Laparoscopic Colorectal Cancer Surgery - What is the Rationale?

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ABSTRACT

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Though laparoscopy was introduced decades ago, its role in colorectal surgery was not well established for want of better skills and technology. This article examines the advantages of laparoscopy in the management of colorectal cancer. The safety, oncologic clearance, long term effects of laparoscopic surgery were compared with that of conventional surgical procedures.

Keywords: Laparoscopy, Colorectal cancer, Oncologic clearance, Immunological effects, Safety, Long term effects.

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Though laparoscopy was introduced decades ago, its role in colorectal surgery was not well established for want of better skills and technology. This coupled with high incidences of port site recurrences prevented laparoscopic surgery from being incorporated into the mainstream colorectal cancer surgery. A recent increase in the number of reports, retrospective analyses, randomized trials and multicentric trials have now provided sufficient data to support the role of laparoscopy in colorectal cancer surgery.

The problems associated with laparoscopic surgery for colorectal cancers are

- Steeper learning curve
- Early reports of port site recurrence
- Fear about adequate oncological clearance

Safety of the Procedure

When we consider a surgical procedure with a new approach, the new method should be as safe as the existing one. As far as safety of laparoscopy is concerned, many studies in the literature[1-3] show that it is as safe as the open surgery and moreover, it has got short-term benefits like

1. Decreased pain
2. Short hospital stay period
3. Early return to work
4. Reduced usage of drugs

Numerous large trials have shown that laparoscopic colectomy is comparable to open in terms of postoperative morbidity and mortality.

Oncological Clearance

The next concern regarding laparoscopic colectomy is whether we can achieve satisfactory oncological clearance in terms of two important parameters:

1. LN Clearance
2. Resection Margins

One meta- analysis of 3935 patients, in multiple trials of Lap. Assisted Colectomy with Open Colectomy has shown that more number of LNs could be extracted laparoscopically (2.1) than by open surgery (0.3).

The same meta- analysis has looked at distal marginal clearance. Distal margin is not a concern when we do colectomy, where we visually get adequate margin. Distal margin is a concern when one is dealing with rectal cancer, where the surgeons aim to achieve a margin of 2 cm distally, which is the accepted distal margin of oncological safety. In the above mentioned meta-analysis the mean distal margin was 4.6 cm in Laparoscopy group and 5.3 cm in Open group. But this 4.6 cm is more than adequate for the acceptable margin of safety.

Effect on the Immune System

Are There Immune Benefits to Laparoscopic Surgery?

It is well known that surgery leads to transient immunosuppression, though the underlying etiology remains unclear. A well-known cascade of physiologic

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and immunologic responses occurs after surgery. Inflammation involves the recruitment of macrophages and neutrophils at sites of tissue injury, release of pro-inflammatory cytokines and growth factors to promote wound healing (and that may also stimulate tumor growth), and activation of T cell (cellular) and B cell (humoral) immunity. Surgery has been shown to dampen each of these responses, leading to varying degrees of immunosuppression. Laparoscopic surgery, which is associated with less patient trauma through smaller incisions and less postoperative pain, may be associated with less immunosuppression, compared with open surgery, though the data remain a subject of debate and the clinical significance of this effect remains unclear.[14]

In a study by Belizon et al, patients who underwent surgery for colon cancer had further elevations in serum vascular endothelial growth factor levels during the early postoperative period.[15] The increase occurred earlier, and was more profound, in patients having open surgery compared with laparoscopically treated patients. Levels also increased in proportion to incision length. Insulin and insulin-like growth factor are also associated with tumor growth; elevated levels may place patients at increased risk for the development of colon cancer

To date, no survival differences have been found comparing cancer patients treated by the open method and those treated laparoscopically; however, some intriguing trends have been seen in smaller studies. Systemic immune function and tumor growth may be differentially regulated by the degree of surgical trauma. Though the clinical impact of these findings is uncertain, the concept certainly warrants further study.

Long -Term Results

Port Site Metastasis

Many surgeons questioned whether there was a novel risk for tumor cell dissemination during laparoscopy compared to open, or conventional surgery. Proposed mechanisms included cancer cell implantation during there lease of pneumoperitoneum, direct tumor implantation from a contaminated instrument or during extraction of the specimen through a small incision, stimulation of tumor growth by the insufflating gas, and the laparoscopic technique itself.

Döbrönte et al, first described port-site metastasis in 1978 after an ovarian cancer operation.[5] Though the underlying etiology is still unclear, the development of recurrent cancer at a previous surgical site is not unique to laparoscopic surgery but occurs after open surgery as well.

