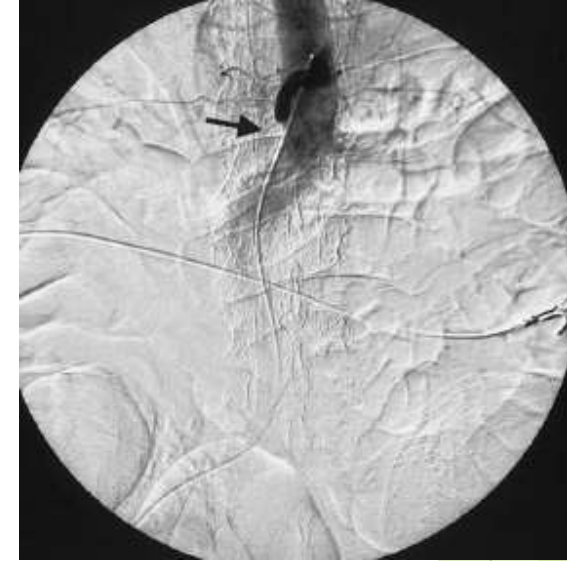


An Account of:

Acute Mesenteric Ischemia



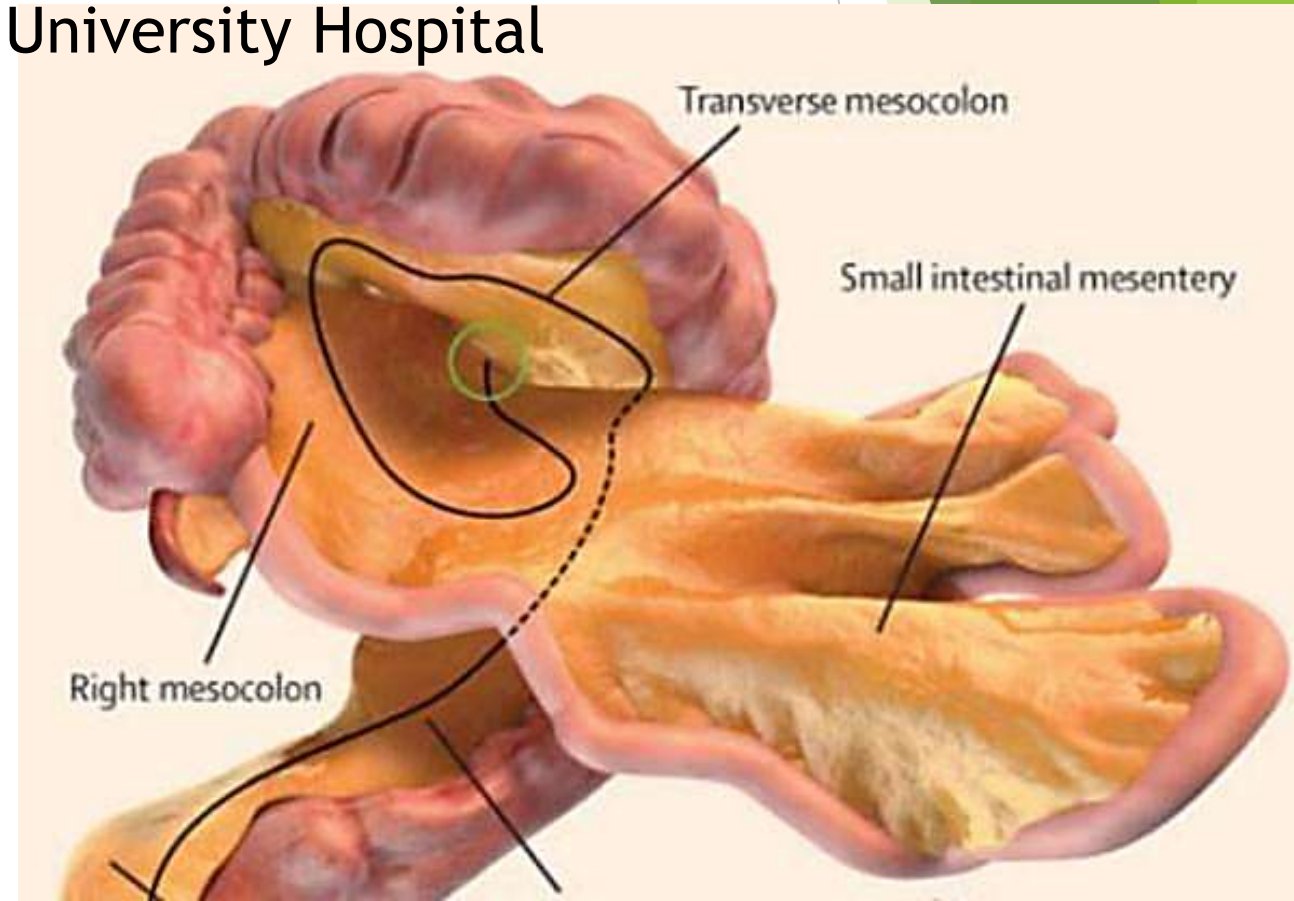
www.surgical-tutor.org.uk



- ▶ Dr. Debayan Chowdhury
- ▶ 22.02.2017
- ▶ Malda Medical College

Interesting Fact

- On 3rd January 2017, [The Mesentery](#) has been declared as a New Organ and has been published in The Lancet Medical Journal(The Lancet Gastroenterology & Hepatology) by J Calvin Coffey, a researcher at the University Hospital Limerick, Ireland.
- Gray's Anatomy has already been updated with the definition.



Definition of Acute Mesenteric Ischaemia:

Acute Mesenteric Ischaemia is a catastrophic abdominal emergency characterized by sudden critical interruption to the intestinal blood flow which commonly leads to bowel infarction and death.

