

Laparoscopy in treatment of malignant colorectal diseases

Zelić, Marko

Source / Izvornik: **Libri Oncologici : Croatian Journal of Oncology, 2013, 41, 21 - 26**

Journal article, Published version

Rad u časopisu, Objavljena verzija rada (izdavačev PDF)

Permanent link / Trajna poveznica: <https://um.nsk.hr/um:nbn:hr:184:638088>

Rights / Prava: [Attribution-NonCommercial-NoDerivatives 4.0 International/Imenovanje-Nekomercijalno-Bez prerada 4.0 međunarodna](#)

Download date / Datum preuzimanja: **2025-02-21**



Repository / Repozitorij:

[Repository of the University of Rijeka, Faculty of Medicine - FMRI Repository](#)



LAPAROSCOPY IN TREATMENT OF MALIGNANT COLORECTAL DISEASES

MARKO ZELIĆ

Department of Digestive Surgery, University Hospital Center Rijeka, Rijeka, Croatia

Summary

In the 1980s and 1990s, success of laparoscopic approach in cholecystectomy introduced laparoscopy as a treatment option in various diagnosis. In past 20 years, laparoscopic approach became increasingly popular for treating patients with colorectal cancer.

Numerous studies have stressed the advantages of laparoscopic approach compared to open surgery which is quantified in reduced blood loss, earlier postoperative bowel movements, lower complication rates and shorter hospital stay. These advantages led to laparoscopic approach being considered as a modality of treating colorectal cancer. Shorter hospital stay lead to reduction of overall costs of treatment, in spite of initial higher cost of laparoscopic procedure.

Laparoscopic approach in colorectal cancer treatment has better shortterm outcome, equal oncological safety and longterm results when compared to open surgery. Advantages and wider acceptance of laparoscopic surgery for colorectal cancer could improve quality of care of oncological patients and further reduce cost of treatment if implemented along with multimodal perioperative care program (enhanced recovery).

KEY WORDS: *laparoscopy, colorectal cancer, minimally invasive surgery*

LAPAROSKOPIJA U LIJEČENJU MALIGNIH BOLESTI DEBELOG CRIJEVA

Sažetak

Krajem 80-tih i u početcima 90-tih godina prošlog stoljeća uspjesi laparoskopskog pristupa kod kolecistektomije otvorili su put za upotrebu ove tehnike u raznim bolestima. U posljednjih 20 godina, laparoskopski pristup je postao popularan izbor za liječenje pacijenata s rakom debelog crijeva.

U mnogim studijama dokazana je prednost laparoskopskog pristupa u usporedbi s otvorenom operacijom koji se očituje kroz manje gubitke krvi, raniju uspostava motiliteta crijeva, nižoj učestalosti komplikacija i kraćim trajanje boravka u bolnici. Sve navedeno je dovelo do prihvaćanja laparoskopskog pristupa kao jednog od modaliteta liječenju raka debelog crijeva. Smanjenje trajanja boravka u bolnici dovodi do smanjenja ukupnih troškova liječenja, unatoč činjenici da su veći inicijalni operativni troškovi.

Laparoskopski pristup u liječenju raka debelog crijeva pokazuje bolji kratkoročni ishod, ima jednaku onkološku sigurnost i jednaki dugoročni ishod kao i otvorene operacije. Prednosti minimalno invazivne kirurgije mogu poboljšati kvalitetu skrbi onkoloških bolesnika i dovesti do dodatnih ušteda u liječenju uvođenjem programa multimodalne perioperativne skrbi.

KLJUČNE RIJEČI: *laparoskopija, kolorektalni karcinom, minimalno invazivna kirurgija*

INTRODUCTION

Despite the reports of decrease in cancer incidence, cancer is still the leading cause of death worldwide (1). Small percentage of malignant diseases is genetically determined, most of them occur due to biological responses to environmental factors (2,3). Interventions targeted on primary prevention are based on reduction of tobacco and alcohol consumption and dietary recommendations (4).