Two retrospective reviews of open colectomy for colorectal cancer, each with more than 1500 patients, demonstrated an incidence of 0.6% to 0.68% of incisional tumors, with overall abdominal wall tumors having an incidence of 1%. Multiple studies have now demonstrated that the incidence of port-site metastasis after laparoscopic surgery is low. A prospective evaluation by the Laparoscopic Bowel Surgery Registry, which was initiated in 1992 by the American Society of Colon and Rectal Surgeons, the American College of Surgeons, and the Society of American Gastrointestinal Endoscopic Surgeons, reported the rate of this complication to be at 1.1%,[8] similar to the results for open surgery. Recent trials evaluating the outcomes of laparoscopic colectomy for cancer have also reported a similarly low incidence of port-site metastasis.

With the extra precautions of preventing the PSM while doing surgery, we can still bring down the incidence of port site metastasis to negligible level. The precautions like avoiding tumor manipulations, securing port sites to prevent air leak, evacuating the pneumoperitoneum only through the ports, protecting the wound while delivering the specimen and irrigating the wound with cytotoxic agents, will help in reducing the port site recurrence.

Several large uncontrolled trials with comparison to historical controls are available in the literature, showing equal or comparable 3 to 5 years survival results.

Barcelona Trial

Lacy et al, in a randomized trial in Lancet2002 showed better survival at 48 months in stage III colon cancers. The 48 months survival in Stage I and II were similar. This was a single center trial from the University of Barcelona for a period of 4 years from 1993 to 1996. 219 patients were randomized (109 patients in the open group and 111 patients in the lap group) Barcelona trial concluded that Lap. Assisted Colectomy is more effective than Open Colectomy for the treatment of colon cancer in terms of morbidity, hospital stay, tumor recurrence and cancer related survival.

Similar results were observed by other authors in the subsequent publications.[10-13]

Cost Trial (Clinical Outcomes of Surgical Therapy Study Group)[3]

Another prospective randomized trial was initiated

by National Cancer Institute and NCI co- operative group. This trial included 66 experienced surgeons from 48 centers in USA for a period of 1994 to 2001. 872 patients were randomized (428 in the open group and 435 in the laparoscopic group). They summarized the results as Laparoscopic Colectomy for cancer was associated with equivalent morbidity and mortality, equivalent oncologic outcomes, equivalent recurrence rates, overall and disease free survival rates. There were short-term benefits of reduced pain and short-term hospital stay.

Color Trial (Colon Cancer Laparoscopic or Open Resection Study Group)[4]

Another Randomized Controlled Trial, the COLOR Trial (sponsored by Ethicon Endo Surgery) included 29 centers in Europe. 1248 patients were randomized (627 patients in the Laparoscopic group and 621 patients in the Open group). They excluded transverse colon and rectal cancers. Their conclusions were Short-term outcomes (blood loss, return of bowel functions, pain control and hospital stay) are improved by Laparoscopy.

Short-term oncological parameters are (LN clearance and margin clearance) preserved. Preoperative morbidity and mortality were equivalent.

MRC Clasicc Trial

It is a prospective randomized trial sponsored by UK Medical Research Council, which included 32 surgeons from 27 centers in UK. 794 patients were randomized. The trial included both colon and rectal cancers in the study.

Early results[17] of the trial were:

- No observed differences between Open & Lap. Assisted surgery for both colon and rectal cancers in terms of tumor and nodal status, short term morbidity and mortality and quality of life.
- There was a trend towards shorter hospital stay after laparoscopic procedures.
- Laparoscopic surgery for rectal cancer may be associated with more frequent positive margins.
- For colon cancer, laparoscopic resection is oncologically safe, with equivalent pathologic results.
- For rectal cancer, equivalency of laparoscopic resection is not yet proven.

The long-term results[18] were:

The local recurrence rate in anterior resection was 7% in Open group and 7.8% in Lap group. The difference in possibility of circumferential resection, which was observed in short-term study, did not translate into a difference in 3 years local recurrence rate, overall survival rate or disease-free survival rates. Taking into consideration of the long-term results, MRC Clasicc Trial supported the continued use of laparoscopic surgery in rectal cancer patients.

Nice Guidance (National Institute for Health& Clinical Excellence and professional experts, UK)

At the guidance committee meeting reported that the consensus among clinicians is that there is no difference in long-term outcomes between Lap& Open Colorectal surgery provided lap procedure is performed by adequately trained surgeons

CONCLUSION

If the Laparoscopic approach for Colorectal Cancer has equivalent Morbidity and Mortality, equivalent Oncological clearance and equivalent long term survival in comparison to Open Surgery, why not offer our patients the added benefits of decreased pain, reduced hospital stay, less disability, early return to work and better cosmetic results.

