Laparoscopic colorectal surgery: beyond the short-term effects
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GENERAL INTRODUCTION

Colorectal Cancer
Annually, colorectal cancer is diagnosed in approximately 12,000 patients in the Netherlands. The incidence is expected to rise in the next years, which is mainly due to ageing and population growth. Moreover, as of this year implementation of the population-based screening program will start, which is expected to temporarily increase the incidence. Five-year overall survival rate is 60%, although patients who are diagnosed at an early stage have a much better five-year overall survival rate than patients diagnosed with metastasized disease: 94% versus 9%. The traditional curative treatment for colorectal cancer is surgery.

Laparoscopic surgery and enhanced recovery programs
In the past two decades there have been two major developments in colorectal surgery. In the early nineties laparoscopic surgery was introduced and from the year 2000 onwards ‘enhanced recovery after surgery’ (ERAS) or fast track programmes were introduced.

Ever since the introduction, laparoscopic and open resections for colon cancer have been compared extensively in various randomized controlled trials; well-known are the COST, COLOR I and CLASICC studies. Both short- and long-term results were summarized in two Cochrane systematic reviews which showed that laparoscopic resection is safe and feasible for malignant disease. Short-term advantages of laparoscopy include a shorter hospital stay, a reduction in morbidity and less postoperative pain when compared to open surgery. Moreover, long-term recurrence and mortality rates of laparoscopy did not differ from those of open colectomy. The authors of the latter review concluded that there was not enough evidence yet to determine if the incidence of incisional hernias and adhesion related complications was affected by laparoscopic surgery. More recent publications - including the long-term results of the MRC CLASICC trial - indicate that laparoscopic colorectal surgery could possibly lead to a lower incisional hernia and adhesion-relation SBO rate, other publications however contradict these findings.

ERAS programs aim to combine several evidence-based care principles into a multi-modal approach with the goal to enhance postoperative recovery. The program comprehends the entire perioperative phase starting with preoperative preparation, followed by minimizing trauma and the neuroendocrine stress response during surgery and anaesthesia. Postoperatively early oral feeding, enforced mobilization, standard laxation and early removal of catheters are included in the program.
In 2011 the LAFA study was published by Vlug et al comparing laparoscopy and/or fast track care to open surgery and standard care in a multicenter randomised controlled trial.\textsuperscript{23} Four-hundred patients who had an elective resection for adenoma or adenocarcinoma of the colon were included in the study. The patients were randomized to open or laparoscopic surgery, either within a ‘fast track’ care setting or a standard perioperative care setting. The results of the randomized controlled LAFA study showed that patients who had laparoscopic surgery within a fast track setting had the shortest postoperative hospital stay. In-hospital costs were similar in all four treatment groups.\textsuperscript{23}

**Inflammatory Bowel Disease (IBD)**

IBD is a chronic, idiopathic inflammatory disease of the gastrointestinal tract. Most patients with IBD have either ulcerative colitis (UC) or Crohn’s disease (CD) and a small remainder is classified as having unspecified disease, which is known as IBD-U. In the past 50 years, incidence of IBD in Western countries has risen to 8-14 per 100,000 individuals for UC and to 6-15 per 100,000 persons for CD.\textsuperscript{24} In the Netherlands, every year approximately 1500 new patients are diagnosed with UC and 1000 patients with CD.\textsuperscript{25} Peak incidence for UC occurrence is 30-40 years old; for CD this is 20-30 years old.\textsuperscript{24} Distribution of both diseases is often typical: CD can occur throughout the entire gastrointestinal tract and UC involves the rectum and colon and extends in a continuous retrograde mode.\textsuperscript{24}

The research in this thesis focuses on colonic IBD, which most often is ulcerative colitis. If the colon is affected by Crohn’s disease this is referred to as Crohn’s colitis. Patients with UC often present with a history of abdominal cramping, bloody diarrhea, weight loss and fatigue.\textsuperscript{26} Treatment starts with medication according to the step-up approach.\textsuperscript{27} Colitis refractory to medical treatment will require surgery, often a subtotal colectomy in the emergency setting, or in the elective setting a restorative proctocolectomy. Reported cumulative probabilities of surgical treatment vary greatly, but are between 20-30% after 25-years of UC.\textsuperscript{24}

**Familial Adenomatous Polyposis (FAP)**

FAP is characterised by the development of hundreds of adenomas in the colon and rectum during childhood and adolescence. Without treatment, colon cancer rate around age 40 to 50 is 100%. FAP is an autosomal dominant disease with an estimated incidence of 1 per 100,000 individuals. However 15-20% of cases occur ‘de novo’ - in which case the parents have no genetical evidence or signs of FAP. The guidelines state that endoscopic surveillance should be done every other year from the early teens onwards. Once adenomas are detected however, frequency of surveillance should increase to every year until a colectomy is planned. There are no strict guidelines on the
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Timing of surgery. Indication for surgery is the presence of large numbers of adenomas over 5 mm in size, including adenomas showing high grade dysplasia. Often this criterion is reached between 15 and 25 years. In general, a restorative proctocolectomy is indicated.28

Subtotal colectomy
In case of severe colitis, a subtotal colectomy is performed, in which the colon is removed and an end-ileostomy is created. The colectomy can be carried out in a laparoscopic or open fashion. Laparoscopic colectomy is mostly performed hand-assisted by the aid of a hand-port inserted in a Pfannenstiel incision. In selected cases the resected specimen can be extracted transrectally or via the future ileostomy opening. Open colectomy is carried out through a midline incision.

