“That Distended Belly”

Surgical Issues in the ICU Setting

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Granulation bed on a chronically open abdomen

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Surgical Considerations in the ICU Setting

Acute necrotizing pancreatitis

Acute Mesenteric Ischemia

Intra Abdominal Hypertension and Abdominal Compartment Syndrome

45 yo male presents with epigastric pain

Symptoms for 8 hours, radiates to his back

No fever or chills, but having nausea/vomiting

Had fish and chips about 2 hours before pain started

Drinks 6-12 beers every weekend

BMI 35

No other medical issues

HR 135 BP 110/65 RR 22 T 37.8

Abdomen tender across upper abdomen, slightly distended

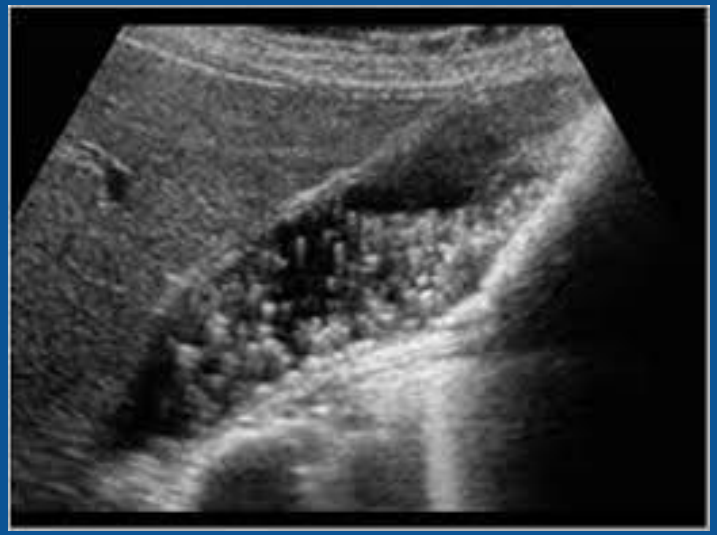
Wbc 15K, Hct 49

Na 133 K 4.0 Ca 7.5 BUN 33 Cr 1.1

Bili 1.5 Alk Phos 145 lipase 2000

Receives 2 liters LR in ED -
HR still 120 BP 115/70

IVF at 200 ml/hr



Gallstones
Mildly dilated common bile duct.
Normal intrahepatic ducts.

HD 2

HR 120s BP 100/60 RR 28 T 37.8 SaO2 94% on 6L O2

Fluids + 5 liters, UOP 25 ml/hr

Wbc 16, Hct 40, bili 2.5, lipase 1800, BUN 35, Creat 1.9

Abdomen increasing distension, tender epigastrium

What do we do now?

