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original article

Colorectal cancer in aged patients. Toward the routine treatment through laparoscopic surgical approach

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SUMMARY: **Colorectal cancer in aged patients. Toward the routine treatment through laparoscopic surgical approach.**

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Aim. *Colorectal cancer is one of the most common malignancies in general population. The incidence seems to be higher in older age. Surgery remains the treatment of choice and laparoscopic approach offers numerous benefits. We report our personal experience in elderly patients operated on for colorectal cancer with laparoscopic resection.*

Patients and methods. *From January 2003 to September 2013, out of 160 patients aged 65 years or older and operated with minimally invasive techniques, 30 cases affected by colorectal cancer and operated on with laparoscopic approach were analyzed in this study.*

Results. *Male/female ratio was 1.35 and mean age 72 years. Constipation, weight loss, anemia and rectal bleeding were the most commonly reported symptoms. Lesions involved descending-sigmoid colon in 53% of cases, rectum in 37% and ascending colon in 10%. Among laparoscopic colo-rectal operations laparoscopic left colectomy was the most frequently performed, followed by right colectomy, abdominoperineal resection and Hartmann procedure. Operative times ranged from 3 to 5 hours depending on surgical procedure performed. Mean hospital stay was 6 days (range 4–9). Conversion to open approach occurred only in a case of laparoscopic right colectomy (3%) for uncontrolled bleeding. A single case of mortality was reported. In two cases (7%) anastomotic leakage was observed, conservatively treated in one patient and requiring reoperation in the other one.*

Conclusions. *Laparoscopic colorectal surgery is feasible and effective for malignancies in elderly population offering several advantages including immunologic and oncologic ones. However an experienced surgical team is essential in reducing risks and complications.*

KEY WORDS: Laparoscopy - Colorectal surgery - Colorectal cancer - Aged patients.

Introduction

Colorectal cancer is the third most common neoplasm in men (after lung and prostate malignancies) and the second in women (after breast cancer) worldwide, respectively accounting for 21.0 and 17.6 new cases per 100,000. Mortality is otherwise responsible for 10.5 deaths per 100,000 in men and 9.2 in women (1), reflecting a good survival due to early diagnosis through screening protocol and better treatment efficacy.

Among well-known risk factors for colorectal cancer, age has a preeminent role. Incidence rises as people become older with a higher rate of patients aged 65 years or more (1). This trend is probably due to an improved life expectancy with an increase in the population's mean age in the developed countries, and a consequent higher number of senior citizens (2). On the other side, the increased incidence in aged people is secondary to the major susceptibility of elderly's intestinal cells, which induces cancer initiation (3).

Most commonly described symptoms are a change in bowel habits, either diarrhea or constipation, rectal bleeding, abdominal pain, weakness and unintended weight loss. Nowadays, if early diagnosed and treated, colorectal cancer offers a good prognosis. Even if it often requires a multidisciplinary approach, surgery remains the mainstay of treatment.

With the advent of laparoscopic surgery, many referral centers of colorectal surgery adopted minimally invasive approach for colorectal cancer treatment. Numerous studies confirmed that laparoscopic technique offers similar oncologic results than open traditional surgery in addition to the well-known less ho-

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spital stay, fast recovery, quick return to work, less postoperative pain and better cosmesis (4). Moreover, laparoscopic surgery reduces alterations of general and immunological conditions of operated patients when compared to traditional surgery (5, 6), probably reducing postoperative tumor growth (2, 7).

In older patients minimal access approach could be of advantage since it induces less perioperative physiopathologic changes in patients whose functional capacity is commonly compromised (8). However, the coexistence of associated cardiopulmonary, immunologic and renal diseases might negatively interfere with the postoperative outcome after laparoscopic surgery (9). Therefore, risks, complications and mortality of minimally invasive technique in elderly patients still need to be evaluated and debated.

In this study the Authors report their experience on 30 patients aged 65 years or older who underwent laparoscopic colorectal resection for cancer. Results are discussed.

Patients and methods

Records of patients aged 65 years or older who underwent laparoscopic surgery at our Department were retrospectively analyzed. In this study the data of 30 cases, out of 160 laparoscopically operated old patients, submitted to a laparoscopic resection for colorectal cancer from January 2003 to September 2013, were analyzed.

Laparoscopic colon resection consisted in minimally invasive left colectomy, right colectomy, Hartmann procedure and abdominoperineal resection.