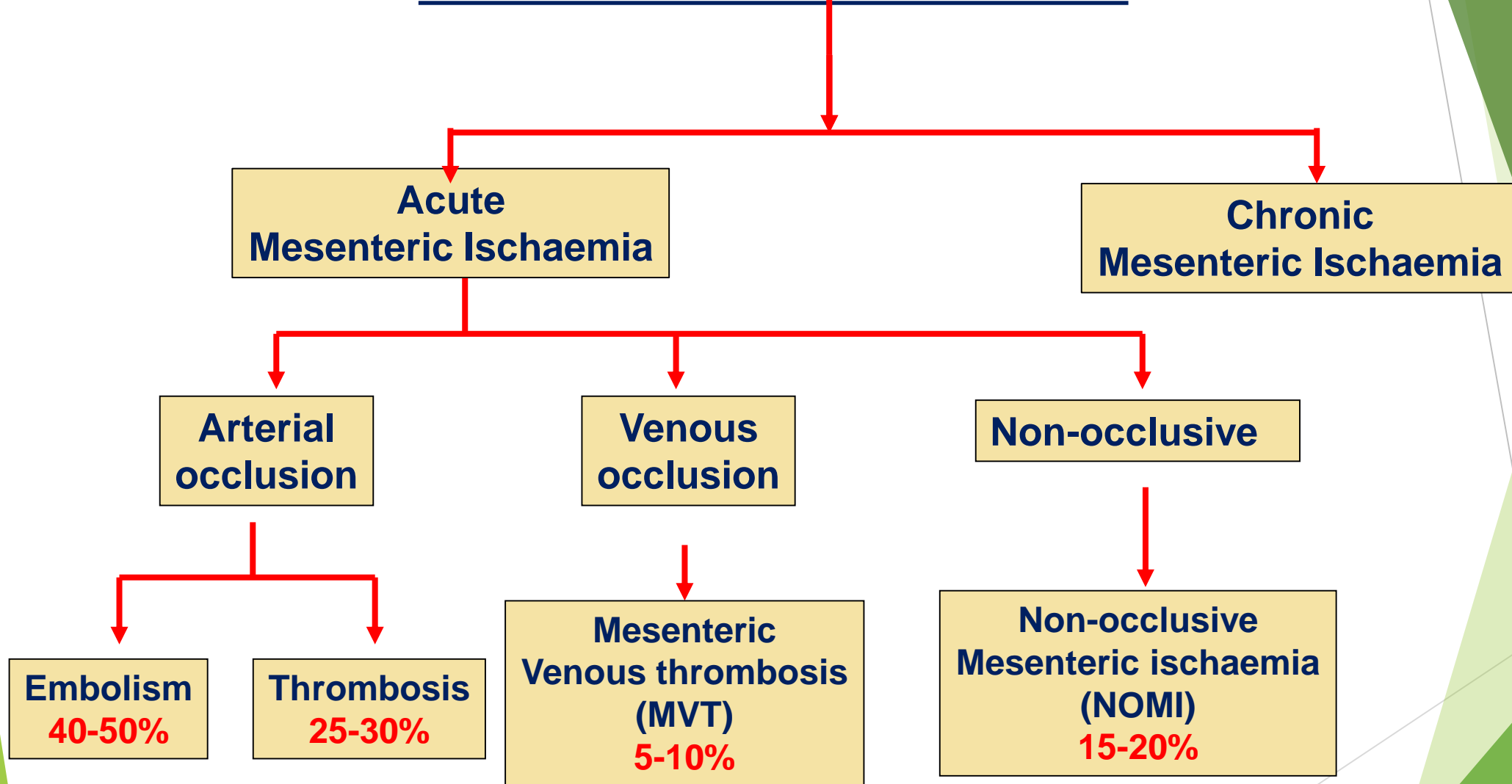
It is uncommon but life-threatening disease

Incidence ~1 in every 1000 hospital admissions₁

Mortality remains as high as 60-80%

Prognosis is poor

Mesenteric ischaemia



Acute SMA Occlusion

SMA Embolism

Aortic ostium
~15%

Around Middle colic artery
~40%

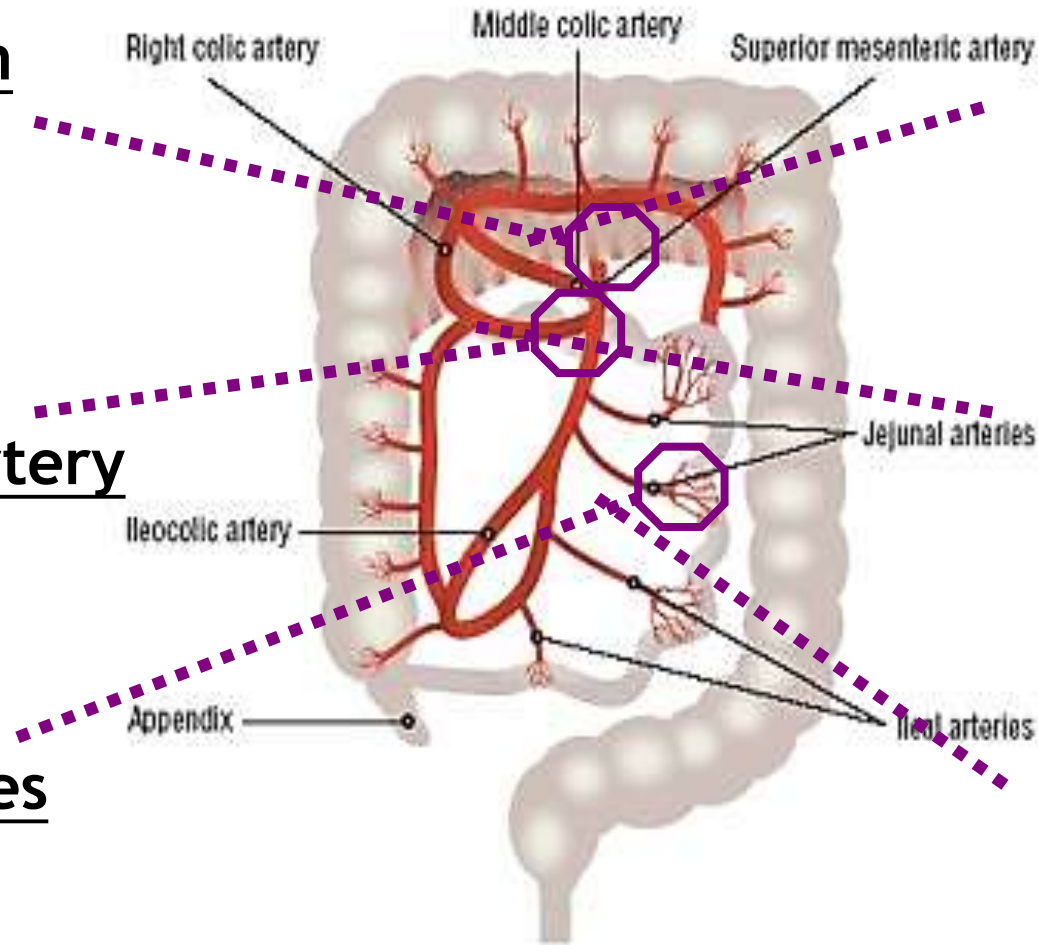
Distal branches
~45%

SMA Thrombosis

Aortic ostium
~60-80%

Around Middle colic artery
~15%

Distal branches
~5%



Acute Mesenteric Ischemia due to Embolism

- ✓ Embolism - commonest cause of acute mesenteric ischaemia.
- ✓ Majority of emboli arise from the heart, most commonly the left atrium in patients of atrial fibrillation.
- ✓ SMA is most commonly affected - acute angle of origin from abdominal aorta.

