

ORIGINAL PAPER

OPEN VERSUS LAPAROSCOPIC SURGERY FOR RECTAL CANCER IN ELDERLY PATIENTS WITH COMORBIDITIES

Andrei C. GHIOLDIS^{1,2✉}, Vasile SARBU^{1,3}, Cristina DAN², Cristina BUTELCHIN²,
Cornelia OLTEANU², Razvan C. POPESCU^{1,2}

¹ Faculty of Medicine, "Ovidius" University, Constanta, Romania

² Department of General Surgery, Constanta Emergency County Hospital, Constanta, Romania

³ Academy of Romanian Scientists, Bucharest, Romania

Received 05th Febr 2024, Accepted 27th Febr 2024

<https://doi.org/10.31688/ABMU.2024.59.1.07>

ABSTRACT

Introduction. Rectal cancer is one of the most common neoplasms of the digestive tract and one of the leading oncological causes of death worldwide. The safety and feasibility of laparoscopic surgery in elderly patients over 70 years of age with comorbidities is still a debated and controversial topic.

The objective of the study was to investigate the safety of using modern minimally invasive surgical techniques in elderly patients with major comorbidities, comparing its outcomes with open surgery techniques.

Material and methods. We performed a retrospective study during the period 01.01.2017- 31.12.2021, in the General Surgery Clinic 1 of the Emergency Clinical County Hospital Constanta, Romania. During this period, 124 patients with different forms of rectal cancer were surgically approached in the clinic. Among them, we exclusively selected patients over 70 years old, who had at least one comorbidity at the time of admission. These patients were divided into two subgroups: an open surgery group (n=44, 67.7%) and a laparoscopic group (n=21, 32.3%).

Results. The most frequent comorbidities were arterial hypertension, diabetes mellitus, anemia and obesity. Laparoscopic surgery had a longer operating time but

RÉSUMÉ

Chirurgie ouverte versus laparoscopique pour le cancer rectal chez les patients âgés avec des comorbidités

Introduction. Le cancer rectal est l'une des tumeurs du tube digestif les plus courantes et l'une des principales causes de décès par cancer dans le monde. La sécurité et la faisabilité de la chirurgie laparoscopique chez les patients âgés de plus de 70 ans présentant des comorbidités restent un sujet débattu et controversé.

L'objectif de l'étude était d'évaluer la sécurité de l'utilisation de techniques chirurgicales modernes mini-invasives chez les patients âgés présentant des comorbidités majeures, en comparant ses résultats avec les techniques de chirurgie ouverte.

Matériel et méthodes. Nous avons fait une étude rétrospective entre le 01.01.2017 et le 31.12.2021, dans la Clinique de Chirurgie Générale 1 de l'Hôpital Clinique Départemental de Constanta, Roumanie. 124 patients atteints de différentes formes de cancer rectal ont été traités par la chirurgie. Parmi eux, nous avons sélectionné exclusivement des patients de plus de 70 ans, présentant au moins une comorbidité au moment de leur admission. Ces patients ont été divisés en deux sous-groupes: un groupe de chirurgie ouverte

✉ Address for correspondence:

Andrei C. GHIOLDIS
Faculty of Medicine, "Ovidius" University Constanta, Romania
Address: 124 Mamaia Av., 900527 Constanta, Romania
Email: andreighioldis@yahoo.com

less blood loss than the open surgery group. We did not encounter significant differences in terms of general systemic complications. Laparoscopic surgery proved its benefits with a lower rate of local complications and a faster recovery of the patients.

Conclusions. Laparoscopic surgery is the most appropriate therapeutic approach of rectal cancer in the elderly patients with comorbidities. It is a safe, efficient therapeutic option, with numerous short and long-term advantages.

Keywords: rectal cancer, elderly patients, laparoscopic surgery

INTRODUCTION

Rectal cancer is one of the most common neoplasms of the digestive tract and one of the leading oncological causes of death worldwide.¹ It is frequently associated with increased morbidity and mortality rates, particularly in elderly patients with multiple comorbidities.

