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Chronic Mesenteric Ischemia: Diagnosis and Management

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Abstract Chronic mesenteric ischemia (CMI) is the most common vascular disorder involving the intestines, however it is unusual in clinical practice. The redundancy of the visceral circulation with multiple interconnections between the superior mesenteric artery (SMA) and the inferior mesenteric artery (IMA) is the most likely explanation for the infrequent occurrence of CMI in clinical practice. Atherosclerosis is by the far the most common etiology of CMI. The increased utilization of diagnostic abdominal cross-sectional imaging has increased the recognition of atherosclerotic mesenteric stenoses. CMI is a clinical diagnosis, based upon symptoms and consistent anatomic findings. The classic setting for CMI is a female patient presenting with post-prandial abdominal discomfort that results in significant weight loss. Endovascular therapy with stenting has become the most common method chosen for revascularization having replaced open surgery with its associated morbidity and mortality. (Prog Cardiovasc Dis 2011;54:36-40)

Keywords: Chronic mesenteric ischemia; Mesenteric stenosis; Mesenteric artery disease; Revascularization; Visceral ischemia; Mesenteric stent

Chronic mesenteric ischemia (CMI) is the most common vascular disorder involving the intestines; however, it is unusual in clinical practice. Atherosclerosis is by the far the most common etiology of CMI, whereas other etiologies associated with this uncommon syndrome include fibromuscular dysplasia, Buerger disease, and aortic dissection. With increased utilization of cross-sectional imaging (magnetic resonance angiography [MRA], and computerized tomographic angiography [CTA]) of the abdomen, finding atherosclerotic disease of the aorta with associated aorto-ostial stenosis of the visceral vessels becomes a common occurrence and remains an infrequent clinical problem.

A population-based prevalence study of mesenteric artery stenosis of 553 healthy Medicare beneficiaries was performed using abdominal duplex ultrasonography to screen for evidence of mesenteric disease.[1] Severe (>50% diameter stenosis) stenosis of a mesenteric artery was detected in 17.5% of the total cohort, the great majority (>97%) of which were isolated to the celiac artery. There was no correlation with age, race, sex, or body mass index and the presence of mesenteric artery stenosis. Only 1.3% of the patients had involvement of more than one mesenteric artery.

Another natural history study reported on a group of 980 asymptomatic patients with mesenteric ischemia who were followed clinically.[2] Only 3 patients eventually developed symptoms, and they had severe stenosis of all 3 mesenteric vessels. The redundancy of the visceral circulation with multiple interconnections between the superior mesenteric artery (SMA) and the inferior mesenteric artery (IMA) is the most likely explanation for the infrequent occurrence of CMI in clinical practice.

Clinical presentation

Women present for treatment of CMI much more commonly (70%) than men. The classic symptom for

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Abbreviations and Acronyms
CMI = chronic mesenteric ischemia
CTA = computerized tomographic angiography
IMA = inferior mesenteric artery
MRA = magnetic resonance angiography
SMA = superior mesenteric artery

CMI is post–prandial abdominal discomfort that results in significant weight loss (Fig 1). The abdominal discomfort associated with eating causes patients to avoid food (food fear), and they typically lose weight. When a patient presents for consideration of CMI and has not had significant weight loss, consideration should be given to alternate diagnoses including functional bowel complaints. Patients with ischemic gastropathy may also present with atypical symptoms such as vomiting, diarrhea, constipation, ischemic colitis, and lower gastrointestinal bleeding. Most patients will have evidence of atherosclerosis in other vascular beds manifested by a history of myocardial infarction, stroke, or intermittent claudication.

Patients with atypical symptoms may be very difficult to diagnose, but a high degree of suspicion for CMI in patients with other manifestations of atherosclerosis and unexplained weight loss is appropriate. Often, the diagnosis is delayed in patients who are being evaluated for a possible malignancy as an explanation for their weight loss. Patients with functional bowel complaints rarely experience significant weight loss, which helps to differentiate them from patients with CMI. Evidence of significant obstruction of 2 or more of these vessels is often found when classic symptoms and endoscopy suggest bowel ischemia,[3] although single-vessel disease, usually of the SMA, has been described as a cause of symptomatic CMI, particularly if collateral connections have been disrupted by prior abdominal surgery.

