

# Indications for laparoscopic colorectal surgery

## Results from the Medical Centre Alkmaar, The Netherlands

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### Abstract

**Background:** Between November 1991 and May 1995, a series of laparoscopic colectomies were performed in our hospital.

**Methods:** Our main aim was to define more specifically the indications for laparoscopic colectomy.

**Results:** A total of 69 patients underwent laparoscopic surgery for benign polypoid colorectal disease (n = 10), inflammatory bowel disease (n = 24), and colorectal malignancy (n = 35). Of the latter group, four patients underwent a palliative procedure. The conversion rate of the whole group was 29%. The main reason to convert was infiltrative growth in inflammatory disease or cancer. Respectively, seven (10%) and 12 (17%) patients sustained complications in the perioperative and early postoperative phase. Two patients died perioperatively (3%). The mean hospital stay was 12 days. On follow-up, 11 patients had developed a stenotic anastomosis, which was successfully dilated in all cases. After 3 years, the survival rate according to Kaplan-Meier is 86%, 66%, 68%, and 0% for Dukes' A, B, C, and D color carcinoma, respectively. In one patient with a Dukes B carcinoma, port site metastases were found.

**Conclusions:** Justifiable indications for laparoscopic colorectal surgery include (a) a benign polyp 20–50 cm from the anal ring; (b) mobile, inflammatory large bowel disease; (c) palliation in case of malignant disease, preferably of the left hemicolon. It remains to be proven that laparoscopic colectomy is superior and not just equivalent to open colectomy. This is especially true for resections of colorectal carcinoma with curative intent. Therefore a cost/benefit analysis should be performed in a prospective, randomized setting.

**Key words:** Laparoscopy — Colectomy — Port site recurrence

Laparoscopic procedures have been, performed by gynecologists since the 1960s. Only in the last 8 years has this type of surgery become more common in general surgery. The relatively rapid acceptance of laparoscopic cholecystectomy as a standard procedure is remarkable, given that Philippe Mouret performed the first procedure as recently as 1987 [1, 5, 9, 14–16, 20]. In the meantime, minimally invasive surgery has been adapted to many surgical procedures, including hernia repair, esophagectomy, appendectomy, vagotomy, and Nissen fundoplication. In colorectal surgery, the use of laparoscopy has not developed at the same rate because of the need for advanced laparoscopic surgical skills, deficiencies in instrumentation, and the potential risks of laparoscopic surgery for malignancy. Yet its feasibility has been demonstrated by many authors [8]. Its ultimate role, however, is still under investigation because of such crucial unresolved issues as increased morbidity due to the learning curve, cost effectiveness, and the safety of the laparoscopic technique in the management of intestinal malignancy.

In this paper, we present the results of laparoscopic colorectal surgery from the Medical Centre Alkmaar 5 years after performing the first laparoscopic colorectal procedure.

### Patients and methods

Before starting with the laparoscopic colorectal procedure, the surgical team had been trained using an animal model and had also joined several clinical sessions in a university hospital. In addition, the procedure was discussed in a national panel.

A 5-trocar method was used. The location of the trocars depended on the planned resection and anatomy of the patient. The procedure was called "laparoscopic-assisted" since mobilization of the affected bowel was performed by laparoscopic means and the resection was done in part extracorporeally. Anastomoses were made laparoscopically assisted with the double-stapling technique, or when feasible, by hand, extracorporeally. "Conversion to open surgery" was defined as an unplanned incision made or an incision made longer or earlier than planned.

The records of all patients undergoing laparoscopic and laparoscopic-assisted colon resection between November 1991 and January 1995 were studied. Decisions to offer the patient a laparoscopic approach were made by a team of two colorectal surgeons. The diagnosis was usually based on both colonoscopy and radiograph of the colon. In cases of malignancy,

**Table 1.** Indications for laparoscopic colorectal resections and types of resection

Indications	n	(Segmental) resections			Conversion n (%)
		Right hemicolon	Left hemicolon	Colotomy	
IBD	24	2	22	—	9 (38)
Benign polyps	10	3	6	1	2 (20)
Malignancy	35	10	25	—	9 (26)
Total	69	15	53	1	20 (29)

ultrasound of the liver and radiograph of the thorax were done to search for metastases.

