Mesenteric ischemia

Ehab Sorial
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University of Kentucky
Dept of General/Vascular Surgery
Anatomy

- Gastroduodenal artery
- Posterosuperior pancreaticoduodenal artery
- Anterosuperior pancreaticoduodenal artery
- Middle colic artery
- Right colic artery
- Ileocolic artery
- Superior mesenteric artery
- Jejunal arterial branches
- Illeal arterial branches
Selective celiac artery injection - collateral to SMA via common hepatic artery and gastroduodenal artery
Anatomy

SMA & IMA collateral - Arc of Riolan & marginal artery of Drummond
Mesenteric ischemic syndromes

- Chronic
  - Atherosclerotic
  - Non-atherosclerotic

- Acute
  - Occlusive
    - Embolic
    - Thrombotic
  - Non-Occlusive
  - Mesenteric Venous Thrombosis
Chronic mesenteric ischemia

• Relatively Uncommon
• Usually 2-3 vessel disease
• Asymptomatic Mesenteric Stenosis 6-24%
• Unclear Asymptomatic Natural History
  4/15 with 3-vessel disease
  0/45 with 1-or 2-vessel disease

Thomas, et al. JVS, 1998
Chronic mesenteric ischemia

- Usually Women
- Younger
- Smokers
- 2/3 with Other Vascular Disease
  - Half with abdominal bruit
- Classic Symptoms
  - Post-prandial Pain
  - Weight Loss
  - Food Fear
  - GI ulceration
Diagnosis

• Clinical: “high index of suspicion”
• R/o other causes for atypical abdominal pain
• MRA
• CT Scan
• Biplanar Aortography
• Endoscopy
Diagnosis
Duplex

- SMA
  - PSV > 275 cm/s
  - EDV > 45 cm/s
- Celiac
  - PSV > 200 cm/s
  - EDV > 55 cm/s

Reverse Splenic/Hepatic flow
Controversies

- Optimal Reconstruction Method
- Completeness of Revascularization
- Optimal Graft Configuration
- Optimal Conduit
Antegrade vs Retrograde
Endarterectomy
Transperitoneal vs retroperitoneal
Medial visceral rotation
Medial visceral rotation
Revasc. one vs two vessels
Vein conduit
Combined aortic aneurysmal disease
Nutrition
“Elective Surgical treatment of Symptomatic chronic mesenteric occlusive disease: Early results and late outcomes”

Mateo, O’Hara, Hertzer, et al (Cleveland Clinic)


- 1977-1997
- 85 patients; avg. age 62y, 25 men and 60 women
- Abdominal pain-92%
- Weight loss-87%
- Food fear-18%
CLEVELAND SERIES 1977-1997

- 49 (58%) 3-Vessel Disease
- 32 (38%) 2-Vessel Disease
- 4 (5%) 1-Vessel Disease (SMA)
CLEVELAND SERIES 1977-1997

- Retrograde 34 (40%)
- Antegrade 24 (28%)
- TAE 19 (22%)
- Transarterial EA with Patch 6 (7%)
- Thrombectomy only 1 (1%)
- SMA Reimplantation 1 (1%)

*Complete in only 25%*
CLEVELAND SERIES 1977-1997

• No apparent difference in reconstruction method or conduit choice
• Serious Complications 33%
• Factors associated with M and M
  – Concomitant Aortic Replacement
  – Renal Dysfunction
  – Advanced Age
  – Complete Revascularization
CLEVELAND SERIES 1977-1997

- 5-Year Cumulative Survival 64%
- Postoperative mortality 8%
- 3-Year Cumulative Symptom-free 81%
- Recurrence in 21 patients
  - 3 early thromboses
  - 18 objective re-stenoses
- Recurrence-free survival 76% at 3 years
“Durability of Antegrade Synthetic Aortomesenteric Bypass for Chronic Mesenteric Ischemia”

Jimenez, Huber, Ozaki, et al (University of Florida)

- Primary patency 69%
- Primary-assisted 94%
- Secondary 100%
- 5-year survival 74%
- 11% In-house Mortaltiy
- 79% Went Home
“Current Results of Open Revascularization for Chronic Mesenteric Ischemia: A Standard for Comparison”

Chua et al (The Mayo Clinic)

- 98 patients (1989-1998)
- Abdominal Pain 97%
- Weight Loss 94%
- 93% BPG
  - 79% antegrade
  - 79% two-vessel
• 98 patients (1989-1998)

• In-house mortality 5.1%

• 5-year Symptomatic Relief 92%

• 5-year Survival 63% (worse > 70yo)
“Revascularization of the Superior Mesenteric Artery Alone for Treatment of Intestinal Ischemia”

Foley, Moneta, Abou-Zamzam et al (OHSU)  

- Primary-assisted 79%
- 5-year survival 61%
Acute mesenteric ischemia

- Relatively Uncommon
- Difficult Diagnosis
- High Complication Rate
- High Mortality Rate
  (69% in meta-analysis)
Clinical presentation

- Abdominal Pain: sudden severe diffuse
- Few physical exam findings early; peritoneal signs and acidosis late
- “Pain out of proportion to physical findings”
- “Half” with prior symptoms c/w CMI
Clinical presentation

