International Journal of Surgery Open 7 (2017) 10–16

Contents lists available at ScienceDirect

International Journal of Surgery Open

journal homepage: www.elsevier.com/locate/ijso

A systematic review of pre, peri and postoperative factors and their implications for the lengths of resected bowel segments in patients with Crohn's disease

Kristoffer Hendel [a, *], Sebastian Kjærgaard [a], Alaa El-Hussuna [b]

[a] University of Copenhagen, Blegdamsvej 3B, 2200 Copenhagen N, Denmark
[b] Aalborg University Hospital, Klinik Kirurgi og Kræftbehandling, Hobrovej 18-22, 9100 Aalborg, Denmark

ARTICLE INFO

Article history:
Received 27 February 2017
Received in revised form
11 April 2017
Accepted 12 April 2017
Available online 15 April 2017

Keywords:
Inflammatory bowel disease
Crohn's disease
Resected segment
Small bowel resection

ABSTRACT

Aim: Several pre, peri and postoperative factors may have implications for the lengths of resected small bowel segments in Crohn's disease patients. It might also affect patient outcome. We reviewed the current literature on factors and their implications for the lengths of resected small bowel segments and possible correlations with postoperative outcome.
Method: Searches were independently engineered by the authors and a research-librarian in MEDLINE and OVID databases using PubMed and EMBASE engines in compliance with PRISMA recommendations. All original articles, reviews and guidelines published in the period of 1985–2016 with last search date 13th of February 2016 on bowel resection in Crohn's disease patients were assessed for inclusion.
Results: We identified 52 studies for synthesis. *Preoperative*: Perforation as indication for surgery and increased visceral obesity may be factors resulting in longer lengths of resected small bowel segments. Administration of total parenteral nutrition might reduce resection lengths. *Perioperative*: No difference in resection lengths in elective versus acute surgery, laparoscopic versus open approaches or in case of intra-operative blood transfusions. Stapled anastomoses might conserve more bowel than sutured ones. *Postoperative*: The lengths of the resected small bowel segments most likely have no impact on recurrence rates.
Conclusion: No pre, peri or postoperative factors were found to have definitive implications for the lengths of resected small bowel segments. Correlation between the lengths of resection and recurrence is weak.

1. Introduction

Crohn's disease (CD) is becoming more prevalent [1] with continually higher incidence rates argued to be 3.1 to 14.6 cases per 100,000 person-years [2,3]. While both medical and surgical treatment of CD is improving, the disease still presents itself with increased morbidity and an increasing burden of disease [4]. Surgical intervention has been shown to still be required in up to two-thirds of CD patients [5]. Furthermore, early surgery can be a factor in better patient outcome [4]. While it appears that strictureplasty procedures for CD have become an accepted treatment option, small bowel (SB) resection is still widely used and considered the only option in penetrative disease phenotypes and long affected segments [6–8]. Pre, peri and postoperative factors may have implications for the lengths of resected small bowel segments in Crohn's disease patients. There are a limited number of studies on the subject with conflicting reports [9].

Repeated bowel resections can lead to intestinal failure [10], yet it appears there is a lack of quality registries and statistical data on factors that might lead to resection of longer SB segments. Although two thirds or more of CD patients undergo repeated bowel resection during a life-time [9,11], measurements and documentation of the resected bowel segments remain scarce; this makes planning for additional resections more difficult.

A recent shift in favour of laparoscopic surgical approaches - and even a single port approach - has naturally demanded research comparing the laparoscopic versus open approaches in CD-related surgery [12–14]. A recent review on this includes only a single article reporting on a possible correlation between the two approaches and lengths of the resected segments [15].

While it has been argued that lengths of resection margins do

* Corresponding author. H.P. Ørums Gade 42, 2100 Copenhagen Ø, Denmark.
E-mail addresses: hendel@me.com (K. Hendel), sebastian@kjaergaard.cc (S. Kjærgaard), alaa@itu.dk (A. El-Hussuna).

http://dx.doi.org/10.1016/j.ijso.2017.04.002

not affect surgical recurrence [16–18], a newer study suggests that the use of correct resection margins is crucial to avoid recurrence [19]. This further strengthens the need for data on the lengths of resected SB segments in CD patients, especially when margins can be as low as 2 cm [20].

Objectives: To review the current literature for pre, peri and postoperative factors and their implications for the lengths of resected SB segments and possible correlations with postoperative outcome.

2. Materials and methods

Search strategy: (KH) executed a broad-spectrum search strategy (see below) in the MEDLINE and EMBASE records with no limits using the Ovid EMBASE and PubMed search engines. An external research-assistant librarian repeated the search to ensure validity, integrity and robustness of the search strategy. All articles were screened for title and abstract by two authors (KH and SK), and select articles were included for review based on full-text assessments by two authors (KH and SK). All authors participated in the final selection of included studies (KH, SK and AE). Fig. 1 shows our PRISMA flowchart.