Acute Necrotizing Pancreatitis

Classification

Atlanta Criteria - interstitial edematous or acute necrotizing

Severity

Mild acute - no organ failure or local/systemic complications

Moderately severe - transient organ failure <48hr or local complications

Severe - persistent organ >48hr in one or more organs

Acute Necrotizing Pancreatitis - Clinical Predictors

Morbid Obesity

Rapid progression of symptoms

Hemoconcentration or rising Hct

Rising BUN/creatinine

Pleural effusion or infiltrates in first 24 hrs

SIRS on admit and persisting at 48 hrs

Acute Necrotizing Pancreatitis - Diagnosis

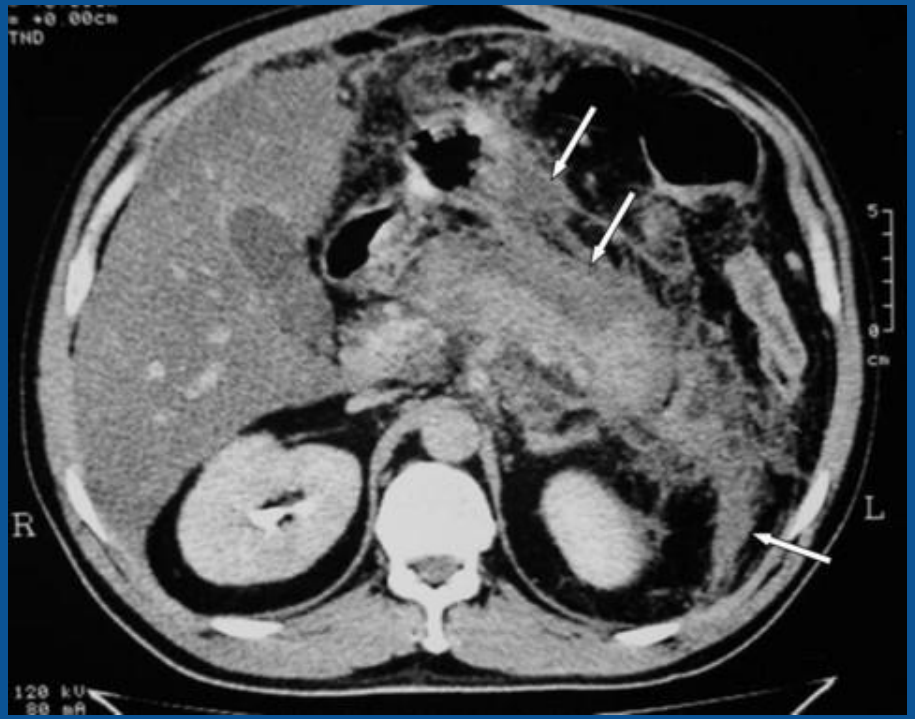
Presenting symptoms

Elevated lipase/amylase

CT not necessary initially unless diagnosis is in question

CT best done with IV contrast (pancreas protocol) at minimum 72-96 hrs after onset of symptoms to best determine severity of pancreatitis

CT imaging of the pancreas



Acute Necrotizing Pancreatitis - Early Management

Fluid resuscitation - limit to 4 liters in first 24 hours

Judicious use of inotropes

Monitor for intraabdominal hypertension in ventilated patients

No antibiotics for prophylaxis

Early enteral feeding

Acute Necrotizing Pancreatitis - Late Management

Use CT and clinical findings to determine infected necrosis (air in tissue)

Wait 3-4 weeks if possible before intervention to allow necrosis to “wall off”

No intervention for 6-8 weeks if sterile, and then only if symptoms

Percutaneous or endoscopic drainage preferred over surgical

Drainage procedure if infection and persistent organ failure

Delayed cholecystectomy if gallstones

Air in necrotic pancreatic fluid collection

Laparoscopic view of infected pancreatic necrosis

73 yo female with acute onset abdominal pain

POD 4 urgent CABG

IABP needed to get off pump, removed on POD 2

Started diet POD 3, felt ok initially

Associated with nausea and vomiting

Transient hypotension associated with pain, improved with fluid challenge, but now recurring.

