Case Conference

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Discussion

Mesenteric Ischemia

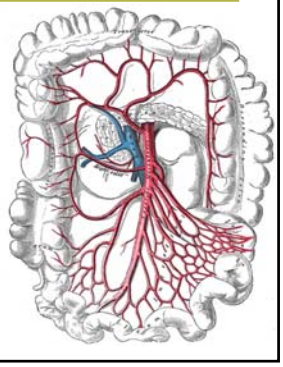
- Acute mesenteric ischemia: sudden onset of intestinal hypoperfusion
  - Superior mesenteric artery embolism (50 %)
  - Superior mesenteric artery thrombosis (15 to 25 %)
  - Mesenteric venous thrombosis (5 %)
  - Nonocclusive ischemia (20 to 30 %)
- Chronic mesenteric ischemia: episodic or constant intestinal hypoperfusion (intestinal angina)

Anatomy of SMA

- **Branch Supplies:**
  - inferior pancreaticoduodenal artery: head of the pancreas and to the descending and inferior parts of the duodenum
  - middle colic artery: to the transverse colon
  - right colic artery: to ascending colon
  - intestinal arteries: branches to ileum, branches to jejunum
  - ileocolic: last part of ileum, cecum, and appendix

Collateral circulation of SMA

- The celiac axis and the SMA
  - through the junction of the superior and inferior pancreaticoduodenal arteries
- The SMA and IMA
  - The middle colic and left colic arteries ➔ anastomose through the marginal artery of Drummond



Mesenteric Arterial Emboism

- SMA is most susceptible to embolism
  - large caliber
    - IMA had small caliber, 較少embolus進入
  - narrow take-off angle
  - The embolus usually lodges 3 to 10 cm distal to the origin of the SMA
    - 通常在 the middle colic artery 之後

Risk Factor of Acute Mesenteric Embolism

- Coronary artery disease
  - Post-myocardial infarction mural thrombi
  - Congestive heart failure
- Valvular heart disease
  - Rheumatic mitral valve disease
  - Nonbacterial endocarditis
- Arrhythmias
  - Chronic atrial fibrillation
- Aortic aneurysms or dissections
- Coronary angiography

Mesenteric Arterial Thrombosis

- The origin of SMA is the most common site for thrombus formation.
  - Greater visceral damage and poor prognosis
- Acute mesenteric thrombosis
  - a superimposed phenomenon in patients with a history of chronic intestinal ischemia from progressive atherosclerotic stenoses
    - Hint: abdominal angina or abdominal pain after meals

Mesenteric Venous Thrombosis

- Least common cause of acute mesenteric ischemia
- Mortality: 20 ~ 50%
- Risk factor:
  - hypercoagulable states
  - portal hypertension
  - Inflammatory disease: pancreatitis, diverticulitis
  - blunt abdominal trauma
  - malignancy in the portal region.

Nonocclusive Mesenteric Ischemia

- splanchnic hypoperfusion and vasoconstriction
- Risk factor:
  - Cardiovascular disease leading to low-flow states
    - CHF, arrhythmias, cardiogenic shock, post-cardiopulmonary bypass
  - Preceding hypotensive episode
    - Septic shock
  - Drug-induced splanchnic vasoconstriction
    - Digoxin, vasopressors, ergo alkaloid poisoning, cocaine abuse

Clincal Features

- History:
  - > 50 years with risk factor
  - Sudden onset of severe abdominal pain
    - Severe, poorly localized, colicky abdominal pain
  - Duration > 2 hours
  - History of abdominal angina
- Physical examination:
  - Abdominal distention
  - Palpation reveals diffuse abdominal tenderness without guarding
  - Transmural intestinal injury → peritoneal sign

Laboratory - I

- Nonspecific
  - leukocytosis with a predominance of immature white blood cells
  - elevated hematocrit consistent with hemoconcentration
  - Metabolic acidosis
- A useful clinical guideline is that any patient with acute abdominal pain and metabolic acidosis has intestinal ischemia until proven otherwise.

