International Journal of Surgery 9 (2011) 382–385

Contents lists available at ScienceDirect

International Journal of Surgery

journal homepage: www.theijs.com

Original Research

Laparoscopic colectomy for colonic neoplasms in a developing country

J.M. Plummer [a,*], D.I.G. Mitchell [a], M. Arthurs [b], P.A. Leake [a], J. Deans-Minott [a], S.O. Cawich [a], A. Martin [a]

[a] The Department of Surgery, Radiology, Anaesthesia and Intensive Care, University of the West Indies, Mona, Jamaica
[b] Department of Medicine, University of the West Indies, Mona, Jamaica

ARTICLE INFO

Article history:
Received 15 July 2010
Received in revised form
25 February 2011
Accepted 4 March 2011
Available online 16 March 2011

Keywords:
Laparoscopic colectomy
Colon carcinoma
Developing country

ABSTRACT

Aim: To report the outcome of patients treated for colonic neoplasms using a laparoscopic assisted technique since its introduction at the University Hospital of the West Indies, Jamaica.
Subjects and Methods: All consecutive patients undergoing laparoscopic assisted colectomy were entered into a prospective database and this data analysed. Data collected included patient demographics, pre-operative diagnosis, operative events, post-operative morbidity and outcome.
Results: Over the thirty-six months period July 1, 2005–December 31, 2005 and July 1, 2006–December 31, 2008, thirty patients each underwent laparoscopic assisted colectomy for a colonic neoplasm. Their mean age was 63 years with M: F ratio of 1:2. Seventy-four per cent of the patients had carcinomas which was located on the right and sigmoid colon in 17 and 10 patients respectively. Mean operative time was 98 min for patients with right-sided lesions and blood loss for the entire group was minimal. Two patients were converted to open resections. Median duration of hospitalization was five days. There was no mortality but three patients had complications. After median follow-up of 30 months, there was no local or systemic recurrence.
Conclusions: Appropriately selected patients with colonic neoplasms can be safely subjected to a laparoscopic assisted resection and expect to enjoy the advantages of this technique even in a developing country setting.
The outcome of thirty consecutive laparoscopic assisted colectomies is reported demonstrating that this technique can be safely applied to selected patients with colonic carcinomas in developing countries.

1. Introduction

The success with laparoscopic cholecystectomy sparked a revolution in minimal access surgery, with the extension of laparoscopic techniques to other general surgical procedures. Laparoscopic colectomy was first introduced for diverticular disease but was soon extended to involve malignant disease. Since then there have been several studies proving the safety of laparoscopic colonic resections for malignant colonic neoplasms, with significant advantages being demonstrated when compared to conventional laparotomy. It is now well established in the developed world, with considerable interest growing in developing countries, albeit with caution.[1] Laparoscopic colectomy was first introduced at the University Hospital of the West Indies (UHWI) in 2005. This report describes our experience with this procedure since its addition to the surgical armamentarium at the UHWI.

2. Subjects and methods

This report comprises thirty consecutive patients who underwent laparoscopic assisted colectomy for colonic neoplasms at the UHWI during a thirty-six month period 2005–2008. These patients were selected from the overall group referred to the general surgical team for colonic resections. All patients had pre-operative colonoscopy with confirmation, by biopsy, of carcinoma or of an advanced adenoma which was not resectable by colonoscopic techniques. Patients with palpable masses were excluded. All patients had no evidence of metastatic disease on pre-operative ultrasound or contrast computer tomography scans of the abdomen.

They were all performed under general anaesthesia with routine uretheral catheterization. Patients were divided into two main groups and this determined the standard operative technique. For patients undergoing laparoscopic assisted right hemicolectomy, pneumoperitoneum was created through a 12 mm visual port placed at the umbilicus using the open Hassan technique. Under laparoscopic vision, two 5 mm working ports were placed along the mid-clavicular line in the left upper and lower quadrants. These

* Corresponding author. Tel.: +1 876 9271270.
E-mail address: joseph_plummer@yahoo.com (J.M. Plummer).