Acute Mesenteric Ischemia

Embolic or thrombotic mesenteric arterial occlusion

Nonocclusive mesenteric ischemia

Mesenteric venous thrombosis

The intraoperative finding that all surgeons dread

Mesenteric Arterial Thrombosis & Embolism

Sudden pain out of proportion to exam is hallmark sign

Thrombosis seen in patient with peripheral arterial disease

- May have signs of chronic mesenteric ischemia

Embolism seen in older patients with atrial fibrillation

- May also be seen in patients with recent arterial intervention

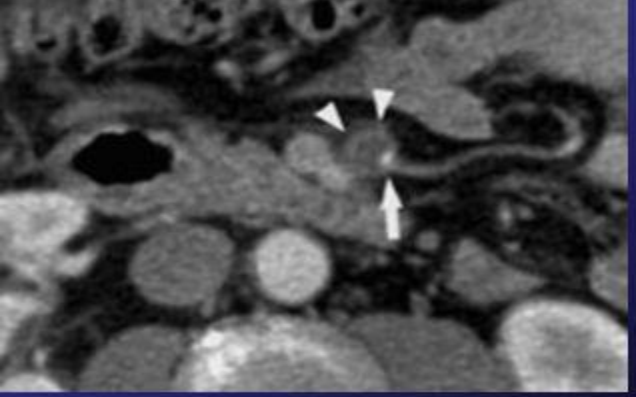
Mesenteric Arterial Thrombosis

Patient with peritonitis -> immediate laparotomy

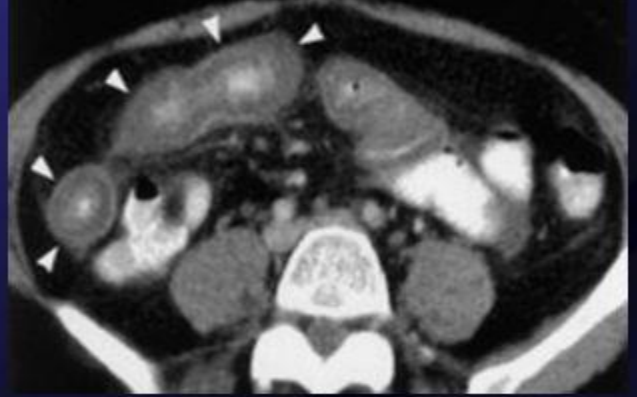
Stable patients without peritonitis -> CT angio

Open bypass v endoscopic stenting

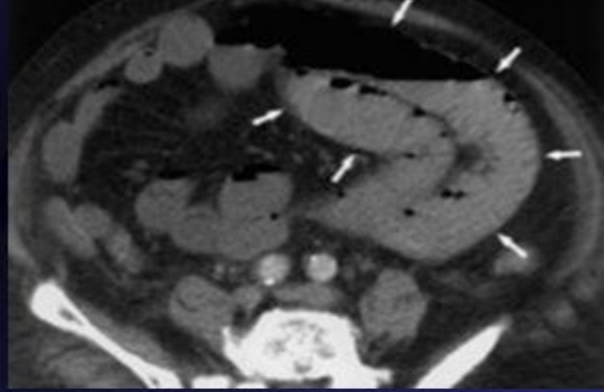
- Thrombolytic therapy
- Heparin gtt in ICU, ASA, plavix for stents
- Low threshold for exploration if any clinical deterioration



