Techniques and Developments in Colon & Rectal Surgery

Phuong H Nguyen MD, FACS
7/13/18
Grand Rounds
St. Charles Medical Center

Diplomat, American Board of Surgery
Diplomat, American Board of Colon and Rectal Surgery

St. Charles Surgical Specialists

- 2 Board Certifications
  - American Board of Surgery
  - American Board of Colon and Rectal Surgery
- Extensive Training in Minimally Invasive Surgery (MIS)
  - Laparoscopic & Robotic
- 1/3 Benign and Malignant Colon and Rectal Diseases
  - Diverticulitis, IBD, Rectal Prolapse, CR Cancer
- 1/3 Benign and Malignant Anorectal diseases
  - Hemorrhoids, Fissures, Fistulas, Anal Cancer
- 1/3 Preventive Medicine
  - Screening Colonoscopy
  - Lifestyle Modification

Disclosures

- No Disclosures

Overview

- Surgical Treatment for Colon and Rectum
- Open “Traditional” Surgery
- Minimally Invasive Surgery
  - Laparoscopic Surgery
  - daVinci Robotic Surgery
Colon

- 5 ft
- Cecum
- Ascending
- Hepatic Flexure
- Tranceverse
- Splenic Flexure
- Descending
- Sigmoid

Rectum

- 12-15 cm
- Upper
- Middle
- Lower

Anal Canal

- Anatomical
- Surgical
- Sphincter Complex
  - Internal
  - External

Colon and Rectal Surgery

- Removal of portion of the colon or rectum associated with the mass or diseased segment
- Oncologic Resection
  - NEGATIVE MARGINS
  - Adequate lymph node harvest for proper staging of cancer
  - Sphincter preservation (rectal cancer)
    - No need for permanent colostomy
Colon Surgery

Rectal Surgery

- Total Mesorectal Excision (TME)

Surgical Approach Techniques
- Open
- Minimally Invasive
  - Laparoscopic
  - Robotic

Rectal or Polyp

Tumor or Polyp

Skin Incision

Dime-sized Incision

Open Colon Resection

Minimally Invasive Colon Resection
Open Approach

- Open Laparotomy
  - Maximally Invasive
  - Midline incision from breast bone to pubis
  - Allows space for multiple hands inside the abdomen
  - “Traditional” surgery

Minimally Invasive Approach

- Laparoscopic Surgery
  - Surgery with use of a laparoscope
  - Minimally Invasive
  - Multiple small incisions
Laparoscopic Surgery

Clinical Outcomes and Resource Utilization Associated With Laparoscopic and Open Colectomy Using a Large National Database

Conor P. Delaney, MCh,* Enniee Chang, PA-C,† Anthony J. Senagore, MD, MS, MBA,‡ and Michael Broder, MD, MSHS?*†

Annals of Surgery • Volume 247, Number 5, May 2008

Results: We identified 32,733 patients who had elective colectomies throughout 402 hospitals. 11,044 (33.7%) were laparoscopic and 21,689 (66.3%) were open colectomies. The mean age was 64.2 ± 13.9 years and 53.8% were women. Laparoscopic colectomy patients had a longer mean operative time (195 ± 76 vs. 178 ± 80 minutes; \( P < 0.0001 \)) and higher total hospital costs (88076 vs. 87678; \( P = 0.0002 \)). Laparoscopic patients had shorter mean length of stay (7.0 vs. 8.1; \( P < 0.0001 \)) and fewer mean intensive care unit days (0.7 ± 3.8 vs. 1.3 ± 5.2 days; \( P < 0.0001 \)). The laparoscopic cohort also had lower rates of transfusions (odds ratio [OR] = 0.68; \( P < 0.0001 \)), in-hospital complications (OR = 0.89; \( P < 0.0001 \)), and readmissions within 30 days (OR = 0.89; \( P = 0.0051 \)), although reoperation rates were slightly, but significantly increased (OR = 1.78; \( P = 0.002 \)). Laparoscopic colectomy patients were more likely to be discharged home without nursing care (OR = 0.70; \( P < 0.0001 \)).
Open Surgery

- Increase postoperative pain
- Longer hospital stay
- Delay in return to work
- Infection
- Hernia

Unfortunately majority of colon and rectal resections are performed with this approach
- “Traditional” surgeons unwilling to learn new skills
- Patients are unaware of other operative approaches

