

# Long Term Follow up for Colon Cancer in a Minimally Invasive, Colorectal Unit

## Abstract:

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## Abstract

Our aim was to assess the long term survival advantage associated with the laparoscopic approach for colon cancer resection in an Irish minimally invasive unit. Between January 2005 and December 2006, 154 patients underwent resection for colon cancer. 108 underwent a laparoscopic resection, with a conversion rate of 11%. The overall 5 year survival was 71.4%. The overall 5 year survival rate for laparoscopic resections was 80.6% whereas the overall survival for open resection was 50%. Laparoscopic surgery had a significant 5 year overall survival advantage compared to open in both non metastatic disease (Stage I and II) (92.2% vs. 69.6%,  $p=0.0288$ ) and metastatic disease (Stage III and IV), (68.4% vs. 30.4%,  $p=0.0026$ ). Laparoscopic surgery in a dedicated minimally invasive unit with verifiable low conversion rates is feasible and in our experience associated with a long term survival advantage for colon cancer.

## Introduction

Cancer of the colon is the third most common cancer in men and women in the developed world, and surgical resection is the only curative treatment. Three notable randomised control trials (COLOR, MRC CLASICC and COST) have reported laparoscopic surgery to be a safe acceptable alternative to open surgery. These studies have proven laparoscopic surgery to offer non inferior survival outcomes. The Barcelona trial (Lacy et al.), suggested laparoscopic assisted colectomy may be more effective than open colectomy for the treatment of non metastatic colon cancer. Laparoscopic colectomy has clear benefits compared with open colectomy with shorter length of stay, faster return of bowel function, decreased use of analgesia and lower rates of wound complications. These benefits are offset by prolonged operative time, intra-operative cost and the learning curve associated with this technically challenging approach. Within Ireland our unit is the first unit to report 5 year survival data following laparoscopic colon resection. Our aim is to establish the long term survival associated with laparoscopic resectional colon cancer surgery in a minimally invasive surgical (MIS) unit in an Irish setting.

## Methods

Patients were identified retrospectively from a prospectively recorded database. Patients were analysed on an intention to treat basis. All patients underwent colonoscopy, biopsy, tumour markers and computed tomogram of the thorax, abdomen and pelvis. All cases were discussed at our multi-disciplinary conference. Open resections were advised on bulky tumours, patients with multiple previous abdominal surgeries and patients with a BMI >30.

Patients were placed in the Lloyd-Davis position. Port placement consisted of a 10mm sub-umbilical camera port, a 12mm right lower quadrant port and 3 X 5mm ports in the remaining 3 quadrants. After initial inspection the colon was mobilised using a medial to lateral approach and the vessels (inferior mesenteric or ilioocolic) were identified, skeletalised and early flush ligation performed. For right hemi-colectomies, the hepatic flexure and remaining lateral attachments were then divided, the specimen delivered through a mini-laparotomy (<5cm) at the umbilicus, the remaining mesentery ligated and divided and after delivery of the specimen a stapled functional end-to-end anastomosis was fashioned extracorporeally. For left sided lesions, the lateral attachments were divided and splenic flexure taken down, after transection distal to the tumour the bowel was delivered through a <5cm incision extended from the left iliac fossa port site. After the specimen was resected and pulsatile flow confirmed and end-to-end anastomosis was fashioned with a circular stapler (Ethicon, Inc.) intracorporeally. All mini-laparotomy sites were covered with 3Mfi Steri-Drapefi wound protector. Conversion was defined as intra-abdominal dissection carried out through an extended extraction or new incision site.

Post operatively patients were managed according to a revised enhanced recovery program which is proven to enhance recovery and shorten hospital stay, the RAPID protocol (remove, ambulate, post-operative analgesia, introduce diet). All patients were analysed for the following parameters: histopathology (including tumour type, TNM status, nodal yield), Operative parameters (including operative time, conversion rate, morbidity and mortality rates and length of stay). The use of adjuvant chemotherapy was decided at the multi-disciplinary conference. All 5 year survival figures were confirmed with the National Cancer Registry of Ireland. Follow-up consisted of an initial out-patient appointment 1 month after discharge. Subsequently, patients were followed up in a dedicated cancer outpatient clinic (OPD) led by a colorectal oncology nurse. This consisted of an OPD every three months for the first two years and then six monthly for the subsequent 3 years. Surveillance consisted of both history and physical examination (including faecal occult blood testing) along with haematological investigations (including serum CEA levels). CT TAP and endoscopy were performed annually. Statistical analysis was performed using GraphPad Prism (California, USA). A p value of 0.05 was deemed statistically significant.