Description of the surgical procedure of *Laparoscopic Left Colectomy (LLC)* is reported in details in our previously published work (10).

Laparoscopic Right Colectomy (LRC) was performed mobilizing the ascending colon and the splenic flexure through a medio-lateral approach, dissecting and dividing ileocolic artery, right colic artery and the right branch of middle colic artery at their origin. The ileocolic anastomosis was fashioned extracorporeally, through a side-to-side hand-sewn double layer suture.

Laparoscopic Hartmann's Procedure (LHP), following LLC steps was completed fashioning an end colostomy, after suturing the rectal stump by means of an endostapler, commonly used in laparoscopic surgery (11).

In patients requiring a *Laparoscopic Abdominoperineal Resection (LAPR)* after the above-mentioned steps of LLC, the operation was continued in lithotomy position, with the classic resection of the perineum together with the anal canal and the final fashioning of the definitive colostomy.

Results

Among 30 patients enrolled in our study males were 17 whereas female were 13 with a Male/Female ratio of 1.31. Age ranged from 65 to 84 years with a mean age of 72 years. With regard to history and physical examination constipation was referred by 18 patients (60%), weight loss by 15 (50%), anemia was evident in 9 cases (30%) and 6 patients (20%) complained rectal bleeding. Preoperative diagnosis was achieved by means of colonoscopy in 29 cases (97%) and only in a single case (3%) by CT scan followed by colonoscopy. Neoplastic lesions were located at descending-sigmoid colon in 16 patients (53%), rectum was involved in 11 cases (37%), lesions at the ascending colon were revealed in 2 (7%) and a single patient presented hepatic flexure localization (3%).

All patients were treated by the laparoscopic approach. Twenty-five (83%) underwent a LLC whereas a LRC was performed in 3 cases (10%). In a single patient (3%) with tumor located at 2 cm from the anal verge a LAPR was performed. Another patient with a perforated rectal cancer was submitted to a LHP. Temporary diverting ileostomy was performed in 6 cases (20%). Concomitant splenectomy was performed in a patient (3%) with neoplastic splenic hilum invasion and associated cholecystectomy was accomplished in another one for lithiasis. Operative time ranged between 3.5 and 5 hours with a mean of 4 hours when LLC was performed and between 3 and 5 hours in LRC (mean 4 hours). Operative time for LAPR and LHP was respectively 5 and 4.5 hours.

Intraoperative complications occurred in a case of rectal cancer (3%) with deadly cardiac arrest. Conversion to open surgery was required in only one case of LRC for uncontrolled bleeding. Postoperative complication, consisting in anastomotic leakage, was observed in 2 patients (7%), one of them requiring reintervention with Hartmann procedure. Hospital stay ranged from 4 to 9 days (mean 6 days).

Postoperative cancer staging revealed a T2N1 stage in 20 patients with left colon cancer, T2N0 in 2 patients and T3N1 in 5 cases. A T2N1 stage was evident in all the 3 cases of right colon cancer. Mean number of lymph nodes harvested by laparoscopic technique was 20 (range 15-30).

Tables 1-3 summarize the results of our group of patients.

Discussion

First experiences of minimally invasive colectomy were reported in 1990 when Moises Jacobs performed

TABLE 1 - PREOPERATIVE DATA OF 30 PATIENTS AGED ≥ 65 YEARS WHO UNDERWENT LAPAROSCOPIC COLORECTAL RESECTION FOR CANCER.

Period of study	Jan 2003–Sep 2013
Colorectal resection for cancer	30 (out of 160 laparoscopies in pts ≥ 65 years of age)
Male/Female	17/13
Mean age (range)	72 yrs (65–84)
History & physical examination	
Constipation	18 pts (60%)
Weight loss	15 pts (50%)
Anemia	9 pts (30%)
Rectal bleeding	6 pts (20%)
Diagnosis	
Colonoscopy	29 pts (97%)
CT + colonoscopy	1 pt (3%)
Tumor location	
Descending–sigmoid colon	16 pts (53%)
Rectum	11 pts (37%)
Ascending colon	2 pts (7%)
Hepatic flexure	1pt (3%)

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TABLE 2 - OPERATIVE DATA OF 30 PATIENTS AGED ≥ 65 YEARS WHO UNDERWENT LAPAROSCOPIC COLORECTAL RESECTION FOR CANCER.

