The evaluation of the role of Laparscopic colectomy versus open colectomy in cases of cancer colon

Thesis

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By

Tarek Osama Salem Hegazy
M.Sc
Cairo University

Supervised by

Prof. Dr. Abd El Moaty Hussein Aly
Professor of general surgery
Faculty of Medicine
Cairo University

Prof. Dr. Ibrahim Galal Khalifa
Professor of general surgery
Faculty of Medicine
Cairo University

Dr. Nader Makram Milad
Lecturer of general surgery
Faculty of Medicine
Cairo University

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ABSTRACT

Recently, colorectal cancer has been a significant leading cause of death from malignancies worldwide. Conventional open surgery is associated with significant morbidity and long convalescence. Laparoscopic surgery has been widely used as a minimally invasive surgery to treat diverse benign diseases such as benign gall bladder disease. Jacobs et al. first reported the technical feasibility of laparoscopic colectomy in 1991. Since then, laparoscopic surgery has been widely operated for various benign colorectal conditions such as polyps, diverticular disease inflammatory bowel disease, rectal prolapse and now colorectal cancer increasingly. The benefits of laparoscopic surgery in comparison with open surgery have been suggested with respect to decreased morbidity, decreased pain, faster recovery, shorter hospital stay and possibly reduced immunosuppression. Laparoscopic colorectal surgery is technically complex as it involves laparoscopic mobilization of colon over a wide area, intracorporeal division of major vessels, extraction of specimen and a bowel anastomosis. There is a steep learning curve to achieve advanced laparoscopic skills, and specialized equipment is required. Conclusion: In our study, a comparison between 2 Groups each has 20 cases of colorectal cancer in these criteria: Operative time, lymph node yield, resection margins and postoperative stay, postoperative pain, morbidity and mortality. The results showed no significant difference in the lymph node yield, resection margin and mortality. A significant increase in the operative time in the laparoscopic colectomies in comparison to open colectomies, although the mean operative time was progressively decreasing with increasing the number of cases.

Keywords:

Laparoscopic colectomy
Open colectomy
Cancer colon

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Introduction

Evolution of laparoscopic colon surgery:

The first endoscopic examinations of the peritoneal cavity were accomplished early in the 20th Century. In 1901, Dimitri Ott, a German gynecologist described "ventroscopy," a technique in which a speculum was introduced through an incision in the posterior vaginal fornix. Ott wore head mirrors to reflect light and augment visualization. Also in 1901, George Kelling, a German surgeon, reported using a cystoscope to examine the intra-abdominal viscera of a dog after insufflating the peritoneal cavity with air, and coined the term "celioscopy." Jacobeus performed the first human celioscopy in Sweden in 1910, advocating the technique for the evaluation of patients with ascites (Haubrich WS et al.1987).

In recent years, laparoscopic surgery has become a matter of growing interest. Since its introduction in the late 1980s and the subsequent recognition of its advantages,minimally invasive surgery has been applied to almost all areas of abdominal surgery.

Patients who require colorectal surgery are often elderly and debilitated by chronic diseases. The abdominal wound has always been a source of major morbidity for these patients. The high concentration of bacteria within stool contributes to the high rate of wound infections, dehiscences and eviscerations associated with colorectal surgery. In addition, the pain from the abdominal wound often compromises pulmonary function and may limit the mobility of these patients in the immediate postoperative period as well as after hospital discharge. As a result, minimally invasive techniques, which limit the size of the abdominal wound, theoratically offer distinct advantages to patients requiring colorectal operations (Forde KA et al.,1994).

Laparoscopic techniques have been applied to a variety of benign colorectal conditions, including inflammatory and diverticular disease (Semm K et al.,1997).

Application of videolaparoscopic techniques to colorectal operations was initially limited by the lack of appropriate instruments. Consequently, the first laparoscopic colon resections were "laparoscopically-assisted" colectomies, i.e., mini-laparotomies were utilized for ligation of mesenteric vasculature, extracorporeal anastomoses, and specimen removal. The first

laparoscopic colonic resection using this technique was a right hemicolectomy, which was accomplished Moises Jacobs in Miami, Florida, in June of 1990. Similarly, closure of a colostomy required few specialized laparoscopic instruments. Joseph Uddo performed a laparoscopic colostomy closure on November, 1990,the anastomosis was constructed with a circular stapling device (Corbitt et al.,1992).

