Crohn’s disease first described as a surgical condition, with the belief that “regional enteritis” could be cured with surgery.

Recognition of Crohn’s disease throughout the gastrointestinal tract led to more conservative management with gradual movement away from surgical therapy towards medical management.
However…

- Majority will need surgery: 78% over twenty years
- Surgery generally indicated for complications of disease
- 70-90% of patients with Crohn’s disease will require surgery.
- Who gets it depends on location
  - Probability of surgery within 5 years of disease onset 75% in patients with ileocecal disease and 90% at ten years.
  - 50-60% of patients with perianal Crohn’s disease will develop an abscess; 60% will have recurrent abscesses.
- More recently, decreasing rates of surgery in IBD have been noted: 35% rate of surgery within one year of diagnosis between 1962 and 1987 vs. 12% between 2003 and 2005. (Vend et al., 2006) No differences in 5 and 10 year rates reported so far.

The question then becomes not “If?” but “When?”

Is it better to salvage or treat?
Indications for Surgery

- Intestinal Obstruction
- Intraabdominal Abscess
- Fistulas
- Perforation
- Toxic Colitis
- Anorectal Abscess/ Fistula in Ano
- Refractory Disease

Intestinal Obstruction
Cut, cut, cut....

- Ileocolonic Anastomosis
- Jejunocolonic Anastomosis
- End-jejunostomy
Intestinal obstruction may be due to a single narrow stricture or series of strictures.

May present acutely (acute inflammation, food bolus obstruction) or with chronic symptoms.

Surgery reserved for fibrotic strictures, acute obstruction which does not resolve, or with associated fistula, abscess, or malnutrition.

- Single stricture or stricture associated with fistula or abscess treated with resection.
- Multiple strictures treated with stricturoplasty.
- Recurrence rates higher for short disease duration, younger age, number of strictures/stricturoplasties, and short interval from prior resection/stricturoplasty.
Stricturoplasty
Laparoscopic Surgery

- Diagnostic laparoscopy
- Adhesiolysis
- Fecal diversion for perineal sepsis
  - (stoma creation)
- Closure of stomas
- Segmental small bowel resections
- Ileocolectomy
- Strictureplasty
- Feeding jejunostomy
- Segmental or total abdominal colectomy with or without anastomosis
- TPC with IPAA

### Laparoscopy for Crohn’s disease

#### Comparative Studies

<table>
<thead>
<tr>
<th>Author</th>
<th>Study</th>
<th>Lap/Ope n (n)</th>
<th>Oper.time (min)</th>
<th>Conversio n (%)</th>
<th>Morbidity (%)</th>
<th>Hospital stay (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bemelman, 2000</td>
<td>Case-control</td>
<td>30/48</td>
<td>138/104</td>
<td>6.6</td>
<td>10/14.6</td>
<td>5.7/10.2</td>
</tr>
<tr>
<td>Alabaz, 2000</td>
<td>Case-control</td>
<td>26/48</td>
<td>150/90.5</td>
<td>11.5</td>
<td>15.4/16.7</td>
<td>7/9.6</td>
</tr>
<tr>
<td>Milsom, 2001</td>
<td>RCT</td>
<td>31/29</td>
<td>140/85</td>
<td>6</td>
<td>12.9/27.6</td>
<td>5/6</td>
</tr>
<tr>
<td>Young-Fadok, 2001</td>
<td>Case-match</td>
<td>33/33</td>
<td>147/124</td>
<td>5.9</td>
<td>-</td>
<td>4/7</td>
</tr>
<tr>
<td>Msika, 2001</td>
<td>Prospective Case-control</td>
<td>20/26</td>
<td>302/244.7</td>
<td>0</td>
<td>9.5/18.5</td>
<td>8.3/13.2</td>
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<tr>
<td>Duepree, 2002</td>
<td>Case-control</td>
<td>21/24</td>
<td>75/98</td>
<td>4.8</td>
<td>14.3/16.7</td>
<td>3/5</td>
</tr>
<tr>
<td>Bergamaschi, 2003</td>
<td>Case-control</td>
<td>39/53</td>
<td>185/105</td>
<td>0</td>
<td>10.2/9.4</td>
<td>5.6/11.2</td>
</tr>
<tr>
<td>Šnore, 2003</td>
<td>Case-control</td>
<td>20/20</td>
<td>145/133.5</td>
<td>5</td>
<td>0/5</td>
<td>4.25/8.2</td>
</tr>
</tbody>
</table>

