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Mesenteric Ischemia – Observe, Anticoagulate, or Surgery

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1

Conflict of Interest Disclosure

- We, Dr.'s Cohen and Lavingia, certify that, to the best of our knowledge, no affiliation or relationship of a financial nature with a commercial interest organization has significantly affected our views on the subject which is being presented.

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2

Learner Outcomes/Objectives

1. Define mesenteric ischemia

2. Understand both medical and surgical option may be standard of care

3. Recognize what lab values, diagnostic imaging, and other objective data are utilized to make a proper diagnosis.

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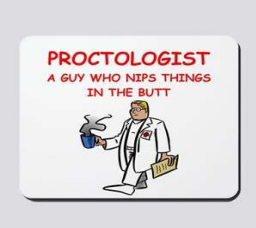
3

How It Started

- UCLA
- Boston University
- Cleveland Clinic Florida
- Private/Academic – 30 years



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4

Richmond VA Medical Center

VA HEALTH CARE

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5

Case #1

- 52 yo male – 1830 after eating Mexican food – ED (BMI 30)
- RLQ pain, hurt back at work, lifting 50 lbs
- No Nausea, vomiting or diarrhea
- + smoker HTN, CAD, PVD s/ CABG

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6

Case #1

- 195/106 98 HR afebrile SpO2 98% (no Beta blocker)

- Normal bowel sounds
- RLQ tenderness
- No rigidity, rebound, guarding, CVA tenderness

7

Case #1

- WBC 10.4 (58 Neutrophils)
- Electrolytes – Normal Serum C02 – 26
- LFT's – Normal
- Lipase – Normal

- CT scan – No contrast

8

Case #1

ABDOMEN/PELVIS:
Noncontrasted images of the liver show scattered linear collections of gas within the liver, primarily involving the medial segment caudate and posterior segments. These gas collections extend out into the periphery of the liver, raising concern for portal venous gas; however, this could also relate to pneumobilia. There are no signs of ischemic bowel or inflammatory process involving the bowel which would support that these gas collections are likely due to pneumobilia. Recommend followup ultrasound. Normal gallbladder, pancreas, spleen, adrenal glands and kidneys. No renal or ureteral calculus. No hydronephrosis. Atherosclerosis. No abdominal aortic aneurysm. Diverticulosis. No evidence of diverticulitis. Normal appendix. Small bowel loops are normal. No bowel obstruction. No adenopathy or ascites.

9

Case #1

RADIOLOGY:

CT URINARY CALCULI WO CONTRAST

Radiologist Impression: IMPRESSION:

1. Scattered linear collections of gas within the liver parenchyma, difficult to discern whether or not this is portal venous gas or pneumobilia. There is no evidence of bowel ischemia or inflammatory process within the abdomen. Recommend followup ultrasound to potentially differentiate.
2. Atherosclerosis.
3. Diverticulosis.

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Case #1

No improvement in pain with morphine
Pain mildly improved with toradol
Patient now states that his pain is worse with twisting and trying to sit up
Pain improved with valium
He is tolerating oral fluids
Follow up with PCP or return with any concerns or worsening of symptoms as outlined in discharge

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Case #1

- Call to General Surgeon
- Vitals on D/C 108/78 98 18 91%
- Pain scale 5/10 0213

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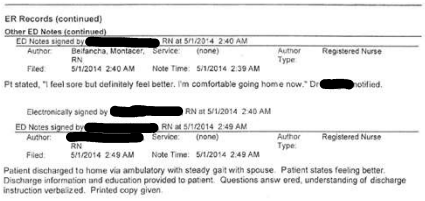
12

Case #1



ER Records (continued)

Other ED Notes (continued)

ED Notes signed by [redacted] RN at 5/1/2014 2:40 AM

Author: Bellancha, Montacer; RN | Service: (none) | Author Type: Registered Nurse

Filed: 5/1/2014 2:40 AM | Note Time: 5/1/2014 2:39 AM

Pt stated, "I feel sore but definitely feel better. I'm comfortable going home now." Dr [redacted] notified.

Electronically signed by [redacted] RN at 5/1/2014 2:40 AM

ED Notes signed by [redacted] RN at 5/1/2014 2:49 AM

Author: [redacted] RN | Service: (none) | Author Type: Registered Nurse

Filed: 5/1/2014 2:49 AM | Note Time: 5/1/2014 2:49 AM

Patient discharged to home via ambulatory with steady gait with spouse. Patient states feeling better. Discharge information and education provided to patient. Questions answ ered, understanding of discharge instruction verbalized. Printed copy given.

