Outcomes of Laparoscopic Colorectal Surgery

Outcomes after laparoscopic colectomy for diverticular disease:

Laparoscopic colon surgery is being successfully performed since 1991, during the last decade several prospective series of patients and comparative studies between open and laparoscopic approach of a group of patients with diverticulitis have been published. Short term advantages of laparoscopic over open treatment for elective sigmoid resection for symptomatic diverticulitis, including less operative trauma, decreased postoperative pain, early discharge from the hospital and less morbidity. Differences between 35% of morbidity in the open procedure versus 12% for the laparoscopic approach have been published.\(^{(81)}\)

Recently, it was reported that an admirably low conversion rate of 7.2%, and a low mortality rate of 1.1%. This demonstrates the significant potential for laparoscopic assisted colectomy for diverticular disease.\(^{(82)}\)

Laparoscopic management of colonic diverticular disease has emerged as an important adjunct to the existing armamentarium which offers earlier restoration of intestinal function and resumption of normal diet, less postoperative pain and lower morbidity, thus facilitating earlier discharge from hospital and quicker return to normal daily activity.\(^{(83)}\)

Although there are no prospective randomized studies directly comparing laparoscopic (LC) and open colectomy (OC) for diverticulitis, comparative studies has provide compelling data. A French study has demonstrated LC offered significantly reduced hospital stay than OC (18 days vs. 10 days).\(^{(81)}\)
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The mean operative times in experienced hands have also achieved acceptable levels of 159 to 167 minutes, although conversion rates (7%-10%) are higher for this disease than for other colorectal pathologies treated by laparoscopic procedures.\(^{(84)}\)

The magnitude of benefits achieved with LC in the hand of experienced laparoscopic colorectal surgeons may soon be sufficient to make LC as a routine procedure. However, complicated diverticular disease presents additional challenges, and should not be undertaken without considerable experience in laparoscopic assisted colectomy.\(^{(82)}\)

**Outcomes After Laparoscopic Colectomy for Crohn’s Disease:**

Short term significant benefits of laparoscopic compared with conventional colorectal resection has been demonstrated for intraoperative blood loss, pulmonary function, duration of postoperative ileus, and hospital stay. The rather small but significant improvement of pulmonary function after laparoscopic compared with conventional surgery and the faster postoperative recovery of pulmonary complications after laparoscopic colorectal resections. The only disadvantage of laparoscopic surgery, an increased operative time of approximately 40 minutes, is significant and may also be economically relevant.\(^{(85)}\)

Laparoscopy for management of Crohn’s disease has been reported in the literature since the early 1990s. A summary of most of the published series is presented in [Table 1].\(^{(81)}\)
Table (1): Laparoscopy for Crohn's disease.\textsuperscript{(81)}

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Procedure</th>
<th>n</th>
<th>Conversion Rate (%)</th>
<th>Operating Time (min)</th>
<th>Resumption PO Intake (days)</th>
<th>Bowel Activity (days)</th>
<th>Morbidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canin-Endres et al.</td>
<td>1999</td>
<td>Ileocolic</td>
<td>70</td>
<td>1</td>
<td>183</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Small bowel resection</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Right hemicolectomy</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Subtotal colectomy</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sigmoid resection</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hamel et al.</td>
<td>2001</td>
<td>Ileocolic</td>
<td>109</td>
<td>17</td>
<td>167</td>
<td>3.2</td>
<td>7</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Subtotal colectomy</td>
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<td>24</td>
<td>231</td>
<td>3.3</td>
<td>29</td>
<td>33</td>
</tr>
<tr>
<td>Evans et al.</td>
<td>2002</td>
<td>Ileocolic</td>
<td>84</td>
<td>18</td>
<td>145</td>
<td>-</td>
<td>-</td>
<td>10.7</td>
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<tr>
<td></td>
<td></td>
<td>Subtotal colectomy</td>
<td>21</td>
<td>24</td>
<td>231</td>
<td>3.3</td>
<td>29</td>
<td>33</td>
</tr>
</tbody>
</table>

Abbreviations: PO, per os; LOS, length of stay.