* Bold indicates statistically significant difference (p<0.05)
Laparoscopy for Crohn’s Disease

<table>
<thead>
<tr>
<th>Variable</th>
<th>Laparotomy</th>
<th>Laparoscopy</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postoperative narcotics (days)</td>
<td>6.3</td>
<td>2.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>“Good cosmesis”</td>
<td>13 (42%)</td>
<td>14 (88%)</td>
<td>0.004</td>
</tr>
<tr>
<td>Social/Sexual (vs preoperative)</td>
<td>5 (16%)</td>
<td>8 (50%)</td>
<td>0.02</td>
</tr>
<tr>
<td>Return to normal activity (weeks)</td>
<td>8.2</td>
<td>3.7</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Return to work (weeks)</td>
<td>9.3</td>
<td>4.4</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>


Laparoscopy and Open Ileocecal Resection for Crohn’s Disease: a Metaanalysis

Overall conversion rate of 6.8%
Operative time was significantly longer in the laparoscopic group
Blood loss and complications in the two groups were similar
Laparoscopic patients had a significantly shorter time for enteric function recovery and shorter hospital stay

Tilney et al, Surg Endosc 2006
Laparoscopy and Open Ileocecal Resection for Crohn's Disease: a Metaanalysis

Laparoscopic ileocecal resection is associated with equal adverse events than open surgery
Postoperative recovery was enhanced
Length of hospital stay was reduced
Short incision was associated with improvement in perceived cosmetic results
Long-term follow-up evaluation is required
Contraindications to laparoscopy for Crohn's disease remain poorly defined

Tilney et al, Surg Endosc 2006
## Laparoscopy for Crohn’s Disease

### Cost Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Laparoscopy ($)</th>
<th>Laparotomy ($)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital Stay (days)</td>
<td>4.0</td>
<td>7.0</td>
<td>0.0001</td>
</tr>
<tr>
<td>Direct Costs ($)</td>
<td>8,684</td>
<td>11,373</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Indirect Costs ($)</td>
<td>1,358</td>
<td>2,349</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total Costs ($)</td>
<td>9,895</td>
<td>13,268</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

*Young-Fadok et al. Surg Endosc 2001*
Restorative proctocolectomy with ileal pouch-anal anastomosis has become the standard of care in the surgical management of ulcerative colitis and familial adenomatous polyposis. Majority of patients report improved quality of life and high satisfaction with the procedure (Farouk et al., 2000)
Restorative Proctocolectomy and Crohn’s Disease?

- Use of restorative proctocolectomy for Crohn’s colitis remains controversial.

- Although earlier studies reported up to 60% pouch loss, more recent studies do not support this.

- Functional outcomes similar to ulcerative colitis although higher incidence of development of perianal disease, chronic pouchitis, pouch-vaginal fistula, and strictures.

- Patients with isolated Crohn’s colitis do not have increased risk of pouch failure or operative complications. (Reese et al., 2006)

- Restorative proctocolectomy can be offered to select patients with no perianal or small bowel involvement as an alternative to total proctocolectomy with end ileostomy.
Table 1: Long-term outcome of restorative proctocolectomy: comparison between Crohn's disease and chronic ulcerative colitis.