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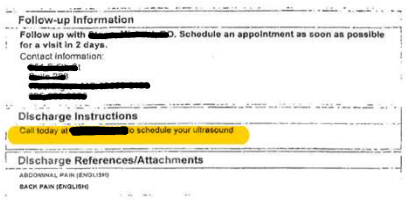
13

Case #1



Follow-up Information

Follow up with [redacted]O. Schedule an appointment as soon as possible for a visit in 2 days.

Contact information:

[redacted]

Discharge Instructions

Call today at [redacted]o schedule your ultrasound

Discharge References/Attachments

ABDOMINAL PAIN (ENGLISH)

BACK PAIN (ENGLISH)

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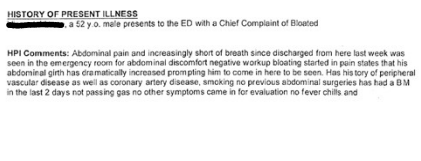
Case #1 - 3 DAYS LATER – NO F/U

- ED – Bloated, SOB, Nausea and Emesis today



HISTORY OF PRESENT ILLNESS

[redacted], a 52 y.o. male presents to the ED with a Chief Complaint of Bloated

HPI Comments: Abdominal pain and increasingly short of breath since discharged from here last week was seen in the emergency room for abdominal discomfort negative workup bloating started in pain states that his abdominal girth has dramatically increased prompting him to come in here to be seen. Has history of peripheral vascular disease as well as coronary artery disease, smoking no previous abdominal surgeries has had a B.M in the last 2 days not passing gas no other symptoms came in for evaluation no fever chills and

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Case #1

- Vitals 123/76 HR 120 16 94%
- Distention Tenderness Guarding No rebound
- Potassium 2.9 CO2 27 LFT's normal
- WBC 4.6 31 Bands Lactic Acid 1.8

16

Case #1

There is significant fluid and gaseous distention of the stomach and proximal several loops of the small intestine which measure up to 5 cm in diameter. There are some areas showing a possible pneumatosis in the left flank. There is no evidence of free intraperitoneal air to suggest perforation. There are a couple of short loops of normal caliber bowel distally at the terminal ileum. There is no gas in the portal venous system.
The kidneys, adrenal glands, spleen, gallbladder, pancreas and liver appear normal. There is no lymphadenopathy.
Pelvis:
The distal colon is collapsed. There is no free fluid mass or lymphadenopathy. There is no focal inflammatory process in the pelvis.
IMPRESSION
IMPRESSION:
Findings are concerning for small bowel obstruction. There are some areas showing question of pneumatosis, concerning for necrosis. However there is not much bowel wall thickening. Clinical correlation is needed. There is no evidence of perforation."

Impression:
1. Marked small bowel distention with some pneumatosis and a densely calcific aorta with plaques extending into the mesenteric vessels on CT scan

17

Case #1 – 3 Operations

- Surgery #1 - Exploratory Laparotomy – 6 cm TI/35 cm Colon
- Surgery #2 – 48 hour later 165 cm SB
- Surgery #3 - Jejunostomy/MF 130/140 cm small bowel remains

18

Mesenteric Ischemia

- 1. What happened
- 2. Was this preventable
- 3. Was there a Breach in the Standard of Care
- 4. Any Causation

19

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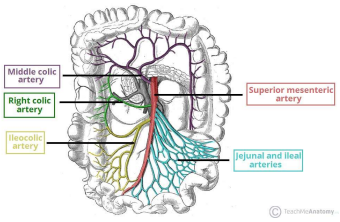
- University of Virginia
- Medical College of Virginia
- Eastern Virginia Medical School - Residency
- Stanford - Fellowship

20

Acute Mesenteric Ischemia

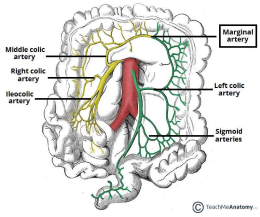
21

Superior Mesenteric Artery



22

Inferior Mesenteric Artery



23

Acute Mesenteric Ischemia (AMI)

- Inadequate blood flow in mesenteric vessels → ischemia and necrosis of bowel wall
- Infarction starts from the mucosa outward – bowel may appear normal during laparotomy
  - "pain out of proportion"
- 1/3 pts present w triad of abdominal pain, fever, and bloody stool
- Symptoms may be vague – nausea, vomiting, diarrhea, bloating, fever, rectal bleed

