Risk of Late-Onset Adhesions and Incisional Hernia Repairs after Surgery

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BACKGROUND: Long-term adhesion-related complications and incisional hernias after abdominal surgery are common and costly. There are few data on the risk of these complications after different abdominal operations.

STUDY DESIGN: We identified Medicare beneficiaries who underwent endovascular repair of an abdominal aortic aneurysm from 2001−2008 who presumably are not at risk for laparotomy-related complications. We identified all laparoscopic and open operations involving the abdomen, pelvis, or retroperitoneum and categorized them into 5 groups according to invasiveness. We then identified laparotomy-related complications for up to 5 years after the index operation and compared these with the baseline rate of complications in a control group of patients who did not undergo an abdominal operation.

RESULTS: We studied 85,663 patients, 7,513 (8.8%) of which underwent a laparotomy, including 2,783 major abdominal operations, 709 minor abdominal operations, 963 ventral hernia repairs, 493 retroperitoneal/pelvic operations, and 2,565 laparoscopic operations. Mean age was 76.7 years and 82.0% were male. Major abdominal operations carried the highest risk for adhesion-related complications (14.3% and 25.0% at 2 and 5 years compared with 4.0% and 7.8% for the control group; $p < 0.001$) and incisional hernias (7.8% and 12.0% compared with 0.6% and 1.2% for the control group; $p < 0.001$). Laparoscopic operations (4.6% and 10.7% for adhesions, 1.9% and 3.2% for incisional hernias) carried the lowest risk.

CONCLUSIONS: Late-onset laparotomy-related complications are frequent and their risk extends through 5 years beyond the perioperative period. With the advancement and expansion of laparoscopic techniques and its attendant lower risk for long-term complications, these results can alter the risk-to-benefit profile of various types of abdominal operations and can also strengthen the rationale for additional development of laparoscopic approaches to abdominal operations. (J Am Coll Surg 2013;216:1159−1167. © 2013 by the American College of Surgeons)

Long-term complications after abdominal surgery, including adhesion-related complications and incisional hernia repairs, are common and costly, but the risks for these complications have been poorly characterized. Although rarely fatal, both of these complications can have substantial clinical and cost implications because they frequently require additional hospitalizations and/or surgical procedures. These longer-term complications must be considered when counseling patients about the risks and benefits of surgery and different surgical approaches.

After undergoing laparotomy, 93% of patients have been shown to have adhesions at a subsequent operation[1] and the risk of bowel enterotomy during reoperations complicated by adhesions is as high as 19%.[2] Although many adhesions are asymptomatic, others cause serious complications, such as bowel obstruction and ischemia. The prevalence of incisional hernia after laparotomy is reported to be between 11% and 20%,[3,4] and incisional hernia recurrence after surgical repair is as high as 45%.[5,6] Incisional hernias cause pain and other more serious problems, such as bowel

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Abbreviations and Acronyms
AAA = abdominal aortic aneurysm
EVAR = endovascular repair
LAP = laparotomy
RP = retroperitoneum

obstruction, incarceration, and strangulation. Surgeons are aware of these complications, but few studies have examined the risk of such complications for different types of abdominal procedures.[7]

Few data that we are aware of have examined the risks of laparotomy-related complications after various types of abdominal operations. Previously, we showed high rates of laparotomy-related complications after open abdominal aortic aneurysm (AAA) repair, but also noted a baseline rate of such complications after endovascular repair (EVAR).[8,9] Because uncomplicated EVAR is confined to the arterial system, there should be no risk of laparotomy-related complications, so observed complications in the EVAR group were likely influenced by earlier abdominal surgery. We therefore studied the risks of late-onset laparotomy-related complications in a large cohort of patients undergoing EVAR to estimate the rates of laparotomy-related complications in a general elderly population.

METHODS

Patient selection

We used a previously identified cohort of all traditional Medicare beneficiaries with a diagnosis of AAA who underwent endovascular repair during the period 2001−2008 as our study group. We identified all traditional Medicare beneficiaries age 67 or older with at least 2 years of earlier Medicare claims who had a diagnosis of AAA (ICD-9-CM code 441.4) and underwent EVAR (code 39.71 endovascular implantation of graft). Beneficiaries enrolled in health maintenance organizations at any time during the study period and those not enrolled in both Medicare Parts A and B were excluded.

Identifying laparotomy/laparoscopic operations

We used Current Procedural Terminology codes to identify laparoscopic and open operations involving the abdomen, pelvis, or retroperitoneum (RP). We categorized these into 5 distinct laparotomy (LAP) groups based on the level of invasiveness and direct entry into the peritoneal space (see Appendix; online only): those who underwent major abdominal operations (eg, esophagectomy, colectomy, hepatectomy, pancreatectomy), minor abdominal operations (eg, open appendectomy, gastrostomy, cecostomy, ileostomy), abdominal wall hernia operations (inguinal hernias were excluded), RP/pelvic operations (eg, total abdominal hysterectomy, nephrectomy, cystectomy), and all laparoscopic operations. Those who underwent 2 operations more than 30 days apart where the second operation was not a study result were categorized according to their first operation. As a sensitivity analysis, we categorized them according to their most invasive operation, but this did not substantively affect our results.

Identifying late-onset laparotomy-related complications

We identified late-onset laparotomy-related complications using both ICD-9-CM diagnosis codes and CPT procedure codes (Table 1). Complications were categorized as hernia-related or adhesion-related. Hernia-related complications included ventral incisional hernia repairs. Adhesion-related complications were characterized as operative (lysis of adhesions, small bowel resection, and large bowel resection) and nonoperative (admission for bowel obstruction without an operation). To ensure that small and large bowel resections were performed for adhesions or obstructions rather than diverticular disease or carcinoma, we required all bowel resection procedure codes to be accompanied by a diagnosis code for bowel obstruction.

To be considered a late-onset laparotomy complication, the event had to occur at least 30 days after the initial operation. Complications that occurred within 30 days of the operation were excluded. Because all of the operative complications (lysis of adhesions, small bowel resection, large bowel resection) could have also qualified as an initial LAP operation, these were only counted as a complication if they were preceded by an earlier operation.

Control group

We included as a control population all patients who did not undergo a designated LAP operation for the 2-year period before their EVAR. We imposed this 2-year "clean" period to limit the potential impact of any pre-existing adhesions resulting from an earlier operation that occurred before enrollment in Medicare. The date of their EVAR then became their index date to determine rates of subsequent complications. We chose a 2-year period because in a previous study we found that most laparotomy-related complications after open AAA repair occurred within 2 years of the operation.[8] In addition, previous studies have shown that most incisional hernias occur within 12 months of the laparotomy,[10,11] and the greatest percentage of readmissions due to