Acute Mesenteric Ischemia due to thrombosis

- ✓ Commonly involves the Aortic ostium.
- ✓ Thrombosis occurs on top of atherosclerosis.
- ✓ Prognosis - worse than embolic ischaemia
- ✓ Often previous history of
 - intestinal angina
 - Sitophobia - fear of eating
 - significant wt loss

Acute Mesenteric Ischemia due to nonocclusive disease

- ✓ Results from systemic hypoperfusion, or low flow states - CCF, Shock, critically ill patients following surgery
- ✓ Cause - Intense vasospasm and Sympathetic-induced vasoconstriction.
- ✓ Most Lethal - Because once arterial vasospasm is initiated, it may persist even after correction of the initiating event.
- ✓ Prognosis is very poor

Acute Mesenteric Ischemia due to venous thrombosis

- ✓ **Least common**
- ✓ **Typically affects superior mesenteric vein and rarely inferior mesenteric vein**

Cause	Aetiology		Incidence (%)
1. Embolism	➤ Cardiac	• Atrial fibrillation	Commonest (40-50%)
		• Mural Thrombus following Myocardial Infarction	
		• Left atrial myxoma	
		• Prosthetic heart valves	
	➤ Proximal aortic disease, e.g. aneurysm, atheromas		
➤ Iatrogenic, e.g. arteriography			
2. Thrombosis	Mesenteric Atherosclerosis		25-30%

Cause	Aetiology		Incidence (%)
3. Non-occlusive mesenteric ischaemia	<ul style="list-style-type: none"> • Low-flow states, e.g. shock 		15-20%
	<ul style="list-style-type: none"> • Drugs, e.g. digitalis, vasopressors 		
4. Mesenteric vein thrombosis	<ul style="list-style-type: none"> ➤ Inherited hypercoagulable states 	<ul style="list-style-type: none"> • Factor V Leiden mutation 	Least common (5-10%)
		<ul style="list-style-type: none"> • Protein C, S, antithrombin III deficiency 	
	<ul style="list-style-type: none"> ➤ Acquired hypercoagulable states 	<ul style="list-style-type: none"> • Malignancy 	
		<ul style="list-style-type: none"> • Oral contraceptives 	
		<ul style="list-style-type: none"> • Portal Hypertension 	
		<ul style="list-style-type: none"> • Intra-abdominal sepsis, e.g. acute pancreatitis 	
<ul style="list-style-type: none"> • Postoperative states, e.g. abdominal surgery 			

Presentation

- ▶ Classical description of early symptom
 - ▶ Severe Abdominal pain that is out of proportion to physical findings in 95% cases



Presentation

▶ Early

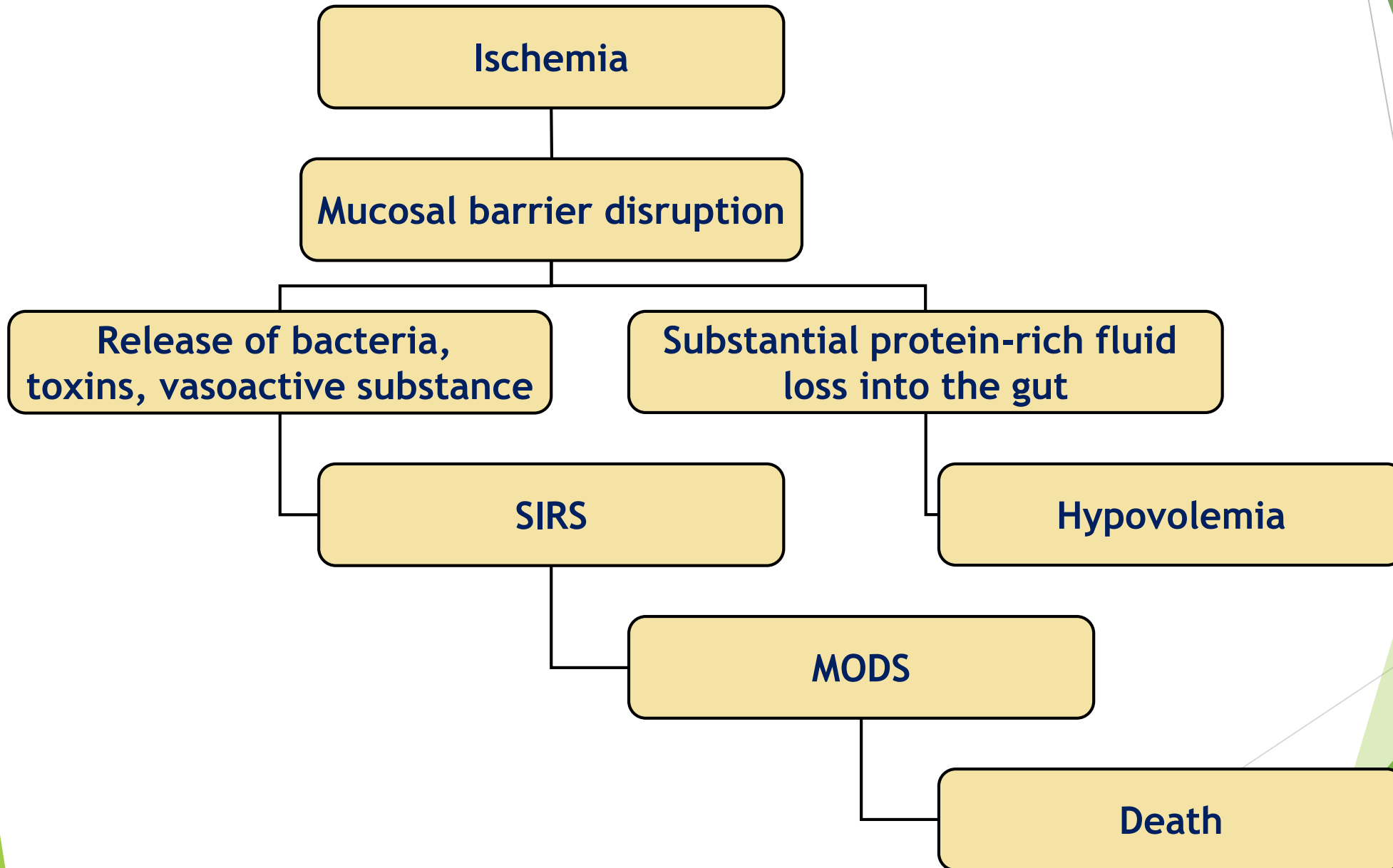
- ▶ Prominent symptoms of GI emptying (nausea, vomiting , diarrhea)

Early diagnosis requires high index of suspicion

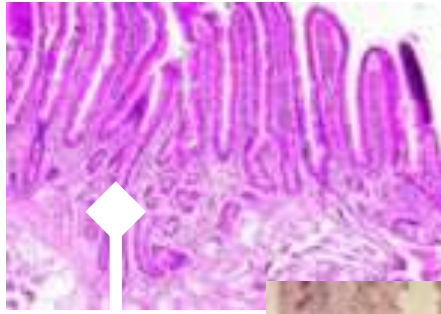
▶ Late

- ▶ Bloody diarrhea
- ▶ Abdominal distension
- ▶ Features of Peritonitis-
 - ▶ Fever
 - ▶ Shock
 - ▶ Tachycardia

Pathophysiology

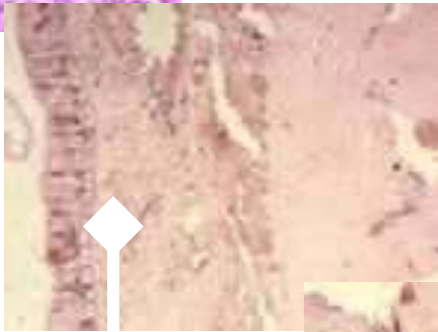


What happens to bowel during absolute ischaemia?