TABLE 2. Unadjusted Clinical Outcomes* and Hospital Utilization†

|                           | Laparoscopic Colectomy  
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>(N = 11,644)</td>
</tr>
<tr>
<td></td>
<td>Open Colectomy</td>
</tr>
<tr>
<td></td>
<td>(N = 21,689)</td>
</tr>
<tr>
<td></td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>(N = 32,333)</td>
</tr>
<tr>
<td>Transfusions</td>
<td>794 (7.2)</td>
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<td></td>
<td>2946 (13.6)</td>
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<tr>
<td></td>
<td>3740 (11.4)</td>
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<tr>
<td>Reoperations†</td>
<td>54 (0.5)</td>
</tr>
<tr>
<td>(abdominal surgeries)</td>
<td>74 (0.3)</td>
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<tr>
<td></td>
<td>128 (0.4)</td>
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<tr>
<td>Readmission within 30 d</td>
<td>876 (7.9)</td>
</tr>
<tr>
<td></td>
<td>2088 (9.6)</td>
</tr>
<tr>
<td></td>
<td>2964 (9.1)</td>
</tr>
<tr>
<td>Complications</td>
<td>2875 (26.0)</td>
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<tr>
<td></td>
<td>6888 (31.8)</td>
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<tr>
<td></td>
<td>9763 (29.8)</td>
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<tr>
<td>Ileus</td>
<td>1703 (15.4)</td>
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<tr>
<td></td>
<td>3821 (17.6)</td>
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<tr>
<td></td>
<td>5524 (16.9)</td>
</tr>
<tr>
<td>Pulmonary</td>
<td>723 (6.5)</td>
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<tr>
<td></td>
<td>1953 (9.0)</td>
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<tr>
<td></td>
<td>2676 (8.2)</td>
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<tr>
<td>Intraoperative</td>
<td>416 (3.8)</td>
</tr>
<tr>
<td></td>
<td>951 (4.4)</td>
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<tr>
<td></td>
<td>1367 (4.2)</td>
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<tr>
<td>Infections</td>
<td>319 (2.9)</td>
</tr>
<tr>
<td></td>
<td>795 (3.7)</td>
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<tr>
<td></td>
<td>1114 (3.4)</td>
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<tr>
<td>Cardiovascular</td>
<td>209 (1.9)</td>
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<tr>
<td></td>
<td>583 (2.7)</td>
</tr>
<tr>
<td></td>
<td>792 (2.4)</td>
</tr>
<tr>
<td>Wound</td>
<td>157 (1.4)</td>
</tr>
<tr>
<td></td>
<td>453 (2.1)</td>
</tr>
<tr>
<td></td>
<td>610 (1.9)</td>
</tr>
<tr>
<td>Systemic</td>
<td>124 (1.1)</td>
</tr>
<tr>
<td></td>
<td>331 (1.5)</td>
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<tr>
<td></td>
<td>455 (1.4)</td>
</tr>
<tr>
<td>Urinary</td>
<td>112 (1.0)</td>
</tr>
<tr>
<td></td>
<td>280 (1.3)</td>
</tr>
<tr>
<td></td>
<td>392 (1.2)</td>
</tr>
<tr>
<td>Operative time, (min)†</td>
<td>195 (76)</td>
</tr>
<tr>
<td></td>
<td>178 (80)</td>
</tr>
<tr>
<td></td>
<td>183.5 (79)</td>
</tr>
<tr>
<td>Intensive care unit (d)†</td>
<td>0.7 (3.8)</td>
</tr>
<tr>
<td></td>
<td>1.3 (5.2)</td>
</tr>
<tr>
<td></td>
<td>1.1 (4.8)</td>
</tr>
<tr>
<td>Length of stay (d)†</td>
<td>6.3 (6.4)</td>
</tr>
<tr>
<td></td>
<td>8.5 (8.4)</td>
</tr>
<tr>
<td></td>
<td>7.7 (7.8)</td>
</tr>
</tbody>
</table>
**Surgical Techniques**

**Laparoscopic Surgery**

- **Advantages**
  - Smaller skin incisions
  - Less postoperative pain
  - Decrease LOS
  - Return to work
  - Less hernia
  - Less infection
  - Cosmetic

*Estimates generated by Intuitive Surgical, Inc. based on Premier Database*
Laparoscopic Surgery

- Disadvantages
  - Requires specialized training
  - Operative time longer
  - Labor intensive for surgeon
  - Camera images are 2D
  - Surgeon dexterity limited due to instruments

Minimally Invasive Approach

- daVinci Robotic System

What Is Robotic Surgery?