The therapeutic approach to rectal cancer is multimodal, combining oncological and surgical treatment. From this point of view, it poses numerous technical challenges, given the narrow pelvic cavity and bulky tumours.^{2,3} Thus, the development of the concept of total mesorectal excision, neoadjuvant radiotherapy and development of minimally invasive surgical techniques contributed to a good oncological outcome of patients with rectal cancer, in terms of local recurrence and survival.⁴

Multiple recent studies consider the short and long-term outcomes of the types of surgical approaches, providing numerous comparisons between open and laparoscopic techniques. From this point of view, laparoscopic surgery offers the advantages of lower intraoperative blood loss, a quicker patient recovery and social-professional reintegration, less postoperative pain and a lower rate of postoperative morbidity.^{5,6}

Open surgery is associated with numerous postoperative complications and longer hospital stay but is still considered by many authors to be more feasible than laparoscopic surgery in elderly patients with comorbidities.⁷

The safety and feasibility of laparoscopic surgery in elderly patients over 70 years of age with

(n = 44, 67,7%) et un groupe laparoscopique (n = 21, 32,3%).

Résultats. Les comorbidités les plus fréquentes étaient l'hypertension artérielle, le diabète sucré, l'anémie et l'obésité. La chirurgie laparoscopique avait une durée opératoire plus longue mais moins de pertes sanguines que le groupe de chirurgie ouverte. Nous n'avons pas rencontré de différences significatives en termes de complications systémiques générales. La chirurgie laparoscopique a prouvé ses bénéfices avec un taux moindre de complications locales et une récupération plus rapide des patients.

Conclusions. La chirurgie laparoscopique est l'approche thérapeutique la plus appropriée du cancer rectal chez les patients âgés présentant des comorbidités. Il s'agit d'une option thérapeutique sûre et efficace, présentant de nombreux avantages à court et à long terme.

Mots-clés: cancer rectal, patients âgés, chirurgie laparoscopique

comorbidities is a widely debated and controversial topic, especially considering the numerous cardiovascular comorbidities.

THE OBJECTIVE OF THE STUDY was to investigate the safety of modern minimally invasive surgical techniques for rectal cancer in elderly patients with major comorbidities such as arterial hypertension, type 2 diabetes mellitus, obesity and secondary anaemia, monitoring the intraoperative and postoperative outcomes of these patients.

MATERIALS AND METHODS

We performed a retrospective study during the period 01.01.2017- 31.12.2021, in the General Surgery Clinic 1 of the Emergency Clinical County Hospital Constanta, Romania. During this period, 124 patients with different forms of rectal cancer were surgically approached in the clinic, respecting all oncological outcomes regarding total mesorectal excision and lymphadenectomy. Among them, for the current study, we exclusively selected patients over 70 years old, who had at least one comorbidity at the time of presentation, resulting in a total of 65 patients (52.41% of cases). We excluded from the study the patients who presented with complicated forms of rectal cancer, with metastatic or locally advanced tumours, as well as patients who required emergency surgeries, because of complications like haemorrhages, perforated tumours or bowel obstructions. These patients were divided for the current study in two

groups: one group of open surgery (n=44, 67.7%) and one laparoscopic group (n=21, 32.3%).

We studied patients' data resulting from the observation records, the paraclinical investigations and the operating protocols and postoperative follow-up, that led to the database of the study.

Regarding the statistical analyses, we used Statistical Package for the Social Science, Version 29.0 software. In this matter, categorical variables were compared using Mann-Whitney test, while continuous variables were compared using T-test. For all the analyses performed, p-values < 0.05 were considered statistically significant.

All the procedures of the study respect the ethical standards in the Helsinki Declaration of 1975, as revised in 2008(5), as well as the national law and the current study has an ethical approval waived by the local Ethics Committee of Emergency County Hospital Constanta, Romania, no 15/16.11.2018.

The two groups were analyzed in terms of comorbidities and body mass index, neoadjuvant radiotherapy, tumour location, by assessing the distance of the tumour from the anal verge, type of surgery performed, number of lymph nodes harvested during lymphadenectomy, operative time, blood loss, postoperative active mobilization, resumption of bowel movement, resumption of oral feeding, postoperative analgesic and antibiotic therapy requirements, incidence of postoperative complications, number of days of hospitalization and subsequent time required to close the protective ileostomy.