◆ 15 mins

- Structural changes to intestinal villi



◆ 3 hours

- Mucosal sloughing
- Still reversible



◆ 6 hours

- Transmural necrosis
- Gangrene
- Perforation

Time is crucial !

Signs of Peritonitis appear



Absolute ischaemia

Investigation (Preliminary)

Blood test:

- ▶ **Most common laboratory abnormalities are:**
 - ▶ Haemoconcentration
 - ▶ Leukocytosis (Neutrophilic)
 - ▶ Metabolic acidosis
 - ▶ Lactic acidosis (in more advanced case)
- ▶ **Other serum markers**
 - ▶ Raised
 - ▶ amylase
 - ▶ ALP

Neither sensitive nor specific.
But Ix help exclude other DDx

**Straight X-ray
Abdomen
(Erect Posture)**

**Dilated
Bowel
Loops**



Thumb-printing Sign (Signifying Bowel wall oedema and thickening)



Pneumatosis Intestinalis (Gas in the wall of small bowel)

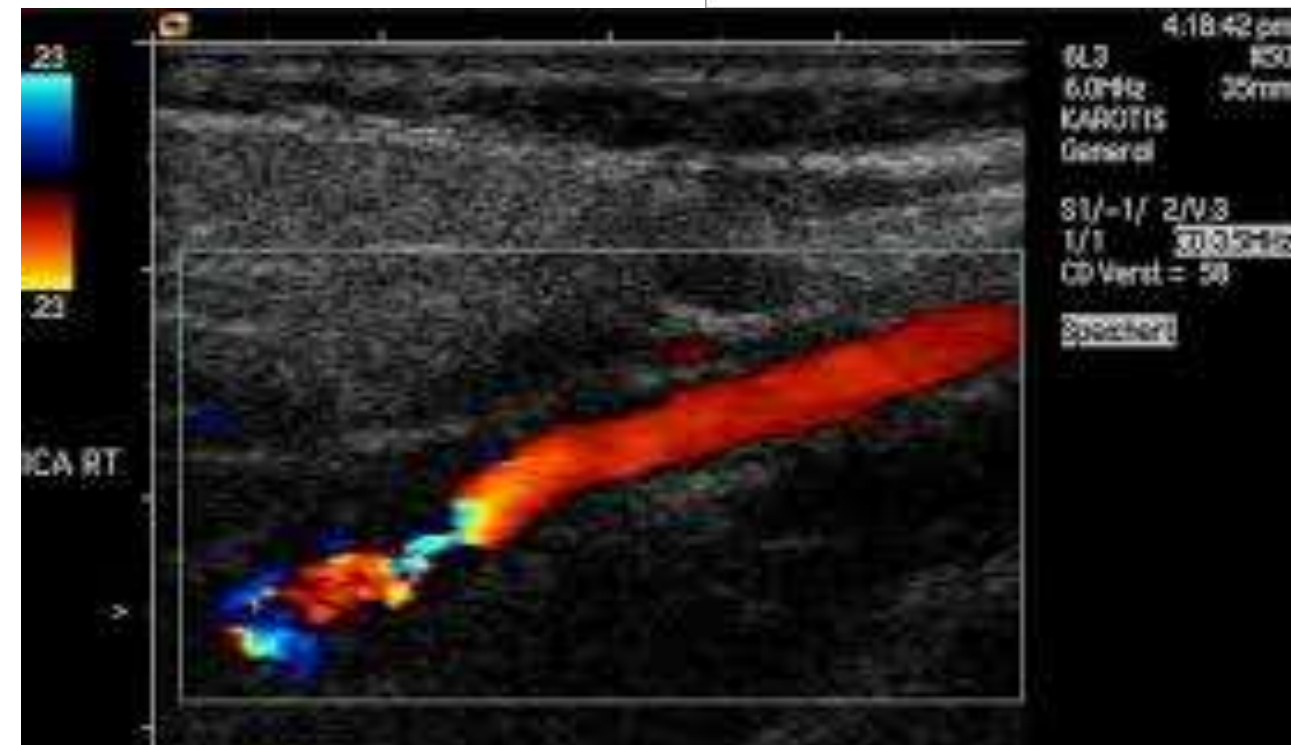
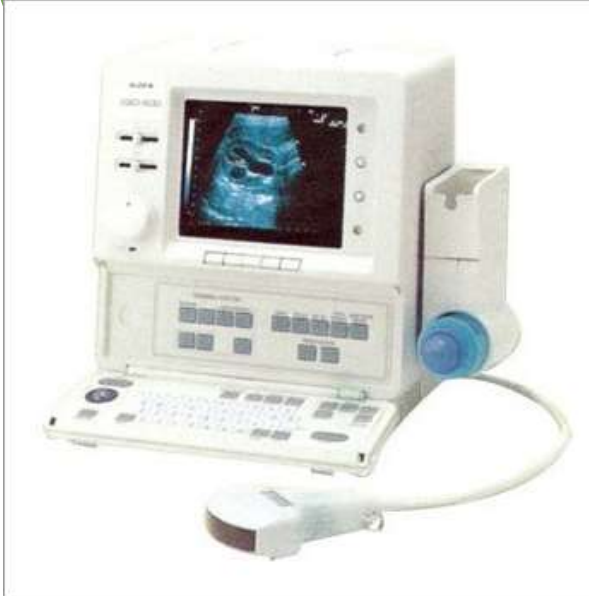


Gas in the Portal Vein



Doppler USG

- Able to identify severe stenosis or total or partial occlusion and velocity of blood flowing through the vessels
- Unable to detect
 - ✓ emboli beyond the proximal main vessel
 - ✓ Non-obstructive mesenteric ischaemia