As for the therapeutic approach, achievements of laparoscopic cholecystectomy during the late 1980s, set foundations for contemporary application of laparoscopy in various entities (5,6,7). Amongst most common benign and malignant diseases which require surgical therapy, laparoscopic treatment of colorectal carcinoma achieved the best results in level of se procedure (8), post-operative recovery time (9) and longterm survival (10,11).

Hence, in past 20 years, laparoscopic approach became a popular choice for treatment of colorectal carcinoma. Several studies stressed above mentioned benefits to which reduced loss of blood, earlier postoperative bowel movements, reduced morbidity and shorter hospital stay were added. All this led to laparoscopic approach being recognized as adequate and safe addition to conventional surgical procedures for colorectal cancer (12-17).

Nevertheless, despite argued advantages of laparoscopic approach, these are still not widely accepted in colorectal cancer treatment. The reason may be in long and steep learning curve, technical limitations and anatomical and pathological characteristics of patients and their disease. The aim of this paper is to review current data and evidence on laparoscopic surgery in colorectal cancer, with all advantages and disadvantages when compared to open approach.

TECHINICAL ASPECTS

Surgical principals of treatment of malignant diseases should be satisfied whether the approach is laparoscopic or open. Laparoscopic approach has certain particularities which render this method somewhat more demanding. Two dimensional view, due to standard video equipment, reduces

the perception of depth. Direct tactile perception is also reduced, since the operation is conducted through small skin incisions through which the instruments are inserted. These disadvantages are compensated with the experience of the surgeon and his team. This also means that these operations may last longer than their open counterparts (19).

Longer operative time in laparoscopic approach depends on complex and technically more demanding parts of operation. In fact, operative time of laparoscopic procedures is comparable to open ones depending on team's experience due to long learning curve (18,20).

Main reasons for considering laparoscopic procedures more demanding is that operation is usually taking place in more than one abdominal quadrant and there is reduced tactile feedback which makes vascular structures control and anastomosis formation more demanding. Main drawbacks of these method, which were not substantiated by recent studies, were possibilities of port site metastases, incomplete lymphadenectomy and difficulties with extracting the specimen after resection (13,21). Development of technology and improved and structured education successfully solved these issues. Finally, most reports agree that learning curve and surgeon's experience substantially reduce operating time.

Blood loss and postoperative analgesia depends on invasiveness of surgical procedure. Results of recent meta analysis of clinical data demonstrated significant reduction of intraoperative blood loss and subsequent need for blood derivatives in laparoscopic compared to open procedures (22).

SHORTTERM RESULTS

Initial randomized studies showed shortterm results of laparoscopic colorectal surgery to be comparable and in some aspects even better than open colorectal procedures. When laparoscopic approach was adopted as a standard technique, a study that included 48 institutions (different surgeons) recruiting 872 patients was undertaken. It was shown in this study that even in experienced surgeon (20 or more laparoscopic resections) operative time is somewhat longer, but operative technique gives better results, such as fewer complications and shorter recovery and hospitalisation time (14).

Substantial improvements in postoperative recovery of laparoscopically operated patients are manifested by earlier initiation of enteral nutrition and resuming normal eating habits, shorter hospital stay and return to everyday activities (11,23).

However, comparison of length of hospital stay between different institutions may be influenced by various factors. For example, socioeconomic status is associated with level of care in USA. In fact, the level of care is determined by patient's insurance company agreement. On the other hand, some countries have solidarity based health care systems, which foster equality in health care provision regardless of socioeconomic factors. When these countries are compared to USA with regards to length of hospital stay, it is shorter in USA (15,16).

Even when this is considered, hospitalisation length for colorectal cancer surgery in different countries has wide variations. Even in USA, postoperative hospitalisation after laparoscopic resection spans from 5 to 7 days (14,16,17); and its slightly longer in countries where health care is based on solidarity principals (11).

Advantages of laparoscopic resection are best shown in early postoperative period and short term results viewed through studies of immune response in perioperative period (23,24). In early postoperative period, better cellular immune response is noted, manifested in white blood cell counts, CD4 and CD 8 T lymphocytes after laparoscopic resections when compared to open surgery (25).