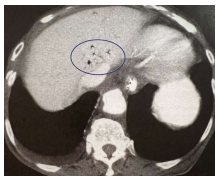
24

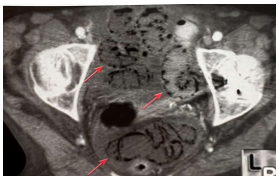
Presentation

- Peritonitis – poor prognostic indicator
  - **Transmural** ischemia leading to necrosis and perforation
  - >12 hours
- High index of suspicion and prompt diagnosis
- **Delay in diagnosis → higher mortality**

25

Late Imaging findings

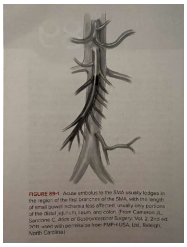


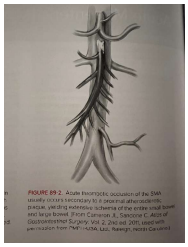


26

Types of AMI

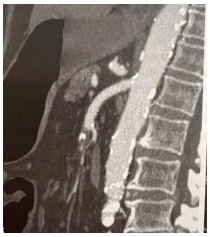
- Arterial embolic (50%)
  - SMA – narrow take off from aorta
  - Emboli lodge 3-10 cm from origin (beyond branch point of middle colic a)
  - sparing the proximal jejunum + colon
  - Valvular heart disease, atrial fibrillation, prior embolic events
- Arterial thrombotic (20%)
  - Poor prognosis – occurs more proximally in area of pre-existing atherosclerosis
  - Low flow state → occlusion at ostia → large territory of ischemia





27

Imaging



28

Types (cont.)

- Mesenteric venous thrombosis (10%)
  - Hypercoagulable states → factor V leiden, protein C or S deficiency
- Non-occlusive (NOMI) (20%)
  - High mortality
  - Comorbid conditions

29

Table 1. Different forms of acute mesenteric ischemia [10,11]

	Arterial occlusive		Venous occlusive	Nonocclusive (NOMI)
	Thrombosis	Embolism		
Diagnosis				
Medical history/ risk factors	Cardiovascular atherosclerotic disease Previous symptoms of chronic mesenteric ischemia	Atrial fibrillation; age >80 years; previous myocardial infarction, previous embolism	Previous DVT or PE Also in age <50 years	Critically ill patient, low cardiac output, severe vasoconstriction, vasopressor therapy
Onset/Symptoms	Insidious, progressive or sudden abdominal pain, vomiting, diarrhea and/or melaena	Sudden strong abdominal pain, vomiting, diarrhea and/or melaena	Insidious or progressive Usually milder symptoms compared with arterial occlusive disease	Insidious or sudden Nonspecific GI symptoms, abdominal distension, worsening of general condition
Vascular involvement	Coeliac trunk, SMA, IMA origins	Main stem or branches of SMA	Superior mesenteric vein	Systemic hypoperfusion Stenosis of SMA
Aggravating factors	No collaterals Previous surgery	Atheromatous arteries, synchronous embolism	Intra-abdominal hypertension	Insufficient resuscitation Surgery as first-line treatment in a patient without peritonitis Intra-abdominal hypertension
Organ dysfunction	After vascular occlusion leading to intestinal ischemic injury	After vascular occlusion leading to intestinal ischemic injury	After vascular occlusion leading to intestinal ischemic injury	Prior to visceral ischemic injury
Management				
Endovascular revascularization	Local thrombolysis, thrombo-aspiration, mechanical thrombectomy, stenting	Local thrombolysis, thromboaspiration	Percutaneous trans-hepatic or transjugular thromboaspiration, thrombectomy and thrombolysis	Intra-arterial vasodilation, balloon-dilatation or stenting of SMA stenosis
Surgical revascularization	Endarterectomy, bypass, arterial reimplantation, hybrid revascularization (open abdomen, exposure of the SMA and reconalization and stenting)	Embolectomy	Thrombectomy	
Visceral surgery	Evaluation of viability of bowels with bowel resections as needed. Damage control surgery with open abdomen and NPWT			
Anticoagulation	Low-dose anticoagulation during hospital stay, then standard-dose antiplatelet therapy	Full anticoagulation	Full anticoagulation	?

30

Non-Occlusive (NOMI)

- 20-30% of all cases of AMI
- Mortality - 50%
- In shock state blood flow is redistributed to vital organs → mesenteric arteries vasoconstriction
- Heart failure, hypotension, hypovolemia, sepsis, and abdominal compartment syndrome
- Limited surgical therapy (unlike occlusive)
  - Endovascular stenting if hemodynamically significant SMA stenosis.