Colour Doppler USG showing partially occluded Artery

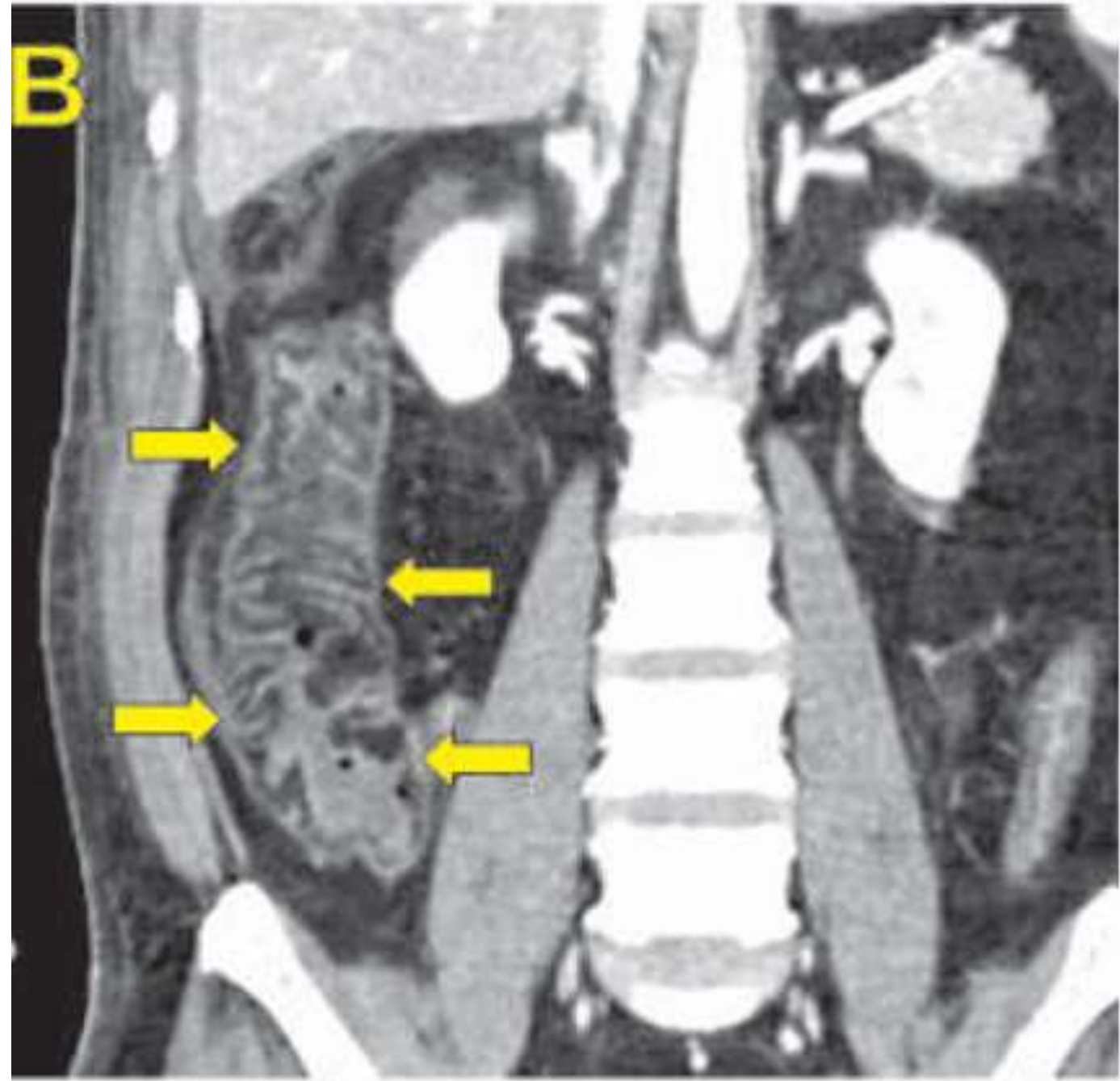
CECT abdomen

Gas in Bowel wall
(Pneumatosis
intestinalis)