Difference in immune response in various surgical techniques has been studied. IFN gamma, which is produced in effectors of cellular immunity, Th1 cells, shows significantly higher levels after laparoscopic resection than after open ones. This represent immunological 'benefit' in reducing the activity of proinflammatory cytokines such as IL-1 (26).

Better preserved immune response and immunological function after laparoscopic surgery indirectly shows that there was lesser trauma when compared to open surgery. This also means that fewer postoperative complications, better results and diminution of cost could be expected.

LONGTERM RESULTS

Immune response, especially cellular immunity, play a key role in lowering early postopera-

tive recurrence rates in patients with colorectal carcinoma (27). Laparoscopic approach diminishes tissue trauma and lowers the physiological response to surgery immediately after the operation, it was believed that this implies better oncological outcome and better survival rates (27). In spite of early promising results in favour of this premise, later reasearch did not clear that relation.

Regarding overall survival and disease free survival, local and distant recurrences and quality of life after colorectal cancer surgery there are no differences between laparoscopic and open (14, 15,16). Results of multicentric, prospective, randomized trials for rectal cancer patients regarding above mentioned parameters showed the same results (14-17,28).

Meta-analysis have shown that long term outcomes are comparable in laparoscopic and open approach (29). Safety of the procedure, concerning oncological principals, is achieved mostly through experience of the lead surgeon as well as the entire team.

One of the reasons why the laparoscopic approach was considered inadequate for patients with advanced disease was conversion to open surgery. Most studies have shown this does not influence the long term outcome (30). In most cases, reason for conversion was advanced stage of disease, technical reasons, extreme obesity or intraoperative complications. Higher morbidity in these patients and worse overall survival might be explained by this being mostly patients with severe comorbidities. Nevertheless, conversion in hands of experienced surgeon does not present a risk since the disease free survival remains the same regardless of surgery being performed laparoscopically, open or has been converted. Therefore, decision to convert laparoscopic to open surgery when indicated does not compromise the outcome (31).

Another controversial issue were port site metastases, due to which laparoscopic surgery has long been reserved for benign conditions (32,33). If oncological principals are obeyed in colorectal cancer surgery, minimized intestinal manipulation and atraumatic instruments, again the outcome is comparable. When the specimen is extracted, wound protectors or endobags are used and air is simultaneously released from the abdominal cavity.

Finally, multicentric prospective randomized trials have cleared all the issues concerning laparoscopic surgery. It has been demonstrated that there are no differences in oncological outcome between laparoscopic and open colorectal surgery, that conversion does not pose an additional risk for spread of malignant disease and the rate of port site metastases does not exceed the rate of incisional metastases in open surgery, which is under 1% (16).

Postoperative hernias and adhesions are results of every surgical procedure. Laparoscopic approach might have reduced the rate of postoperative hernias when compared to open surgery (35). The obvious reason is reduction of incision length and reduced postoperative wound infection rates in laparoscopic approach (36). Reduced formation of adhesions and complications related to them, has been noted when laparoscopic approach was compared to open one (37).

ANALIZA TROŠKOVA

Laparoscopic approach proved to be applicable in a number of benign conditions such as diverticulitis, Crohn's disease, rectal prolaps and longterm efficacy in treatment of malignant conditions has been demonstrated, economic aspects remains an obstacle for wider acceptance of this approach. Earlier studies compared expenses of laparoscopic and open colectomy and provided a wide range of results. Certain studies showed increased cost of laparoscopic approach when compared to open surgery due to higher cost of expandible surgical material (38). This can lead to a conclusion that laparoscopic approach are less cost effective than the open alternative.

On the other hand, more contemporary studies have focused on other variables when economically comparing the two. Laparoscopic colorectal surgery is performed through small incisions, therefore has less complications related to infections and postoperative hernias compared to open colorectal surgery. Furthermore, laparoscopic colorectal surgery has lower rates of postoperative ileus, earlier initiation of enteral nutrition which also reduces infection rates. Moreover, smaller incisions contribute to reduced analgesics consumption, earlier verticalisation, hospital discharge and return to normal activities which all reduce morbidity and result in reduced costs of treatment.

