Editorial

Minimally invasive colectomy and the risk of anastomotic leak

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Introduction

With the current development of robotic assisted, natural orifice and single-incision surgery, the finer details of the original minimally invasive surgery are being explored with comparisons made to open surgery. This is of unquestionable importance for the continued development of the laparoscopic approach for better patient care. In March 2016, this journal published a paper entitled "*Risk of anastomotic leak after laparoscopic versus open colectomy*" in which the authors proposed a reduced odds of developing an anastomotic leak with laparoscopic surgery in a cohort of 23,568 patients undergoing colectomy (1). The results were compelling read but how realistic is the conclusion that the operative approach can alter intestinal healing?

The nature of leaks

Anastomotic leaks contribute significantly to patient morbidity and mortality and thus are the most dreaded complications following colectomy. Leaks often present in the initial postoperative phase, heralded by abdominal pain, pyrexia, and haemodynamic changes or instability or, on occasion, by more subtle indicators such as failure to progress or prolonged gastrointestinal quiescence (2). Quoted rates of leak range from 2–23% (1,3,4) with a mortality of 5–16% (2,3,5).

Multifactorial risk factors and heterogeneity of diagnosis, management and even in definition of anastomotic leaks combined with primarily retrospective available data make the assessment of this topic difficult (1,6). To each surgeon, the definition of an anastomotic leak is often clear in their understanding with a combination of clinical signs, laboratory, and radiological or re-operative findings (6,7). A definition may not necessarily align appropriate diagnosis with management. Should leaks be defined, for example, as a breach of the surgical junction of hollow viscera with or without active output, then logically it must be proven radiologically or operatively with the first step being clinical suspicion (6). This latter entity remains constant however the lack of specificity leads to a list of clinical signs including abdominal pain or distention, peritonitis, tachycardia or arrhythmia, pyrexia and drain output (faecal, purulent).

Routine postoperative blood tests may yield a leukocytosis or elevated C-Reactive protein (8). CT scan may not yield a radiological leak (3,9,10). Scoring or grading systems for risk prediction, diagnosis and stratification for management purposes are available (3,8,11,12).

Management will be driven by the suspicion or proof of a leak guided by surgical opinion, experience, and patient conditions. At this point the most important treatment window (of prevention) has already passed. Is this where choosing laparoscopy can assist in avoiding leaks?

Leak risks

Risk factors for leaks are multifactorial and can be recognised as patient, operation or surgeon specific. Preoperative non-modifiable risk factors include male gender, metastatic disease, comorbidities (ASA score >2) (4-6,13,14). Patients with significant comorbidities may not be selected for laparoscopic approach due to the longer length of anesthetic required in some cases. Modifiable patient risk factors include smoking cessation, obesity reduction, alcohol cessation, minimising immune modulating agents, non-steroidal anti-inflammatory drugs and reversing malnutrition (4,13). Optimisation and modifications made may profoundly improve patient overall conditions and thus reduce the risk of anastomotic leak.

Operative factors that are case specific include more distal anastomoses and emergency surgery which may cause a surgeon to decide upon an open procedure or more likely to fashion a defunctioning stoma. Increased inotropic support has been implicated with anastomotic leak as is increased blood loss and blood transfusion (4). Once again healthier patients will land on the more favourable side of these factors being more resilient, requiring less inotropic support, or blood transfusion. Operative time is a risk factor for leaks although this could be related to other factors such as the use of laparoscopy or indeed the surgeon's workload and proficiency (13).

Surgical technique provides multiple potential pitfalls for anastomotic leak to occur. A well trained surgeon will know to limit anastomotic tension, ischemia, contamination, operative time, blood loss and hypothermia. Limiting these factors will logically contribute to a better anastomosis. However, anastomotic tension, ischemia, and local contamination may be difficult to objectively measure (6,15). Proficiency in technique is often attributed to the surgeon's experience, caseload, and level of institutional care (16,17). A hand sewn anastomosis may have an increased rate of leak versus stapled ileocolic anastomoses, however this is controversial as shown within a recent observational study of 3,208 patients (18,19). Leak limiting techniques such as omentoplasty or mesenteric buttressing are often employed by specialist surgeons (20,21).

Laparoscopic confounders

The heterogeneity of definition, diagnosis, and management of anastomotic leaks combined with complex interaction of patient and operative factors causing leaks can lead to challenges in research to establish laparoscopic superiority on this topic. Studies of laparoscopy versus open bowel resections tend to be observational and retrospective carrying a risk of selection bias by matching surgical approach to individual patients, and information biases caused by under-reporting of complications and coding differences. Randomised control trials do not show significant superiority (22,23).

Many articles supporting the superiority of laparoscopy in preventing anastomotic leaks will also recognise major confounders amongst patient groups (1). In general, patients offered laparoscopy are younger with fewer comorbidities. Despite the cost effectiveness of laparoscopy and development of affordable reusable equipment, centres that offer specialised laparoscopic surgery tend to be more widely available in wealthy populations globally (24,25). These factors provide a selection bias which should be considered.

Could laparoscopy prevent leaks?

When one considers the benefits laparoscopy provides to each patient, an improvement in specific general outcomes may in fact contribute to specific outcomes (26). Laparoscopy allows for faster recovery time and thus shorter hospital stay (27,28). The requirement of less opiate analgesia due to minimal invasive approaches allows for faster intestinal and overall recovery (29,30).

Lower immune dysfunction and faster normalisation of the surgical stress response with laparoscopy may assist with anastomotic healing and integrity (31). Microbiome alterations and bacterial translocation can be less with laparocopic surgery to assist with recovery and prevent infective or inflammatory progression (32,33). Warmed carbon dioxide sometimes provided by laparoscopy potentially leads to less peritoneal injury having been associated with decreased clinical complications including anastomotic leaks (34).

The optimisation of these factors may be the major contributors to anastomotic success however they are difficult to assess objectively and in isolation. Advances in technology such as enhanced angiographic imaging can provide quality feedback at the time of anastomotic creation (35). Other methods of answering the specific questions relating to anastomotic leak will need to be developed to truly establish superiority on this multifaceted topic.

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Footnote

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