Surgical technique	
LLC	25 pts (84%)
LRC	3 pts (10%)
LAPR	1 pt (3%)
LHP	1 pt (3%)
Concomitant procedures	
Temporary diverting ileostomy	6 pts (20%)
Splenectomy	1 pt (3%)
Cholecystectomy	1 pt (3%)
Mean operative time (range)	
LLC	4 hrs (3.5–5)
LRC	4 hrs (3–5)
LAPR	5 hrs
LHP	4.5 hrs
Intraoperative complications	
Cardiac arrest	1 pt (3%)
Conversion to open surgery	1 pt (3%)

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LLC: Laparoscopic Left Colectomy; LRC: Laparoscopic Right Colectomy; LAPR: Laparoscopic AbdominoPerineal Resection; LHP: Laparoscopic Hartmann Procedure

TABLE 3 - POSTOPERATIVE DATA OF 30 PATIENTS AGED ≥ 65 YEARS WHO UNDERWENT LAPAROSCOPIC COLORECTAL RESECTION FOR CANCER.

Postoperative complications	
Anastomotic leakage	2 pts (7%)
Mortality	1 pt (3%)
Mean hospital stay (range)	6 days (4–9)
TNM staging	
Left colon/rectal cancer	27 pts
T2N0	2 pts (7%)
T2N1	20 pts (74%)
T3N1	5 pts (19%)
Right colon cancer	3 pts
T2N1	3 pts (100%)
Mean harvested nodes n° (range)	20 (15–30)

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a laparoscopic right colectomy. Unluckily the lack of specific instruments limited a complete intracorporeal technique and therefore, that first attempt was only in part laparoscopic-assisted and mostly (vascular ligation, anastomosis) extracorporeal. With the introduction of the laparoscopic intestinal stapling devices, in the same year, Dennis Fowler accomplished an intraperitoneal sigma resection using EndoGIA stapler, and Joseph Uddo performed the first laparoscopic colostomy closure by means of a circular stapler. At last, in 1991, the same Joseph Uddo successfully attempted the first complete laparoscopic right hemicolectomy (12).

Even if at the beginning surgeons accepted with enthusiasm the modern minimally invasive technique, there were a lot of skepticism concerning laparoscopic treatment for bowel pathologies, and especially colon malignancies, mostly due to the fear for oncologic outcome (12). Feasibility of laparoscopic procedure is more technically complex than traditional approach. It requires different manual ability, advanced skills and experienced surgical team (13). In general, minimal access surgery carries out a series of complications of its own, which add to those well-known of open surgery, like port-site hernias (14). Nevertheless, it has been demonstrated similar complications rate between modern minimal invasive colectomy and traditional open technique, providing it is performed by experienced surgeons. Short- and long-term outcome, especially with regard to anastomotic leak rate, wound infection and cancer recurrence rate were found to be statistically not different when laparotomy and laparoscopic approaches were compared (12).

The initial pessimism, which discredited laparoscopic large bowel surgery for cancer, was certainly due to the potential enhancement of tumor dissemination, accredited by first reports in literature, which emphasized the risk of trocar-site cancer metastasis (15). An explanation of this phenomenon might be a seeding during the extraction of the specimen through direct contact with the wound or with contaminated instruments, or indirectly, through neoplastic cells in the aerosol which move through pneumoperitoneum (chimney effect) (15). However, further studies concluded the higher rate in trocars' recurrences was probably attributed to lack of technique (12), and reported other trials in which recurrence rate in laparoscopic port sites was similar to wound metastasis in open surgery at about 1% (16). The significant decrease of alarmism for this threatening complication that initially compromised laparoscopic adoption for colorectal cancer is certainly due to tumor isolation techniques according to which specimen is extracted through wound protector (17).

Among benefits of minimally invasive approach the most important is represented by the length of abdominal surgical incision, which varies from 4.5 cm to 10.6 cm for laparoscopic approach, and from 17.4 cm to 22 cm for the laparotomy one. This results in less postoperative pain and less painkiller requirement for minimal invasive approach (18). Moreover, the consequent early mobilization after laparoscopic colectomy leads to a lower incidence of thromboembolic complications (19). A large 2003 meta-analysis concluded that extent of oncological resection and number of lymph nodes harvested during laparoscopic colectomy are as adequate as conventional surgery (20). In some reports, the rate of bladder and sexual dysfunction seems to be higher after the laparoscopic technique. The inferior mesenteric artery lymph nodes removal during its division,

and total mesorectal excision with negative circumferential radial margin is, as known, necessary to accomplish a good oncologic result, although these steps are at risk for autonomic nerves injuries. The reported higher incidence of visceral dysfunction after laparoscopic surgery may be related to surgeons' learning curve, since in large series their occurrence is comparable with the open colon surgery. Moreover, laparoscopic approach, with the magnificence of anatomical details might prevent these functional complications (21).

