



Small bowel obstruction after colon cancer surgery: does the laparoscopic approach mitigate risk?

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Comment on: Jensen KK, Andersen P, Erichsen R, *et al.* Decreased risk of surgery for small bowel obstruction after laparoscopic colon cancer surgery compared with open surgery: a nationwide cohort study. *Surg Endosc* 2016;30:5572-82.

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Jensen *et al.* present a thoughtful study exploring the incidence and outcomes of laparoscopic surgery for colon cancer. A national database, the Danish Colorectal Cancer Group database, was utilized over a 7-year period, to compare outcomes of open and laparoscopic colon cancer surgery in 8,601 patients, with a median follow up of 9.6 and 7.0 years, respectively. The primary endpoint of this study was operations for small bowel obstruction at any time after the first 30 days postoperatively and the secondary endpoint was mortality. Multivariate analysis was used to compare laparoscopic and open procedures and to identify risk factors for surgery for small bowel obstruction. The authors report a 2.9% incidence of surgery for small bowel obstruction over the study period, with a 3-year cumulative incidence of 1.5% (1.2% for laparoscopic surgery and 1.6% for open surgery) with a median time to surgery of 19.1 months. Multivariate analysis identified significant risk factors for surgery for small bowel obstruction to be: perioperative blood transfusion, higher mean blood loss during the operation, lower BMI, anastomotic leak, left/sigmoid colectomy, and open surgery. In regards to the secondary outcome of mortality, there was a 36-month median mortality of 8.6%, and 55.1% of patients who underwent surgery for small bowel obstruction died during the follow up period. The authors report that there was no significant difference in mortality between patients who underwent laparoscopic and open surgery.

The utility of laparoscopic surgery has been studied in several randomized control trials, which have paved the way for the widespread adoption of laparoscopy for colon cancer surgery by colorectal surgeons. The COST trial,

a randomized multicenter prospective trial, was the first trial to confirm the non-inferiority of laparoscopy for colon cancer, with no significant differences in oncologic outcome and improved postoperative outcomes for patients undergoing laparoscopic resection (1-3). Soon after, the MRC CLASSIC trial from the UK and the COLOR trial from multiple centers in Europe also demonstrated non-inferiority of the laparoscopic approach (4-6). Since that time, several other trials have confirmed these findings (7-10). The incidence of mechanical bowel obstruction following abdominal surgery has been reported to be 9% and one of the purported benefits of laparoscopy is the lesser development of postoperative adhesions (11,12). Laparoscopic colon resection is associated with shorter intensive care unit stays, fewer complications, lower mortality, fewer readmissions and less utilization of skilled nursing facilities post discharge (13). Recently, it has been suggested that the combination of laparoscopy and enhanced recovery protocols may confer an overall survival benefit in patients with colorectal cancer (14). Similarly, a large national database study including over 45,000 patients utilized propensity score matching to demonstrate that laparoscopic colectomy is associated with lower 30-day mortality, shorter length of stay, and greater likelihood of adjuvant chemotherapy initiation among stage III colon cancer patients when compared with open colectomy (15).

Given the suspected benefits of laparoscopy, it is hypothesized that utilizing the laparoscopic approach theoretically should decrease the development of postoperative adhesions and therefore decrease the development of postoperative bowel obstruction that