## Results

Between January 2005 and December 2006, 154 consecutive patients underwent resectional colon surgery. 108 patients underwent laparoscopic resectional surgery for colon cancer, 96 patients were completed laparoscopically with an 11.1% conversion rate. 46 patients had a de novo open resection. The median length of stay was 10 days (range 5 - 35). Of the 12 patients converted to an open procedure, three were due to failure to progress as a result of dense adhesions, five were due to bulky adherent tumours, two were due to technical difficulties as a result of obesity, one was due to difficult haemorrhage at the splenic angle and one was due to respiratory compromise secondary to the pneumoperitoneum. Procedures performed included: anterior resections (97- 63%), abdomino-perineal resections (8- 5.2%), left hemi-colectomy (10- 6.5%) and right hemi-colectomy (39- 25.3%). All pathological subtypes were adenocarcinoma. The median number of lymph nodes retrieved was 14 (range 2 - 37). 87 (56.4%) patients received adjuvant chemotherapy following discussion at the multidisciplinary conference. According to the AJCC staging system 19 (12.3%) were stage I, 55 (35.7%) stage II, 73 (47.4%) stage III and 7 (4.5%) stage IV. Of the converted cases, one was stage I, 3 were stage II, 7 were stage III and 1 was stage IV.

The overall 5 year survival was 71.4%. The overall 5 year survival rate for laparoscopic resections was 80.6% where as the overall survival for open resection was 50%. The overall number of deaths was 44, of which 36 were colon cancer related, as cross referenced with the National Cancer Registry, Ireland. Laparoscopic surgery in non metastatic disease (Stage I and II) had a significant 5 year overall survival advantage compared to open (92.2% vs. 69.6%,  $p=0.0288$ ). Laparoscopic surgery also had a significant 5 year overall survival in metastatic disease (Stage III and IV), (68.4% vs. 30.4%,  $p=0.0026$ ). Overall, laparoscopic surgery resulted in a significant 5 year overall survival advantage compared to open surgery (80.9% vs. 50%,  $p=0.0002$ ). Resections completed by the laparoscopic approach resulted in a significant survival advantage compared to those converted to an open procedure (83.3% vs 58.3%,  $p=0.05$ ). There was no significant difference noted between de novo open resections and those converted to open from the laparoscopic approach (50% vs 58.3%,  $p=0.75$ ).

### Discussion

This study reports for the first time the 5 year survival outcomes for colon cancer in an Irish unit which specialises in minimally invasive surgery. Our unit's rate of laparoscopic surgery has improved from 70.1% in 2005 to 92.4% in 2011. During the study period the unit had 3 colorectal surgeons with varying levels of laparoscopic experience. The overall conversion rate of the unit was 11.1% (Range 8.7-14.3%), the individual conversion rates were indicative of the surgeon's laparoscopic training and experience. In 2011, the unit's conversion rate has decreased to 4% with 98% of resections been carried out by a single surgeon. Our unit continues to establish itself as a dedicated MIS unit with a growing laparoscopic experience. This is one of the largest studies in the British Isles to report long term outcomes for laparoscopic surgery.

Interestingly, our study has not only shown a survival advantage for non metastatic resectional surgery, as Lacy et al. have shown, we have demonstrated an overall survival advantage favouring the laparoscopic approach. In our study, we report a unit conversion rate of 11.1%. This compares with the COLOR, CLASICC, COST and Barcelona trials (17%, 25%, 21% and 11%). This also compares favourably to a composite figure of 14% conversion rate has been calculated by the European Association of Endoscopic Surgery consensus group looking at 2800 published cases<sup>10</sup>. A low conversion rate is reflective of a rich expertise in case selection as well as technical proficiency. This study has analysed our units first two years with a dedication to laparoscopic surgery, our conversion rate has significantly improved since as our laparoscopic caseload has increased and surgeon's experience, with a 92% laparoscopic caseload for 2011 with a 4% conversion rate, more in line with dedicated minimally invasive units<sup>11-13</sup>. With an increased laparoscopic caseload and the adoption of an enhanced recovery program (RAPID protocol) the unit's length of stay for colonic resection has decreased from 10 days in 2005 to 6 days in 2011. Strict adherence to a modified enhanced after surgery recovery program aimed at early ambulation, removal of tubes, parenteral analgesia and early resumption to diet aids a quicker recovery<sup>14</sup>. Our length of stay reflects stringent institutional discharge criteria which include: absence of sepsis, resumption of pre-morbid dietary intake and the passage of formed stool. The advantage of this comparably longer mean stay is a 0% 30 day readmission rate.

In an Irish context, there is limited published survival data available. In 2006, a case mix of 100 cases with 61 cancers resected concluded the challenge facing Irish surgery is to disseminate this technique in a controlled and safe manner for Irish patients<sup>15</sup>. Our study is the first Irish study reporting long term follow up of laparoscopic colon resection. In 2011, Markey et al. published the long term experience for open colorectal resections in a peripheral hospital in Ireland, reporting an overall 5 year survival rate of 61.8%. Our data compares favourably with this, highlighting the survival advantage of the laparoscopic approach in a dedicated minimally invasive unit. The overall survival rates for the open cases in this series is reduced in comparison to other reported series and our laparoscopic cohort, possible reasons for this include the favoured laparoscopic approach of the unit limiting the number of open resections (n=46) and the pre-operative case selection of laparoscopic cases at the multi disciplinary meeting. De-novo open cases were undertaken due to increased BMI (>30), multiple previous abdominal surgeries or bulky tumours. Furthermore, the mean age of the open cases was significantly older (71.3 vs 62.5 years,  $p=0.041$ ). This difference between our open and laparoscopic series although not comparable, outlines the further benefits of a high volume unit demonstrated with our favourable laparoscopic results.