To conclude, when these is taken into account, laparoscopic colorectal cancer surgery proves to be significantly less expensive than open colorectal surgery, despite initial higher cost. Average cost reduction is hard to define since studies were conducted over longer time period during which the prices of materials varied. Expenses were also very variable depending on country and even region where the study was conducted. The economic analysis show that the cost reduction is mainly derived from reduced need for nursing and medicines. On the other hand, intense perioperative care modalities such as 'fast track' surgery protocols, also reduce some of the observed variables in open surgery and could narrow the difference in calculated expenses (39,40).

CONCLUSION

Laparoscopic approach is slowly becoming widely accepted as a method of choice in treating colorectal cancer. Operation performed laparoscopically have substantially better shortterm results, can be performed respecting all principals of surgical oncology, they are safe, which is confirmed by having comparable longterm results as open colorectal surgery. Laparoscopic surgery for rectal cancer demonstrated similar results, however in this type of surgery experience and surgeons technical skills proved to be quite important. All advantages of minimally invasive surgery may bring additional benefit to overall quality of care for the patient with malignant disease. Complementary beneficial could be introduction of multimodal (earlier) rehabilitation (enhanced recovery).

By reducing morbidity and quicker resumption of everyday activities, perhaps initially more expensive, these procedures justify them in the long run.

REFERENCES

1. Haggard FA, Boushey RP: Colorectal cancer epidemiology: incidence, mortality, survival, and risk factors. *Clinics in colon and rectal surgery* 2009;22(4):191-197.
2. Biondi A, Fisichella R, Fiorica F, Malaguarnera M, Basile F: Food mutagen and gastrointestinal cancer. *European review for medical and pharmacological sciences* 2012;16(9):1280-1282.