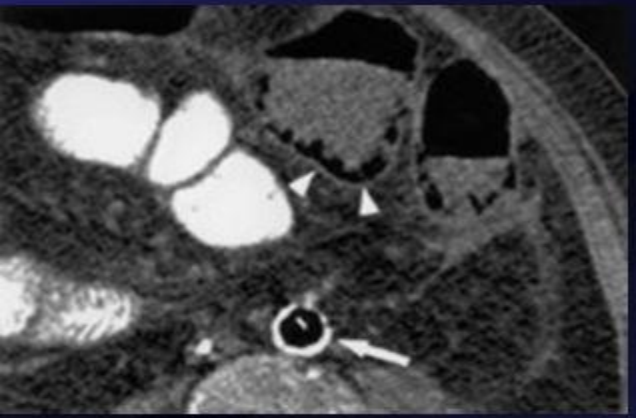
SMA thrombus



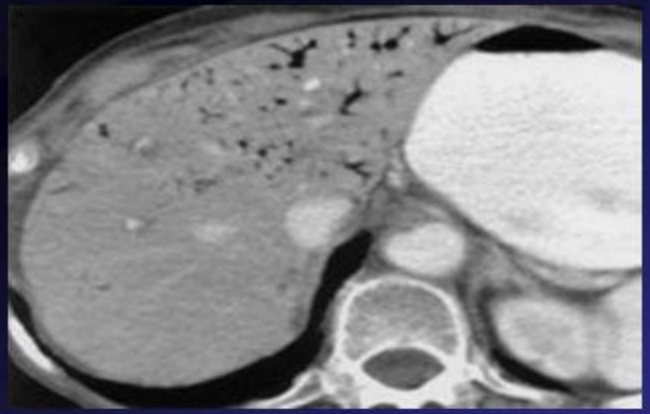
Bowel wall thickening



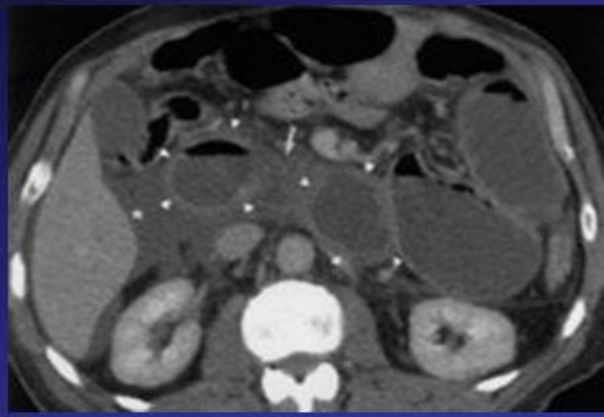
Non-enhanced bowel wall



Pneumatosis intestinalis



Portal venous gas



Fluid collection

Wiesner W, et al. *Radiology* 2003;226:635-50

Nonocclusive Mesenteric Ischemia

Decreased blood flow to mesenteric arteries

Intestine can compensate for a 75% reduction in flow for up to 12 hours

Risk factors

- Heart failure/cardiogenic shock
- Aortic insufficiency
- Vasoconstrictive agents including pressors and cocaine
- Recent cardiopulmonary bypass
- dialysis

Nonocclusive Mesenteric Ischemia - Diagnosis

More variable presentation, not necessarily acute pain

Patients are already ill and may be intubated/sedated

Early exam may show only mild distension and tenderness

Plain films unremarkable until significant ischemia present

CT may show bowel wall thickening/pneumatosis, but early may be fairly normal

Nonocclusive Mesenteric Ischemia - Treatment

Improve blood flow to intestines

Treat heart failure, decrease vasoconstrictors, fluid resuscitation

NG tube, prophylactic antibiotics

Anticoagulation not well studied

Directed vasodilator infusion

Exploratory laparotomy, especially if underlying cause can’t be reversed or clinical deterioration

39 yo female with constant abdominal pain

Symptoms for 4 days, dull but constant

abdominal pain, nausea and anorexia

Loose stools without blood

Uses OCPs

No prior abdominal surgeries

FH DVT

Mesenteric Vein Thrombosis

Reduces perfusion due to increased venous pressure, bowel wall edema, and eventually leading to arterial insufficiency

Sequestration of fluid in bowel lumen in addition to bowel wall edema

- Hypotension
- decreased splanchnic circulation
- exacerbates ischemia

Mesenteric Vein Thrombosis

Risk Factors

- Abdominal mass/pseudocyst causing venous obstruction
- Abdominal inflammatory process (pancreatitis, diverticulitis, IBD)
- Portal hypertension
- Myeloproliferative disorders
- Acquired thrombophilia (malignancy, OCP)
- Inherited thrombophilia (Factor V Leiden, protein S/C or antithrombin III def)
- Mesenteric adenopathy/viral infection
- Personal or family history of venous thromboembolism

Acute Mesenteric Vein Thrombosis

Slower onset of symptoms than arterial thrombosis

- 75% have symptoms for over 2 days before presentation

Diagnosis with CT v MRI v angiography

- Fairly accurate with SMV and PV thrombus
- Less accurate with smaller vessels
- CT easiest to obtain and shows bowel ischemia if present

Treatment with anticoagulation, sometimes thrombolytics. Monitor for abdominal distension/IAH

35 yo male with perforated appendicitis with diffuse peritonitis. Sepsis criteria.

Undergoes laparoscopic appendectomy, notes purulent fluid in abdomen

IV antibiotics, IVF, postop mild abdominal distension.

Started enteral feeding per feeding tube.

Next day, BP 100/60, slowly diminishing UOP and rising creatinine

RR 22, SaO2 93% on 4L O2

Bladder pressure 18

Abdominal Compartment Syndrome - Risk Factors

Trauma and Burns - hypovolemic shock

Postop abdominal surgery - liver transplant, septic shock

Retroperitoneal bleeding - AAA, hematomas

Medical conditions requiring fluid resuscitation - sepsis/pancreatitis

Consider in any patient that requires large volume resuscitation!