**Comparative studies of laparoscopic versus open procedures for ulcerative colitis:**

Over the past decade, morbidity rates in these comparative studies have improved, and have been found to be equivalent with the open procedure in all studies except one. This study involved a hand-sewn rectal mucosectomy as part of the laparoscopic assisted procedures. The morbidity rate in the laparoscopic group was 60% higher than in the open group, but consisted mainly of postoperative bowel obstructions and wound infections. In addition, of the studies performed at highly experienced institutions, none reported any conversions, implying improvement in expertise with experience [Table 2].\textsuperscript{(86)}
The results of laparoscopic-assisted total abdominal colectomy in patients who had acute but not fulminant ulcerative colitis and Crohn’s disease requiring urgent colectomy were published. The report included the experience of 19 laparoscopic and 29 conventional total colectomies with end buried mucous fistula. No conversions or intraoperative colostomies occurred in the laparoscopic group. The laparoscopic group demonstrated longer operative times (210 versus 120 minutes) but comparative blood loss (100 cc), earlier return of bowel function (1 versus 2 days), and shorter hospital stay (4 versus 6 days). Complications occurred in 3 (16%) of the laparoscopic patients and in 7 (24%) of the conventional patients. The study’s authors concluded that laparoscopic total colectomy is feasible and safe in patients who have acute nonfulminant colitis, and may lead to faster recovery than conventional surgery in the hands of an experienced team.\(^{(87)}\)
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The controversy regarding whether the minimally invasive laparoscopic approach to restorative proctocolectomy allows for the safe omission of a diverting ileostomy is not resolved. Single-stage procedures may be safe when performed by experienced surgeons in a selected group of patients.\(^{(88)}\)

**Outcome**

After a decade of experience and improvements in technology, several factors remain barriers to the widespread practice of laparoscopic total colectomy for ulcerative colitis. These procedures have a steep learning curve and require a level of expertise that is difficult to acquire outside a colorectal institution that specializes in laparoscopy and inflammatory bowel disease. For most surgeons with limited training in laparoscopy for inflammatory disorders, the technical demands of laparoscopic total colectomy may lend to higher morbidity, conversion rates, and cost, as seen with earlier studies of laparoscopic total colectomy.\(^{(86)}\)

With experience, the higher morbidity and increased rates of blood transfusion requirements noted in early reports have virtually been eliminated, and replaced by shortened hospital length of stay; however, prolonged operative times continue to offset the advantages by posing a barrier in institutions with a high workload of cases and where operating room times is at a premium. For these surgeons, additional operating time (as high as 8 hours in some series) may be an unacceptable disadvantage, even if other 'surgical parameters are unchanged. Other surgeons have justified these prolonged procedures by claiming significantly improved cosmesis, postoperative recovery, and decreased future risk of postoperative adhesive disease. The importance of cosmesis to patients should not be underestimated. In addition, shortened recovery is also of extreme importance in those young patients who have chronic disease, malnourishment, and sustained immunosuppression, and who are most likely to benefit from a minimally invasive approach.\(^{(86)}\)
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Outcomes after laparoscopic colorectal cancer surgery

The short term outcomes have been studied considering the following aspects:

*Post-operative pain*

Numerous randomized controlled trials have demonstrated a significant reduction in pain or analgesic requirements in the immediate post-operative period. In a meta-analysis Abraham and coworkers found significant advantages for the laparoscopic colectomy group in pain levels at rest and during coughing.\(^{(89)}\)

*Quality of life (QOL)*

Exact QOL between two groups is difficult to measure because of lack of more sensitive and appropriate instruments. Therefore based on literature the patients experienced better quality of life with reduced pain in the immediate post-operative period. Satisfaction with the cosmetic result of the scar was significantly higher in the laparoscopic-assisted group compared with the conventional group.\(^{(90)}\)

*Recovery of bowel function*

Faster recovery of bowel function is another significant advantage seen in the laparoscopic group. Schwenk and colleagues found that first passage of flatus was one day earlier in the laparoscopic colectomy group, and the first bowel movement was 0.9 day earlier. Lacy and colleagues demonstrated faster initiation of peristalsis and oral intake in laparoscopic group.\(^{(91)}\)