• Vomiting-50%
• Diarrhea-33%

• Occult gastric/rectal blood-25%

• Labs: often normal early
  Leucocytosis & elevated lactate late
Etiology

- Mesenteric artery occlusion
  - 1/3 embolic
  - 1/3 thrombotic

- 1/3 Non-occlusive mesenteric ischemia

- Mesenteric venous thrombosis-rare
Diagnosis

• Clinical: “high index of suspicion”

• CT Scan

• Angiography
CTA

- SMA occlusion
- Signs of bowel ischemia
  - Bowel wall thickening
  - Bowel dilatation
  - Ileus
  - Pneumatosis intestinalis
Angiography

- Controversial
- Definitive but time-consuming
- Determining cause guides therapy; delineation of anatomy very helpful
- Use appropriately:
  - Clinical judgment
  - Benefit of percutaneous therapy?
Emboli

- Preferential to SMA
  - Usually lodges distal to middle colic
  - Spares proximal jejunum

- Underlying cardiac arrhythmias, MI or recent aortic catheterization (cholesterol)
Thrombosis

• Underlying atherosclerotic stenosis
  – History of prior postprandial pain/wt loss
  – Occurs at vessel origin with poor collaterals: Entire small bowel involved
Treatment

• Limited role for endovascular therapy
  – PTA/stenting
  – Thrombolysis

• Operative
  – Laparotomy
  – Revascularization
  – Determine viability
  – Second-look
Revascularization

• Difficult to predict reversibility of ischemia; hence, revascularization should precede resection

• If embolic thromboembolectomy

• If thrombotic bypass
Approach
Embolectomy
Embolectomy
Embolectomy
Embolectomy
Retrograde bypass
Contaminated field
Retrograde bypass
Non-contaminated field
Determine viability

- Inspection: color, pulses, peristalsis
- Hand-held doppler
- IV fluorescein
- Other:
  - infrared photoplethysmography
  - surface oximetry
  - laser doppler velocimetry
Second look Laparotomy

- Usually within 24 hours
- Decision to reoperate made at first operation, independent of early postoperative course
- “third-look” procedures may be necessary to check anastomoses or precarious segments
“Contemporary management of acute mesenteric ischemia: Factors associated with survival”

Park, Gloviczki, Cherry et al (Mayo Clinic)


- 1990-2000
- 58 patients
- embolic-28%
- thrombotic-64%
- non-occlusive-8%
Mayo series

- 95% - acute, severe abdominal pain
- 43% - prior symptoms of C.M.I.
- 81% - underwent angiography
Mayo series

- Revascularization- bypass most often usually single vessel
- 53% bowel resection at first operation
- 50% had second-look
- 50% second-look required bowel resections
Mayo series

- 30-day mortality- 32%
  - 31% embolism
  - 32% thrombosis
  - 80% non-occlusive
- Cumulative survival @ 90d= 59%,
  1 yr= 43%, 3 yrs= 32%
- 38% late deaths related to complications of A.M.I.
Conclusion

- High index of suspicion
- Rapid preoperative evaluation
- Revascularization with open surgical techniques
- Resection of non-viable bowel
- Liberal use of second-look
Conclusion

• Timely revascularization of symptomatic patients with C.M.I. Will hopefully reduce the incidence and subsequent high morbidity/mortality of A.M.I.
Intestinal Gangrene with patent arteries
- Low-flow states
- Drugs (i.e. digitalis)
- Hemodialysis
- Cardiopulmonary Bypass
- Cardiac (CHF, arrhythmias)
- Importance of underlying atherosclerotic disease?

Arteriography - “string of sausages”
Rx- treat cause
Papaverine via SMA 30-60mg/hr
- Explore for peritonitis
- Poor Outcomes
String of Sausages
MVT

- 20% Idiopathic
- Hypercoagulable States
- Low-flow (CHF, Cirrhosis with PH, Budd-Chiari)
- Intra-abdominal inflammatory or suppurative processes and malignancies
- Smoking, prior DVT or thrombosis
Diagnosis

• Plain Films
• CT
• Mesenteric Venography
Treatment

- Systemic Anticoagulation
- Exploration with resection of non-viable bowel for peritonitis; multiple look
- Poorly defined role for thrombectomy and operative thrombolysis
- Poor Outcomes
Median arcuate ligament syndrome

- Aka- Celiac Artery Compression Syndrome
- Etiology - Compression of CA by the median arcuate ligament.
- Female 20-40 years old
- Symptom - post-prandial epigastric abdominal pain
- Treatment - release the median arcuate ligament
Angio/CTA
Change in percentage of celiac artery stenosis between end expiration and end inspiration
Angioplasty
“Chronic Mesenteric Ischemia: Open Surgery Versus Percutaneous Angioplasty and Stenting”

Kasirajan, O’Hara, Gray, et al (Cleveland Clinic)

J Vasc Surg 2001;33:63-71

- 28 patients
- Fewer vessels with PCI
- Equivalent in early M and M and 3-year restenosis
- Higher Incidence of recurrent Symptoms
• 63 interventions in 29 patients with CMI
• Primary patency 1-year 70.1%
• Primary Assisted Patency 1-year 87.9%
• Major Complications 3.4%
• Minor Complications 10.3%
PTCA

• Viable option for chronic stenosis rather than for occlusion
• Equivalent early results to open
• Higher rate for re-intervention
• Higher incidence for recurrence of symptoms
• Used for low and high risk patients if lesion is amenable for angioplasty.
• Retrograde vs antegrade stenting during open SMA embolectomy for acute on chronic occlusion
Use sound judgment

Thank you