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Immediately recognizable benefits and drawbacks after laparoscopic colon resection for benign disease

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Abstract

Background: A prospective assessment of the impact of laparoscopic colon resection (LCR) was carried out in order to quantify immediately recognizable benefits and limitations of this approach.

Methods: Elective LCR was attempted in 95 selected patients (mean age 64 years, range 39–81 years) presenting with benign disease of the colon. A completely intracorporeal approach was adopted. Results were compared with a control group of 90 patients who had previously undergone open colectomy (OC) by the same surgeons at the same institution.

Results: There were no perioperative deaths. Intraoperative complications included difficult extraction of accidentally detached anvil ($n = 1$), air leak at colonoscopy ($n = 2$), and conversion to OC ($n = 1$). Operating time was significantly longer after LCR compared with OC (180 ± 10.3 vs 116 ± 97, $p < 0.001$). Passage of flatus (3.5 ± 1.2 days vs 4.4 ± 1.4, $p < 0.5$) and morbidity (4 vs 3, $p = 0.48$) were not significantly different in the two groups. Hospital stay was significantly shorter after LCR (5.2 ± 1.3 days vs 12.2 ± 1.9 days, $p < 0.001$). Theater and ward costs were, respectively, significantly increased ($ 2,829.6 ± 340 vs $ 1,422 ± 318, $p < 0.001$) and decreased ($ 2,600 ± 366 vs $ 6,022 ± 916, $p < 0.001$) in LCR patients compared with the OC group. There was no significant difference in total hospital costs ($ 10,929 ± 369 vs $ 9,944 ± 1,014).

Conclusions: LCR does not appear to offer any immediately recognizable advantages.

Key words: Laparoscopy — Colectomy — Complications

The main rationale for choosing a laparoscopic approach to the surgical treatment of benign diseases of the colon is the achieval of a certain number of immediately recognizable benefits for the patients. Claims on less postoperative pain, immediate patient mobilizing, shorter postoperative ileus, earlier oral solid intake, reduced hospital stay, more cost-effectiveness, quick return to normal activities, and improved cosmetic results have characterized the literature of the early 1990s [4, 6, 10].

A minimally invasive approach may, in theory, not be devoid of advantages provided that colon resection is performed in accordance to the standards of surgical technique and that indications for surgery are not influenced by the change of access [8]. This prospective evaluation of laparoscopic colon resection (LCR) in a selected group of patients with benign disease of the colon was carried out in order to identify and quantify immediately recognizable benefits as well as limitations of this approach.

Materials and methods

Between January 1992 and November 1994, all patients presenting with benign disease of the colon necessitating elective surgery were considered as candidates for laparoscopic colon resection (LCR). Exclusion criteria included previous extensive abdominal surgery, previous and/or ongoing treatment for malignant disease, liver cirrhosis with portal hypertension, severe coagulopathy, intraabdominal abscess, and emergency surgery. Data regarding operating time, intra- and postoperative complications, passage of flatus, duration of hospital stay, and operating room, ward, and total hospital costs were recorded prospectively. Patients who underwent LCR were compared with a control group of 90 patients who underwent elective open colectomy (OC) by the same surgeons at the same institution from January 1990 to December 1991.

A mechanical bowel preparation was achieved using 2 l of polyethylene glycol ingested orally during 2 days before surgery. Broad-spectrum intravenous antibiotics were given 1 h preoperatively. Whenever indicated and feasable, preoperative colonic tattooing was made to aid lesion identification at LCR. Patients were given perioperative epidural analgesia and general endotracheal anesthesia and underwent placement of nasogastric tube and urinary catheter. Pneumoperitoneum was induced using carbon dioxide insufflated to a pressure of 12 mmHg by placement of a trocar in the infraumbilical skin using a cut-down technique. The approach to right LCR differed from a previously reported technique [18] with regard to the side-to-side ileocolic anastomosis which was fashioned intracorporeally with Endo-GIA 60 stapler (USSC, Norwalk, CT). Left LCR was carried out

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Table 1. Demographics of the patients[a]