3. Michels KB. The role of nutrition in cancer development and prevention. *Int J Cancer* 2005;114(2):163-5.
4. Frieden TR, Myers JE, Krauskopf MS, Farley TA: A public health approach to winning the war against cancer. *The oncologist* 2008;13(12):1306-1313.
5. Terblanche J: Laparoscopic cholecystectomy: a new milestone or a dangerous innovation? HPB surgery : a world journal of hepatic, pancreatic and biliary surgery 1991;3(3):177-180.
6. Biondi A, Tropea A, Basile F: Clinical rescue evaluation in laparoscopic surgery for hepatic metastases by colorectal cancer. *Surgical laparoscopy, endoscopy & percutaneous techniques* 2010;20(2):69-72.
7. Grbas H, Kunisek L, Zelic M, Petrosic N, Ćepić I, Pirjavec A, Lovasic F, Uravic M. Outcome Evaluation Of 10317 Laparoscopic Cholecystectomies: A 17-Year Experience At A Single Center. *Hepatogastroenterology* 2013; doi: 10.5754/hge121136.
8. Jacobs M, Verdeja JC, Goldstein HS: Minimally invasive colon resection (laparoscopic colectomy). *Surgical laparoscopy & endoscopy* 1991; 1(3):144-150.
9. Lacy AM, Garcia-Valdecasas JC, Delgado S, Castells A, Taura P, Pique JM, Visa J: Laparoscopy-assisted colectomy versus open colectomy for treatment of non-metastatic colon cancer: a randomised trial. *Lancet* 2002;359(9325):2224-2229.
10. Biondi A, Grosso G, Mistretta A, Marventano S, Toscano C, Gruttadauria S, Basile F: Laparoscopic-assisted versus open surgery for colorectal cancer: short- and long-term outcomes comparison. *Journal of laparoendoscopic & advanced surgical techniques Part A* 2013;23(1):1-7.
11. Sun J, Jiang T, Qiu Z, Cen G, Cao J, Huang K, Pu Y, Liang H, Huang R, Chen S: Short-term and medium-term clinical outcomes of laparoscopic-assisted and open surgery for colorectal cancer: a single center retrospective case-control study. *BMC gastroenterology* 2011;11:85.
12. Kim HJ, Lee IK, Lee YS, Kang WK, Park JK, et al. A comparative study on the short-term clinicopathologic outcomes of laparoscopic surgery versus conventional open surgery for transverse colon cancer. *Surgical endoscopy* 2009;23(8):1812-1817.
13. Fazio VW, Lopez-Kostner F: Role of laparoscopic surgery for treatment of early colorectal carcinoma. *World journal of surgery* 2000;24(9):1056-1060.
14. Clinical Outcomes of Surgical Therapy Study Group: A comparison of laparoscopically assisted and open colectomy for colon cancer. *The New England journal of medicine* 2004; 350(20):2050-2059.
15. Jensen CC, Prasad LM, Abcarian H: Cost-effectiveness of laparoscopic vs open resection for colon and rectal cancer. *Diseases of the colon and rectum* 2012;55(10):1017-1023.
16. Guillou PJ, Quirke P, Thorpe H, Walker J, Jayne DG, Smith AM, Heath RM, Brown JM: Short-term endpoints of conventional versus laparoscopic-assisted surgery in patients with colorectal cancer (MRC CLAS-ICC trial): multicentre, randomised controlled trial. *Lancet* 2005; 365(9472):1718-1726.
17. Fleshman J, Sargent DJ, Green E, Anvari M, Stryker SJ, Beart RW, Hellinger M, Flanagan R, Peters W, Nelson H: Laparoscopic colectomy for cancer is not inferior to open surgery based on 5-year data from the COST Study Group trial. *Annals of surgery* 2007;246(4):655-662, discussion 662-654.
18. Miskovic D, Ni M, Wyles SM, Tekkis P, Hanna GB: Learning curve and case selection in laparoscopic colorectal surgery: systematic review and international multicenter analysis of 4852 cases. *Diseases of the colon and rectum* 2012;55(12):1300-1310.
19. Li JC, Leung KL, Ng SS, Liu SY, Lee JF, Hon SS: Laparoscopic-assisted versus open resection of right-sided colonic cancer—a prospective randomized controlled trial. *International journal of colorectal disease* 2012; 27(1):95-102.
20. Aziz O, Constantinides V, Tekkis PP, Athanasiou T, Purkayastha S, Paraskeva P, Darzi AW, Heriot AG: Laparoscopic versus open surgery for rectal cancer: a meta-analysis. *Annals of surgical oncology* 2006;13(3):413-424.
21. Bonjer HJ, Hop WC, Nelson H, Sargent DJ, Lacy AM, Castells A, Guillou PJ, Thorpe H, Brown J, Delgado S, et al: Laparoscopically assisted vs open colectomy for colon cancer: a meta-analysis. *Arch Surg* 2007;142(3): 298-303.
22. Trastulli S, Cirocchi R, Listorti C, Cavaliere D, Avenia N, Gulla N, Giustozzi G, Sciannoneo F, Noya G, Bosselli C: Laparoscopic vs open resection for rectal cancer: a meta-analysis of randomized clinical trials. *Colorectal disease : the official journal of the Association of Coloproctology of Great Britain and Ireland* 2012;14(6):e277-296.
23. Zelić M, Štimac D, Mendrila D, Sotošek Tokmadžić V, Fišić E, et al. Influence of preoperative oral feeding on stress response after resection for colon cancer. *Hepatogastroenterology* 2012;59(117):1385-9.
24. Novitsky YW, Litwin DE, Callery MP: The net immunologic advantage of laparoscopic surgery. *Surgical endoscopy* 2004;18(10):1411-1419.
25. Huang C, Huang R, Jiang T, Huang K, Cao J, Qiu Z: Laparoscopic and open resection for colorectal cancer: an evaluation of cellular immunity. *BMC gastroenterology* 2010;10:127.
26. Veenhof AA, Sietses C, von Blomberg BM, van Hoogstraten IM, vd Pas MH, Meijerink WJ, vd Peet DL, vd Tol MP, Bonjer HJ, Cuesta MA: The surgical stress response and postoperative immune function after laparoscopic or conventional total mesorectal excision in rectal cancer: a randomized trial. *International journal of colorectal disease* 2011;26(1):53-59.
27. Kumara HM, Feingold D, Kalady M, Dujovny N, Senagore A, Hyman N, Cekic V, Whelan RL: Colorectal resection is associated with persistent proangiogenic