Limitations include this study was carried out in dedicated MIS unit which favours the laparoscopic approach where possible, with published low conversion rates and a high proportion of laparoscopic caseload. Furthermore, a direct comparison between our laparoscopic and open caseload is not valid as there is a limited number of open cases performed in the unit. The open cases were excluded from a laparoscopic approach pre-operatively which again makes direct comparison flawed. Our experience in a dedicated minimally invasive surgical unit advocates the laparoscopic approach for colon cancer as a safe alternate to conventional open surgery. Excellent long term survival rates can be achieved with laparoscopic surgery when performed in the expert hands.

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### References

1. The colon cancer laparoscopic or open resection study group, Buunen M, Veldkamp R, Hop WC, Kuhry E, Jeekel J, Haglind E, Pohlman L, Cuesta MA, Msika S, Morino M, Lacy A, Bonjer HJ. Survival after laparoscopic surgery versus open surgery for colon cancer: long term outcome for a randomised clinical trial. *Lancet Oncol*. 2009 Jan;10:44-52.
2. Guillou PJ, Quirke P, Thorpe H, Walker J, Jayne DG, Smith AM, Heath RM, Brown JM; MRC CLASICC trial group. Short term endpoints of conventional versus laparoscopic assisted surgery in patients with colorectal surgery (MRC CLASICC trial): multi centre randomised control trial. *Lancet*. 2005 May 14-20;365:1718-26.
3. Nelson H, Sargent DJ, Wienand HS, Fleshman J, Anvari M, Stryker SJ, Beart RW Jr, Hellinger M, Flanagan RW, Ota D (2004) The clinical outcomes of surgical therapy study group. A comparison of laparoscopically assisted and open colectomy for colon cancer. *New Engl J Med* 350:2050-2059
4. 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: 2224-29
5. Marohn MR, Hanly EJ, McKenna KJ, Varin CR. Laparoscopic total abdominal colectomy in the acute setting. *J Gastrointest Surg* 2005; 9: 881-6; Discussion 887.
6. Rosman AS, Melis M, Fichera A. Metaanalysis of trials comparing laparoscopic and open surgery for Crohn's disease. *Surg Endosc* 2005; 19: 1549-55.
7. Kavanagh DO, Gibson D, Moran DC, Smith M, O'Donnell K, Eguare E, Keane FB, O'Riordain DS, Neary PC. Short-term outcomes following laparoscopic resection for colon cancer. *Int J Colorectal Dis*. 2011 Mar;26:361-8.
8. Delaney C, Neary P, Heriot A. (2006) Operative techniques in laparoscopic colorectal surgery. Lippincott Williams & Wilkins, USA
9. Lloyd GM, Kirby R, Hemingway DM, Keane FB, Miller AS, Neary P. The RAPID protocol enhances patient recovery after both laparoscopic and open colorectal resections. *Surg Endosc*. 2010 Jun;24:1434-9.
10. Veldkamp R, Gholghesaei M, Bonjer HJ, Meijer DW, Buunen M, Jeekel J, Anderberg B, Cuesta MA, Cuschierl A, Fingerhut

- A, Fleshman JW, Guillou PJ, Haglund E, Himpens J, Jacobi CA, Jakimowicz JJ, Koeckerling F, Lacy AM, Lezoche E, Monson JR, Morino M, Neugebauer E, Wexner SD, Whelan RL; European Association of Endoscopic Surgery (EAES). Laparoscopic resection of colon Cancer: consensus of the European Association of Endoscopic Surgery (EAES). *Surg Endosc.* 2004 Aug;18:1163-85.
11. Buchanan GN, Malik A, Parvaiz A, Sheffield JP, Kennedy RH. Laparoscopic resection for colorectal cancer. *Br J Surg.* 2008; 95: 893â 902
12. Newman CM, Arnold SJ, Coull DB, Linn TY, Moran BJ, Gudgeon AM, Cecil TD. The majority of colorectal resections require an open approach, even in units with a special interest in laparoscopic surgery. *Colorectal Dis.* 2012 Jan; 14:29-34
13. Hohenberger W, Weber K, Matzel K, Papadopoulos T, Merkel S. Standardized surgery for colonic cancer: complete mesocolic excision and central ligation â technical notes and outcome. *Colorectal Dis.* 2009; 11: 354â 65.
14. Mehigan B, White A, Winter D, Sheahan K, Hyland J. Laparoscopic Colorectal Resection: Initial Experience in a Specialist Unit. *Ir Med J.* 2006 Jul-Aug;99:211, 213-4.
15. Markey GC, Wosu E, Keane R. Outside the high volume unit: survival in an 11year cohort of colorectal cancer patients. *Ir J Med Sci.* 2011 Mar;180:97-101.

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