Restorative proctocolectomy
A restorative proctocolectomy actually consists of three elements: colectomy, proctectomy and creation of the ileal pouch anal anastomosis (IPAA). The procedure was originally described by Nicholls and Parks in 1978.29 Nowadays most often a J-pouch is created by folding a loop of the terminal ileum which is subsequently stapled to become a pouch. This pouch is then stapled or sewn to the anal canal. In patients with an increased risk of anastomotic leakage, i.e. high dosage prednisone use or technical problems, a loop ileostomy is created for protection of the IPAA.

The restorative proctocolectomy can be done as a single stage or as a two-stage procedure. The single stage procedure is carried out in one stage entirely, whereas the two-stage procedure consists of an emergency (sub)total colectomy at first, and after the patient has sufficiently recovered, completion proctectomy with IPAA is performed in a second stage. If a temporary loop ileostomy is created during the one- or two stage procedure, an extra stage is added. Restorative proctocolectomy can be carried out by a laparoscopic or open approach; in addition to the cosmetic advantages, laparoscopic IPAA has proved to be safe and feasible in both benign and malignant diseases.30-32 Recent studies demonstrated a significant decrease in adhesion formation after laparoscopic abdominal surgery.18,33

AIM OF THE THESIS

In this thesis we present several reviews, retrospective and prospective studies - all with the aim to evaluate both short- and long-term effects of laparoscopy and enhanced recovery programs in colorectal surgery. Part I focuses on surgery for colorectal cancer and in part II the research focuses on emergency colectomies and restorative proctocolectomies in patients with IBD and FAP.
The first part of this thesis focuses on laparoscopy and enhanced recovery programs in colorectal cancer surgery. Assessment of self-reported quality of life of cancer patients has become increasingly important in clinical trials nowadays. In chapter 1 we present a systematic review comparing quality of life after laparoscopic and open colorectal surgery. The results of the LAFA study (laparoscopy and/or fast track versus open or standard care) showed that laparoscopic surgery within a fast track program is the optimal surgical treatment strategy in patients with colon cancer. The results also showed us that implementation of all fast track elements can be strenuous and it has been questioned whether all separate fast track elements are essential for enhanced postoperative recovery. In chapter 2 we therefore aimed to determine which baseline characteristics and which fast track elements are independent predictors of faster postoperative recovery in patients undergoing resection for colon cancer. In chapter 3 the long term results of the LAFA study are presented. With laparoscopic surgery came endoscopic tattooing to mark the tumour site. In chapter 4 we have studied if colonoscopic tattooing can be used to refine staging accuracy by increasing the lymph node yield and we determined its accuracy as a sentinel lymph node procedure.

The second part of this thesis focuses on laparoscopic surgery for patients with inflammatory bowel disease (IBD) and familial adenomatous polyposis (FAP). Approximately one third of patients with an acute severe colitis will have an emergency subtotal colectomy, either by laparoscopic or open approach. To date, most research on laparoscopic colorectal surgery focuses on elective surgery. In chapter 5 we performed a systematic review with meta-analysis to compare short-term outcomes after laparoscopic and open emergency colectomy. We also present the results of a series of patients who had an emergency colectomy in the Academic Medical Center in chapter 6. We have aimed to determine possible risk factors for postoperative complications.

Proctocolectomy with ileal pouch anal anastomosis (IPAA) is the standard surgical treatment for patient with refractory ulcerative colitis or FAP. This procedure can be carried out as a single-stage or as a two-stage procedure, either by laparoscopic or open approach. A series of two-stage restorative proctocolectomies is described in chapter 7, in which we aimed to determine whether the need for adhesiolysis during the second stage is influenced by the surgical approach of the initial emergency colectomy and the hospital setting. Unfortunately, IPAA is associated with tubal factor infertility in female patients. Several studies have shown less adhesion formation after laparoscopic colectomy. The relation between laparoscopic pouch surgery and fertility, however, had not been studied so far. The aim the cross-sectional study in chapter 8 therefore was to assess the impact of a laparoscopic approach on female fecundity in ileoanal pouch surgery. In chapter
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9 we performed a validation study of a prognostic model for pouch failure which was proposed by the Cleveland Clinic in 2012. Finally, chapter 10 describes a new technique for anastomotic leakage repair in a small series of patients with a low anastomotic leakage after IPAA or low anterior resection.
REFERENCES