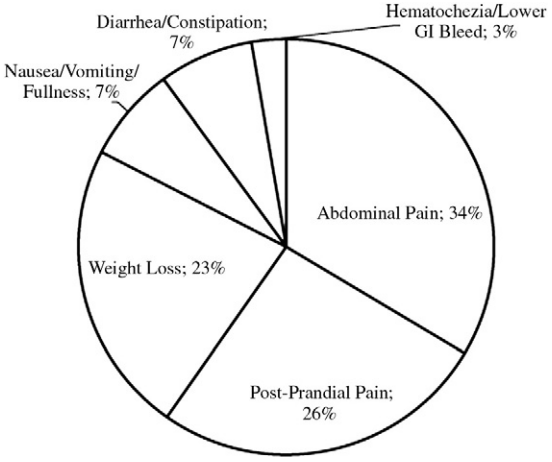

Fig 1. Initial clinical presentation of patients with CMI.[34]

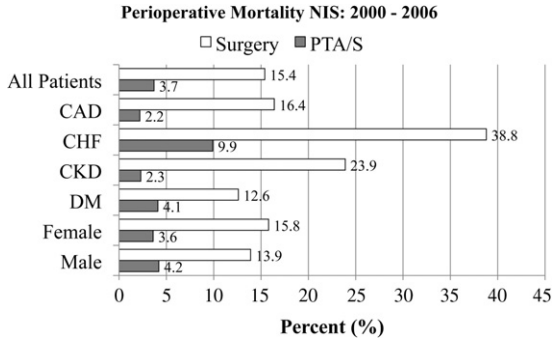

Fig 2. Bar graph of mortality rates for surgery and endovascular treatment of CMI taken from the National Inpatient Sample database.[7] PTA/S indicates percutaneous transluminal angioplasty or stent; CKD, chronic kidney disease; DM, diabetes mellitus.

Diagnosis

Chronic mesenteric ischemia is a clinical diagnosis based on symptoms and consistent anatomical findings. Patients in whom there is a high degree of clinical suspicion for CMI should undergo screening with duplex ultrasound imaging or noninvasive angiography with CTA and MRA to confirm their anatomy.

The ability to visualize the mesenteric vessels with duplex ultrasound may be technically challenging and requires a skilled and dedicated technologist. The reported accuracy of duplex imaging to identify significant stenoses of the celiac and superior mesenteric arteries approaches 90%.[4,5] With the relatively common application of CTA and MRA imaging for abdominal pathology, it is now possible to make the "anatomic" diagnosis without performing an invasive procedure.[6]

Invasive digital subtraction angiography is also very useful for diagnosis and allows the measurement of translesional pressure gradients in lesions of equivocal severity. Angiography requires a large field (15-in image intensifier) frontal view to visualize collateral vessels (ie, wandering [meandering] artery of Drummond) and a lateral

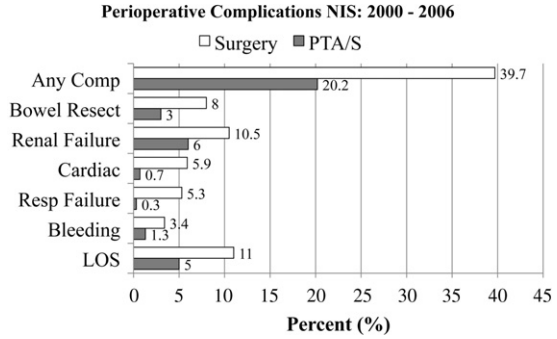

Fig 3. Bar graph of mortality rates for surgery and endovascular treatment of CMI taken from the National Inpatient Sample database.[7] LOS indicates length of stay.

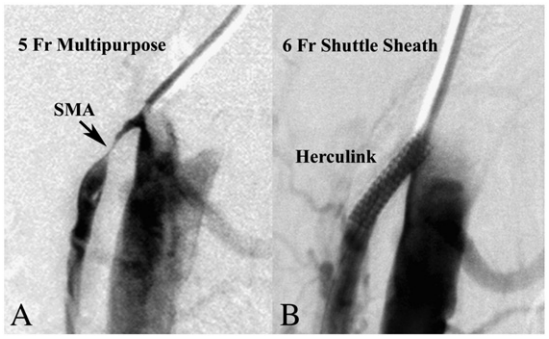

Fig 4. A, Baseline angiogram of tight proximal SMA stenosis with brachial artery access. B, Final angiogram after deployment of balloon expandable stent (Herculink; Abbott, Abbott Park, IL).

aortogram to visualize the ostia of the mesenteric arteries (Figs 2 and 3). Occasionally, an enlarged collateral vessel connecting a branch of the IMA with the SMA (arc of Riolan) is seen on the anterior-posterior aortogram and is an indication of proximal mesenteric artery disease. When critical stenoses (≥70%) in multiple arteries are found in symptomatic patients, revascularization is appropriate.