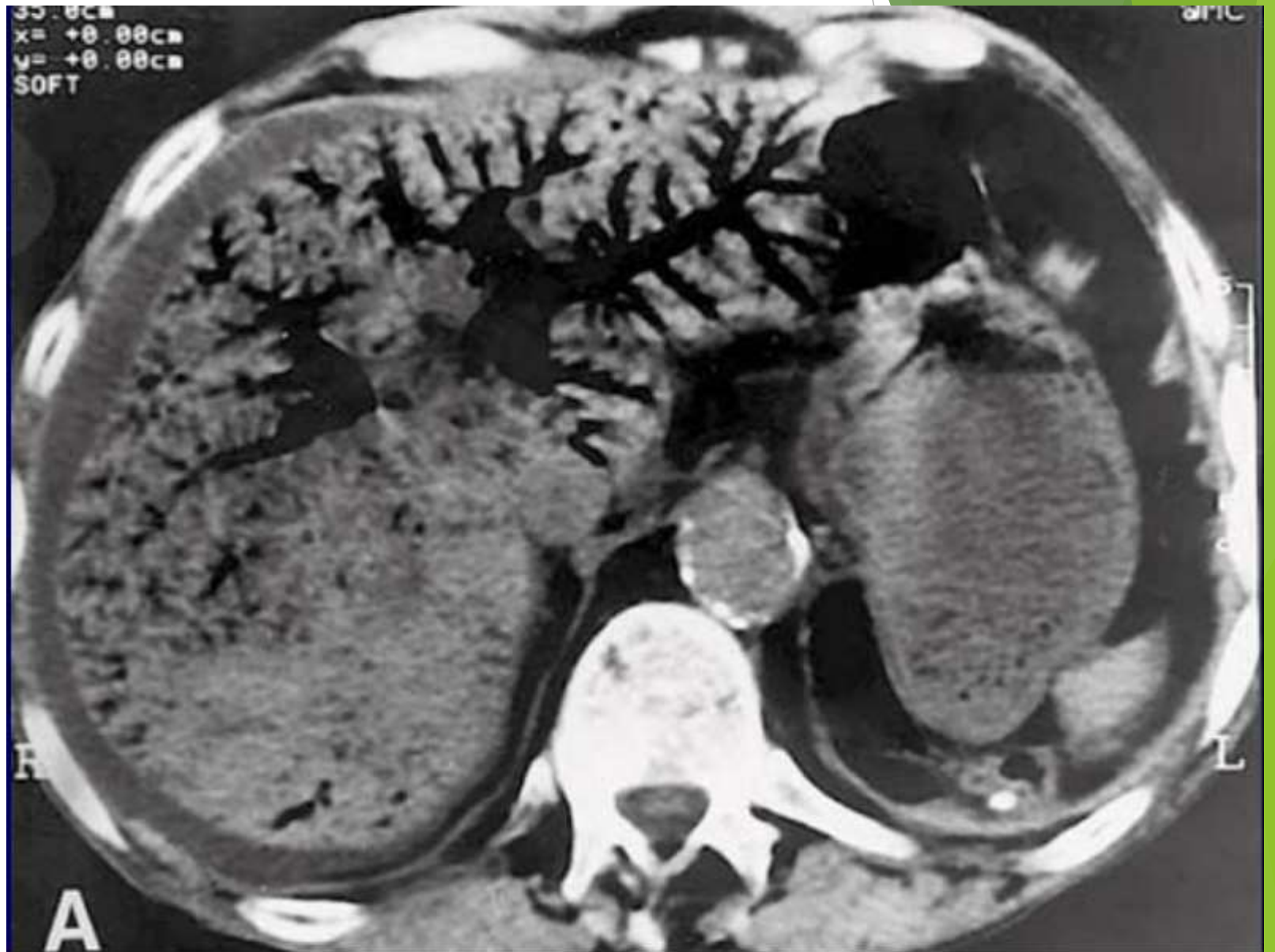
Gas in
Mesenteric Vein



**Bowel Wall
Oedema**



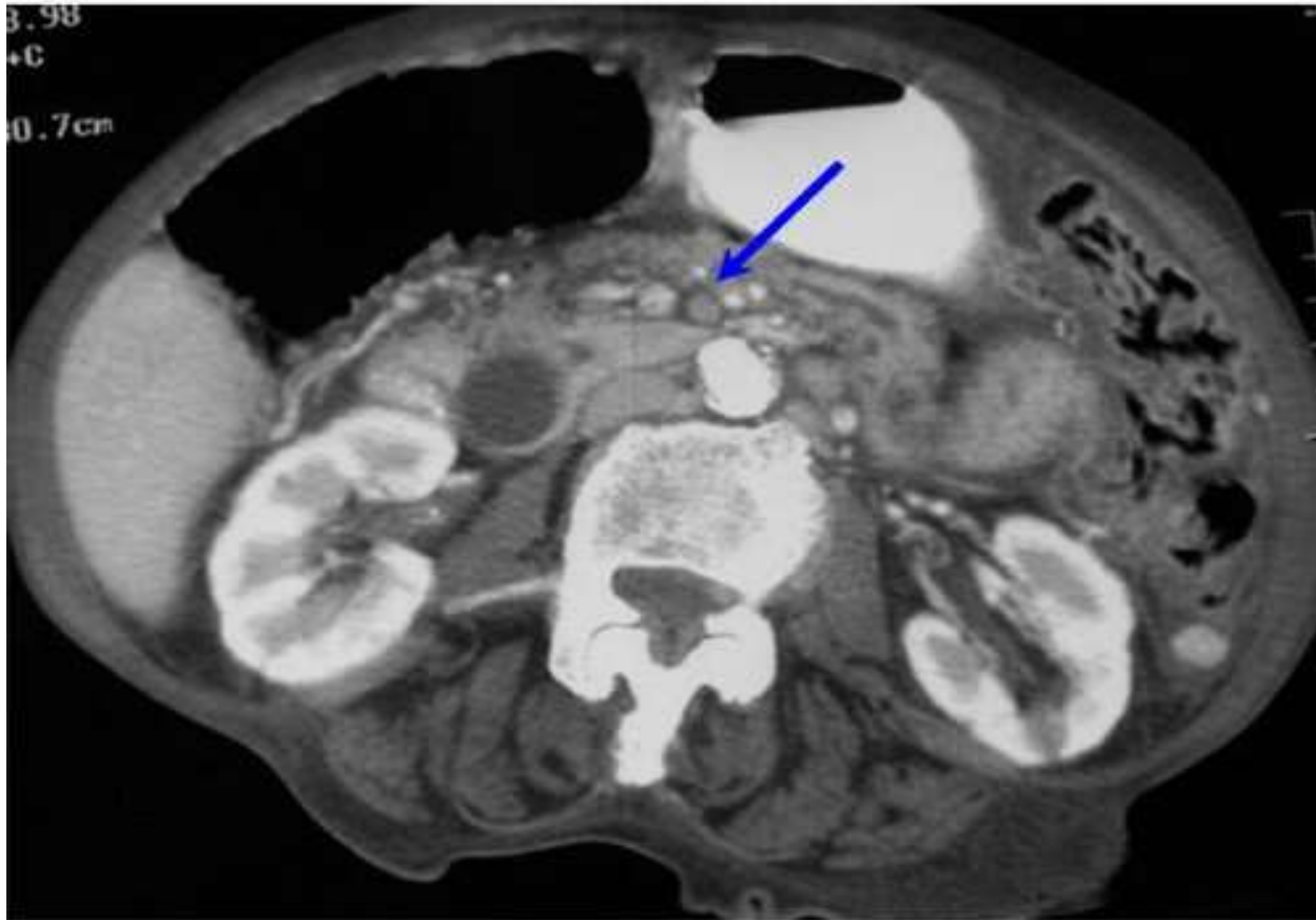
**CECT showing in
Extensive Portal
Venous Gas**



