

REVIEW

Accuracy of Routine Endoscopy Diagnosing Colonic Ischaemia After Abdominal Aortic Aneurysm Repair: A Meta-analysis

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WHAT THIS PAPER ADDS

This paper presents a comprehensive overview of the diagnostic value of endoscopy in colonic ischaemia (CI) after aneurysm surgery. The 12 prospective studies included in this review showed that endoscopy is an accurate tool in ruling out CI rather than diagnosing the presence of the clinically relevant transmural CI. Endoscopy is a safe diagnostic test as none of the studies reported adverse events. The decision whether an exploratory laparotomy is necessary should also include the presence of pre- and post-operative risk factors of patients suspected of CI.

Background: Colonic ischaemia (CI) is a devastating complication after abdominal aortic aneurysm (AAA) surgery. The aim of this review was to evaluate the diagnostic test accuracy of routine endoscopy in diagnosing CI after treatment for elective and acute AAA.

Patients and methods: The Pubmed and Embase database searches resulted in 1188 articles. Prospective studies describing routine post-operative colonoscopy or sigmoidoscopy after elective or emergency AAA repair were included. The study quality was assessed with the QUADAS-2 tool. Sensitivity and specificity forest plots were drawn. Diagnostic odds ratios were calculated by a random effect model.

Results: Twelve articles were included consisting of 718 AAA patients of whom 44% were treated electively, 56% ruptured and, 6% by endovascular repair. Of patients, 20.8% were identified with CI (all grades), 6.5% of patients had Grade 3 CI. The pooled diagnostic odds ratio for all grades of CI on endoscopy was 26.60 (95% CI 8.86–79.88). The sensitivity and specificity of endoscopy for detection of Grade 3 CI after AAA repair was 0.52 (95% CI, 0.31–0.73) and 0.97 (95% CI 0.95–0.99) respectively. The positive post-test probability is up to 60% in all kinds of AAA patients and 68% in ruptured AAA patients.

Conclusion: Routine endoscopy is highly accurate for ruling out CI after AAA repair. Clinicians should be aware that endoscopy is less accurate in diagnosing the presence of the clinically relevant transmural CI. Endoscopy is a safe diagnostic test to use routinely as none of the studies reported adverse events.

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INTRODUCTION

Colonic ischaemia (CI) is a rare but severe and potentially fatal complication after abdominal aortic aneurysm (AAA) repair. Recent reports have shown an incidence of clinically significant CI of 1.4–2.8% after elective repair of an AAA

and even higher after ruptured AAA.^{1–4} CI can raise the mortality more than sevenfold after emergency repair compared with elective repair.⁵ Open repair, emergency repair, peri-operative hypotension, abdominal compartment syndrome, and female sex are known risk factors for developing CI after AAA repair.

To lower the mortality after AAA repair, the early diagnosis of CI is important to allow for prompt and timely treatment of CI.⁶ Different tests have been studied to determine the presence of CI but most lack specificity.^{7–10} Bloody diarrhoea or early passage of stool occurred only in just over half of patients with transmural CI which makes

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clinical assessment very challenging. Moreover, measuring intra-abdominal pressure or sigmoid intramural pH did not correlate sufficiently with the occurrence of CI.

The diagnostic test most frequently used for diagnosing CI is sigmoidoscopy or colonoscopy. The majority of CI diagnosed on endoscopy will not involve transmural CI and will resolve with supportive care. However, full thickness CI may lead to colonic perforation and associated increased mortality and thus necessitates immediate diagnosis and treatment.

The aim of this review was to evaluate the diagnostic test accuracy of routine endoscopy in diagnosing CI after treatment for AAA, in both the elective and emergency setting.

METHODS

This systematic review was written according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)¹¹ and the Cochrane handbook for diagnostic test accuracy reviews.¹²

Objective

The study objective was divided in three key questions to improve full clinical comprehension.

Key question 1: What is the value of endoscopy (all grades) to diagnose CI confirmed at positive laparotomy or CI related death in AAA patients?

Key question 2: What is the value of Grade 3 CI (transmural) at first post-operative endoscopy confirmed at positive laparotomy or confirmation of CI on post-mortem in AAA patients?

Key question 3: What is the value of Grade 3 CI (transmural) at first post-operative endoscopy confirmed at positive laparotomy or confirmation of CI on post-mortem in ruptured AAA patients?

Data sources

PubMed and Embase were searched up to March 1, 2017, identifying eligible studies. The search strategy was formulated with the assistance of a clinical librarian (see [Supplementary material 1](#)). Medical subject heading¹³ terms and additional free entry terms for the patient groups (patients with an AAA, ruptured or elective, treated endovascular or with open surgery), the diagnostic test and result (endoscopy with CI), the reference standard (laparotomy), and outcome (sensitivity and specificity) were used. The references of the selected papers were reviewed for the completion of the list of articles eligible for full text assessment.

Study selection

Two investigators (G.v.M. and G.M.) individually reviewed 1188 titles and abstracts. Discrepancies were resolved through consensus and consultation with the last author. Pre-specified inclusion and exclusion criteria in the research protocol were used to select potentially eligible studies for

full text analysis. Inclusion of a study followed if the study used prospective data and performed at least one mandatory (routine) endoscopy after AAA repair. Acute and electively treated AAA patients were included as well as open and endovascular treated AAA patients. Both colonoscopy and sigmoidoscopy based studies were included. The endoscopies had to be done in the same admission as the initial treatment of the AAA. The studies needed to include at least 10 patients. There was no restriction in the year of publication or language of the study. The process of study inclusion was summarised in a flow diagram with explanation of exclusion of studies mentioned.

Data extraction

The two investigators (G.v.M. and G.M.) independently extracted the necessary information from the eligible articles. The data were cross-checked, and any discrepancies were resolved by discussion between the two investigators. Some of the studies also reported on the grade of CI: Grade 1 was defined as mucosal ischaemia; Grade 2 was defined as mucosal ischaemia and involvement of the muscular layer; and Grade 3 was defined as transmural ischaemia, gangrene, and perforations.¹⁴ If any of the main variables were missing or not reported separately for AAA patients and aortic occlusive disease the authors of that particular study were contacted.

Quality assessment

The methodological quality of the included studies was independently assessed by two investigators (G.v.M. and G.M.). The quality assessment tool for diagnostic accuracy studies guidelines (QUADAS-2)¹⁵ was used to judge the risk of bias and applicability of the studies for the research question. Patient selection, the index test, the reference standard, and flow and timing were included in this assessment.

Data synthesis and analysis

Sensitivity and specificity forest plots were drawn using RevMan version 5.3.3¹⁶ per key question. Pooled sensitivities and specificities were calculated using 2×2 contingency tables and reported to show an estimation of the direction of the trend. Heterogeneity was investigated using the I^2 statistic and interpreted as follows: 0–40% was considered not to be important, 30–60% represented moderate heterogeneity, 50–90% represented substantial heterogeneity, 75–100% indicated considerable heterogeneity.¹⁷ The heterogeneity of the included studies was also visually drawn for all analyses in hierarchical summary receiver operating characteristics (HSROC). Publication bias was tested using the linear regression method and funnel plot of Deeks et al.¹⁸ A p value $< .05$ in this linear regression model indicated potential publication bias.

For the three key questions the pooled odds ratios were calculated using a random effect model because there was moderate heterogeneity between studies. Weighted estimates for each study were calculated and illustrated in a

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