*Length of hospital stay*

Length of hospital stay is often dependent upon bowel function recovery and severity of postoperative pain. There is high level of evidence suggesting laparoscopic group has shorter stay compared with laparotomy group.\(^{(92)}\)
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Cost

Cost issues have been a growing reality in the practice of medicine but there has been no randomized clinical trial of the costs of laparoscopic colon resection compared with those of open colon resection in the treatment of colonic carcinoma. Direct costs following the laparoscopic surgery are higher than the open one. However, the diehard supporters of laparoscopic surgery have argued that the total costs to the society may actually be lower considering the improved short term and potential long-term outcomes associated with the minimally access approach.\(^{(93)}\)

Long term outcomes

The vast majority of comparative studies published have found no significant difference in the long term outcomes between the laparoscopic and open resections.\(^{(93)}\)

Lacy and colleagues have published one of the first landmark randomized controlled trials comparing lap assisted and open resections for the colon cancer reporting tumor recurrences rate of 1.7% and 27% respectively with a non-significant trend favoring lap resection. Similarly based on an intention-to-treat analysis, the overall mortality rates were not significantly different between the two groups but the cancer related mortality rates favored the laparoscopic group. The Lacy group also demonstrated that the overall advantages found with the laparoscopic approach were attributable to the locally advanced Stage III disease subgroup. The reason is not exactly known but may be related to immune function alteration with laparoscopy.\(^{(92)}\)

Another case series has demonstrated similar survival advantage for locally advanced disease. The Clinical Outcomes of Surgical Therapy (COST) study group demonstrated that laparoscopic colectomy for curable cancer is safe and at least equivalent to open resection in experienced hands.\(^{(93)}\)
Port site metastases and tumor dissemination

In 1993, Alexander and colleagues reported a case of wound recurrence after 3 months following laparoscopic right hemicolectomy for a Dukes C adenocarcinoma. After this there were flood of reports of increased port site metastasis with laparoscopy for malignancy. In a critical review of the literature from 2001, Zmora and colleagues analyzed total of 16 series of Laparoscopic colorectal resections for carcinoma published between 1993 and 2000. Each comprising of greater than 50 patients are found an incidence of port site metastases of less than 1% among 1737 patients. More recently the data from well designed randomized controlled trials have provided definitive evidence against a higher incidence of port site metastasis in laparoscopic colon surgery compared with traditional resection.\(^{(94)}\)

The COST study reported a wound recurrence rate of 0.5% in laparoscopy group compared with a 0.2% in the open group (n=872). Lacy and colleagues found a single case of port site recurrence in the laparoscopic group (n=106) as compared to none in the open group (n=102) after a median follow up of 43 months. Early high incidence of port metastasis was probably because enthusiastic laparoscopic surgeons ignored oncological principles.\(^{(95)}\)

Another concern is regarding the accidental tumor spillage during laparoscopic colorectal resections that is caused by grasping and manipulating the bowel in the narrow pelvis. The prevalence of intraoperative tumor cell dissemination that is caused by iatrogenic tumor perforation or transaction during laparoscopic APR has been reported to be as high as 5%.\(^{(96)}\)

In two series where patients underwent laparoscopic rectal resection for advanced tumor, local pelvic recurrence rates were 19% and 25%, quite similar to recurrence rate in the open group.\(^{(91)}\)

In classic trial, 242 rectal resections were performed and conversion rate ranges from 34% for rectal cancer as opposed to 25% for colonic cancer. Rate of positive margins were not statistically difficult. This clearly demonstrates that
laparoscopic rectal resections even in the hands of experienced surgeons are more technically demanding than laparoscopic colonic surgery. Although large randomized, prospective trials may show that experienced laparoscopic colectomists can achieve good outcomes for patients who have curable intraperitoneal colon adenocarcinoma, these results can not be extrapolated immediately to patients who have rectal cancer. Thus, it is critical to evaluate immediate pathology and long term oncological results of laparoscopic proctectomy prospectively before recommending the technique for mass consumption.\textsuperscript{(92)}