- Computer enhanced surgical approach
Robotic Surgery

- Minimally Invasive
- Multiple small incisions

daVinci Robotic System

- Hands are placed in special devices that directs robotic instruments

daVinci Robotic System

- Greater dexterity than laparoscopic surgery
- EndoWrist® Instruments
  - Active wrist and finger movements
  - Allows increase precision
daVinci Robotic System

- Robot is docked onto patient
- Surgeon sits at console
- Hands are placed in special devices that directs robotic instruments

Advantages
- Less fatigue on surgeon
- Increased optics and visibility (3D)
- Intuitive movements of instruments
- Increased surgical precision
  - Avoid injury to surrounding nerves and blood vessels
- Access to deep pelvis with increased dexterity and maneuverability

Lap vs Robotic

- Laparoscopy
  - Requires specialized training
  - Operative time
  - Labor intensive for surgeon
  - Camera images are 2D
  - Surgeon dexterity limited due to interposed computer system

- daVinci Robotic
  - Requires specialized training
  - Operative time
  - Not labor intensive for surgeon
  - Camera images are 3D
  - Surgeon dexterity increased due to interposed computer system
Considering Value in Rectal Cancer Surgery
An Analysis of Costs and Outcomes Based on the Open, Laparoscopic, and Robotic Approach for Proctectomy

Jorge Silva-Wilczek, MD, David W. Dietz, MD, Luca Stocchi, MD, Megan Cosgrove, MD, Euna Gorean, MD, Matthew E. Kalady, MD, Hermann Kessler, MD, Ian C. Lawrenz, MD, and Tessa H. Remzi, MD

From the Department of Colorectal Surgery, Digestive Disease Institute, Cleveland Clinic, Cleveland, OH.

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TABLE 2. Perioperative and Short-term Oncologic Outcomes

<table>
<thead>
<tr>
<th>OS (n = 304)</th>
<th>LS (n = 110)</th>
<th>RS (n = 66)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operative time, min</td>
<td>214 (47–550)</td>
<td>259 (66–535)</td>
<td>283 (141–541)</td>
</tr>
<tr>
<td>Anastomosis time, min</td>
<td>271 (134–602)</td>
<td>306 (161–537)</td>
<td>480 (242–670)</td>
</tr>
<tr>
<td>Conversion to open</td>
<td>10 (15.6)</td>
<td>6 (9.1)</td>
<td>6 (9.5)</td>
</tr>
<tr>
<td>EBL, ml</td>
<td>260 (1–5600)</td>
<td>300 (15–3000)</td>
<td>230 (51–8000)</td>
</tr>
<tr>
<td>Intestine transection</td>
<td>35 (11.3)</td>
<td>5 (14.3)</td>
<td>4 (6.1)</td>
</tr>
<tr>
<td>Erythrocyte harvest</td>
<td>23 (260)</td>
<td>24 (429)</td>
<td>22 (470)</td>
</tr>
<tr>
<td>Involuted staple (pathology)</td>
<td>4 (1.3)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Involuted CRM (pathology)</td>
<td>16 (5.9)</td>
<td>4 (6.6)</td>
<td>5 (7.6)</td>
</tr>
<tr>
<td>Metastatic exclusion grade (n = 473)</td>
<td>0.31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operative time</td>
<td>247 (49.4)</td>
<td>103 (0.4)</td>
<td>59 (0.4)</td>
</tr>
<tr>
<td>EBL, ml</td>
<td>27 (7)</td>
<td>7 (6.1)</td>
<td>3 (6.5)</td>
</tr>
<tr>
<td>Involuted staple (pathology)</td>
<td>10 (2.4)</td>
<td>4 (3.3)</td>
<td>4 (6.1)</td>
</tr>
<tr>
<td>Successful resection (n = 470)</td>
<td>210 (45.9)</td>
<td>102 (49.5)</td>
<td>56 (69.0)</td>
</tr>
<tr>
<td>LOS, days</td>
<td>5 (3–10)</td>
<td>6.1 (5–15)</td>
<td>5 (3–20)</td>
</tr>
<tr>
<td>Readmission</td>
<td>32 (10.3)</td>
<td>35 (12.7)</td>
<td>43 (6.1)</td>
</tr>
<tr>
<td>Reoperation</td>
<td>18 (6.2)</td>
<td>11 (9.3)</td>
<td>3 (5.8)</td>
</tr>
<tr>
<td>LS closure</td>
<td>152 (89.3)</td>
<td>77 (92.8)</td>
<td>34 (85.5)</td>
</tr>
</tbody>
</table>