The patients were fully informed about the recent advances and experience with laparoscopic colectomy, about the advantages and disadvantages of the procedure, about the procedure itself (included the possibility of conversion and longer operating time) and the alternative procedure. They gave informed consent orally.

The following parameters were recorded and analyzed for each patient: age, results of colonoscopy and radiograph of the colon, indications, morbidity, abdominal scars, type and duration of the procedure, conversion to open surgery, intraoperative and postoperative complications, and length of hospitalization. The primary outcome measures were operating time, postoperative pain, length of admission, and cosmetic result.

Data were presented as mean and range. A survival curve was constructed according to Kaplan-Meier.

## Results

Sixty-nine consecutive patients (29 men and 40 women) were finally included in our study. The mean age of the patients was 62 years (range, 30–86).

The indications for surgery and the procedures performed are shown in Table 1. The most common indication for surgery was colorectal malignancy in 35 patients. In 24 patients the indication was inflammatory large bowel disease (IBD), including Crohn's disease (n = 3) and diverticular disease of the sigmoid (n = 21). In 10 patients, the indication was benign polypoid disease. Oncological resections with curative intent were only performed until 1994.

To localize a tumor exactly, colonoscopy was performed preoperatively in 11 patients. The laparoscopic procedures included 53 segmental resections of the left colon (six polyps, 22 IBD, 25 malignancies), 15 segmental resections of the right hemicolon (three polyps, two IBD, 10 malignancies), and one colotomy. In 20 patients (29%), conversion to open laparotomy was needed, mainly because of infiltrative growth in inflammatory disease (12 patients) or malignant disease (five patients). In four patients, conversion was needed because the tumor was located too low in the anorectum or because the tumor was too large. In one patient, an iatrogenic perforation of the gut made conversion necessary.

The anastomoses were end-to-end. Thirty-three were handmade (eight polyps, twelve IBD, twenty-three malignancies) and 25 were double-stapled (two polyps, twelve IBD, twelve malignancies). The mean operating time was 220 min (range, 105–400). In cases of conversion, the operating time was not significantly prolonged.

Table 2 shows the complications. Perioperatively, seven patients (10%) sustained complications. In two patients, an iatrogenic perforation of the gut occurred. The other five complications included hypercapnia (n = 1), excessive bleeding (n = 1), and technical problems with the stapler

during anastomosing (n = 3). In one patient, this problem even necessitated the creation of an ileostomy to prevent leakage of the imperfect anastomosis. In the early postoperative phase, 12 patients sustained complications (17%), and four patients sustained more than one complication. In four of five patients with postoperative bleeding and hemodynamic instability, a surgical exploration was indicated. One patient developed a cholecystitis and therefore required surgery. He had already been reoperated on the first postoperative day because of bleeding. Unfortunately, he died on the 22nd postoperative day. Other complications included a large hematoma (n = 1) and atrial fibrillation (n = 1). In total, two patients died in the perioperative phase (3%). One patient died due to a cardiac asthma; the other one was our cholecystitis case.

In cases of malignancy, the specimen was radically excised—i.e., with the related mesentery. Exact lymph node quotes were not available, since lymph node counts are not routinely performed at our institution.

The mean hospital stay was 11 days (range, 6–45). All patients were admitted to hospital 2 days preoperatively for colonic preparation.

## Follow-up

### *Inflammatory disease (n = 24)*

On follow-up, six patients developed a stenotic anastomosis, which was successfully dilated in all cases. All these anastomoses had been created by the double-stapling technique. The other late complications were a hernia cicatricialis (n = 1), a Douglas abscess after 6 months (n = 1), and a peritonitis due to perforation of the gut after an ileus due to adhesions after 9 months (n = 1). The first and latter patient were reoperated.

The recovery of the patients with Crohn's disease (n = 3) was uneventful.