RESULTS

The comorbidities of the patients from the study groups were analyzed. Arterial hypertension was encountered in 31 patients in the open surgery group (70.5% of cases) and in 14 patients in the laparoscopic group (66.7% of cases). Diabetes mellitus was diagnosed in 13 patients in the open surgery group (29.5% of cases) and in 12 patients in the laparoscopic group (57.1% of cases).

Regarding other comorbidities, 11 patients from the 65 patients had moderate secondary anemia at the time of presentation (16.9% of cases), thus requiring preoperative transfusions. Among these, 5 patients were from the open group (11.4%), with a mean hemoglobin level of 10.8 g/dL, and 6 patients in the laparoscopic group (28.6% of cases), with a mean hemoglobin level of 10.5 g/dL. A total of 13 patients were obese: 5 patients from the open surgery group (11.4% of cases) and 8 patients from the laparoscopic group (38.1%) (Table 1).

We compared the two groups regarding the value of body mass index and level of hemoglobin at

the time of admission. The patients from the open surgery group had a lower mean body mass index compared to the laparoscopic group (24.6 kg/m² versus 27.9 kg/m², p=0.0022). The mean hemoglobin levels were not significantly different between the two groups of patients (12.2 g/dL versus 12.04 g/dL, p=0.204) (Table 2).

Regarding the types of tumours treated, most patients in the two groups were diagnosed with adenocarcinomas: 59 patients, representing 90.8% of all cases. The moderate degree of G2 differentiation was the most frequently encountered, in 55 cases (84.6%). 69% of the patients in the study group underwent neoadjuvant radiochemotherapy, with malignant rectal tumours located on average 6.95 cm away from the anal verge in the open surgery group, respectively 6 cm in the laparoscopic group (p=0.172) (Table 2).

Regarding the type of surgery, depending on the tumour location and stage, Hartmann procedure was performed in 3 open surgery cases (4.6% vs 0.0%), anterior rectal resection with colorectal anastomosis in 13 open surgery cases and 6 laparoscopic cases (20% vs 9.2%), ultra-low anterior rectal resection with coloanal anastomosis in 16 open surgery and 10 laparoscopic cases (24.6% vs 15.4%) and Miles rectal amputation in 12 open and 5 laparoscopic cases (18.5% vs 7.7%).

The principles of oncological surgery were applied. All patients underwent total mesorectal excision. D2 lymphadenectomy was the preferred approach in the majority of cases, 55 patients (84.6%), and in terms of the primary vascular approach, the low tie approach with ligation and sectioning of the inferior mesenteric artery below the emergence of the left colonic artery after central lymphadenectomy was preferred in 54 cases (83.1%). 29 patients out of the total of 65 received protective ileostomy (44.6% of cases). Given the fact that the current study involved elderly patients with comorbidities, the low tie vascular approach was preferred, because advanced age, anemia, obesity and possible atherosclerosis are risk-factors related to ischemia and could involve a higher rate of anastomotic fistulae associated with high tie approach.

After the statistical analysis of the obtained data, in terms of operating time, laparoscopic surgery required a longer duration, with an average of 210.19 minutes vs 192.72 minutes (p=0.000013). In laparoscopic surgeries, the intraoperative blood loss was lower, with an average of 210.71 mL vs 252.95 mL in open surgeries (p=0.051). A higher mean number of lymph nodes were harvested during laparoscopic lymphadenectomy (15.95 vs 14.34 in open surgeries) (p=0.140), respectively with a rate of 1.52 vs 1.95

Table 1. Comorbidities of the patients from the study group.

Comorbidities	Open surgery group (n=44)	Laparoscopic group (n=21)	P value
Arterial hypertension	31 (70.5%)	14 (66.7%)	0.759
Diabetes mellitus	13 (29.5%)	12 (57.1%)	0.034
Anemia	5 (11.4 %)	6 (28.6%)	0.086
Obesity	5 (11.4%)	8 (38.1%)	0.012

Table 2. The mean values of body mass index, hemoglobin and tumor localization in the study group.

