Laparoscopic Colectomy Versus Open Colectomy for Colorectal Carcinoma: A Retrospective Analysis of Patients Followed Up for at Least 4 Years

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Abstract

Purpose. To compare the long-term outcome of laparoscopic-assisted colectomy (LAC) with that of open colectomy (OC) for carcinoma in patients followed up for a minimum of 4 years.

Methods. We reviewed the medical records of 118 patients who underwent LAC between January 1993 and September 1999, and compared the results with those of 163 selected patients who underwent OC during the same period.

Results. Curative surgery was performed in 114 of the LAC patients. Because recurrence did not develop in any of the patients with stage I cancer, we analyzed the patterns of recurrence only in those with stage II or III disease; 58 patients were analyzed in the laparoscopic group and 130 in the open colectomy group. In the LAC group, 7 (12.1%) patients had recurrence after a median follow-up of 58 months and in the OC group, 19 (14.6%) patients had recurrence after a median follow-up of 56.5 months. The 5-year disease-free rate was similar in the LAC (87.8%) and OC (85.5%) groups (P = 0.75 by the log-rank test).

Conclusions. Laparoscopic-assisted colectomy is effective and safe for the treatment of colorectal carcinomas under the criteria used in this study. However, further validation of these results is recommended.

Key words Colorectal cancer · Laparoscopic colectomy · Recurrence

Introduction

Laparoscopic surgery is commonly performed for various disorders of the digestive organs. Its benefits include a lower incidence of postoperative ileus, shorter hospitalization, less postoperative pain, and a smaller incision.1–3 The practice of laparoscopic cholecystectomy for gallstone disease is well established, based on the simplicity of the procedure and the benign nature of the disease. In contrast, laparoscopic operations for cancer of the digestive organs remain controversial. In recent years, many reports on successful laparoscopic colectomy have been published and it is gradually becoming the procedure of choice for the treatment of colorectal carcinoma.4–10 However, the curability of laparoscopic colectomy for colorectal carcinoma remains controversial because of uncertainties about the adequacy of resection, the possibility of cancer cell spread to the port site, and the lack of data on long-term results. The aim of this study was to compare the clinical outcome of patients who underwent laparoscopic-assisted colectomy (LAC) for colorectal carcinoma with that of patients who underwent conventional open colectomy (OC) after a minimum follow-up period of 4 years.

Patients and Methods

Study Design

Between January 1993 and September 1999, 118 patients underwent laparoscopic colorectal surgery for colorectal carcinoma at our hospital. All patients diagnosed with colorectal carcinoma were considered candidates for laparoscopic-assisted colectomy (LAC). Criteria determining ineligibility for LAC were: lower rectal carcinomas deemed surgically resectable, lesions of the transverse colon or ascending colon near the hepatic flexure or descending colon which tumors suspected of invading the muscularis or deeper layers, tumors requiring low anterior resection or abdominoperitoneal resection of the rectum, tumors larger than
8 cm on barium enema or computed tomography (CT), tumors infiltrating adjacent organs on CT, previous major abdominal surgery near the field of the colorectal operation, and patients presenting with intestinal obstruction or perforation, other gastrointestinal tumors, or obesity (body mass index >30 kg/m²). All patients underwent preoperative colonoscopy and biopsy of the tumor, as well as barium enema to confirm the site of the lesion. CT was done to gauge the size of the lesion and look for evidence of local infiltration or distant metastases. If we considered that the tumor would be difficult to identify during the subsequent laparoscopic procedure, the site was marked preoperatively by a colonoscopic injection of sterilized China ink into the submucosa near the tumor.

All consecutive patients who underwent an elective procedure were enrolled prospectively in a registry database which recorded the following variables: the patient’s age, gender, and purpose of procedure (curative vs palliative); conversion to open surgery; tumor pathology data (stage, differentiation, radial margins, lymph nodes harvested, and the number of lymph nodes with metastasis); duration of surgery; intraoperative blood loss; operative and postoperative complications; surgical reintervention; and hospitalization. Follow-up data included the incidence of local, distant, or trocar site recurrence, and cancer-related death. Data on patients requiring conversion to OC were analyzed, together with those on patients who underwent laparoscopically completed surgery, by an intention-to-treat analysis.

The same surgeon performed all laparoscopic procedures using a standardized technique, which we described previously. Surgical standards for colon cancer included radical resection of the tumor-bearing segment with central ligation of its vessels according to the lymphatic dissection. For patients with sigmoid and rectal cancers invading the muscularis propria or deeper layers, high ligation of the inferior mesenteric artery with clips was routinely performed. For patients with right-sided colon cancers invading the muscularis propria or deeper layers, the ileocolic vessels and right colic vessels were clipped at their origin.

During the same period (January 1994 to September 1999), 324 patients underwent conventional curative OC for colorectal carcinoma. To assess the long-term outcome of LAC, a control group of 163 patients was selected as follows. Because abdominoperitoneal resection and low anterior resection were not performed as laparoscopic procedures, no patient who underwent either of these procedures was included in the control group. We also excluded patients with pathological findings of a tumor larger than 8 cm or a tumor infiltrating the adjacent organs, those with more than ten lymph nodes positive for metastasis (because the maximum number of lymph nodes with metastasis identified by laparoscopic surgery was ten), and patients older than 84 years (because none of the patients who underwent LAC was older than 84 years).

Pathological classifications were based on the Japanese Classification of Colorectal Carcinoma by the Japanese Society for Cancer of the Colon and Rectum. The number of lymph nodes with metastasis was divided into two groups according to the TNM classification, in which N1 indicates one to three nodes involved, and N2 indicates four or more nodes involved.

**Assessment of Endpoints**

All patients were followed up by a structured program of four outpatient visits for the first year and two thereafter. Investigations at each visit included regular physical examination, liver function tests, and carcinoembryonic antigen assay. Ultrasonography or CT of the abdomen was done at 3- to 6-month intervals, chest X-ray was done biannually, and colonoscopy was done annually.

**Statistical Analysis**

Results were evaluated with the chi-squared test, Student’s t-test, and Mann-Whitney U-test to compare categorical, parametric, and nonparametric data, respectively. Disease-free intervals were calculated by the Kaplan-Meier method, and differences between groups were compared with the log-rank test. A P value of less than 0.05 was considered significant.

**Results**

The 118 patients comprised 66 men and 52 women with an average age of 61.7 years (range 31–83), and an average body mass index of 22.5 (range 15.2–30). There was no mortality during the first 30 days after laparoscopic surgery. The rate of conversion from laparoscopic to open surgery was 8.5% (10/118) and the reasons for conversion were bleeding (n = 4), adhesions (n = 1), tumor fixation (n = 3), and injury of the bowel wall (n = 2). Postoperative complications developed in 27 (22.9%) of the 118 patients, wound infection being the most common, occurring in 14 (12.3%). The other complications were small bowel obstruction (n = 6), bleeding (n = 1), and anastomotic leakage (n = 3). In the final assessment of long-term outcome, four patients were excluded because they underwent palliative surgery of colorectal cancer or of coexisting cancer in another organ. The other 114 patients underwent curative surgery. According to TNM staging, 56 patients had Stage I cancer, 33 had Stage II cancer, and 25 had Stage...