Treatment

Revascularization has traditionally been performed with open surgery for either endarterectomy or bypass grafting of the mesenteric vessels. However, this patient group has

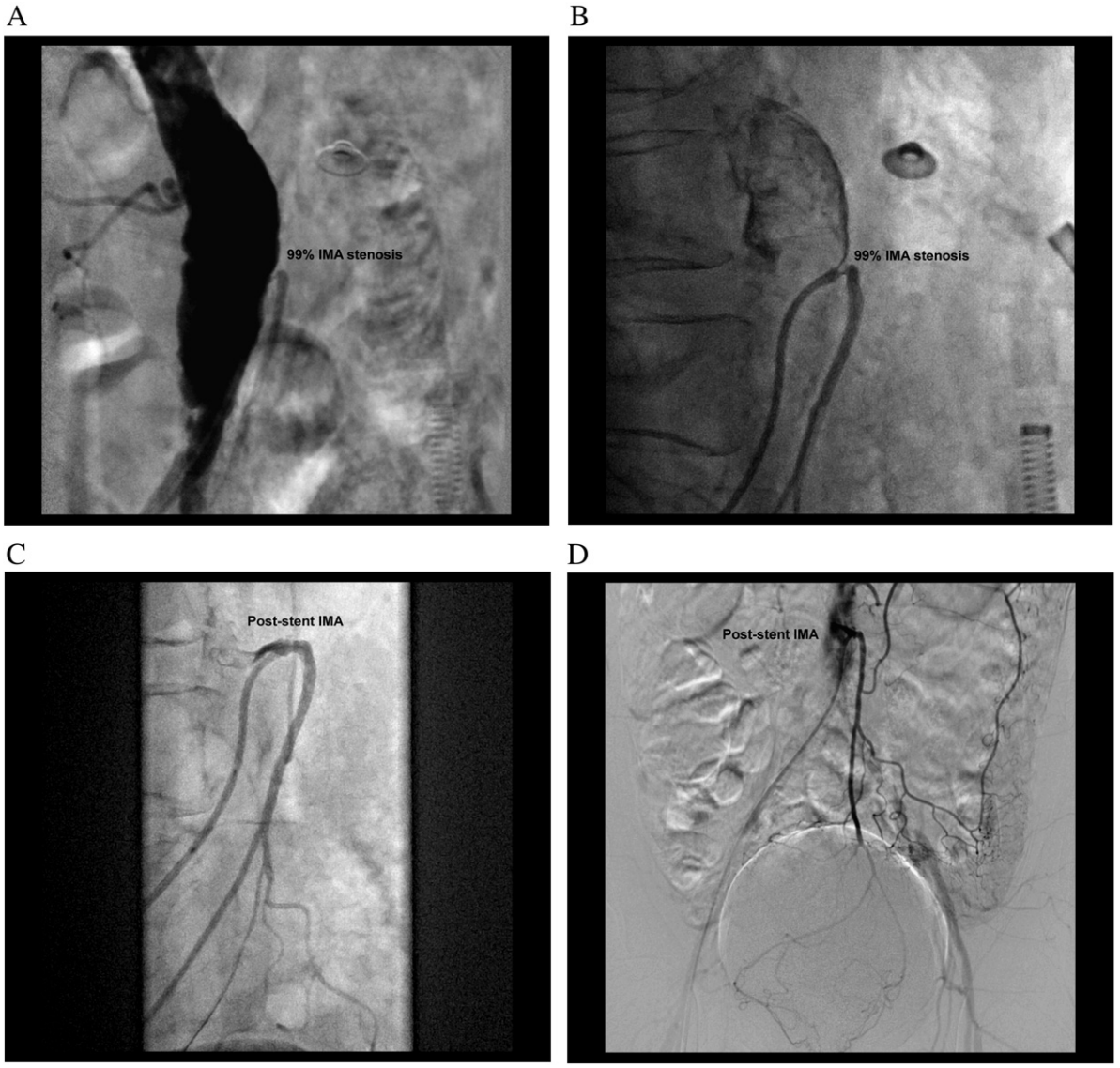

Fig 5. A, Baseline aortogram showing 99% stenosis of the IMA. B, Selective imaging of the IMA stenosis. C, Post–stent angiogram of the IMA. D, Aortogram after IMA stent placement.