	LCR (n = 95)	OC (n = 90)	p
Age (years)	64 ± 9.8	65 ± 9.2	NS
Weight (kg)	80 ± 15.2	79 ± 13.6	NS
ASA grade, I:II	70:25	66:24	NS
Resection type, right: left	41:54	39:51	NS
Indications for surgery			
Diverticular disease	48 (50)	35 (38.5)	NS
Crohn's disease	39 (41)	38 (42.2)	NS
Villous adenoma	4 (4.2)	9 (10)	NS
Volvulus	3 (3.1)	8 (8.8)	NS
Ischemic colitis	1 (1)	− (0)	NS
Previous surgery[b]	12 (12.6)	10 (11.1)	NS

[a] Mean values ± the standard error of the mean (SEM); values in parentheses are percentages; NS, not significant
[b] Previous cholecystectomy and/or appendectomy

according to a lately described technique [1]. All ileocolic and colorectal anastomoses were checked for leaks with air pressure, respectively, via a colonoscope or submerging the pelvis in saline and insufflating via a 50-ml syringe. Fascial closure of all trocar sites was performed regardless of the cannula size. All specimens were sent for histology.

Morbidity was defined after the Troidl Classification [22]. Criteria for discharge were the same after OC and LCR. Patients were dismissed tolerating oral solid food intake, after the passage of one bowel movement, and with no evidence of sepsis. Data were expressed as mean ± standard error of mean and calculated by a statistical software program (Harvard Graphics 1.0—Software Publishing Corp., 1991). Student's t-test, Fisher's exact test, and chi-squared test were used where appropriate. Statistical significance was set at $p < 0.05$.

Results

The LCR and OC patient groups were not significantly different with regard to age, weight, ASA grading, type of resection, previous minor abdominal surgery (cholecystectomy and/or appendectomy), and indications for surgery (Table 1). Conversion rate was 2% (1/54) in patients undergoing left LCR. Laparoscopy was deliberately abrupted in a 53-year-old obese (body mass index [BMX] 30) man presenting with stenosing diverticular disease of the sigmoid because operating time had reached 4 h. The thickness of the mesentery and the presence of small bowel in the pelvis accounted for the duration of the resection. This patient had postoperative ileus during 5 days and delayed wound healing which recovered without further surgery.

There were no deaths. Intraoperative complications occurred in three patients (3%). A 63-year-old man presenting with stenosing diverticular disease of the sigmoid had an end-to-side colorectal anastomosis performed with a 28-mm circular stapler. During per anum extraction of the circular stapler, the anvil was accidentally detached and subsequently removed with forceps. Residual disease left behind at the transection site of the sigmoid rectum probably made it easier to staple the anastomosis on the anterior rectal wall. A barium enema carried out 6 months after surgery revealed an asymptomatic anastomotic stenosis. Two of 41 patients (5%) with ileocolostomy had intraoperative air leaks at colonoscopy with air pressure. Each of two anastomoses was reinforced with sutures.

Postoperative complications occurred in four of 94 patients (4.2%) (Table 2). A patient with a superficial abscess at the infraumbilical site was readmitted for incision and drainage. Morbidity rates (4 vs 3, $p = 0.48$) were not significantly different in the LCR and OC groups. Table 3 compares the two patient groups with respect to operating time, first flatus, length of stay, and operating room, ward, and total hospital costs.

Table 2. Morbidity after Troidl classification [21]

Stage		LCR (n = 94)	OC (n = 90)
II	Air leaks	2	
	Anvil detached	1	
III	Pleural effusion	1	1
	Deep vein thrombosis		2
	Urinary retention	1	
IV	Wound hematoma	1	
	Wound abscess	1	