END NOTE

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REFERENCES

1. Berends FJ, Kazemier G, Bonjer HJ, Lange JF. Subcutaneous metastases after laparoscopic colectomy. Lancet. 1994 Jul 2;344(8914):58.
2. Clinical Outcomes of Surgical Therapy Study Group. A comparison of laparoscopically assisted and open colectomy for colon cancer. N Engl J Med. 2004 May 13;350(20):2050–9.
3. Weeks JC, Nelson H, Gelber S, Sargent D, Schroeder G, Clinical Outcomes of Surgical Therapy (COST) Study Group. Short-term quality-of-life outcomes following laparoscopic-assisted colectomy vs open colectomy for colon cancer: a randomized trial. JAMA. 2002 Jan 16;287(3):321–8.
4. Veldkamp R, Kuhry E, Hop WCJ, Jeekel J, Kazemier G, Bonjer HJ, et al. Laparoscopic surgery versus open surgery for colon cancer: short-term outcomes of a randomised trial. Lancet Oncol. 2005 Jul;6(7):477–84.
5. Döbrönte Z, Wittmann T, Karácsony G. Rapid development of

malignant metastases in the abdominal wall after laparoscopy. Endoscopy. 1978 May;10(2):127–30.

6. Reilly WT, Nelson H, Schroeder G, Wieand HS, Bolton J, O'Connell MJ. Wound recurrence following conventional treatment of colorectal cancer. A rare but perhaps underestimated problem. Dis Colon Rectum. 1996 Feb;39(2):200–7.
7. Hughes ES, McDermott FT, Polglase AL, Johnson WR. Tumor recurrence in the abdominal wall scar tissue after large-bowel cancer surgery. Dis Colon Rectum. 1983 Sep;26(9):571–2.
8. Vukasin P, Ortega AE, Greene FL, Steele GD, Simons AJ, Anthone GJ, et al. Wound recurrence following laparoscopic colon cancer resection. Results of the American Society of Colon and Rectal Surgeons Laparoscopic Registry. Dis Colon Rectum. 1996 Oct;39(10 Suppl):S20–3.
9. Lacy AM, García-Valdecasas JC, Delgado S, Castells A, Taurá P, Piqué JM, et al. Laparoscopy-assisted colectomy versus open colectomy for treatment of non-metastatic colon cancer: a randomised trial. Lancet. 2002 Jun 29;359(9325):2224–9.
10. Milsom JW, Böhm B, Hammerhofer KA, Fazio V, Steiger E, Elson P. A prospective, randomized trial comparing laparoscopic versus conventional techniques in colorectal cancer surgery: a preliminary report. J Am Coll Surg. 1998 Jul;187(1):46–54; discussion 54–5.
11. Franklin ME, Rosenthal D, Abrego-Medina D, Dorman JP, Glass JL, Norem R, et al. Prospective comparison of open vs. laparoscopic colon surgery for carcinoma. Five-year results. Dis Colon Rectum. 1996 Oct;39(10 Suppl):S35–46.
12. Lechaux D, Trebuchet G, Le Calve JL. Five-year results of 206 laparoscopic left colectomies for cancer. Surg Endosc. 2002 Oct;16(10):1409–12.
13. Hasegawa H, Kabeshima Y, Watanabe M, Yamamoto S, Kitajima M. Randomized controlled trial of laparoscopic versus open colectomy for advanced colorectal cancer. Surg Endosc. 2003 Apr;17(4):636–40.
14. Ng CSH, Whelan RL, Lacy AM, Yim APC. Is minimal access surgery for cancer associated with immunologic benefits? World J Surg. 2005 Aug;29(8):975–81.
15. Belizon A, Balik E, Feingold DL, Bessler M, Arnell TD, Forde KA, et al. Major abdominal surgery increases plasma levels of vascular endothelial growth factor: open more so than minimally invasive methods. Ann Surg. 2006 Nov;244(5):792–8.
16. Kirman I, Cekic V, Poltoratskaia N, Sylla P, Jain S, Forde KA, et al. Open surgery induces a dramatic decrease in circulating intact IGFBP-3 in patients with colorectal cancer not seen with laparoscopic surgery. Surg Endosc. 2005 Jan;19(1):55–9.
17. Guillou PJ, Quirke P, Thorpe H, Walker J, Jayne DG, Smith AMH, et al. Short-term endpoints of conventional versus laparoscopic-assisted surgery in patients with colorectal cancer (MRC CLASICC trial): multicentre, randomised controlled trial. Lancet. 2005 May 14;365(9472):1718–26.
18. David G. Jayne, Pierre J. Guillou, Helen Thorpe, Philip Quirke, Joanne Copeland, Adrian M.H. Smith, Richard M. Heath, Julia M. Brown Randomized Trial of Laparoscopic-Assisted Resection of Colorectal Carcinoma: 3-Year Results of the UK MRC CLASICC Trial Group Journal of Clinical Oncology, Vol. 25, No 21, 2007: pp. 3061-3068
19. Review of NICE technology appraisal 17; 2006, Laparoscopic Surgery for Colorectal Cancer, National Institute for Health and Clinical Excellence