1743-9191/$ – see front matter
doi:10.1016/j.ijsu.2011.03.002

facilitated retraction and dissection of the caecum, ascending colon and hepatic flexure. Both the surgeon and assistant surgeon were placed on the patient's left and the video monitor placed on the patient's right. After a general exploration, the patient was placed in the Trendelenburg position where the caecum, appendix and right colon, including hepatic flexure, were mobilized commencing laterally. Once the colon was adequately mobilized, the umbilical incision was extended to 4–6 cm, allowing for colonic exteriorization, division of its mesentery, resection and anastomosis (sutured or stapled depending on availability). The remaining colon was returned to the peritoneal cavity. The umbilical fascia was then closed with 0-polypropylene sutures and the skin sutured. The 5 mm ports were closed with steri-strips only.

Patients undergoing left hemicolectomy or sigmoid colectomy were placed in the lithotomy and Trendelenburg positions. Hasson's technique was used to create a pneumoperitoneum through an umbilical incision. A 12 mm port was introduced into the right lower quadrant to accommodate a linear stapler and two 5 mm ports were placed- one on the right, in line with the umbilicus and the other in the left lower quadrant. The procedure was routinely commenced with dissection and division of the rectosigmoid junction using a linear cutter/stapler. The sigmoid and descending colon was mobilized, commencing medially with dissection and division of the inferior mesenteric artery using the Haemolock® clips or the Ligasure®. The left ureter was routinely identified prior to this division. Mobilization of the descending colon and splenic flexure were completed using electrocautery or a Harmonic Scalpel. After adequate mobilization of the colon and extension of the umbilical port for 3–4 cm, the colon was exteriorized, resected, the anvil of a circular stapler introduced, secured and the proximal bowel returned to the peritoneal cavity. The umbilical incision was closed, the pnuemoperitoneum re-created and the camera re-introduced through the 12 mm right lower quadrant port. Gastrointestinal continuity was then re-established using a circular stapler trans-anally. A wound protector at the extraction site (the umbilical port) was not used.

Patients were offered oral fluids on the first post-operative day and were graduated to a diet once they were passing flatus or had a bowel action. The urethral catheter was removed on the second post-operative day, while parenteral analgesics were discontinued once the patients tolerated diet. They were discharged home after tolerating diet for approximately 12 h.

In this study, all consecutive patients who underwent laparoscopic assisted colonic resections for neoplastic disease were identified. Data were prospectively collected from these patients over a thirty-six month period July 1, 2005 to December 31, 2005 and July 1, 2006 to December 31, 2008. The data collected included patient demographics, pre-operative diagnosis, operative details, post-operative morbidity and mortality. The data were entered into a Microsoft Excel worksheet and analyzed using the Statistical Package for the Social Sciences (SPSS version 14).

3. Results

Over the study period, 35 patients had laparoscopic assisted colonic resection at the UHWI. These included four who underwent surgery for diverticular disease (three sigmoid colectomies and one subtotal colectomy) and one patient who underwent rectosigmoid resection for endometriosis. These five patients were excluded leaving 30 patients who had a pre-operative diagnosis of a neoplasm and formed the basis of this analysis.

The mean age of the patients was 63 years (range 45–84 years) with a male: female ratio of 1:2. Seventeen patients had right hemicolectomy, ten had sigmoid colectomy and two had left hemicolectomy. One patient underwent laparoscopic assisted subtotal colectomy for a descending colon carcinoma and a synchronous, large adenoma at the hepatic flexure. Two patients were converted to open surgery; one due to equipment failure (patient with an ascending colon lesion) and the other due to extensive pelvic adhesions post hysterectomy, with inability to identify the colonic lesion. In the latter patient, the lesion was not appreciated after full mobilization of the sigmoid. The decision was made to convert because intra-operative colonoscopy was not available. The lesion was eventually located in the region of the splenic flexure. Mean operative time for the entire group was 150 min but for right hemicolectomies, it was 98 min. Mean operative blood loss for the group was 185 mls and median duration of hospitalization was five days (range 3–23 days). Three patients had combined procedures; two laparoscopic cholecystectomies and one bilateral inguinal hernia repair. There were no deaths, anastomotic complications or wound infections. Three post-operative complications were noted in this series. One patient required re-exploration on day 14 post-operation for intestinal obstruction. Dilated bowel was found without an obstructing point and she required a further nine days in hospital before she was re-established on a diet. Another patient needed drainage of a pelvic collection 30 days after laparoscopic assisted right hemicolectomy while a third patient was found to have an incisional hernia about 12 months after sigmoid resection. This required operative mesh repair.