Discussion

A note of caution about the risk of replacing traditional colectomy with ''two operations'' has been expressed [19]. However, in spite of some criteria that have been given to define laparoscopy-assisted colectomy [11, 23], one can hardly see how laparoscopy-assisted procedures actually differ from electively converted operations. Vascular and/or bowel division and/or anastomosis fashioning are often performed extracorporeally through a ''minilaparotomy.'' However, speaking beyond definitions, it is recommendable to keep conversion rates to a minimum. In fact, converted procedures appear to be associated with high morbidity rates [20]. Thus, a policy of attempting all colon resections laparoscopically should be discouraged. Reported conversion rates vary from 3% to 48% depending on definition, patient selection, which phase of the learning curve, and the bowel segment to be resected [20]. Zucker et al. [24] reported a 3% conversion rate in patients selected based on their ability to understand the rationale for the celioscopic approach, provided the absence of morbid obesity and previous extensive abdominal surgery. Milson et al. [12] achieved a 9.3% conversion rate operating on healthy nonobese patients requiring surgery limited to one colon segment. Reissman et al. [17] had a 7% conversion rate in unselected patients. Low conversion rates should be accomplished via careful preoperative patient selection backed by extensive experience with open colorectal surgery, and of course not by excesses of zeal in trying to postpone a necessary conversion.

Claims of shorter postoperative ileus, earlier oral solid intake, and reduced hospital stay after LCR [4, 6, 10] have been supported by a few subsequent controlled studies [5, 13, 15]. However, data from a recent prospective study [9] could not fully confirm that LCR leads to shorter transient postoperative gastrointestinal hypomotility. Moreover, it has been shown that early oral intake is possible after open colorectal surgery [3]. Therefore, it might be very difficult to provide evidence of significant differences in timing for discharge after open and laparoscopic surgery. Shorter hos-

Table 3. Variables compared[a]: laparoscopic colon resection (LCR) vs open colectomy (OC)

	LCR (n = 94)	OC (n = 90)	p
Operating time (min)	180 ± 10.3	116 ± 9.7	<0.001
Flatus (days)	3.5 ± 1.2	4.4 ± 1.4	NS
Hospital stay (days)	5.2 ± 1.3	12.2 ± 1.9	<0.001
Operating room costs ($)	2,829.6 ± 340	1,422 ± 318	<0.001
Ward costs ($)	2,600 ± 366	6,022 ± 916	<0.001
Total hospital costs ($)	10,929 ± 369	9,944 ± 1,014	NS

[a] Mean values ± the standard error of the mean (SEM)

pital stay after LCR represents scanty evidence when it is compared with a length of stay of 11 days [14] or 12.2 days [7] following traditional colectomy. As stated elsewhere [16], better cosmesis is, for the time being, the only proven, but often irrelevant, benefit of LCR. Nevertheless, it must be acknowledged that laparoscopic surgery has contributed to making us review our traditional routines in open surgery.

Immediately recognizable limitations of LCR include a learning phase, prolonged operating time, and ''new'' complications. It has been estimated that 35–50 procedures are necessary before the learning curve flattens [23]. Furthermore, it has been shown that the learning curve is in most cases steep [5], although it may depend on the type of bowel resection [17]. A prolonged operating time at any phase of the learning period may in fact point out the limits of current instruments. Decreasing operating time must be achieved without an increase in complication rates. Data from a large prospective study [11] have shown that overall morbidity following LCR is not increased when compared with open surgery. However, the definition of morbidity may vary [17] and the use of one classification is certainly desirable [22]. ''New'' complications such as resection of the wrong colon segment and port site hernias [17] may be overcome by a more widespread use of intraoperative colonoscopy and routine surgical closure of port wounds regardless of their size.

Early claims on increased cost-effectiveness of LCR [13] have been disconfirmed by convincing evidence showing that increased operating-room costs often offset possible gains from shorter hospital stay [5, 16]. Direct costs of a completely intracorporeal approach may differ markedly among institutions and should not be analyzed as isolated data [19]. A judicious use of reusable laparoscopic equipment may help contain these costs. Early return to work is unlikely to lead to economic benefit since most patients with colorectal diseases are retired [19]. Although it might be very difficult to provide evidence of increased cost-effectiveness of LCR, a cost-utility analysis should be most appropriate because it would measure quality of life following LCR.

No immediately recognizable advantages following LCR can be surmised from the present study. Still-unproven favorable physiologic effects (decreased cell-mediated immunosuppression and blood loss) [2] and still-unknown long-term benefits (reduced adhesion formation and decreased incidence of small-bowel obstruction) [21] might magnify the cost-effectiveness of the celioscopic approach.

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