### *Polypoid disease (n = 10)*

One of the two patients with a double-stapled anastomosis developed a stenosis of the anastomosis, which was successfully dilated.

On follow-up all patients with a (tubulo)villous adenoma (n = 7) were routinely checked by colonoscopy.

### *Malignant disease (n = 35)*

Two patients developed a local recurrence of the disease, but distant metastases (liver; lung and mesenterium) were

**Table 2.** Complications

Type of complication	Time of occurrence		
	Perioperative	Early postoperative	Late postoperative
Perforation of the gut	2	—	—
Bleeding	—	5	—
Urinary bladder retention or cystitis	—	3	—
Leakage of the anastomosis	—	1	—
Pneumonia	—	4	—
Stenosis of the anastomosis	—	—	11
Other	5	3	3
Total	7	16	14

simultaneously discovered. Both died within 6 months after discovery. The case histories of the other two patients are as follows:

### Case 1

Male, 60 years. He was operated for a carcinoma of the sigmoid, which happened to be a Dukes' B carcinoma invading the serosa. Postoperatively, he developed a large hematoma in the right flank, which healed spontaneously. After 41 months, we saw him with two isolated port site recurrences just right to the pubic bone. These were radically excised. Five months later, there were no signs of generalized disease.

### Case 2

Female, 64 years. The indication for surgery was a carcinoma of the ascending colon. This happened to be a Dukes B carcinoma invading the serosa. Perioperatively some tumor spill occurred, for which the abdomen was extensively flushed. At 23 months, nodules were palpable in the right lower abdomen. At laparotomy, she appeared to have a local recurrence at the right mesovarium and tuba and a new primary adenocarcinoma near the anastomosis. Both were excised. She died 9 months later.

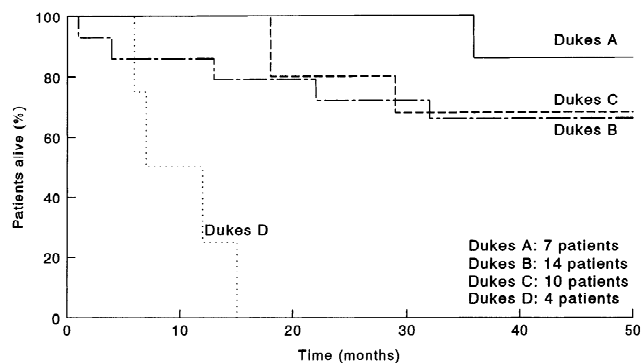
Four other patients underwent a palliative operation as the primary procedure. One patient who was preoperatively known with liver metastases underwent surgery for obstruction. In the other three patients, liver metastases were found perioperatively. Their postoperative recovery was uneventful. All died within 15 months after the operation. By July 1996, 11 of the 35 patients (31%) with colorectal malignancies had died (Fig. 1). The 3-year survival rate according to Kaplan-Meier for Dukes A, B, C, and D is 86%, 66%, 68%, and 0%, respectively.

### Discussion

Laparoscopic colectomy has many theoretical advantages over conventional colectomy [4, 6, 8, 18]. According to Musser et al., laparoscopic colectomy has proven to be a safe, (cost) effective method of colon resection [10].

Still, surgical investigators must prove that laparoscopic colectomy is superior and not just equal to open laparotomic colectomy. In oncological terms, equivalency means that neither 5-year survival rate nor local regional disease control are compromised.

This study shows again that laparoscopic colorectal surgery is feasible. In 24 patients, the indication for surgery was inflammatory large bowel disease, including diverticular disease (stenotic and recurrent diverticulitis) of the sigmoid ( $n = 21$ ) and Crohn's disease ( $n = 3$ ). The conversion rate was the highest in this group (38%)—not surpris-



**Fig. 1.** Kaplan-Meier survival curve 3 years after colorectal carcinoma.

ingly, since diverticulitis is known to lead to fixation to neighboring structures, which was the main reason for conversion in our study. Perhaps a more thorough preoperative evaluation would help to lower this conversion rate.

