Stapled versus Handsewn Bowel Anastomosis in Acute Care Surgery

Latest Updates and Consensus
CENTER REGION: ~ 2,400,000 inh
Coimbra District: ~ 430,000

COIMBRA UNIVERSITY HOSPITAL: 1,500 adult beds

~ 1,800,000 (3/4)

EMERGENCY DPT:

- Admissions / yr ~ 150,000
  > 400 / d
- Inpatients / yr = 14,000 – 15,000
  > 40 / d
- Rec colour pts / yr = 1,400 – 1,500
  > 4 / d
- Surgical pts / yr = 3,500 – 3,600
  = 9 - 10 / d
EMERGENCY SURGERY

Sepsis: 810 – 53%
Sepsis: 810 – 53%
Others: 306 – 20%
Trauma: 413 – 27%

CM, n=1529, 31 years (1982 – 2012)
Stapled versus Handsewn Bowel Anastomosis in Acute Care Surgery – Latest Updates and Consensus

Austin MT et al. J Trauma 2005

Non-trauma emergency surgery operations:

• 1/3 TO 1/2 RELATED WITH BOWELL
Bowel anastomoses: The theory, the practice and the evidence base.

*World J Gastrointest Surg 2012:*

1. Articles in english relating to small bowel, colonic and colorectal anastomotic techniques from 1960 to 2010 were reviewed; references from these articles also reviewed and relevant articles obtained.

2. Anastomoses described as follows:
   - **Sutured:** (1) interrupted or continuous, (2) single or 2-layer, (3) end-to-end, side-to-side or any combination, (4) various suture materials, (5) extramucosal or full-thickness sutures and (6) size of and spacing between each suture.
   - **Stapled:** (1) side-to-side, end-to-end or any combination, (2) staple lines oversewn, buried or not, and (3) various stapling devices.
3. Either a stapled or sutured gastrointestinal tract anastomosis is acceptable in most situations; stated that the key to a successful anastomosis is (1) **meticulous technique**, (2) **good blood supply** and (3) **no tension**

4. Factors that influence the choice of anastomotic technique: (1) **diameter of the bowel ends**, (2) **oedema**, (3) **accessibility and site**, (4) **contamination**, (5) **available time and equipment** and (6) **underlying pathology**

5. Despite healthy bowel and meticulous technique some anastomoses continue to leak, resulting in significant morbidity and mortality:
   - **22.0 % mortality** in patients with a leak vs **07.2 % mortality** in those without

6. **Individual surgical experience** and **personal preference** remain important factors in the decision to perform a particular anastomosis
Vallicelli, C et all.

**Small bowel emergency surgery: literature’s review.**

*World J Emerg Surg 2011:*

- Mechanical small bowel obstruction
- Crohn’s disease
- Small bowel neoplasms
- Meckel’s diverticulum
- Acquired jejunoileal diverticulosis
- Acute mesenteric ischemia
- Pneumatosis intestinalis
- Small bowel ulceration
- Foreign bodies
Stapled versus Handsewn Bowel Anastomosis in Acute Care Surgery – Latest Updates and Consensus

Neutzling, CB et all.

Stapled versus handsewn methods for colorectal anastomosis surgery.

*Cochrane Database Syst Rev 2012:*

- evidence found **insufficient** to demonstrate any superiority of stapled over handsewn techniques in colorectal anastomosis surgery, regardless of the level of anastomosis
- no significant differences were found except that **striction** was more frequent with stapling and **time taken to perform the anastomosis** was longer with handsewn
- no randomised clinical trials comparing these two types of anastomosis in **elective conditions** in the last decade; relevance of this research question has possibly lost its strength where elective surgery is concerned
- however, in risk situations such as emergency surgery, trauma and inflammatory bowel disease, new clinical trials are needed
Ho YH, Ashour MAT.

Techniques for colorectal anastomosis.