The introduction of a laparoscopic intestinal stapler, the Endo- stapler allowed the transection of the bowel to be accomplished intraperitoneally. Using this instrument for ligation of the mesentery and transection of the colon, Dennis Fowler performed the first laparoscopic sigmoid resection in October of 1990. The anastomosis was contructed with a stapling device (Fowler et al.,1991).

The following month, using a similar technique, Patrick Leahy was able to resect a proximal rectal cancer and to construct a low anterior anastomosis. Several months later, on July 26, 1991, Joseph Uddo performed an entirely laparoscopic right hemicolectomy, the ileocolic anastomosis was constructed intracorporally. In a rapid succession, virtually all types of colorectal procedures were accomplished using minimally invasive techniques (Senagore et al.,1993).

These successes have prompted the development of laparoscopic techniques for the resection of colorectal malignancies. Fowler reported one of the earliest laparoscopic sigmoid resections in 1991. Since then, numerous authors have demonstrated the feasibility and safety of laparoscopic colon surgery. Techniques range from full laparoscopic procedures including intracorporeal resection and anastomosis, to laparoscopic-assisted procedures, where a portion of the procedure is done extracorporeally (Wong et al.,2009).

Potential short-term benefits of laparoscopic colectomies include faster recovery of pulmonary function, less pain from smaller incisions, reduced ileus, lower rate of wound complications, and more rapid mobilization of patients leading to a shorter hospital stay and quicker return to normal activities to which has been added lower hospital costs and improved cosmesis. These benefits make laparoscopic colectomy a very attractive option. However, the surgical community has not accepted it in the same way as it has accepted laparoscopic cholecystectomy (Janson et al.,2004).

Acceptance in colorectal malignancies, especially for operations with curative intent, is controversial. This controversy has been fueled by the well-publicated reports of port-site tumor implantations. Other controversies include long-term survival and adequacy of resection. Further, it has been suggested that cancer cells can be spread at the time of the laparoscopic resection,through the misuse of instruments, detrimental effects of CO2 pneumoperitoneum (Van der Voort et al.,2004).

Review of literature

Epidemiology:

Colorectal cancers rank third in frequency in men and second in women. Male incidence rates, adjusted for age and race, appear greater than female rates for both proximal and distal cancers .Globally, the age-standardized incidence rate (ASR) of colorectal cancer is 20.1 per 100,000 males and 14.6 per 100,000 females (Parkin DM et al.,2003).

The incidence of colorectal cancer is higher in developed countries than in developing countries, the incidence rates vary tenfold (Nelson RL et al.,2007).

The characteristics of Colorectal Cancer in Egypt according to results of National cancer inistitute are relative frequency 10-12%,high male predominance 3:1,more than 1/3 under age 45 (early onset), large tumor size 4.5 cm, rectal 51%, poor histology 58%,associated bilharzial colitis 12%,associated polyps 5%.(cancer regisration at nci 2005).

According to the united nations report of the year 2009 showing the incidence of colorectal cancer in different countries showed an estimated incidence in Egypt of 41,500 cases in 2009 (UN Health report.,2009).

Etiology:

Epidemiologic factors have provided initial evidence about the specific factors that initiate the process of carcinogenesis in the large bowel mucosa. Chief among the factors that can initiate colorectal cancer development are a predisposition to mutagen effects, fecal mutagens, meat intake, bile acids, altered vitamin and mineral intake (Winawer SJ et al.,2002).

Risk factors:

I-Environmental and Dietary Factor:

A-Fiber:

Certain types of fiber appear to be more effective than others in reducing the risk of carcinogenesis. Cellulose and bran are specific examples

of fibers that have demonstrated increased effectiveness (Greenwald P et al.,1996).

B-Dietary Fat:

The observation that colorectal carcinoma occurs more commonly in populations that consume diets high in animal fat and low in fiber has lead to the hypothesis that dietary factors contribute to carcinogenesis. A diet high in saturated or polyunsaturated fats increases risk of colorectal cancer, In contrast, a diet high in vegetable fiber appears to be protective. A correlation between alcohol intake and incidence of colorectal carcinoma has also been suggested. Obesity and sedentary lifestyle dramatically increase cancer-related mortality in a number of malignancies, including colorectal carcinoma (Martinez ME et al,.2005).

