Persistent symptom relief after revascularization in patients with single-artery chronic mesenteric ischemia

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ABSTRACT

Objective: An isolated stenosis of the celiac artery (CA) or the superior mesenteric artery (SMA) is frequently detected in patients with abdominal complaints. The dilemma is whether these patients suffer from chronic mesenteric ischemia (CMI) and whether they will benefit from revascularization. We evaluated the long-term clinical success rates for single CA or SMA revascularization in patients with gastrointestinal symptoms and confirmed mucosal ischemia.

Methods: This was a retrospective cohort analysis of 59 consecutive patients with gastrointestinal symptoms and a single atherosclerotic mesenteric artery stenosis who were referred to our tertiary care institution between 2006 and 2010 for standardized diagnostic workup of CMI, including measurement of mucosal ischemia with visible light spectroscopy or gastric-jejunal tonometry. Patients with multidisciplinary consensus diagnosis of CMI underwent surgical or endovascular revascularization. The primary outcome was clinical response to revascularization, defined as relief of presenting symptoms as experienced by the patient.

Results: Consensus diagnosis of CMI was obtained in 37 of 59 patients. Isolated CA stenosis was present in 30 of 37 patients (81%) and isolated SMA stenosis in seven patients. After a mean follow-up of 5.0 ± 3.0 years, 27 of 37 patients (73%) experienced sustained symptom relief after revascularization. Response was not related to lesion localization (CA, 73%; SMA, 71%; $P = .919$).

Conclusions: Revascularization of the CA or SMA provides persistent symptom relief in 73% of patients diagnosed with CMI due to single atherosclerotic mesenteric artery stenosis. (J Vasc Surg 2018;■:1-7.)

Keywords: Chronic mesenteric ischemia; Single-vessel disease; Atherosclerosis; Celiac artery; Superior mesenteric artery

The medical evaluation of patients with abdominal pain is frequently a process of elimination. When common causes of pain, such as gastritis, gastric ulcer disease, gallstones, inflammatory bowel disease, and pancreatitis, are ruled out with the proposed diagnostic algorithms,[1-3] a majority of patients are diagnosed with a functional gastrointestinal syndrome, including functional dyspepsia or irritable bowel syndrome (IBS). Failure to respond to empirical treatment or the presence of alarm features such as unintentional weight loss often triggers further imaging studies to identify chronic mesenteric ischemia (CMI) as a potential underlying cause.

Isolated stenosis of the celiac artery (CA) or the superior mesenteric artery (SMA) is frequently detected during the workup of patients with abdominal symptoms. Imaging studies have demonstrated prevalence rates of up to 15% for isolated CA stenosis and of approximately 1% for isolated SMA stenosis in the asymptomatic general population[4-7] and even higher rates in patients with peripheral or coronary artery disease.[8] Isolated CA stenosis due to external compression by the median arcuate ligament (median arcuate ligament syndrome [MALS]) occurs in about 7% of the population.[5,9,10] However, single mesenteric artery stenosis rarely gives rise to symptoms because of the abundant collateral circulation of the splanchnic vascular bed. Symptoms of CMI, including postprandial pain, are nonspecific, and no single symptom can predict who will respond to revascularization.[11] Furthermore, the correlation between severity of abdominal symptoms, degree of stenosis, and number of affected mesenteric arteries is poor.[12-15]

The challenge is to identify the subset of patients with abdominal complaints due to mesenteric ischemia who might benefit from revascularization of a solitary mesenteric artery stenosis. Assessment of mucosal ischemia with a functional test, either gastric-jejunal tonometry or visible light spectroscopy (VLS), enhances the diagnostic accuracy for mesenteric ischemia.[12,13,16,17]

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In this study, we evaluated the long-term clinical success rates for single mesenteric artery revascularization of either the CA or SMA in patients with chronic gastrointestinal symptoms and confirmed mucosal ischemia.

METHODS

Study design and setting. Retrospective cohort analysis was conducted for all consecutive patients with gastrointestinal symptoms and an isolated atherosclerotic stenosis of either the CA or SMA who were referred to our tertiary referral center between January 2006 and October 2010 for a standardized diagnostic workup of CMI. This center is one of the two Dutch centers that perform functional tests to detect mucosal ischemia. During the inclusion period, a consensus diagnosis of CMI was established in approximately 50% of the 450 patients who underwent evaluation for suspected CMI.