The commonest indication for laparoscopic assisted colectomy was colorectal carcinoma. The final histologic diagnosis of the resected specimens revealed Dukes A, B and C carcinoma in 20%, 27%, and 27% respectively. Adenomas accounted for 26% of cases. Median follow-up for the group was 30 months (range 9–40 months). During this period there were two deaths, one patient at 12 months from an unrelated cause and another within ten weeks of surgery from overwhelming sepsis related to chemotherapy. All other patients were well without evidence of recurrent disease, including port-site metastasis, at their last follow-up visit.

4. Discussion

Laparoscopic surgery for colorectal neoplasia was first reported as a case report after successful resection of a villous adenoma in 1991.[2] Subsequently, more case reports of the successful use of laparoscopy in colonic resection were published, including cases of laparoscopy in colon cancer patients.[3] There were initial concerns about oncologic safety, including the increased risk of recurrence by the way of port-site metastasis.[4] However, laparoscopic colonic resection for curable cancer is now being performed worldwide. It is now firmly established as a viable, and perhaps, the preferred option for colon cancer resection.[5]

The benefits of laparoscopic surgery are well established and result from the reduced surgical trauma through the use of smaller incisions plus minimal bowel handling which leads to a reduction in the systemic inflammatory response.[6,7] The reduced disturbance of the immune function has led to the suggestion that a laparoscopic approach may have an added benefit in cancer patients in reducing tumour recurrence and improving survival.[8] More acceptable however, is that there is improved pulmonary function, earlier return of bowel function, less post-operative pain, faster return to activity and ultimately, shorter hospital stay. Compared to conventional open surgery, cosmetic results are excellent. This is supported by several large multicentre randomized controlled trials and meta-analyses confirming the benefits and allaying the oncologic safety concerns of laparoscopic colorectal cancer resection. These include the Barcelona trial,[9] the Clinical Outcomes of Surgical Therapy (COST) Study Group trial,[10] the Colon Cancer Laparoscopic or Open Resection (COLOR) Study Group trial[11] and

the Conventional versus Laparoscopic assisted Surgery in Patients with Colorectal Cancer (MRC CLASICC) trial.[12] These have shown superior short term outcome in favour of laparoscopic surgery with respect to post-operative pain, return of bowel function, length of hospitalization and cosmesis. Operative time for our series is similar to the results of the COST trial and could have been marginally reduced considering that three patients had additional surgical procedures. Similarly, the median length of hospitalization of five days, in our series, is similar to some published reports which are approximately a day earlier than for open colectomies. It is also expected that this should be further reduced with a protocol of fast-track surgery which was not practised with this group. Our conversion rate is also well within the 20% which is often quoted for colonic resection. We realize that the group was selected, which is biased towards this more favourable outcome.

The superiority of laparoscopic assisted resections is somewhat short-lived and after four weeks there is no significant difference in quality of life in patients subjected to laparoscopic colectomy compared to conventional colectomy.[13,14] Importantly, yet to be documented, are additional potential long term benefits such as a reduction in incisional hernia formation and episodes of intestinal obstruction due to adhesion formation. These are important benefits and translate to important reduction in overall cost of surgery to the society.