II-Clinical risk factors:

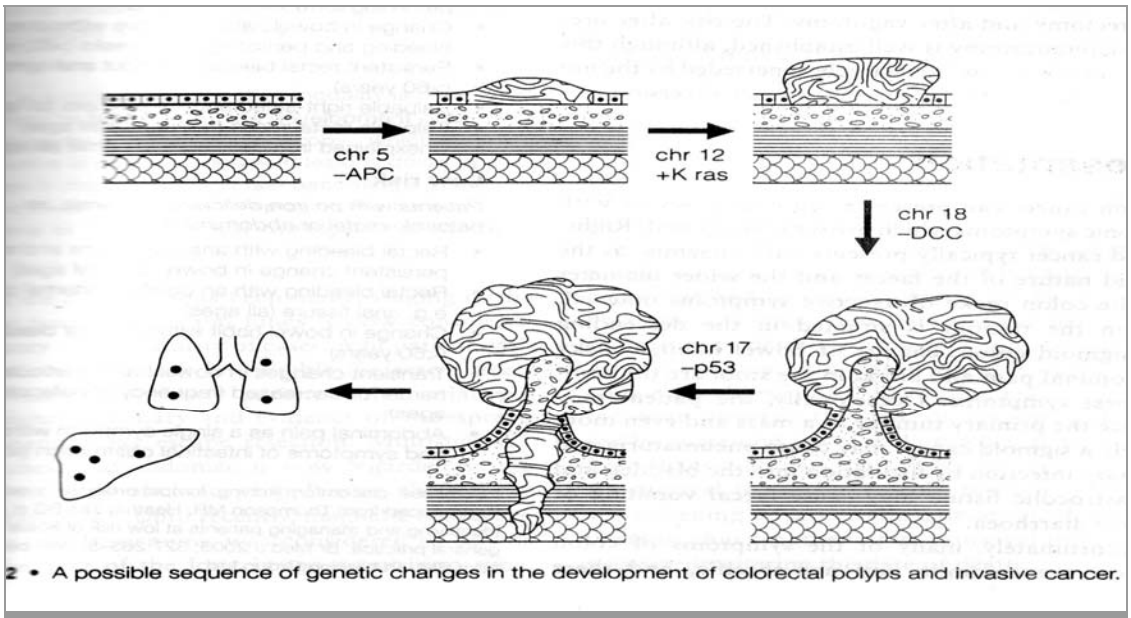
A-Age:

Age is the most relevant factor affecting colorectal cancer risk in most general populations. People older than 40 years are the largest increased-risk group. Fewer than 10% of cancers of the colorectum occur in people younger than 40 years. The increase in incidence with age continues until the eighth decade of life, when a decline begins. The most common risk factor for polyp development is age greater than 50 years (Troisi RJ et al.,1999).

B-Genetic risk factors:

Over the past two decades, an intense research effort has focused on elucidating the genetic defects and molecular abnormalities associated with the development and progression of colorectal adenomas and carcinoma. Mutations may cause activation of oncogenes (K-ras) and/or inactivation of tumor-suppressor genes (APC, DCC [deleted in colorectal carcinoma], p53). Colorectal carcinoma is thought to develop from adenomatous polyps by accumulation of these mutations (Calvert PM et al.,2002).

The Adenoma-Carcinoma Model:



2 • A possible sequence of genetic changes in the development of colorectal polyps and invasive cancer.

Figure 1:Adenoma-Carcinoma model

Defects in the APC gene were first described in patients with FAP. By investigating these families, characteristic mutations in the APC gene were identified. They are now known to be present in 80% of sporadic colorectal cancers as well (Potter JD et al.,2006).

The APC gene is a tumor-suppressor gene. Mutations in both alleles are necessary to initiate polyp formation. (Cannon-Albright LA et al.,2008).

APC inactivation alone does not result in a carcinoma. Instead, this mutation sets the stage for the accumulation of genetic damage that results in malignancy via mutations accumulated in the loss of heterozygosity (LOH) pathway. Additional mutations involved in this pathway include activation of the K-ras oncogene, and loss of the tumor-suppressor genes DCC and p53 (Winawer SJ et al.,2006).

K-ras is classified as a proto-oncogene because mutation of only one allele will perturb the cell cycle. (Gryfe R et al.,2000).

DCC is a tumor-suppressor gene and loss of both alleles is required for malignant degeneration. The role of the DCC gene product is poorly