The mean hospital stay was rather long due to our postoperative feeding scheme. Postoperatively, the patients were allowed to eat solid food only after  $\geq 4$  days. Thus, the minimum hospital stay was 6 days. We now use a much more flexible scheme, so that eating is started as soon as the patients wish.

Six of the patients with a diverticular disease developed a stenotic anastomosis needing dilatation. This could suggest a relation with anastomosing on a remnant diseased colon. However, the criteria used to plan the extent of the resection (proximally: a normal thickness on palpation of the bowel wall; distally: the peritoneal reflections) were the same as in open surgery. The high incidence of stenosis can be explained by undue dilatation of the afferent loop to allow a stapler head as large as possible (as recommended by the manufacturer). Unpublished data of our surgical group show the same incidence of stenosis following open surgery due to this technique (which now has been abandoned).

Ten patients underwent surgery for a benign colonic polyp that could not be removed by colonoscopy. In one patient only a colotomy was needed.

The most common indication for surgery in our series was colorectal malignancy (35 patients). The right hemicolon was partially resected in 10 cases. In 25 patients, the sigmoid or left hemicolon was totally or partially resected.

Cancer control issues in curative laparoscopic colec-

tomy include extent of lymphadenectomy, wound implantation of malignant cells, adequacy of intraperitoneal staging, and the no-touch technique. In conventional surgery, the role of the extent of lymphadenectomy remains controversial [2, 7, 12]. Thus, it is not proven that the chance of cure is increased if more positive lymph nodes are removed, since regional lymph nodes might be not governors but rather indicators of survival. The few publications that report on lymph node counts do not agree about the similarity in laparoscopic colectomy specimens and open colectomy specimens for several reasons [3, 5, 9, 14, 16]. Nor can we make any judgements about the extent of lymphadenectomy in terms of lymph node counts. In our studies, the plane of dissection was free of tumor in all cases.

The incidence of tumor implantation at the port site appears to be a new complication due to laparoscopic surgery. More than 30 patients with port site metastases have already been reported, and the incidence of this alarming complication is estimated to be ~4% [11, 16, 17, 21]. In >50% of cases, this complication was associated with peritoneal dissemination of the cancer. Tumor recurrence within trocar sites where neither the instrumentation nor the wound edges have been exposed directly to the cancer specimen strongly suggests that contamination of the free abdominal space in combination with high pressure due to the pneumoperitoneum and leakage of tumor cells along the trocars are the cause of such recurrences following laparoscopic surgery. Several authors have argued for the timely use of intraperitoneal chemotherapy in an effort to eliminate tumor contamination of the peritoneal surfaces [13]. In our series, we did encounter one isolated port site recurrence after 41 months, but there were no signs of peritoneal dissemination of the cancer (case 1).

Our survival statistics after 3 years do not differ much from those after conventional colectomy. However, the numbers are too small for us to draw any definitive conclusions. Therefore, in agreement with earlier authors, we think that laparoscopic segmental colonic resections with curative intent should be done only as part of a multicenter prospectively randomized trial [19]. Soon, such a study (preliminarily known as the Netcol study) is going to start in our country and Scandinavia. Also, a careful cost/benefit analysis should be performed to evaluate if this procedure is superior and not just equal to the conventional procedure [11].

## Conclusion

We conclude that at present there are three justifiable indications for laparoscopic colorectal surgery. The first is a benign colonic polyp 20–50 cm from the anal ring that can be removed after laparoscopic mobilization of the bowel through a small incision. The second indication is mobile, inflammatory large bowel disease (as long as the amount of fixation to other structures is not too extensive) in a highly motivated patient. The third indication is a palliative pro-

cedure in case of malignant disease, preferably of the left hemicolon, so that a full laparotomy can be avoided. In all cases, patient and surgeon must be strongly motivated and completely informed about the advantages and disadvantages of the laparoscopic procedure. It remains to be proven that laparoscopic colectomy is superior and not just equivalent to open colectomy. This is especially true for resections of colorectal carcinoma with curative intent. Also a cost/benefit analysis should be performed in a prospective, randomized setting.

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