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NOMI

- Mesenteric vasospasm persists even after correction of the precipitating event.
- May respond to direct intra-arterial vasodilator therapy
- Autopsy study - 25/62 patients with fatal NOMI, SMA stenosis was present

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Treatment

- IVF resuscitation > vasopressors
- Broad spectrum ABX
- If arterial occlusive disease → anticoagulation

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AMI Surgical principles

- Laparotomy and resect necrotic/perforated bowel
- Open revascularization vs endovascular approaches

34

Case #2

- 49 yo Female – PCP for recurrent bouts of abdominal pain
- + vomiting + diarrhea
- GI referral UGI/SBF and Colonsocopy – ALL normal

35

Case #2

- Pain continued – writhing on floor, unrelieved by opioids
- Weight 100 pounds down to 65 pounds
- Over 6 month period 3 PCP evaluations/ED visits every 6-8 weeks
- At each ED visit, routine laboratory tests, including a complete blood count, liver function tests, urinalysis, and amylase and lipase, were normal. No imaging was performed

36

Case #2

- Second GI made the suggestion to PCP/Endocrinologist/partner (GI)
- Final ED visit – consulted a surgeon
- Mesenteric angiogram + ischemia with gangrene
- Surgery for near-total enterectomy, post op infections, sepsis death in 3 months

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Chronic Mesenteric Ischemia

- "Intestinal Angina"
  - Prevalence: less than 5% of intestinal ischemia
    - Risk factors: coronary or peripheral vascular
      - 75% of pts with CMI have h/o smoking

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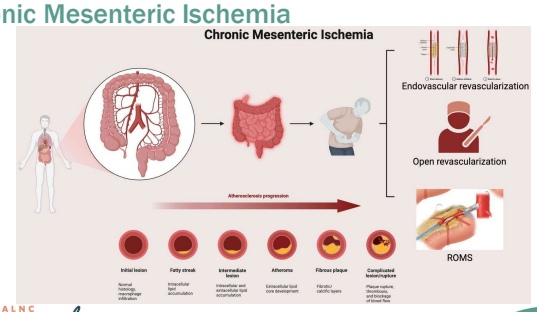
38

Chronic Mesenteric Ischemia



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39

Chronic Mesenteric Ischemia – Management Options

- Surgical Revascularization vs PTA (percutaneous Surgical Revascularization vs PTA (percutaneous transluminal angioplasty)
  - Literature with varied criteria to define outcomes
  - Initial success at revascularization similar
  - Open Surgical approach – bypass grafts, aortic reimplantation of SMA, SMA endarterectomy
    - improved duration of graft patency but increased perioperative mortality

PTA with decreased perioperative mortality but increased recurrence of symptoms and stenosis. Stenting improves recurrence of symptoms and stenosis. Stenting improves these outcomes.

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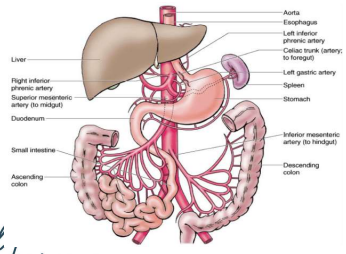
Acute/Chronic Mesenteric Ischemia Lessons



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1. Failure to Diagnose Bowel Ischemia

Bowel ischemia misdiagnosis is a common form of medical malpractice that can result in serious harm to the patient.

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2. Symptoms Can be Misleading

Abdominal pain, nausea, and vomiting, can often be mistaken for less serious conditions, such as indigestion or a gastrointestinal virus.

As a result, healthcare providers may not take the patient's symptoms seriously and may not order the necessary diagnostic tests to identify bowel ischemia.

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3. Delayed diagnosis = Serious Harm

Requires prompt treatment to avoid serious harm to the patient. A delay in diagnosis can result in the progression of the condition and can lead to serious complications, such as *perforation, infection, sepsis, and bowel obstruction.*

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4. Failure to order Appropriate Diagnostic Tests

- To diagnose bowel ischemia, healthcare providers should order appropriate diagnostic tests, such as imaging studies, blood tests, and other diagnostic tests, as needed. If the healthcare provider fails to order these tests, they may not be able to accurately diagnose the condition, leading to a misdiagnosis.

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5. Failure to Properly Interpret Test Results

If the healthcare provider does order appropriate diagnostic tests, they must also properly interpret the results. If the results are misinterpreted or ignored, the healthcare provider may not diagnose the patient with bowel ischemia, even if the test results indicate the presence of the condition.

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6. Miscommunication Between Providers

In some cases, bowel ischemia misdiagnosis can occur due to miscommunication between healthcare providers. For example, if the patient sees multiple healthcare providers, the information about their symptoms and test results may not be properly shared or communicated between providers, leading to a misdiagnosis.

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47

Thank You

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48

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49