Patients' characteristics	Open surgery group (n=44)	Laparoscopic group (n=21)	P value
Body mass index (kg/m ²)	24.6	27.9	0.0022
Hemoglobin (g/dL)	12.2	12.04	0.204
Tumor height to the anal verge (centimeters)	6.95	6	0.172

Table 3. The mean intraoperative surgical data.

Intraoperative surgical background	Open surgery group (n=44)	Laparoscopic group (n=21)	P value
Blood loss (mL)	252.95	210.71	0.051
Operating time (minutes)	192.73	210.19	0.000013
Harvested lymph nodes	14.34	15.95	0.140
Metastatic lymph nodes	1.95	1.52	0.251

Table 4. Postoperative complications in the study group.

Postoperative complications	Open surgery group (n=44)	Laparoscopic group (n=21)	P value
Wound infection	6 (13.6%)	0 (0%)	0.078
Anastomotic leakage	1 (2.3%)	0 (0%)	0.490
Bleeding	3 (6.8%)	1 (4.8%)	0.749
Myocardial infarction	2 (4.5%)	1 (4.8%)	0.969
Pneumonia	4 (9.1%)	1 (4.8%)	0.543
Pulmonary embolism	0 (0%)	1 (4.8%)	0.148

metastatic positive lymph nodes per surgery (p=0.251) (Table 3).

The rate of local postoperative complications (anastomotic leakage, wound infection, postoperative bleeding), as well as general complications (acute myocardial infarction, pulmonary thromboembolism and bronchopneumonia) were evaluated.

The patients who underwent an open surgical procedure had a higher rate of wound infection (13.6% versus 0%, p=0.078), as well as postoperative bleeding (6.8% versus 4.8%, p=0.749). No significant difference was found in terms of anastomotic leakage between the two groups. In terms of systemic complications, the laparoscopic surgery group showed a lower incidence of myocardial infarction or pneumonia (Table 4).

The postoperative outcomes of the patients were subsequently studied, comparing the two groups in

terms of active mobilization, resumption of bowel movement and digestive tolerance, analgesia and postoperative antibiotic therapy requirements. The surgical reoperation rate, number of hospitalization days, time for ileostomy closure and survival were also studied.

In the laparoscopic group, an average of 3.57 days were needed for active mobilization versus 4.95 days in the open surgery group (p<0.00001). The resumption of intestinal bowel movement was achieved in 3.24 days in the laparoscopic group versus 4.55 days in the open surgery group (p=0.000079) and resumption of oral feeding occurred in 3.48 days for the laparoscopic group and 4.64 days for the open surgery group (P=0.000059). In terms of postoperative care, analgesia was required an average of only 4.90 days for the laparoscopic group versus 8.61 days for the open surgery group (p<0.00001), while antibiotic therapy with

Table 5. The mean postoperative outcomes in the study group.

Postoperative outcomes	Open surgery group (n=44)	Laparoscopic group (n=21)	P value
Postoperative mobilization (days)	4.95	3.57	<0.00001
Bowel movement (days)	4.55	3.24	0.000079
Oral feeding (days)	4.64	3.48	0.000059
Postoperative analgesia (days)	8.61	4.9	<0.00001
Postoperative antibiotherapy (days)	8.43	5	<0.00001
Hospitalization (days)	10.05	6.86	<0.00001
Ileostomy loop closure (days)	103.15	93.10	0.378

an average of 5 days versus 8.43 days in favour of the laparoscopic approach ($p < 0.00001$) (Table 5).

The advantages of laparoscopic surgery are also highlighted by the number of hospitalization days. The average in the laparoscopic group was 6.86 days versus 10.05 days in the open surgery group ($p < 0.00001$). Subsequently, following multimodal therapy and remote follow-up, the patients were readmitted for the closure of the ileostomy loop, at an average time of 93 days for the laparoscopic group and 103.15 days for the open surgery group ($p = 0.378$) (Table 5).