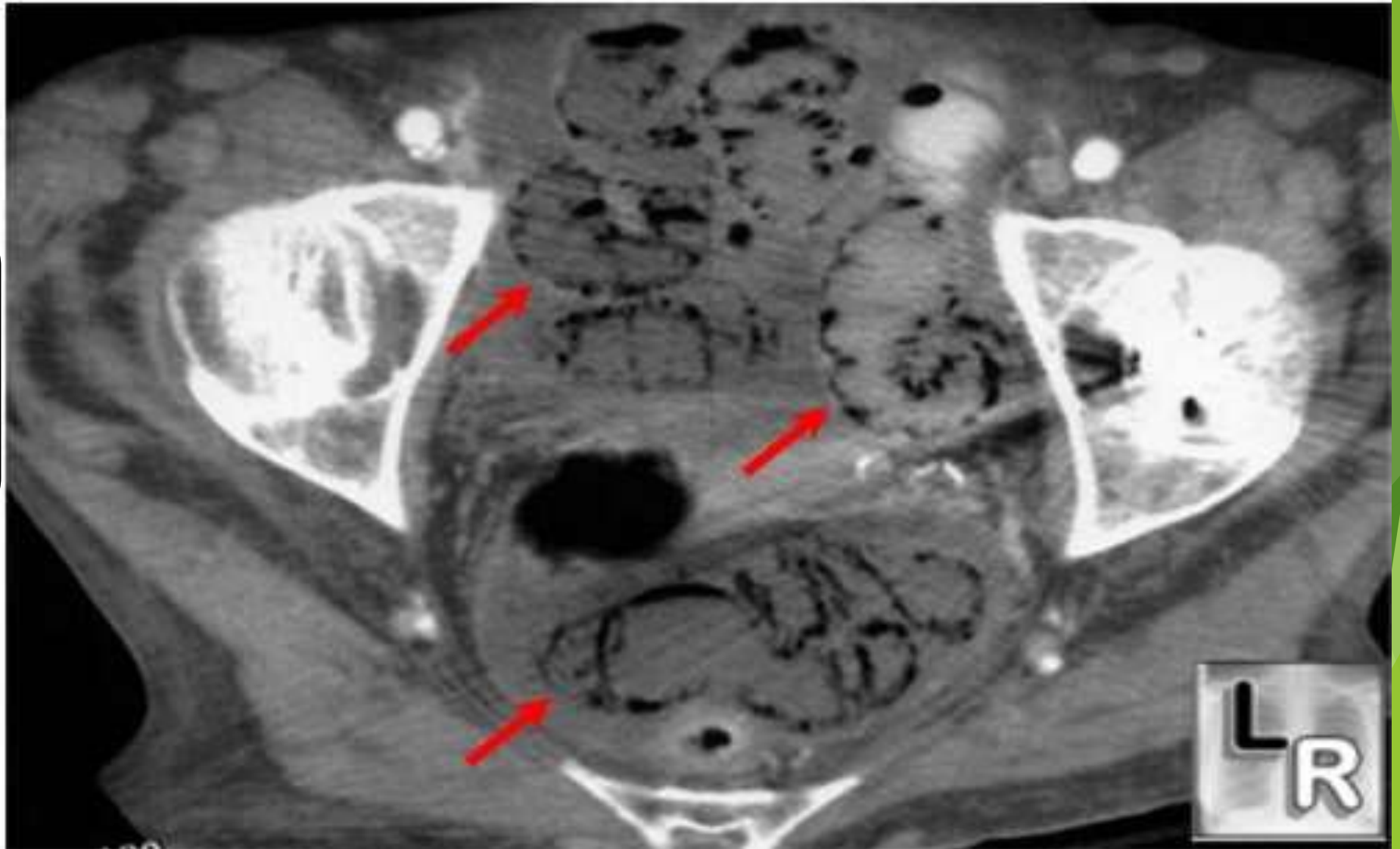
**SMA occlusion
with embolus**



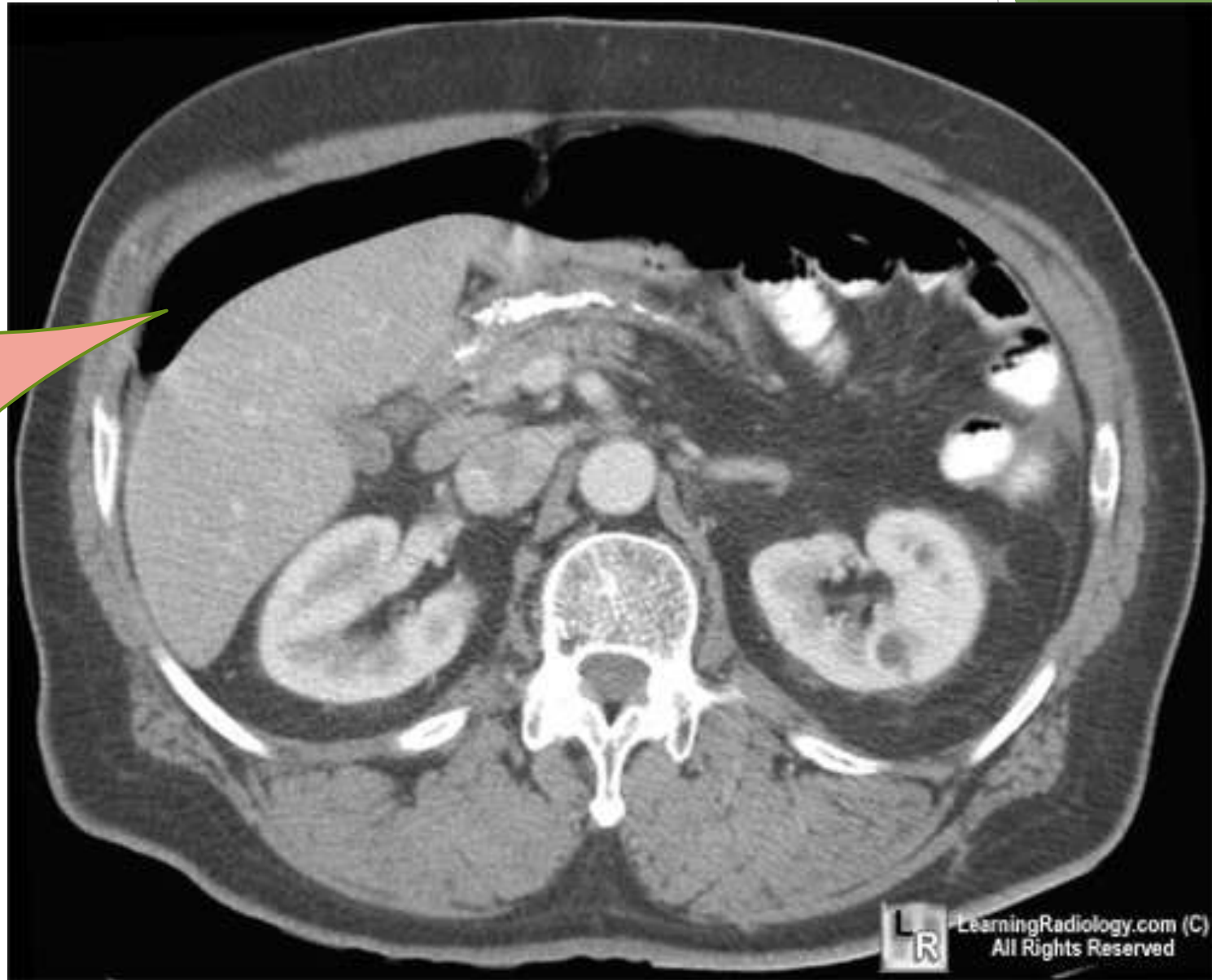
SMA thrombosis



**Extensive
Pneumatosis
intestinalis**



**CECT showing
Pneumoperitonium**



Angiography - Gold Standard

▶ Non-invasive