Before laparoscopic colon resection for cancer could be considered a replacement for open colectomy as standard of care, oncologic safety had to be demonstrated with at least equivalent recurrence and survival rates for laparoscopic surgery. This evidence is available through the COST trial which reported results after a median of 4.4 years of follow-up showing local recurrence (16% lap. Vs 18% open) and overall survival at 3 years was similar between groups (86% lap. Vs 85% open). Two meta-analyses have also been published providing further supportive evidence. Data from four databases (Barcelona, COST, COLOR and CLASICC trials) were used to develop a meta-analysis of 1765 patients from a total of 92 centres. There was no statistically significant difference in disease-free and overall survival in either group. After 3 years, disease-free survival was calculated to be 75.8% for the laparoscopic group and 75.3% for the open group. Overall survival was 82.2% and 83.5% respectively. The follow-up period was admittedly shorter than desired. However, 80% of recurrences occur within 3 years and thus these findings should be representative.[5] Jackson[15] examined 10 randomized controlled trials with a total of 3830 patients. Follow-up in all cases was over 18 months and similar results were observed. Although the follow-up for our series is relatively short, we are encouraged by the findings of no local, port-site or systemic recurrence after a median 30 months of follow-up. We realize that a quarter of the patients had benign neoplasms, but this is the group that should be operated on by the surgical team in the earlier stages of their learning curve. This is also our main reason for selecting clinically non-palpable tumours which are less likely to be locally advanced. This accounted for approximately 75% of the group. The application of laparoscopic resection to patients with rectal cancer should also now be considered as there is good evidence that these patients can have similar long term survival and quality of life compared to open resections.[16]

One of the limiting factors to the widespread use of laparoscopy in colorectal cancer treatment has been the steep learning curve and degree of expertise required. Smith,[17] after assessing laparoscopic left and right hemicolectomies, concluded that a minimum of 25 hand-assisted and 50 totally laparoscopic colectomies should be performed before the surgeon is considered competent. The hand-assisted laparoscopic colectomy, thought to be an alternative to a standard laparoscopic resection for surgeons in the earlier part of their learning curve, was not employed at our institution.

While not represented in our series, the laparoscopic technique can be utilized for palliation including stoma creation and staging purposes.[4] The concern of oncologic safety is moot in patients with metastatic colorectal cancer. It seems evident that laparoscopy would be beneficial in these patients as all the benefits prevail while the potential concerns do not. No randomized trials have addressed this issue to date but several case series have been reported that have demonstrated its advantage.[17–19]

Laparoscopy may also provide savings, as patients have faster recovery and are hospitalized for a shorter period of time. However, these are potentially absorbed by the longer operative times, increased cost of specialized equipment and operating theatre consumables. Conversion to an open technique adds to the cost. Franks et al[20] evaluated 682 randomized patients, a subset of the CLASICC trial for overall cost. Operative costs were found to be significantly greater in the laparoscopic group. This may be an initial deterrent in our population, but as we have already reported,[21] it must be embraced with innovation, in partnership with manufacturers of laparoscopic equipment, if we are to offer modern surgical care for some disease and to retain our position as the leader in post-graduate surgical training in this region.

5. Conclusion

In a developing country setting, laparoscopic colectomy can be safely performed. A dedicated team can achieve sufficient numbers to overcome the 'learning curve' and will allow our patients to enjoy the proven benefits of a laparoscopic resection. Once patients are appropriately selected, it should be a valid surgical option for both curative and palliative means in the care of patients with colonic neoplasms.

Conflict of interest
None declared.

Funding
None.

Ethical approval
Not required.

Author contributions

Each author contributed to the design and production of this manuscript and all are in agreement with the final version of this manuscript.