Intra Abdominal Hypertension

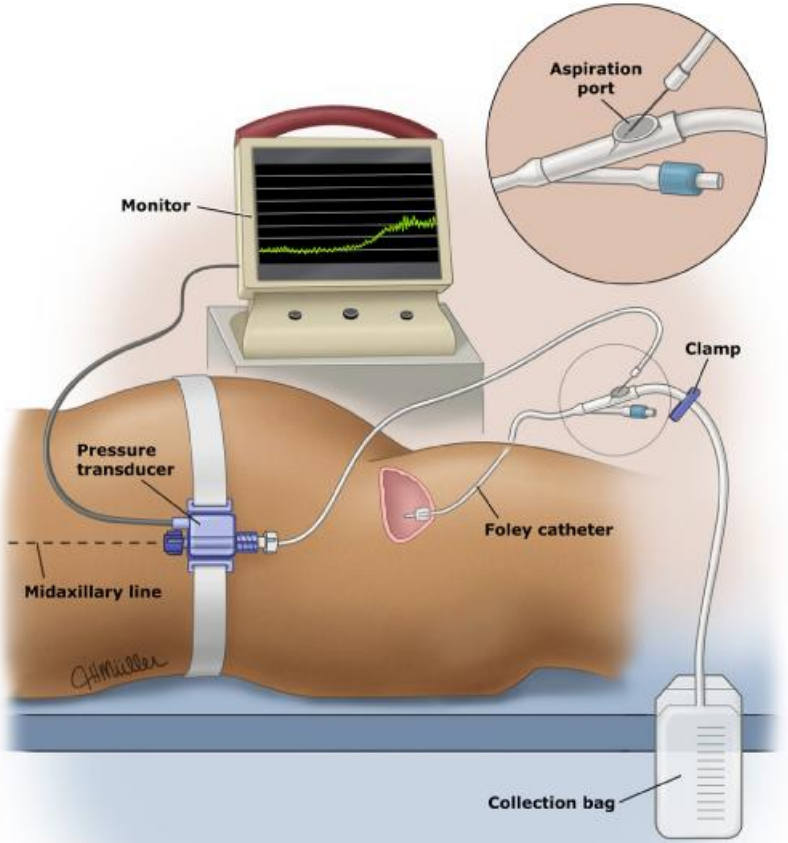
Two measurements to consider

- Intraabdominal pressure (IAP)
- Abdominal perfusion pressure (APP)
- APP = MAP - IAP likely more important than IAP only

IAP > 12 is considered IAH

Abdominal Compartment Syndrome (ACS) = prolonged IAP > 20 associated with new organ dysfunction

APP of at least 60 associated with improved outcomes



1. Clamp the drainage tube of the Foley (bladder) catheter.

2. Instill up to 60 cc sterile saline into the bladder via the aspiration port of the Foley catheter. Be certain the catheter is filled with fluid.

3. Attach a pressure transducer to an 18-gauge needle, and insert into the aspiration port. With some newer-style Foley catheters, a needle-less connection system can be used.

4. Zero the transducer at the level of the midaxillary line.

5. With the patient in the supine position, ensure that abdominal muscle contractions are absent, and measure the bladder pressure at end-expiration.

Consequences of ACS

CV - decreased CO, decreased venous return

Resp - increased PIP, MAP, and barotrauma

Renal - renal vein compression; ATN from decreased CO

GI - hypoperfusion leads to break in mucosal barrier, gut ischemia

Hepatic - reduced function = unable to process lactate

CNS - ICP increased with IAP

Abdominal Compartment Syndrome

NG tube and rectal tube if distension present

Paracentesis can be temporizing maneuver

Patient positioning - HOB flat

Inotropes for BP support (raises MAP which incr APP)

Ventilator adjustments

Pain control/sedation and chemical paralysis

Abdominal decompression

Managing the Open Abdomen

Monitor in ICU, usually on a ventilator, but spontaneous breathing ok

Sedation ok, keep RAS -2 to 0

Watch too much IVF - leads to edema and difficulty closing

Fluid loss = protein loss

Change dressing and try to close fascia ever 2-3 days

No studies to help guide when to give up on primary closure and do alternative closure - high risk of hernia formation

Enteral nutrition ok, if APP above 60


Photo Courtesy of Richard J. Fantus, MD, FACS

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Thank you