*World J Gastroenterol 2010:*

1. No superiority of stapled over handsewn techniques in colorectal anastomosis, regardless of the level of anastomosis

2. Colorectal anastomotic leakage remains one of the most feared post-operative complications, particularly after the shift from abdomino-peritoneal resections to total mesorectal excision and primary anastomosis

3. Wide variations of anastomotic leakage rates among surgeons. Mean rate higher for elective rectal than for colonic anastomoses – 16% vs 11%
Ho YH, Ashour MAT.

Techniques for colorectal anastomosis.

*World J Gastroenterol 2010:*

4. **Ongoing search for an ideal method that**
   - lower the incidence of dangerous complications and
   - avoid the need for a defunctioning colostomy or ileostomy

5. **Alternative techniques** involve a **sutureless anastomosis** by compressing two bowel ends together, leading to a **simultaneous necrosis and healing process**
   - Biofragmental anastomotic rings (Valtrac™ BAR)
   - Anal compression anastomosis (AKA)
   - NiTi – SMA compression rings and clips

6. **New achievements** under investigation:
   - Magnetic compression anastomosis / Staple line reinforcement / Colorectal drain / Polyester stent / Doxycycline coated sutures / Electric welding system
Fils. — Fil métallique. — Le fil métallique (bronze) est facile à stériliser, imperméable et ne s’altère pas au sein des tissus. Il s’applique surtout aux os. Le point s’arrête par torsion des chefs, répétée deux ou trois fois à l’aide des doigts ou d’une pince hémostatique. Son défaut est d’être cassant et moins facile à manier que le fil souple.


Soie et fil de lin. — Nous n’employons pas la soie, mais le fil de lin du commerce. Ce fil ne peut s’employer dans le voisinage d’une suppuration, car il s’infeste facilement. Nous ne faisons jamais de surjet au fil, sauf sur l’intestin ou la peau. Nous ne faisons pas davantage, avec le fil, des points profonds en U ou en X, afin de laisser le moins de longueur possible à ces corps étrangers. Pour la même raison, nous faisons une anse petite et nous coupions les chefs liés au ras du nœud.

Le fil se stérilise par l’ébullition ou l’autoclave. Il ne subit qu’une seule stérilisation. Comme il est sans valeur, il peut, sans inconvénient, être jeté.

Catgut. — C’est un fil assez souple, résorbable en huit ou quinze jours. Il se stérilise par la chaleur dans l’alcool, à l’autoclave à 125°. Cette préparation est assez difficile. C’est elle qui est utilisée par les fabricants de produits aseptiques. Nous employons la méthode chimique, c’est-à-dire l’immersion successive dans la térbenthine, l’éther, puis l’alcool.

Nous n’employons jamais le tendon de renne, ni le tendon de kangourou.
Reverdin's needle: a surgical needle with an eye that can be opened and closed by means of a slide.

Fariña-Pérez, LA et all. Reverdin (1842-1929): the surgeon and the needle. *Arch Esp Urol* 2010
Fig. 1a8. — Pince pour l’application des agrafes.

Agrafes de Michel.
Fig. 197. — Entéro-anastomose latérale à l’aide du bouton.
Choi, HJ et al.

Intestinal anastomosis by use of the biofragmentable anastomotic ring: is it safe and efficacious in emergency operations as well?

_Dis Colon Rectum 1998:_

- prospective randomized study / 119 pts - 56 (47 %) ring vs 63 (53 %) sutured
- **no statistical differences among groups** with respect to leaks, wound complications, postoperative bleeding, intra-abdominal abscess, intestinal obstruction or postoperative death (seven pts); **no deaths directly attributed to the technique**; two fistulas in colocolic anastomoses, one in each group, manifested the risk of primary anastomosis in emergency colon resection
- sutureless anastomosis with biofragmentable ring now **accepted as an alternative to conventional handsewn or stapled methods in elective enterocolic surgery**
- biofragmentable ring **also safe and reliable in emergency enterocolic surgery**, where the rapidity and security of anastomosis may be critical
Kaidar-Person, O et all.