References

1. Baigrie RJ, Stupart D. Introduction of laparoscopic colorectal cancer surgery in developing nations. *Br J Surg* 2010 May;**97**(5):625–7.
2. Cooperman AM, Katz V, Zimmon D, Botero G. Laparoscopic colon resection: a case report. *J Laparoendosc Surg* 1991;**1**:221–4.
3. Roe AM, Harper R, Eltringham WK, Espiner HJ. Intracorporeal laparoscopic resections for colorectal cancer: report of cases of abdominoperineal rectal excision and right hemicolectomy with 2 year follow-up. *J R Soc Med* 1994;**87**:519–21.
4. Hartley JE, Monson JRT. The role of laparoscopy in the multimodality treatment of colorectal cancer. *Surg Clin N Am* 2002;**82**:1019–33.
5. Bonjer HJ, Hop WC, Nelson H, Sargent DJ, Lacy AM, Castells A, et al, Transatlantic Laparoscopically Assisted vs. Open Colectomy Trials Study Group. Laparoscopically assisted vs open colectomy for colon cancer: a metaanalysis. *Arch Surg* 2007;**142**:298–303.
6. Whelan RL, Franklin M, Holubar SD. Postoperative cell mediated immune response is better preserved after laparoscopic vs open colorectal resection in humans. *Surg Endosc* 2003;**17**:972–8.
7. Paraskeva PA, Aziz O, Darzi A. Laparoscopic surgery for colon cancer. *Surg Clin N Am* 2005;**85**:49–60.
8. Sylla P, Kirman I, Whelan RL. Immunological advantages of advanced laparoscopy. *Surg Clin North Am* 2005 Feb;**85**:1–18.

9. Lacy AM, Garcia-Valdecasas JC, Delgado S. Laparoscopic-assisted colectomy versus open colectomy for treatment of non-metastatic colon cancer: a randomised trial. *Lancet* 2002;**359**:2224–9.
10. COST Study Group. A comparison of laparoscopically assisted and open colectomy for colon cancer. *N Engl J Med* 2004;**350**:2050–9.
11. Veldkamp R, Kuhry E, Hop WC, Jeekel J, Kazemier G, Bonjer HJ, et al, Colon Cancer Laparoscopic or Open Resection Study Group. Laparoscopic surgery versus open surgery for colon cancer: short-term outcomes of a randomised trial. *Lancet Oncol* 2005;**6**:477–84.
12. Guillou PJ, Quirke P, Thorpe H, Walker J, Jayne DG, Smith AM. Short-term endpoints of conventional versus laparoscopic-assisted surgery in patients with colorectal cancer (MRC CLASICC trial): multicentre, randomised controlled trial. *Lancet* 2005;**365**:1718–26.
13. 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 versus open colectomy for colon cancer: a randomized trial. *JAMA* 2002;**287**:321–8.
14. Janson M, Lindholm E, Anderberg B, Haglind E. Randomized trial of health-related quality of life after open and laparoscopic surgery for colon cancer. *Surg Endosc* 2007;**21**:747–53.
15. Jackson TD, Kaplan GG, Arena G, Page JH, Rogers Jr SO. Laparoscopic versus open resection for colorectal cancer: a metaanalysis of oncologic outcomes. *J Am Coll Surg* 2007;**204**:439–45.
16. Jayne DG, Guillou PJ, Thorpe H, Quirke P, Copeland J, Smith AM, et al, UK MRC CLASICC Trial Group. Randomized trial of laparoscopic-assisted resection of colorectal carcinoma: 3-year results of the UK MRC CLASICC Trial Group. *J Clin Oncol* 2007;**25**:3061–8.
17. Smith CD. Advanced laparoscopic procedures for the non-advanced laparoscopic surgeon. *Int Surg* 1994;**79**:259–65.
18. Hollyoak MA, Lumley J, Stitz RW. Laparoscopic stoma formation for faecal diversion. *Br J Surg* 1998;**85**:226–8.
19. Milsom JW, Kim SH, Hammerhofer KA, Fazio VW. Laparoscopic colorectal cancer surgery for palliation. *Dis Colon Rectum* 2000;**43**:1512–6.
20. Franks PJ, Bosanquet N, Thorpe H, Brown JM, Copeland J, Smith AM, et al. Short-term costs of conventional vs laparoscopic assisted surgery in patients with colorectal cancer (MRC CLASICC trial). *Br J Cancer* 2006;**95**:6–12.
21. Plummer JM, Mitchell DIG. Beyond cholecystectomy: advanced laparoscopic surgery in practice and training in the Caribbean. *West Indian Med J* 2007;**56**:275–7.