<table>
<thead>
<tr>
<th>Outcome variable</th>
<th>Crohn's disease (n = 13)</th>
<th>Chronic ulcerative colitis (n = 39)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median BMls/24 h (range)</td>
<td>6 (4–12)</td>
<td>8 (4–20)</td>
<td>0.02</td>
</tr>
<tr>
<td>Use of antimotricals</td>
<td>6 (45.2%)</td>
<td>18 (48.7%)</td>
<td>NS</td>
</tr>
<tr>
<td>Incontinence of gas</td>
<td>0 (0)</td>
<td>16 (41.0%)</td>
<td>NS</td>
</tr>
<tr>
<td>Incontinence of liquid</td>
<td>4 (30.8%)</td>
<td>20 (51.3%)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Incontinence of solids</td>
<td>0 (0)</td>
<td>5 (15.4%)</td>
<td>NS</td>
</tr>
<tr>
<td>Pouchitis</td>
<td>3 (23.1%)</td>
<td>21 (53.9%)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Excision of pouch</td>
<td>2 (15.4%)</td>
<td>0 (0)</td>
<td>&lt; 0.02</td>
</tr>
</tbody>
</table>

**Abbreviations:** BM, bowel movement; NS, not significant.

Table 2: Meta-analysis of restorative proctocolectomy.

<table>
<thead>
<tr>
<th>Study</th>
<th>Follow up (months (range))</th>
<th>BMls/24 h (range)</th>
<th>Antimotricals use (%)</th>
<th>Seepage (%)</th>
<th>Pad use (%)</th>
<th>Pouchitis (%)</th>
<th>Morbidty (%)</th>
<th>Pouch loss (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melton et al [3]</td>
<td>294 (12–102)</td>
<td>7 (2–20)</td>
<td>NE</td>
<td>NE</td>
<td>8 (21)</td>
<td>11 (54)</td>
<td>113 (55)</td>
<td>61 (30)</td>
</tr>
<tr>
<td>Tsikitis et al [13]</td>
<td>26 (2–17)</td>
<td>8 (6–15)</td>
<td>5 (43)</td>
<td>2 (14.3)</td>
<td>NE</td>
<td>4 (15.4)</td>
<td>27</td>
<td>15 (57)</td>
</tr>
<tr>
<td>Bowerman et al [5]</td>
<td>32 (6–187)</td>
<td>6 (3–10)</td>
<td>8 (40)</td>
<td>7 (50)</td>
<td>9 (45)</td>
<td>16 (50)</td>
<td>16 (50)</td>
<td>9 (29)</td>
</tr>
<tr>
<td>Hartley et al [14]</td>
<td>69 (4–158)</td>
<td>7 (3–20)</td>
<td>30 (50)</td>
<td>15 (25)</td>
<td>14 (22)</td>
<td>23 (38)</td>
<td>9 (16)</td>
<td>7 (12)</td>
</tr>
<tr>
<td>De Oca et al [15]</td>
<td>12 (70–192)</td>
<td>5 (3–6)</td>
<td>4 (33)</td>
<td>3 (33)</td>
<td>1 (8.4)</td>
<td>1 (8.4)</td>
<td>2 (16.2)</td>
<td></td>
</tr>
<tr>
<td>Regimbau et al [16]</td>
<td>41 (15–174)</td>
<td>6 (2–10)</td>
<td>NE</td>
<td>6 (21)</td>
<td>15 (38)</td>
<td>7 (35)</td>
<td>3 (7)</td>
<td></td>
</tr>
</tbody>
</table>

**Abbreviations:** BM, bowel movement; NE, not examined.
Pouch failure in Crohn’s disease

- Although functional outcomes in Crohn’s patients who undergo restorative proctocolectomy are as good as ulcerative colitis patients, pouch failure and loss rates are significantly higher.
- Pouchitis
- Anastomotic stricture
- Fistulas

Pouchitis

Refractory patients may be treated with oral/topical steroids, oral/topical 5-aminosalicylates, azathioprine, or biologics.

Chronic refractory pouchitis may require pouch excision and end-ileostomy.
Stricture

10-40% incidence at ileoanal anastomosis. Majority of strictures can be managed with dilations, either endoscopic or with Hegar dilators. Endoscopic balloon dilation success rates of 80% reported by Shen with only a 12% pouch failure rate at 10 years.

Refractory strictures:
Excision of strictured segment with ileal mucosal advancement flap or creation of neopouch anal anastomosis.
Pouch Fistulae

Most common site pouch vaginal fistula with incidence of 2-6% in large series from Cleveland Clinic and Toronto.

25% pouch failure rate following pouch vaginal fistula (MacRae et al., 1997)

Majority arise from the ileoanal anastomosis or below it.

