Intestinal Anastomosis
Which Technique is Better?

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Gastrointestinal Anastomosis

- Provides continuity of the gastrointestinal tract
- Clinically apparent anastomosis leak rates ranges from 2-15%
- Complications associated with anastomotic breakdown increases morbidity and mortality
Histology

- Submucosal layer contains high content of collagen fibers which provides the tensile strength of the bowel.
- Collagen is the most important molecule in determining intestinal wall strength.
Healing Phases

- Acute inflammatory “lag” phase
  - Neutrophils and macrophages

- Proliferative phase
  - Fibroblast – collagen synthesis in EC matrix
  - Matrix metalloproteinases (MMP) – collagen degradation, increase with sepsis

- Remodeling/maturation phase
Day 4: 60%

Day 7: 100%

Anastomotic Strength

Time

Remodeling

Proliferative

Lag
Principles of Successful Intestinal Anastomosis

- **Technical Factors**
  - Adequate blood supply
  - Tension-free
  - Minimize contamination
  - Meticulous technique

- **Patient-Related Factors**
  - Malnourished
  - Chronic steroid use
  - Diabetes mellitus
  - Malignancy, prior chemoradiation
  - Hypotension/Shock
  - Emergency surgery
Hand Sewn Technique
Suture Material

- Ideal suture is one that elicits little to no inflammatory response while maintaining strength of the anastomosis during the lag phase of healing
Continuous versus Interrupted

- Prospective studies comparing single-layer continuous and interrupted suture technique
- No significant difference
Single-layer versus Double-layer

  - Compared single-layer continuous technique with two-layer interrupted technique
  - Prospective randomized trial
  - No difference in leak rates
  - Lower cost
  - Less time

- **Shikata et al. (2006) BMC Surgery**
  - Compared single versus two layer intestinal anastomosis
  - Meta-analysis of randomized controlled trials
  - No difference in leak rates

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**Table 2. OUTCOME VARIABLES FOR THE STUDY GROUPS**

<table>
<thead>
<tr>
<th></th>
<th>One-Layer</th>
<th>Two-Layer</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of anastomoses</td>
<td>65</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>Leaks</td>
<td>2 (3.1%)</td>
<td>1 (1.5%)</td>
<td>.62*</td>
</tr>
<tr>
<td>Abscesses</td>
<td>2 (3.1%)</td>
<td>2 (3.0%)</td>
<td>.0*</td>
</tr>
<tr>
<td>Time (min)</td>
<td>20.8</td>
<td>30.7</td>
<td>.000†</td>
</tr>
<tr>
<td>Length of stay (days)</td>
<td>7.9</td>
<td>9.9</td>
<td>.084†</td>
</tr>
<tr>
<td>Cost</td>
<td>$4.51</td>
<td>$35.38</td>
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</tbody>
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* Fisher exact test.
† Student t test.
Staple Technique
Various stapling devices

- Staples come in various width, height, distance between staples
  - Each designed for specific tissues
- Open and laparoscopic uses
- Made of titanium – minimal tissue reaction
- Nonmagnetic – MRI compatible
Transverse Anastomosis (TA) Stapler

- 2 staggered rows of staples
- Does not cut
Gastrointestinal Anastomosis (GIA) Stapler

- 2 double rows of staples
- Simultaneously cuts in between the rows
End-to-end Anastomosis (EEA) circular stapler

- Double rows of staples in circle
- Tissue cut within the circle of staples with cylindrical knife
Retrodirecional anastomosis of colon & ileum with EEA stapler

Arvil placed in ileum and secured with pursestring suture
Anvil attached and inserted into rectum, and... 
...pursestring sutures tightened and tied.

Anastomosis completed.

TA-55 stapler closing end of colon.
Handsewn vs Stapled in Ileocolic Anastomosis

- Choy et al. (2011) Cochrane Review
- Stapled functional end-to-end ileocolic anastomosis is associated with fewer leaks than handsewn.
- Subgroup analysis of cancer patients showed leak rate of 1.3% vs 6.7% in stapled vs handsewn group.
Neutzling et al. (2012) Cochrane Review

Insufficient evidence to demonstrate any superiority of stapled over handsewn techniques in colorectal anastomosis
Handsewn vs Stapled Anastomosis in Trauma

- Demetriades et al. (2002) J Trauma
  - Prospective multicenter study of trauma patients that underwent colon resection with primary anastomosis
  - No significant difference between handsewn or stapled techniques
Handsewn

- Low cost
- Longer operating time
- Learning curve
  - surgeons experience
  - great variability

Staple

- Expensive
- Shorter operating time
- Easy to learn
- Little variability
- Malfunctioning of device/Misfiring
Sutureless Compression Anastomosis
• Murphy's Button – introduced by Dr John Benjamin Murphy in 1892
Valtrac BAR
(Biofragmentable Anastomosis Ring)

- Introduced in 1985 by Hardy et al
- Double-sgemented ring composed of polyglycolic acid and barium sulphate
So which is the better technique??
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