Laboratory - II

- Normal D-dimer levels may help to exclude acute intestinal ischemia.
  - 但是對於診斷acute mesenteric ischemia沒有幫助。

D-Dimer in patients with suspected acute mesenteric ischemia
American Journal of Emergency Medicine (2009) 27, 975–979

- More specific marker?
  - cobalt-albumin binding assay (CABA)
    - 12 p't was diagnosed with acute mesenteric ischemia (total 26 p't under laparotomy) → high CABA level
  - Ischemia-modified albumin (IMA)
    - 7 p't had SMA occlusion vs. control (P=.003)

Ischemia-modified albumin in the diagnosis of acute mesenteric ischemia: a preliminary study
American Journal of Emergency Medicine (2008) 26, 202–205

TABLE 1: Clinical Features and Typical CT Findings of Mesenteric Ischemia in Various Conditions

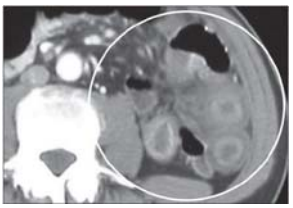
Characteristic	Arterial Occlusion	Venous Occlusion	Strangulation	Nonocclusion
Incidence	60–70% of PMI	5–10% of PMI	10% of SBO	20% of PMI
Presentation	Acute	Subacute	Acute	Acute or subacute
Risk factors	Arrhythmia, myocardial infarction, valve disease, atherosclerosis[a], prolonged hypotension[a]	Portal hypertension, venous hypercoagulopathy, right-sided heart failure	Previous abdominal surgery, internal and external hernia, intestinal malrotation	Hypovolemia, hypotension, low cardiac output, digoxin, α-adrenergic agonists
Bowel wall	Thinning, no change, or thickening with reperfusion	Thickening	Thickening	No change or thickening with reperfusion
Attenuation of bowel wall on unenhanced CT	Not characteristic	Low with edema; high with hemorrhage	Low with edema; high with hemorrhage	Not characteristic
Enhancement of bowel wall on contrast-enhanced CT	Diminished, absent, target appearance or high with reperfusion	Diminished, absent, target appearance, or increased	Diminished, absent, target appearance, or increased	Diminished, absent, heterogeneous in distribution
Bowel dilatation	Not apparent	Moderate to prominent	Prominent (filled with fluid)	Not apparent
Mesenteric vessels	Defect or defects in arteries, arterial occlusion, SMA > SMV in diameter	Defect or defects in veins, venous engorgement	No defect, venous engorgement	No defect, arterial constriction
Mesentery	Not hazy until mesenteric infarction occurs	Hazy with ascites	Hazy with ascites, "whirl sign" [44], or "spoke wheel sign" [45]	Not hazy until mesenteric infarction occurs

Note—PMI = primary mesenteric ischemia (i.e., arterial or venous occlusive or nonocclusive bowel ischemia), SBO = small-bowel obstruction, SMA = superior mesenteric artery, SMV = superior mesenteric vein.
[a]A risk factor for thrombosis.

CT Diagnosis of Acute Mesenteric Ischemia from Various Causes
***AJR* 2009; 192:408–416**

CT of SMA occlusion

Bowel loops are distended with air and their wall is "paper-thin."



Reperfusion→ Mural thickening of intestine is visible, showing target appearance

CT Diagnosis of Acute Mesenteric Ischemia from Various Causes
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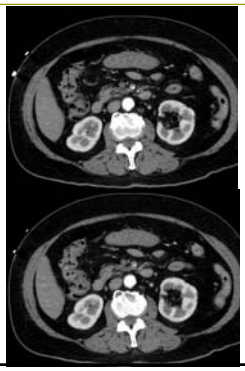
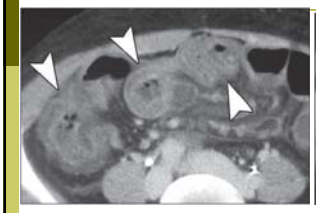
Our patient



CT of SMV thrombosis



Wall thickening of ascending and transverse colon

defect in superior mesenteric vein

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Treatment of acute mesenteric embolism

- early surgical laparotomy with embolectomy
  - the small bowel is carefully examined→ persistent ischemia→be resected
  - A "second-look" laparotomy within the next 24 to 48 hours may be necessary to resect additional ischemic or gangrenous bowel.
- thrombolytic therapy:
  - undergo angiography within eight hours of the onset of abdominal pain and who do not have clinical evidence of bowel infarction or other contraindications to thrombolytic therapy