present and that require surgery. The article by Jensen *et al.* demonstrated that patients who underwent laparoscopic surgery had decreased risk of requiring surgery for small bowel obstruction and had decrease mortality. Surprisingly, the mortality rates reported for all patients in this study seem remarkably high. The three year overall survival rate from the index operation reported by Jensen *et al.* was 51.4%, which was not reported stage for stage. Stage for stage survival, which is a major factor in overall survival, would be helpful in interpretation of the mortality statistics provided. In the Jensen study, there was a significant difference in stage between the laparoscopic and open group, but on univariate and multivariate analysis of those undergoing surgery for small bowel obstruction, there was no difference in stage. The mortality rate amongst those patients who underwent surgery for small bowel obstruction was also considerably high at 55.1%. Stage for stage data was again not provided, which would be helpful in the interpretation of the data. Also, the methodology of identifying small bowel obstruction was “any operation for small bowel obstruction from 30 days after the index operation” utilizing procedure codes in the Danish National Patient Registry. Though we are not familiar with the Danish coding system, without review of operative notes, it is hard to assess the true incidence of adhesions as the cause of obstruction, and differentiate between adhesions and malignant obstruction. It would be informative to know more details about the patients that died after surgery for small bowel obstruction. Factors that could potentially play a significant role in mortality rates, but were not reported in this study, include: presence of carcinomatosis, age, functional status, frailty, presence of preoperative sepsis, and code status. Additionally, it would be informative to know the threshold for operative intervention in the patients who underwent surgery for small bowel obstruction as well as the severity of adhesions identify upon exploration. How long was non-operative therapy attempted prior to operative intervention? Also, did any patients undergo laparoscopic exploration for adhesive small bowel obstruction, and was this a protective factor? Another question that comes to mind is to examine similar outcomes in patients who underwent laparoscopic or open resection for diverticular disease. Though this would not necessarily compare apples to apples, it may help explore the influence of malignancy on the development of small bowel obstruction and specifically could help shed light on the reported mortality rates. If, even in benign disease, there was an increased mortality in patients who undergo open resection, this

would greatly support a laparoscopic approach for all colorectal resections especially in the setting of patients with malignancy who may require adjuvant therapy.

There is also little mention of the need for, and delivery of, adjuvant therapy, nor the relationship of timing of adjuvant therapy to the development of small bowel obstructions and the potential role it may play in mortality. It is possible that patients with advanced stage disease develop and undergo surgery for small bowel obstruction while undergoing adjuvant therapy would naturally carry a higher mortality risk given their immunosuppression and possibly increase in frailty.

A similar study was recently published examining only patients undergoing rectal cancer resection (16). They reported that laparoscopic rectal cancer resection carried a decreased risk of the future need for surgery for adhesive small bowel obstruction, and reported a higher rate than following colon cancer resection (4.4%). Aquina *et al.* utilized propensity score matching to evaluate over 69,000 patients who underwent laparoscopic versus open resection (17). They reported a 2% incidence of surgery for small bowel obstruction, with open surgery and laparoscopic converted to open surgery carrying an increased risk of not only developing small bowel obstruction but requiring surgery.

There are several reports that suggest there is no difference in the risk of development of adhesive small bowel obstruction between open and laparoscopic colon cancer surgery. Alvarez-Downing *et al.* reported the frequency of small bowel obstruction to be 1.8% in the open surgery group and 1.1% in the laparoscopic surgery group within the first postoperative year (18). However, this report only followed patients for 1 year postoperatively; given that the risk of adhesive small bowel obstruction is lifelong, this study period is most likely not long enough to draw firm conclusions. Another study by Smolarek *et al.* showed no difference between laparoscopic and open, but unplanned conversion from laparoscopic to open and stoma formation carried higher risks of future development of small bowel obstruction (19). These conflicting reports of outcomes for laparoscopic resection and subsequent small bowel obstruction mandate further exploration to further elucidate the true incidence of this clinical phenomenon.

The question of whether laparoscopy improves long term outcomes for colorectal cancer is an important one but has yet to be firmly established. Laparoscopy is currently utilized in only 32.5% of colon cancer resections and a majority of operations are still performed in an open

fashion (20). A survey of recent graduates of accredited colon and rectal surgery fellowship training programs in the United States demonstrated that the comfort level with laparoscopic resections has grown steadily over the last 5 years (21). As laparoscopy continues to grow, it is necessary to ask questions regarding outcomes, both short and long term. Patients undergoing any abdominal operation remain at lifelong risk for adhesive bowel obstruction, which can have a significant impact on their quality of life. While overall survival is typically the outcome of interest, the prevalence of small bowel obstruction is also important.

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Footnote

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