- plasma protein changes: postoperative plasma stimulates in vitro endothelial cell growth, migration, and invasion. *Annals of surgery* 2009;249(6):973-977.
28. Lacy AM, Delgado S, Castells A, Prins HA, Arroyo V, Ibarzabal A, Pique JM: The long-term results of a randomized clinical trial of laparoscopy assisted versus open surgery for colon cancer. *Annals of surgery* 2008;248(1):1-7.
 29. Jayne DG, Thorpe HC, Copeland J, Quirke P, Brown JM, Guillou PJ: Five-year follow-up of the Medical Research Council CLASICC trial of laparoscopically assisted versus open surgery for colorectal cancer. *The British journal of surgery* 2010;97(11):1638-1645.
 30. Casillas S, Delaney CP, Senagore AJ, Brady K, Fazio VW: Does conversion of a laparoscopic colectomy adversely affect patient outcome? *Diseases of the colon and rectum* 2004; 47(10):1680-1685.
 31. Moloo H, Mamazza J, Poulin EC, Burpee SE, Bendavid Y, Klein L, Gregoire R, Schlachta CM: Laparoscopic resections for colorectal cancer: does conversion survival? *Surgical endoscopy* 2004;18(5):732-735.
 32. Zmora O, Weiss EG: Trocar site recurrence in laparoscopic surgery for colorectal cancer. Myth or real concern? *Surgical oncology clinics of North America* 2001;10(3):625-638.
 33. Wexner SD, Cohen SM: Port site metastases after laparoscopic colorectal surgery for cure of malignancy. *The British journal of surgery* 1995;82(3):295-298.
 34. Buunen M, Veldkamp R, Hop WC, Kuhry E, Jeekel J, Haglind E, Pahlman L, Cuesta MA, Msika S, Morino M, et al: Survival after laparoscopic surgery versus open surgery for colon cancer: long-term outcome of a randomised clinical trial. *The lancet oncology* 2009; 10(1):44-52.
 35. Duepre HJ, Senagore AJ, Delaney CP, Fazio VW: Does means of access affect the incidence of small bowel obstruction and ventral hernia after bowel resection? *Laparoscopy versus laparotomy. Journal of the American College of Surgeons* 2003;197(2):177-181.
 36. Audebert AJ, Gomel V: Role of microlaparoscopy in the diagnosis of peritoneal and visceral adhesions and in the prevention of bowel injury associated with blind trocar insertion. *Fertility and sterility* 2000;73(3): 631-635.
 37. Dowson HM, Bong JJ, Lovell DP, Worthington TR, Karanjia ND, Rockall TA: Reduced adhesion formation following laparoscopic versus open colorectal surgery. *The British journal of surgery* 2008;95(7):909-914.
 38. Philipson BM, Bokey EL, Moore JW, Chapuis PH, Bagge E: Cost of open versus laparoscopically assisted right hemicolectomy for cancer. *World journal of surgery* 1997; 21(2):214-217.
 39. Basse L, Hjort Jakobsen D, Billesbolle P, Werner M, Kehlet H: A clinical pathway to accelerate recovery after colonic resection. *Annals of surgery* 2000;232(1):51-57.
 40. Delaney CP, Fazio VW, Senagore AJ, Robinson B, Halverson AL, Remzi FH: 'Fast track' postoperative management protocol for patients with high co-morbidity undergoing complex abdominal and pelvic colorectal surgery. *The British journal of surgery* 2001;88(11): 1533-1538.

Author's address: Marko Zelić, Department of Digestive Surgery, University Hospital Center Rijeka, Krešimirova 42, Rijeka, Croatia. E-mail: marko.zelic@medri.uniri.hr