Compression anastomosis: history and clinical considerations.

*Am J Surg 2008:*

- review of the literature regarding compression anastomoses concept of compression anastomosis investigated for nearly two centuries but did not gain worldwide popularity
- various methods of compression anastomosis shown to be at least comparable to the standard techniques of suturing and stapling
- compression anastomosis is time and cost-effective
<table>
<thead>
<tr>
<th>CHARACTERISTICS OF THE FOUR MAIN COMPRESSION DEVICES</th>
<th>Biofragmentable Ring (Valtrac BAR)</th>
<th>AKA-2</th>
<th>Compression Nitinol Clip (CAC)</th>
<th>Compression Nitinol Ring (EndoCAR27)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Absorbable</strong></td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Application</strong></td>
<td>Laparotomy, laparoscopy, transanal</td>
<td>Transanal</td>
<td>Laparotomy, laparoscopy, hand-assisted lap</td>
<td>Laparotomy, laparoscopy, hand-assisted lap</td>
</tr>
<tr>
<td><strong>Internal lumen (mm)</strong></td>
<td>11-20</td>
<td>25, 28, 31</td>
<td>08</td>
<td>One ring size (27) replaces a number of sizes (25-34)</td>
</tr>
<tr>
<td><strong>Expulsion average time (d)</strong></td>
<td>14-21</td>
<td>04-06</td>
<td>7</td>
<td>07-10</td>
</tr>
<tr>
<td><strong>Elective / Emergency</strong></td>
<td>Yes / Yes</td>
<td>Yes / Yes</td>
<td>Yes / No</td>
<td>Yes / No</td>
</tr>
<tr>
<td><strong>Foreign body reaction</strong></td>
<td>No</td>
<td>Possible to metal pins</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Tissue healing</strong></td>
<td>Extensive fibrosis / may cause stricture</td>
<td>Extensive fibrosis / may cause stricture</td>
<td>Primary intention / no strictures reported</td>
<td>Primary intention / no strictures reported</td>
</tr>
<tr>
<td><strong>Anastomotic index</strong></td>
<td>Lumen capacity depends upon standardized ring size</td>
<td>Full lumen capacity within 8-12 wk</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Efficacy</strong></td>
<td>Safe and secure and can be applied to achieve multiple anastomosis (in case requiring rapidity and security)</td>
<td></td>
<td>Technically simple after education /</td>
<td></td>
</tr>
<tr>
<td><strong>Learning curve</strong></td>
<td>Technically difficult than the other three devices / Learning curve of 9 patients</td>
<td></td>
<td>Meta-analysis of over 500 cases in North America, Europe and Israel: 75% of surgeons rated the CAR device to be very easy or easy to use</td>
<td></td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td>About $500</td>
<td>NA</td>
<td>About $3</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Tissue thickness accommodation</strong></td>
<td>Selecting ring size to be compatible with diameter and thickness of bowel wall</td>
<td>Same as BAR</td>
<td>Only one size, shape memory NiTi alloy (SMA) that accommodates varies tissue thickness. Unique thermo-mechanical properties and super elasticity</td>
<td></td>
</tr>
<tr>
<td><strong>Type of anastomosis</strong></td>
<td>End-to-end, end-to-side, side-to-side</td>
<td>Side-to-side</td>
<td>End-to-end</td>
<td></td>
</tr>
<tr>
<td><strong>Site of anastomosis</strong></td>
<td>Intestinal, colonic and rectal anastomosis</td>
<td>Distal colon and rectal only</td>
<td>Intestinal, colonic and rectal anastomosis</td>
<td></td>
</tr>
</tbody>
</table>

Modified from Ho YH, Ashour MAT. Techniques for colorectal anastomosis. *World J Gastroenterol* 2010
The modern operation is safe for the patient. The modern surgeon must make the patient safe for the modern operation.