DISCUSSION

Rectal cancer is one of the most common neoplasms of the gastrointestinal tract, with an increasing incidence in the last 40 years.⁸ It is also one of the cancers that affect more patients in their 60s and 70s, with the oncological results depending on comorbidities of these patients.^{9,10}

Numerous studies have examined the efficacy and indication of laparoscopic surgery in the surgical treatment of rectal cancer in elderly patients, in terms of postoperative outcome, morbidity and mortality. In these studies, a lower rate of respiratory complications in elderly patients approached laparoscopically was particularly noted, despite a longer operative time. Elderly patients have worse preoperative conditions and lower operative tolerance.¹¹

Also, multiple randomized controlled trials compared the safety of minimally invasive surgery and open surgery in the treatment of rectal cancer and confirmed the reduced pain, shorter hospital stay and lower morbidity of laparoscopic surgery.¹²

The most common comorbidities in our study group were arterial hypertension and diabetes mellitus. Also, 11 patients in the study group had at the time of presentation secondary anaemia and 13 patients had obesity.

Our study noted the efficacy and indication of laparoscopic surgery in patients with obesity. Thus,

we studied the body mass index values, resulting in a higher mean body mass index of the laparoscopic approached patients compared to the index values of the patients in the open group (27.90 kg/m² vs 24.6 kg/m²).

Numerous studies consider that the goal of sphincter-saving surgery is possible today due to the evolution of technological processes of surgical approach and neoadjuvant radiotherapy.¹³ From this point of view, our study revealed that 69% of the patients of the study group underwent preoperative radiotherapy and the laparoscopy allowed the approach of rectal tumours located at a closer distance to the anal verge than the open approach (6 cm vs 6.95 cm).

Qi Zhang et al. noted that, from the oncological point of view, laparoscopic surgery provides an efficient total mesorectal excision and lymph node harvesting, facts that assure a good 5-year disease-free survival rate¹⁴. In our study, all the patients underwent total mesorectal excision and most of them D2 lymphadenectomy and there were no major differences regarding long-term survival between the two analyzed groups. In terms of primary vascular approach, in most of the cases we preferred the low tie approach, given the higher risk of anastomotic leakage in elderly patients with comorbidities.¹⁵ However, the effectiveness of laparoscopic surgery is not clear in patients with major cardiopulmonary comorbidities.¹⁶

Laparoscopic surgery in the study group required a longer operating time (210.19 min vs 192.72 min), but less intraoperative blood loss (210.71 mL vs 252.95 mL). There were no significant differences between the two groups in terms of general systemic complications.

Studying the postoperative outcomes of the patients, the laparoscopic approach shows its advantages by a lower rate of local complications (wound infection, postoperative haemorrhages or anastomosis leakage) and similar findings were reported by others.¹⁷ The study also demonstrated a faster postoperative recovery in the laparoscopic group of patients, who required a shorter period of time for active

mobilisation, resumption of bowel movement and resumption of digestive tolerance. Moreover, a significant financial aspect of laparoscopic surgery was noted, which translates in lower number of hospital days and lower amount of postoperative analgesia and antibiotics.

From the point of view of therapeutic follow-up, we noted that patients approached laparoscopically were readmitted more quickly for the closure of the protective ileostomy than patients of the open surgery group (93.10 days versus 103.15 days). Many authors consider that the initial laparoscopic approach allows an better outcome and long-term follow-up.¹⁸

CONCLUSIONS

Laparoscopic surgery for rectal cancer in the elderly patients with comorbidities is a safe, efficient therapeutic option, with numerous short and long term advantages.

Authors contributions

A.C.G, V.S., R.C.P. conceived the original draft preparation. A.C.G, R.C.P., C.O. were responsible for conception and design. A.C.G, C.D., C.B. collected the data. All authors contributed to the critical revision of manuscript. All authors have read and agreed with the final version of the manuscript.

Compliance with Ethics Requirements:

"The authors declare no conflict of interest regarding this article"

"The authors declare that all the procedures and experiments of this study respect the ethical standards in the Helsinki Declaration of 1975, as revised in 2008(5), as well as the national law. Ethical approval was waived by the local Ethics Committee of Emergency County Hospital Constanta, Romania no 15/16.11.2018."