Values presented as median (interquartile range). Individual group pair comparisons are presented as statistically significant. Lowest actual median over within the 3 groups is presented as 100%, with the remaining median over and ranges presented as a proportional comparison to the lowest actual median over within the 3 groups.
Pelvic autonomic nerve preservation in radical rectal cancer surgery: changes in the past 3 decades

Min-Hoe Chew1,*, Yu-Ting Yeh1, Evan Lim2 and Francis Seow-Choen2

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Urinary dysfunction

For laparoscopic TME, there were 2 randomized controlled trials comparing laparoscopic vs open TME techniques which reported functional outcomes [10,49]. While function was not the primary endpoint, there were no significant overall differences in urinary function between the laparoscopic and TME groups. This finding was also supported by other recent cohort studies (Table 1) [50–53,59]. Of note, Jayne et al. and Hur et al. reported that voiding function would reduce after surgery with some restoration by 6 months and full recovery to preoperative levels by 12 months [49,51]. The incidence of minor urinary dysfunction was low regardless of technique (7.3% open TME vs 5.4% laparoscopic TME) [50]. When laparoscopic TME was compared with robotic TME, Kim et al. noted that restoration of urinary function was faster at 3 months [54]. There are, however, no differences seen in bladder function between the 2 groups 12 months after surgery in other studies as well [55–58]. In all studies the incidence of permanent IDC was very low at 0.5%.

Sexual dysfunction

For open TME studies, the incidence of sexual dysfunction ranges from 11% to 65%. If ANP is performed, the incidence of male erectile dysfunction ranges from 15% to 49.1%, and the incidence of male ejaculatory dysfunction ranges from 12% to 44.2% (Table 2) [11,12,29–32,33,34,41–54,58,60–62]. There were, however, 2 older studies that noted a very high incidence of erectile dysfunction (69%) and ejaculatory dysfunction (85%) even with ANP [30,32]. If ANP is not performed, the incidence can be as high as 100% [60]. Only a few studies have reported female sexual dysfunction (due to low questionnaire response rate of female candidates compared with male counterparts).
Sexual dysfunction

Pelvic cancer

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Review

Post-laparoscopic TME results in 12.8% to 57% erectile dysfunction, 40% to 43.7% ejaculatory dysfunction and 7.1% to 41% overall male sexual dysfunction (Table 2) [10,49-57,59,63]. When comparing the incidence of sexual dysfunction following laparoscopic TME with open TME, the benefit of minimally invasive surgery is inconsistent. Jayne et al. and Qzah et al. randomized trails suggested worse sexual functioning in laparoscopic rectal surgery (23.9-41%) compared with open surgery (10.8-18%) [10,49]. However, Liu’s randomized trial demonstrated lower incidence of sexual dysfunction in laparoscopic TME with ANP us open procedure (11.6% vs 16.9%); it is worth noting that the result shows no statistical significance [61]. In a more recent cohort study and a non-randomized trial, there is no statistically significant difference in the incidence of both erectile and ejaculatory dysfunction among laparoscopic vs open TME [51,56], but one study noted worse functioning of both sexes in the open group [50]. When robotic surgery was compared with laparoscopic TME, Kim et al. and Park et al. noted no difference in function between both arms [54,58], but D’Annobile et al. noted that while the erectile function worsened 1 month after surgery, it was almost completely restored at 12 months in the robotic group but only partially restored in the laparoscopic group with an incidence of 57% [55].
Complete TME

- Minimally Invasive Approach

Incomplete TME

TME Comparison

TME Comparison
Surgical Laparoscopy, Endoscopy & Percutaneous Techniques

Advantages of Robotic Right Colectomy With Intracorporeal Anastomosis

Henry J. Luang, MD,1* Gisberto Patracchia, MD,1 Brian X. Rivera, MD,1 Andrea Molano, MD,1 Alex Faginoff, BS,1 Louis A. Jana, BA,1 and Diego Holguin, MD*  

- Multiple operative techniques available
- Not just one tool in the tool box
- MIS improves outcomes!
Summary

- Multiple operative techniques available
  - Not just one tool in the tool box
  - MIS improves outcomes!