Transanal ileal mucosal advancement flap or transvaginal repair appropriate for low fistulas. High fistulas or presence of pelvic sepsis require abdominal approach.

Success rates remain low with approximately 50% overall success rate.
Intraabdominal Abscess

- Result from fistulas to the retroperitoneum, mesentery, and/or abdominal wall.
- Management centered on drainage…after control of sepsis, antibiotics, immunomodulators, and biologic therapy can be used to close fistula.
- Downstream strictures need to be addressed for resolution…
Enteroenteric and enterocolic fistulas most common intraabdominal fistulas, although fistulous communication is possible with any organ.

Surgery indicated if obstructive symptoms present or if sufficient bowel is bypassed to cause malabsorption and/or diarrhea.

Optimal surgical procedure is resection of affected bowel with primary anastamosis

Anorectal Abscess/ Fistula in Ano

Perianal fistula or abscess initial presentation of Crohn’s disease in 30% of cases.

Less is more…

- Drain all abscesses, staying as close as possible to anal verge in case of fistula formation.
- Low-lying fistulas with no evidence of active proctitis may be treated with fistulotomy with 85% success rates. Levien et al., 1989
- High fistulas/complex fistulas treated with non-cutting setons. Silastic seton may be left in place indefinitely.
- Mucosal advancement flap procedure has up to 90% initial healing but with 35%-50% recurrence rates. Makowiec et al., 1995; Hyman, 1999
More recent surgical therapies have centered on biological glues and collagen-based biomaterials. Advantages include less invasive surgeries, shorter healing time, earlier return to work.

Fibrin Glue

- Fibrinogen and thrombin injected into fistula tract. Fibrinogen activated, creating fibrin clot occluding fistula tract.
- Initial healing rates of 60-85% reported.
- More recent data disappointing with healing rates of 0-30% in Crohn’s patients with complex fistulas. (Lougnarath et al., 2004; Singer et al., 2005)
Plug Fistulotomy for Complex Fistulas

Fistula Plug
Porcine small intestine submucosa (SIS)

- Success rates of 80% reported in closure of Crohn’s anorectal fistulas (O’Connor et al., 2006)
- More recent meta-analysis reported 55% closure rates in Crohn’s patients similar to results with more invasive techniques including mucosal advancement flaps (O’Riordan et al., 2012)
- Plug extrusion most common cause of failure. Limited data on newer “button” plug.
- Given low complication rate and less invasive nature of procedure, plug fistulotomy should be considered as first line surgical therapy for complex Crohn’s perianal fistulas.

- Diverting ostomy may control fistulas but does not reduce risk of fistula recurrence or alter natural progression of disease. (Galandiuk et al., 2005)
- Proctectomy may be necessary in patients in whom more conservative surgical procedures fail or where there is aggressive rectal disease refractory to medical management. 10-20% of patients may require proctectomy, however complication rates may be as high as 50%. (Sandborn et al., 2003; Yamamoto et al., 1999)
Does surgery mean failure?

- Surgery may be offered as initial therapy to patients presenting with isolated ileocolic disease. 50% of patients may require no further surgical intervention.
- Isolated colonic disease occurs in up to 25% of patients. With no evidence of small bowel involvement or perianal disease, restorative proctocolectomy may be offered selectively.
- Stricturoplasty allows for bowel preservation with symptomatic relief.

Cumulative Probability of Surgical Intervention in CD

Surgery can be offered up front for limited disease at presentation followed by immunomodulator/biologic therapy to prevent mucosal recurrence.

Treat irreversible structural disease first, if limited, then prevent mucosal/inflammatory lesions.

Recent data suggests that biologic therapy initiated postoperatively significantly decreases endoscopic recurrence rates at one year:

9% with infliximab vs. 85% with placebo.

(54% of placebo patients on immunosuppressive therapy during trial)

Regueiro et al., 2009
Traditional Model

Gastroenterology vs. Colorectal Surgery

Holy Inflammatory Bowel Disease, Batman…
Departing thought…

Half of what I said today is probably false, I just don’t know which half.

e.e. cummings