“The Barber Surgeon”
Jacobus de Cessolis (séc. XV)

Lord Moynihan of Leeds (1865-1936)
<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Evidence from meta-analysis of randomised controlled trials</td>
</tr>
<tr>
<td>1b</td>
<td>Evidence from at least one randomised controlled trial</td>
</tr>
<tr>
<td>2a</td>
<td>Evidence from at least one controlled study without randomisation</td>
</tr>
<tr>
<td>2b</td>
<td>Evidence from at least one other type of quasi-experimental study</td>
</tr>
<tr>
<td>3</td>
<td>Evidence from non-experimental descriptive studies, such as comparative studies and case-controlled studies</td>
</tr>
<tr>
<td>4</td>
<td>Evidence from expert committee reports or opinions or clinical experience of respected authorities, or both</td>
</tr>
</tbody>
</table>

![Venn diagram showing the intersection of Individual Clinical Expertise, Best External Evidence, and Patient Values & Expectations]

1993-2013 COCHRANE 20 years
GO TO THE 20TH ANNIVERSARY SITE
Choy, PY et al.

**Stapled versus handsewn methods for ileocolic anastomoses.**

*Cochrane Database Syst Rev 2011:*

- Meta-analysis of RCTs / 1125 pts – 441 stapled vs 684 sutured / ileocolic anastomoses
- Stapled associated with significantly fewer leaks
- All other outcomes: stricture, anastomotic haemorrhage, anastomotic time, reoperation, mortality, intra-abdominal abscess, wound infection, length of stay, showed no significant difference
- **Stapled side-to-side anastomoses recommended following right hemicolecotomy**
Lustosa, SA et al.

Stapled versus handsewn methods for colorectal anastomosis surgery.

*Cochrane Database Syst Rev 2001:*

**LEVEL 1A EVIDENCE**

- Meta-analysis of RCTs / 1233 pts – 622 stapled vs 611 sutured / elective colorectal anastomoses
- overall leak rates similar between the two groups
- stapled anastomosis: less time to perform but increased risk of stricture
- no demonstrable superiority of one technique over the other, regardless of the level of the anastomosis
- decision regarding what to perform remains a matter of surgical judgement
Brundage SI et al.

Stapled versus sutured gastrointestinal anastomoses in the trauma patient: a multicenter trial.

J Trauma 2001:

LEVEL 3 EVIDENCE

- Multi-centre retrospective study / emergency bowel resection and anastomosis in trauma / 4 year period / 5 Level 1 trauma centres / 199 pts / 289 anastomoses – 175 stapled vs 114 sutured / ISS and distribution of small bowel and large bowel anastomoses not significantly different
- increased leak rate and increased risk of intra-abdominal abscess in the stapled group in trauma patients
CONCLUSIONS

1. SMALL AND LARGE BOWEL ANASTOMOSES

• Either a stapled or sutured gastrointestinal anastomosis is acceptable in most situations

• The key to a successful anastomosis:
  • meticulous technique
  • good blood supply
  • no tension

• Factors that influence the choice of anastomotic technique:
  • diameter of the bowel ends
  • oedema
  • accessibility and site
  • contamination
  • available time and equipment
  • underlying pathology
(CONCLUSIONS)

2. **SMALL AND LARGE BOWEL ANASTOMOSES IN TRAUMA**

   **LEVEL 3 EVIDENCE**
   - Increased leak rate and risk of intra-abdominal abscess in the stapled group

3. **ILEOCOLIC ANASTOMOSES**

   **LEVEL 1A EVIDENCE**
   - Stapled side-to-side anastomoses recommended following right hemicolecetomy
4. COLORECTAL ANASTOMOSES

LEVEL 1A EVIDENCE

- No superiority of stapled over handsewn techniques, regardless of the level
- Decision remains a matter of surgical judgement
- No significant differences except
  - stricture more frequent with stapling
  - time taken longer with handsewn
- New clinical trials needed in risk situations such as
  - emergency surgery
  - trauma
  - inflammatory bowel disease

5. ONGOING SEARCH / SUTURLESS ANASTOMOSIS AS AN ALTERNATIVE?