As life expectancy of general population improves, laparoscopic surgery for elderly people increases too. In patients of 65 years or older general conditions are not as good and stable as in youngers. For this reason, they can take advantage of minimally invasive treatment because of the less perioperative physiopathologic alterations (8). Nevertheless, high incidence of comorbidity like cardiac or pulmonary affections, renal and immunologic disorders might badly influence postoperative outcome (9). Moreover, the fear for anesthesiologic complications and the consequent compromised recovery in the postoperative time is the reason why, often, old patients are considered not fit for surgical treatment either by laparoscopic or open approach (22).

Age-related decline involves every single organ and becomes clinically significant through different comorbidities, which exist at the moment of surgery. Therefore, an older patient with associated diabetes, hypertension, atherosclerosis or chronic obstructive pulmonary disease, underlying a compromised recovery reserve, is more vulnerable to major surgery stress (23).

Studies on physiologic changes during laparoscopy support the indication with low risk for the minimally invasive surgery also in aged patients. The insufflation for the maintenance of carbon dioxide has been constantly enquired as the cause of cardiopulmonary modifications (24); even if in other reports these assertions have been denied confirming stability of cardiac index (25). Critchley et al. demonstrated that cardiac parameters remain stable during intra-abdominal insufflation (26). On the other hand, pneumoperitoneum induces concrete ventilatory modifications because of a forced elevated position of the diaphragm, which limits lung expansion, and leads thereby to hypercapnia and acidosis. This explains why cardiopulmonary alterations results in intraoperative adverse hemodynamic changes. Therefore, laparoscopic surgery is always advocated except when pneumoperitoneum is contraindicated. Preoperative general and cardiorespiratory assessment is therefore mandatory in order to reduce the risk of intraoperative anesthesiologic complications. In our experience insufflation pressure, so as to avoid cardio-ventilatory impairment, must be maintained up to 8 mmHg for aged patients.

In addition, other studies have been addressed to immunologic changes in laparoscopic surgery when compared to traditional open treatment. It has been confirmed that tissue trauma, as a result of incision, tissue desiccation, organ manipulation and room air exposure, stimulate an initial inflammatory response, which unluckily will soon become exaggerate and deleterious for the host. As a matter of fact, a negative feedback, with the function to alleviate the hyperinflammation, will paradoxally lead to a state of immunosuppression with impaired macrophage-mediated intracellular bacterial killing and consequent reduced resistance to bacterial infection. Clinically it results in postoperative infectious complications. The less wound extension of laparoscopic incision results in a minor incidence of postoperative incision site infection, which might delay adjuvant chemotherapy. Moreover, suppressed immune function after surgery might enhance local and distant metastatic tumor growth. Laparoscopic approach confers a better preservation of peritoneal immunity minimizing systemic stress. Reports showed that immunosuppressive state after laparotomy is more severe and prolonged in patients with cancer. This could be of great advantage for patients who undergo a laparoscopic treatment. The reduction of perioperative immunosuppression may affect the timing of aggressive adjuvant chemotherapy, which may be started in the immediate postoperative period, when tumor burden is lowest, without compromising the ability to tolerate the therapy (7).

Conclusions

Laparoscopic surgery for colorectal cancer represents the gold standard in referral centers for surgical bowel conditions. Minimally invasive surgery have offered in our series, differently than open approach, several benefits in terms of short hospital stay, less cost and better cosmetic results. Moreover, a less immunologic postoperative weakness, which results in a better defense against cancer in the postoperative time, is expected after the laparoscopic colon surgery. As a consequence, time between surgery and chemotherapy might be reduced with oncologic advantages.

Minimally invasive technique is safe, feasible and effective. Older patients recover quickly with fewer complications than open approach, especially with regards to surgical infections. A well-trained team in advanced laparoscopy for colorectal affections is nevertheless necessary to achieve positive results.

Disclosure statement
No competing financial interests exist.

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