



Original research

Observational study on preservation of the superior rectal artery in sigmoid resection for diverticular disease



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H I G H L I G H T S

- Our results support a growing evidence base for preservation of vascular supply in surgery for diverticular disease.
- We report the largest patient cohort on preservation of the SRA in sigmoid resection for diverticular disease to date.
- Preservation of the SRA benefits obese patients.
- Preservation of the SRA reduces the incidence of intraoperative hemorrhage, and length of hospital stay.

A R T I C L E I N F O

Article history:

Received 19 April 2015

Accepted 13 July 2015

Available online 17 July 2015

Keywords:

Diverticular disease
Superior rectal artery
Outcome
Obesity
Complications

A B S T R A C T

Aim: Recent investigations have shown improved patient reported outcome after preservation of the inferior mesenteric artery in sigmoid resection for diverticular disease. We report on our experience with preservation of the superior rectal artery (SRA).

Methods: This is an observational single center study in a high-volume, level II inner city hospital from 2006 to 2008. Inclusion criteria were all patients with diverticular disease. Exclusion criteria were stoma formation, cancer, and iatrogenic perforation. Patients were investigated in group A with preservation of the SRA, and group B ligation of the SRA. Outcomes assessed, included incidence of anastomotic breakdown, intraoperative complications, hospital stay, and risk factors.

Results: The patient population included 259 patients, 46 patients were excluded, leaving 100 patients in group A and 113 patients in group B. Patients in both groups were comparable regarding age, gender, comorbidities and stage of disease. Anastomotic breakdown occurred in one patient in group A and in eight patients in group B ($p = 0.038$). Incidence of intraoperative bleeding, wound dehiscence, and length of stay was increased in group B ($p < 0.03$; $p < 0.04$; $p = 0.05$). Obesity was an independent risk factor for anastomotic dehiscence in group B ($p < 0.04$).

Conclusion: Our data comprise the largest patient population reported so far on vascular preservation in surgery for diverticular disease. The results of this study support the establishment of evidence based recommendations on the level of dissection in diverticular disease. Specifically obese patients are at risk of anastomotic breakdown with ligation of the SRA.

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1. Introduction

The most feared complication in bowel surgery is anastomotic

leakage. Despite anastomotic leakage being almost always caused by several factors, vascular supply to the anastomosis has been identified as the most prominent of these factors [1–3]. Thus preservation or ligation of the blood supply seems of definitive interest to surgeons. However randomized trials to elucidate this question further are largely missing [4]. This is despite the fact that randomized controlled trials could be far easier achieved in

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benign compared to malignant disease.

2. Background

Preservation of the superior rectal artery in sigmoid resection for diverticular disease is still a matter of debate [4–6]. Despite recent calls no progress has been made towards a randomized controlled trial. Reporting our experience with preservation of the superior rectal artery we would like to support the call for a randomized controlled trial.

3. Methods

3.1. Study design

This investigation is an observational single center study. The decision for preservation or ligation of the superior rectal artery was left to the discretion of the individual surgeon. Similar the surgical extent of resection (left hemicolectomy, sigmoidectomy and anterior resection) was a matter of intraoperative requirements as judged by the operating surgeon. For anterior resection surgeons were required to document incision of the peritoneal reflection around the upper rectum. An initial audit at our department suggested a reduced incidence of anastomotic insufficiencies with preservation of the superior rectal artery. Surgeons were instructed to document their surgical procedures as exactly as possible in their surgical notes. In an official departmental meeting together with data presentation a decision was made to prospectively gather data from patients with diverticular disease in acute and non-acute cases for an observational study. Surgeons agreed to undertake this study to find out, if vascular preservation should be a general rule in procedures for diverticular disease. Prospective data collection was started using a standard spread sheet and the hospital information system (HIS). Data extraction from surgical notes, medical documents and HIS was first completed by D.H. and repeated by M.S. for his thesis work.

3.2. Participants

The eligibility criteria for participants were a preoperative diagnosis of diverticular disease of any stage. This included acute as well as elective cases. Exclusion criteria were suspicion of cancer intraoperative or verified by final histology, Hartmann's procedure or protective ileostomy, iatrogenic perforation, and missing information related to the preservation or ligation of the superior rectal artery in the operative notes. Data were collected at Sana Hospitals Berlin, Department of Surgery from January 2006 to December 2008. The study population was all patients admitted for diverticular disease to our department during these two years.

3.3. Intervention

The sigmoid colon can either be excised via a tubular or via a segmental resection. These surgical techniques have been used for several decades [7–9]. Tubular resection leads to preservation of the superior rectal artery. In segmental resection the inferior mesenteric artery and superior rectal artery are divided [10]. In tubular resection the mesentery of the colon is divided along the colonic wall [11]. In segmental or radical resection the sigmoid colon is excised with a V-shaped segment of the colon mesentery down to the inferior mesenteric artery. The latter is ligated at or near the origin from the abdominal aorta. Segmental resection is the preferred method in colorectal cancer. But segmental resection might also be helpful in severely inflamed and thickened colon mesentery [6]. Surgical technique is among the most important

factors for postoperative complications. We hypothesized that ligation of the superior rectal artery leads to more anastomotic breakdown.

3.4. Outcomes

Data collected included patient demography, comorbidity, diagnosis on admission, classification according to Hansen and Stock, surgical data and postoperative morbidity [12]. The primary endpoint was evidence for anastomotic insufficiency post-operatively either by reoperation, clinically or via computed tomography. Secondary endpoints included intraoperative bleeding, surgical times, reoperation, mortality and hospital stay. Intraoperative bleeding was assessed by the two main authors from the surgical notes. There was no standardized intraoperative estimation of blood loss. Postoperative use of red packed cells was not assessed. No changes to the primary endpoint were made. Intraoperative bleeding was added as a secondary endpoint, when frequent mention of intraoperative hemorrhage was noted by the authors in the surgical notes.

3.5. Bias

Measures to reduce potential bias included a data collection independent of operating surgeons, prospective data collection through the hospital information system and a standard digital spread sheet unrelated to the hospital administration system. Results of both data collections were cross referenced. One of the main authors, M.S., is unrelated to the hospital but had full access to the hospital information system and paper based archives for his thesis work. Data extraction was independently repeated by M.S.

3.6. Sample size

No formal sample size calculation was performed. A random episode from 2006 to 2008 was chosen for the study period. No randomization of patients. Patients were preoperatively not informed about ligation or preservation of the superior rectal artery, as no formal criteria exist. Ligation of vessels is commonly not explained to patients in large bowel surgery. We did not apply for ethics committee approval. Informed consent used the standard approved consent forms.

3.7. Statistics

Continuous variables are given as mean, median and SD. To compare continuous variables between groups, the Mann–Whitney U test was used. Categorical variables were analyzed with the chi-square test respectively Fisher exact test. p values are two-sided and subject to a local significance level of 0.05. All statistical analysis was made with IBM SPSS statistics version 21 (IBM Corporation, Armonk, NY, USA).

4. Results

The cases collected prospectively were referenced against the hospital information system. All surgical cases with the departmental ICD-10 admission diagnosis K57.21–23 and K57.30–33 were included. Corresponding to the prospective digital collection in a standard spread sheet, 259 patients with a diagnosis of diverticular disease of any stage were cross-referenced and included. 46 patients were excluded due to Hartmann procedure, primary protective ileostomy, intraoperative or histological finding of cancer, endoscopic perforation or missing information (Fig. 1). During the study period there were no patients with CT or ultrasound-guided

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