601-7.
  12. Nauta RJ. Advanced abdominal imaging is not required to exclude strangulation if complete small bowel obstructions undergo prompt laparotomy. *Journal of the American College of Surgeons*. 2005 Jun 30;200(6):904-11.
  13. Seror D, Feigin E, Szold A, Allweis TM, Carmon M, Nissan S, Freund HR. How conservatively can postoperative small bowel obstruction be treated?. *The American journal of surgery*. 1993 Jan 31;165(1):121-6.
  14. Jeong WK, Lim SB, Choi HS, Jeong SY. Conservative management of adhesive small bowel obstructions in patients previously operated on for primary colorectal cancer. *Journal of Gastrointestinal Surgery*. 2008 May 1;12(5):926-32.
  15. Maung AA, Johnson DC, Piper GL, Barbosa RR, Rowell SE, Bokhari F, Collins JN, Gordon JR, Ra JH, Kerwin AJ. Evaluation and management of small-bowel obstruction: an Eastern Association for the Surgery of Trauma practice management guideline. *Journal of Trauma and Acute Care Surgery*. 2012 Nov 1;73(5):S362-9.
  16. Sauerland S, Agresta F, Bergamaschi R, Borzellino G, Budzynski A, Champault G, Fingerhut A, Isla A, Johansson M, Lundorff P, Navez B. Laparoscopy for abdominal emergencies. *Surgical Endoscopy and Other Interventional Techniques*. 2006 Jan 1;20(1):14-29.
  17. Pearl JP, Marks JM, Hardacre JM, Ponsky JL, Delaney CP, Rosen MJ. Laparoscopic treatment of complex small bowel obstruction: is it safe?. *Surgical innovation*. 2008 Jun 1;15(2):110-3.
  18. Wang Q, Hu ZQ, Wang WJ, Zhang J, Wang Y, Ruan CP. Laparoscopic management of recurrent adhesive small-bowel obstruction: Long-term follow-up. *Surgery today*. 2009 Jun 1;39(6):493-9.
  19. O'Connor DB, Winter DC. The role of laparoscopy in the management of acute small-bowel obstruction: a review of over 2,000 cases. *Surgical endoscopy*. 2012 Jan 1;26(1):12-7.
  20. Reissman P, Spira RM. Laparoscopy for adhesions. *Surgical Innovation*. 2003 Dec 1;10(4):185-90.
  21. Wullstein C, Gross E. Laparoscopic compared with conventional treatment of acute adhesive small bowel obstruction. *British journal of surgery*. 2003 Sep 1;90(9):1147-51.
  22. Lal P, Singh L, Agarwal PN, Kant R. Open port placement of the first laparoscopic port: a safe technique. *JOURNAL-SOCIETY OF LAPAROENDOSCOPIC SURGEONS*. 2004 Oct 1;8:364-6.
  23. Landercasper J, Cogbill TH, Merry WH, Stolee RT, Strutt PJ: Long-ter outcome after hospitalization for small-bowel obstruction. *Arch Surg* 1993, 128:765-770
  24. Oyasiji T, Helton SW. Survey of opinions on operative management of adhesive small bowel obstruction: laparoscopy versus laparotomy in the state of Connecticut. *Surgical endoscopy*. 2011 Aug 1;25(8):2516-21.
  25. Vettoretto N, Carrara A, Corradi A, De Vivo G, Lazzaro L, Ricciardelli L, Agresta F, Amodio C, Bergamini C, Borzellino G, Catani M. Laparoscopic adhesiolysis: consensus conference guidelines. *Colorectal Disease*. 2012 May 1;14(5):e208-15.
  26. Suter M, Zermatten P, Halkic N, Martinet O, Bettschart V. Laparoscopic management of mechanical small bowel obstruction. *Surgical endoscopy*. 2000 May 1;14(5):478-83.
  27. Luque-de León E, Metzger A, Tsotos GG, Schlinkert RT, Sarr MG. Laparoscopic management of small bowel obstruction: indications and outcome. *Journal of Gastrointestinal Surgery*. 1998 Apr 1;2(2):132-40.