Table 1
The Ochsner Clinic CMI experience[34]

Vessel Treated	n (%)
Celiac	45 (59%)
SMA	21 (28%)
IMA	8 (11%)
Common hepatic	1 (1.4%)
Vein graft	1 (1.4%)

a high incidence of underlying coronary artery disease, and the perioperative mortality ranges from 3.5% to 15% (Fig 2),[7-24] with the highest incidence of complications occurring in patients older than 70 years (Fig 3).[7,23]

Atherosclerotic aorto-ostial obstructions of the visceral vessels are very similar to those of the renal arteries, and the technical considerations for percutaneous transluminal angioplasty (PTA) with stent placement are similar to those for renal artery intervention (Figs 4 and 5). Analogous with renal interventions, stent placement offers a superior late patency compared with PTA alone. There is no reason to perform PTA alone on these predominantly ostial lesions, which suffer from significant recoil.[25] The endovascular approach does not require general anesthesia or the operative trauma associated with open surgery resulting in lower acute mortality and morbidity.[3,19,25-36]

Because of the infrequency of CMI, there are no clinical trials directly comparing surgery with endovascular treatment. The 20-year (1977-1997) Cleveland Clinic experience in 85 patients with CMI treated with surgery demonstrated an 8% perioperative mortality rate. One third of the patients had a major complication of surgery.[18] Advanced age, hypertension, coronary disease, and disease in other vascular beds correlated with surgical complications. At late follow-up, 23% (n = 18) had objective evidence of restenosis, 21% (n = 16) had recurrent CMI symptoms, and 12% (n = 9) underwent target vessel revascularization. Interestingly, the use of vein conduit as graft material was associated with poorer patency than Dacron as a graft material. The 5-year survival rate was 64% (95% confidence interval, 53%-75%), and the 3-year symptom-free survival rate was 81% (95% confidence interval, 72%-90%).

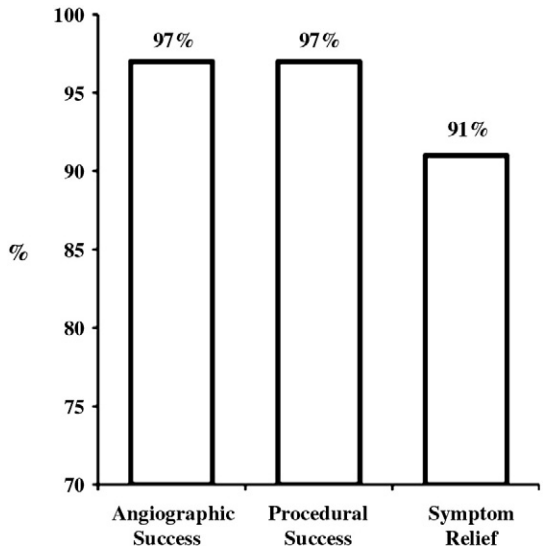

Fig 6. Bar graph showing Ochsner Clinic results of endovascular therapy for CMI.[34]

Data from Mayo Clinic on 229 consecutive patients with demonstrated a propensity for higher risk patients with multiple comorbidities to be referred for angioplasty with stenting, and lower risk patients tended to have open surgical repair.[37] They found that despite the lower risk status of the surgical patients, there remained greater morbidity and prolonged hospitalization rates compared with the endovascular group. The authors noted a higher restenosis rate for endovascular therapy, but there was no difference in secondary patency between surgery and stented patients.[37]

Our series of CMI patients from the Ochsner Medical Center includes 59 patients and 79 vessels treated percutaneously (Table 1).[34] The technical success rate was 96%, which yielded symptom relief in 88% of the patients (Fig 6). There was 1 perioperative death (1.7%) and 2 access site complications. At a mean follow-up of 38 ± 15 months, 17% of the patients had recurrence of their symptoms, but none developed acute mesenteric ischemia. All patients with recurrent symptoms underwent successful retreatment without complication. The in-stent restenosis rate at 14 ± 5 months with 90% of the vessels imaged by CTA, invasive angiography, or Duplex ultrasound was 29%. The rate of target vessel revascularization was 17%. The 5-year cumulative freedom from death, symptom-recurrence, or both was 72%, 79% and 57%, respectively.

Several recent studies have summarized noncontemporaneous comparisons of surgical therapy and catheter-based therapies for CMI patients.[37-41] These reports emphasize that complete surgical revascularization has benefits in terms of midterm patency, but generally at a cost of significant periprocedural morbidity and mortality for the patients. Endovascular approaches are generally preferred by patients, including those with severe comorbidities including cachexia and a hostile abdomen.[37]

Conclusion

The infrequent occurrence of CMI has made randomized control trials comparing treatment outcomes very difficult to perform. Case series have shown that percutaneous therapy with stent placement offers the lowest morbidity and roughly equivalent long-term outcomes when compared with surgery. The current treatment recommendation is that patients who are candidates for either surgery or percutaneous therapy should receive percutaneous therapy with stent placement.

Statement of Conflict of Interest

The author declares that there are no conflicts of interest.

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