"No funding for this study"

Acknowledgements:

None

REFERENCES

- Akiyoshi T, Kuroyanagi H, Oya M, et al. Short-term outcomes of laparoscopic rectal surgery for primary rectal cancer in elderly patients: it is safe and beneficial? *Journal of Gastrointestinal Surgery* 2009;13(9):1614-1618.
- Pedziwiatr M, Malczak P, Mizera M, et al. There is no difference in outcome between laparoscopic and open surgery for rectal cancer: a systematic review and meta-analysis on short- and long-term oncologic outcomes. *Techniques in Coloproctology* 2017;21(8):595-604.
- Hisamatsu Y, Kuriyama N, Fujimoto Y, et al. Indications for laparoscopic surgery for older rectal cancer patients with comorbidities. *Surgery Today* 2020;51(5):721-726.
- Monson J, Weiser MR, Buie WD, et al. Practice parameters for the management of rectal cancer (revised). *Diseases of the Colon&Rectum* 2013;56(5):535-550.
- Douaiher J, Ravipati A, Grams B et al. Colorectal cancer-global burden, trends, and geographical variations. *Journal of Surgical Oncology* 2017;115(5):619-630.
- Bray F, Ferlay J, Soerjomataram I, et al. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: A Cancer Journal for Clinicians* 2018; 68(6):394-424.
- Hida K, Okamura R, Sakai Y, et al. Open versus laparoscopic surgery for advanced low rectal cancer: a large, multicenter, propensity score matched cohort study in Japan. *Annals of Surgery* 2018; 268(2):318-24.
- Kapiteijn E, Putter H, Van de Velde CJH. Impact of the introduction and training of total mesorectal excision on recurrence and survival in rectal cancer in the Netherlands. *British Journal of Surgery* 2002;89(9):1142-1149.
- Sauer R, Becker H, Hohenberger W, et al. Preoperative versus postoperative chemoradiotherapy for rectal cancer. *New England Journal of Medicine* 2004;351:1731-1740.
- Bonjer H, Deijen C, Abis G, et al. A randomized trial of laparoscopic versus open surgery for rectal cancer. *New England Journal of Medicine* 2015; 372:1324-1332.
- Lujan J, Valero G, Biondo S, Espin E, Parrilla P, Ortiz H. Laparoscopic versus open surgery for rectal cancer: results of a prospective multicentre analysis of 4970 patients. *Surgical Endoscopy* 2012;27(1):295-302.
- Huang Jin M, Liang Lin J, Wang H, et al. Laparoscopic-assisted versus open surgery for rectal cancer: a meta-analysis of randomized controlled trials on oncologic adequacy of resection and long-term oncologic outcomes. *International Journal of Colorectal Disease* 2011; 26(4):415-421.
- Chen K, Cao G, Chen B. Laparoscopic versus open surgery for rectal cancer: A meta-analysis of classic randomized controlled trials and high-quality nonrandomized studies in the last 5 years. *International Journal of Surgery* 2017; 39:1-10.
- Zhang Q, Liang J, Chen J, Mei S, Wang Z. Outcomes of laparoscopic versus open surgery in elderly patients with rectal cancer. *Asian Pacific Journal of Cancer Prevention* 2021; 22(4): 1325-1329.
- Devoto L, Celentano V, Cohen R, Khan J, Chand M. Colorectal cancer surgery in the very elderly patient: a systematic review of laparoscopic versus open colorectal resection. *International Journal of Colorectal Disease* 2017;32(9):1237-1242.
- Shigeta K, Baba H, Yamafuji K. Effects of laparoscopic surgery on the patterns of death in elderly colorectal cancer patients: competing risk analysis compared with open surgery. *Surgery Today* 2015;46(4):422-429.
- Ganai S, Lee F, Merrill A, et al. Adverse outcomes of geriatric patients undergoing abdominal surgery who are at high risk for delirium. *Archives of Surgery* 2009;142(11):1072-1078.
- Simon S, Lee J, Yiu R, et al. Long-term oncologic outcomes of laparoscopic versus open surgery for rectal cancer. A pooled analysis of 3 randomized controlled trials. *Annals of Surgery* 2014; 259(1):139-147.