Patients with a significant stenosis of the inferior mesenteric artery were excluded from this study, as were patients with MALS. The diagnosis of MALS was established if computed tomography angiography (CTA) demonstrated focal narrowing of the proximal CA ≥50% with post-stenotic dilation and indentation on the superior aspect of the CA, creating characteristic kinking in the absence of calcifications.[18] In unclear cases, additional catheter angiography of the CA in inspiration and expiration was performed.

Follow-up data were retrieved from the medical records in the context of routine clinical care. The medical research ethics committee of Erasmus University Medical Center approved that the Medical Research Involving Human Subjects Act does not apply to this study and that no informed consent was required according to the local directives for retrospective studies (MEC-2012-336). The study complies with the Declaration of Helsinki on research ethics. To enhance transparency, this article is written according to the Strengthening the Reporting of Observational Studies in Epidemiology checklist for cohort studies.[19]

Participants. All referred patients underwent a standardized diagnostic workup at baseline in our specialized CMI center. This included medical history and physical examination; imaging of the mesenteric arteries with CTA, magnetic resonance angiography (MRA), or conventional catheter angiography; and functional testing for mucosal ischemia detection with either 24-hour gastric-jejunal tonometry or VLS.[11,16,20-22] All patients also underwent upper endoscopy with standard biopsy of the duodenum, gastric corpus, and antrum to rule out *Helicobacter pylori* colonization and celiac disease. Psychiatric evaluation is not included in the routine diagnostic workup.

All referred cases were discussed in a multidisciplinary meeting attended by vascular surgeons, interventional radiologists, and gastroenterologists, all specialized in CMI, leading to an expert-based consensus diagnosis. The diagnosis of CMI was established if the following three criteria were met: (1) at least one of the following symptoms: postprandial abdominal pain, weight loss, or diarrhea; (2) significant stenosis (≥50% diameter reduction[23-26]) on CTA, MRA, or conventional catheter angiography of either the CA or SMA while the other two mesenteric arteries were patent; and (3) mucosal ischemia as determined by 24-hour gastric-jejunal tonometry or VLS. The 24-hour gastric-jejunal tonometry was considered to be positive for ischemia when three or more standard meals were followed by a pathologic response or when one or two pathologic responses after standard meals were combined with a median partial pressure of carbon dioxide (P_{CO_2}) >8.0 kPa between meals. A pathologic response was defined as P_{CO_2} >12.1 kPa for breakfast, >11.4 kPa for dinner, and >11.3 kPa for compound solution meals in the stomach and P_{CO_2} >12.0 kPa for breakfast, >13.6 kPa for dinner, and >10.6 kPa for compound solution meals in the jejunum.[21] VLS measurements were considered to be positive for ischemia when the mucosal oxygen saturation measurements were <63% in the antrum, <62% in the duodenal bulb, or <58% in the descending duodenum.[16]

Patients with a consensus diagnosis of CMI were treated with either surgical or endovascular revascularization. Patients with atherosclerotic single mesenteric artery stenosis were primarily treated with an endovascular intervention: percutaneous transluminal angioplasty (PTA) combined with bare-metal stent placement (Palmaz Blue; Cordis, Bridgewater, NJ) as part of standard care. The post-stenting medical regimen consisted of lifelong acetylsalicylic acid combined with clopidogrel for the first 12 months after the procedure. In-stent restenosis was initially treated with PTA or stent placement. Medical management of atherosclerotic risk factors consisted of antiplatelet drugs, statin treatment, and treatment of diabetes and hypertension if indicated; smokers were advised to quit smoking. Patients who were not eligible for endovascular intervention, including those with recurrent in-stent restenosis, were treated with mesenteric bypass surgery. Patients not meeting the criteria for the consensus diagnosis of CMI were discharged without further follow-up.

ARTICLE HIGHLIGHTS

- **Type of Research:** Single-institution retrospective cohort study
- **Take Home Message:** Symptom relief occurred in 73% of 59 patients with chronic mesenteric ischemia with revascularization of a single mesenteric artery lesion.
- **Recommendation:** The authors suggest that symptomatic patients with single-vessel mesenteric stenosis be considered for revascularization.