(KH) performed data extraction and (AE) re-checked it. Differences were resolved by discussion.

OVID EMBASE and OVID MEDLINE search by authors:

1. crohn* OR inflammatory bowel disease OR IBD.all fields.
2. resection OR resected OR small bowel length OR short bowel OR segment.keyword.
3. 1 AND 2

Yield: 336 on February 13th, 2016.

PubMed MEDLINE search by authors:

((crohn* OR inflammatory bowel disease OR IBD) AND length of resection).all fields.

Yield: 383 on February 13th, 2016.

In total 719 results of which 63 were duplicates resulting in a yield of 656 unique results for the internal searches.

PubMed MEDLINE search by external librarian:

((((((“Perioperative Period”[Mesh]) OR “Risk Factors”[Mesh]) OR “complications” [Subheading]) OR complication*[tw]) OR risk factor*[tw])) AND ((((((((resection*[tw] OR resected*[tw])) OR “Digestive System Surgical Procedures”[Mesh]) OR (“General Surgery”[Mesh] OR “surgery” [Subheading])) OR (surgery[tw] OR surgical[tw]))) AND (((“Intestine, Small”[Mesh]) OR (small bowel*[tw] OR short bowel*[tw])) OR (small intestine*[tw] OR short intestine*[tw]))) AND (((crohn*[tw] or Inflammatory Bowel Disease*[tw] or IBD[tw])) OR “Crohn Disease”[Mesh]))

Yield: 2010 results on February 13th 2016.

2.1. Inclusion criteria

All original articles, reviews and guidelines published in the period of 1985–2016 with last search date 13th February 2016 about bowel resection in CD patients were included. Inclusion criteria for full-text evaluation:

1. Studies/articles reporting the effect of pre, peri, and postoperative factors on the lengths of resected SB segments.
2. Studies/articles reporting the effect of resected segment length on short- and long-term postoperative outcome.

We retrieved these articles for full-length text reading and their reference lists screened for other relevant articles.

2.2. Exclusion criteria

We excluded articles that did not meet the above stated criteria as well as case reports, editorials, letters to editor, conference abstracts and articles where full text was not available.

2.3. Assessment of risk of bias

The quality of bias control in the included observational studies was assessed using the Newcastle-Ottawa scale (NOS). All the included studies present a high risk of bias.

3. Results

We included 52 articles in this review, please see Fig. 1 for a PRISMA flow-diagram. The following subsections and paragraphs present our findings in segments divided by types of comparisons made. Any article may appear in two or more segments if applicable. It was not possible to conduct meta-analysis of the included studies because of heterogeneity in outcome measurements, methodology and reporting of outcome measurements. An overview of the following results is available as Table 1.

3.1. Preoperative factors

3.1.1. Studies comparing the lengths of resected SB segments and different preoperative factors [11,21–28]

One study found that structuring versus fistulising indications for surgery does not affect the lengths of the resections [21]. Another study found the difference based on perforating versus stenotic indications to be of significance, the former patient group having more lengths resected $p < 0.001$ [22]. Both studies lack adjustment for other factors that might influence resection lengths. Another factor that shows an effect on the lengths of resected SB segments is *visceral obesity* (BMI and CT-scan evaluation); longer SB segments were resected in patients with visceral obesity VFA $\geq$ 130 cm squared, $p = 0.04$ tested in univariate analysis. The results were not adjusted for other factors [23]. This appears, however, not to be related to preoperative lipid profile after adjusting for confounding factors in multivariate analysis [24]. Furthermore, the post-surgical lipid profile also seems to be unaffected [28].

Preoperative medical treatment and the lengths of resected SB segments: One study showed no link between the use of a preoperative immunosuppressant and the lengths of the resected segments $p = 0.33$ in univariate analysis [22]. However, with the added cost of longer lengths of stay, total parenteral nutrition (TPN) administration appears to reduce the lengths of resected SB segments in patients undergoing ileo-colic resection $p < 0.001$, and near-significantly in patients undergoing segmental SB resection $p < 0.09$ when tested in multivariate analyses [25].

While initial SB lengths and postoperative residual SB lengths appear not to influence the likelihood of recurrence [26,27], one study found a correlation between preoperative extent of diseased segments and extent at recurrence $r = 0.7$, $p < 0.001$ [11]. This result has however not been adjusted for other factors.

3.2. Perioperative factors

3.2.1. Studies comparing the lengths of resected SB segments in patients undergoing elective vs acute surgery [10,22,29]

A single-centre retrospective study found no difference in the lengths of resected SB segments based on whether the surgery was elective or acute $p = 0.14$ [29]. Another retrospective study analysed patients with intestinal failure and found in agreement with this,