- ▶ CT-Angiography
- ▶ Magnetic Resonance Angiography

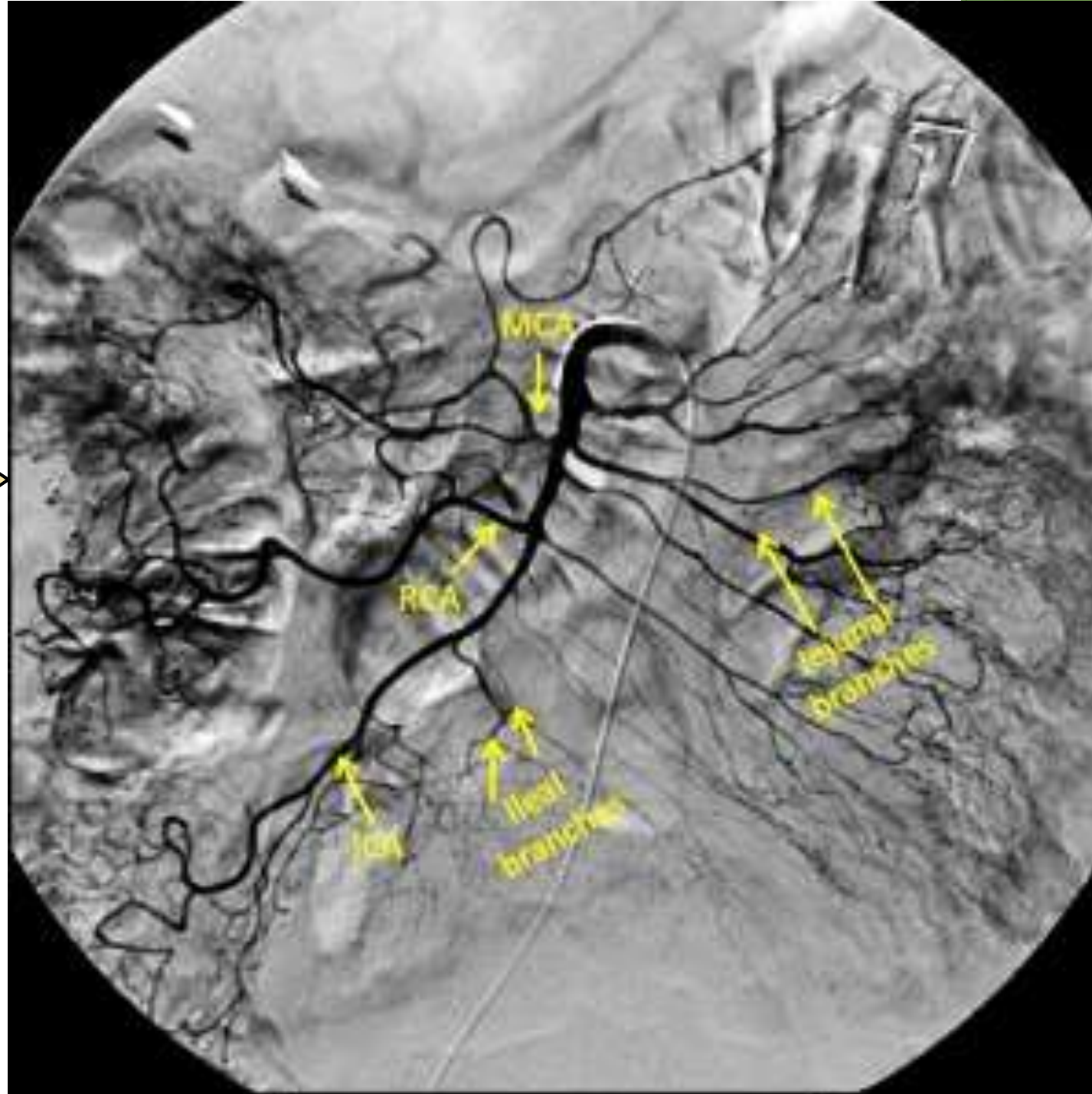
▶ Invasive

- ▶ Catheter (Conventional Method)

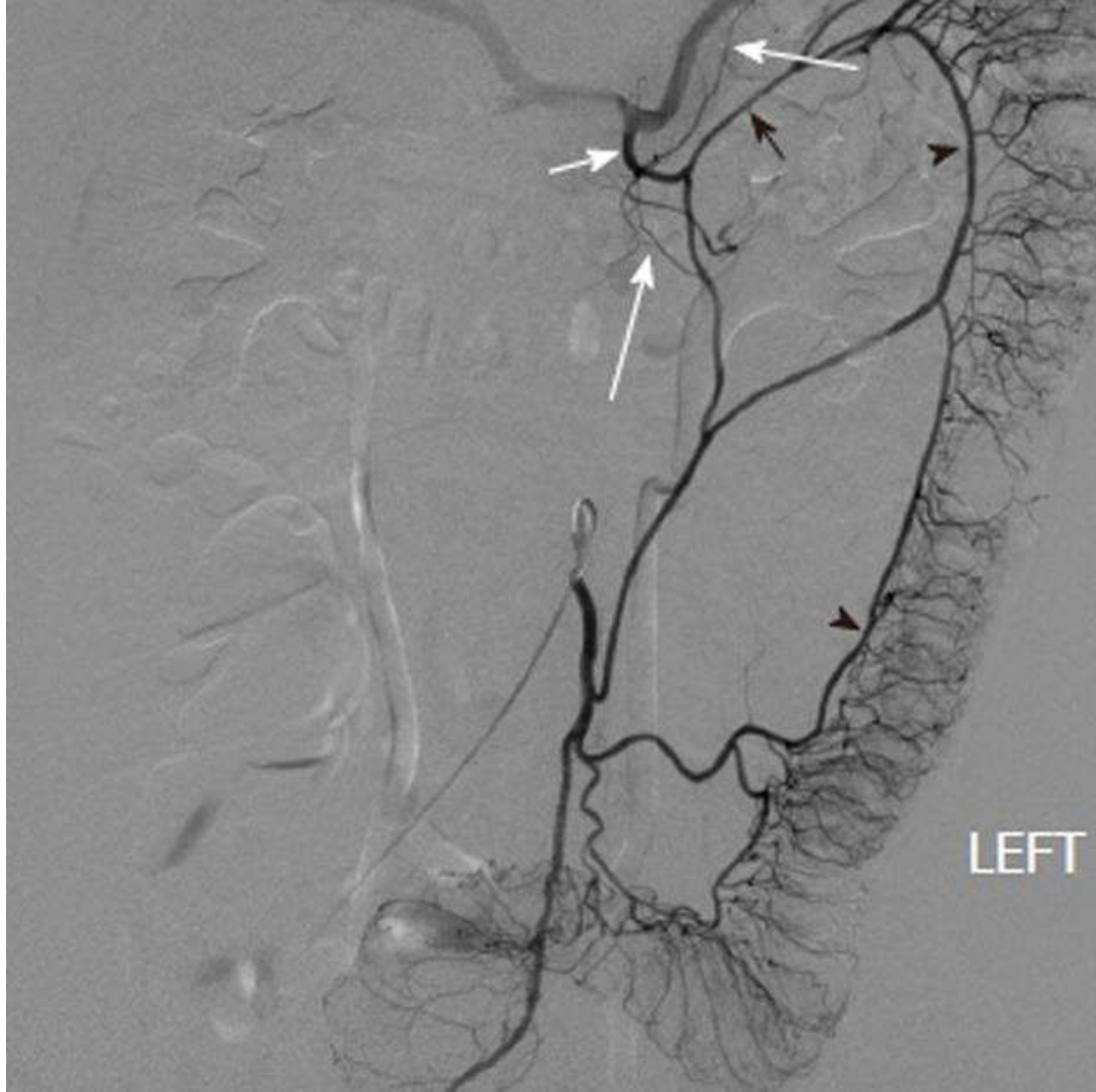
▶ Findings on Angiography:

- ▶ Filling defects
- ▶ Stenosis or blockage

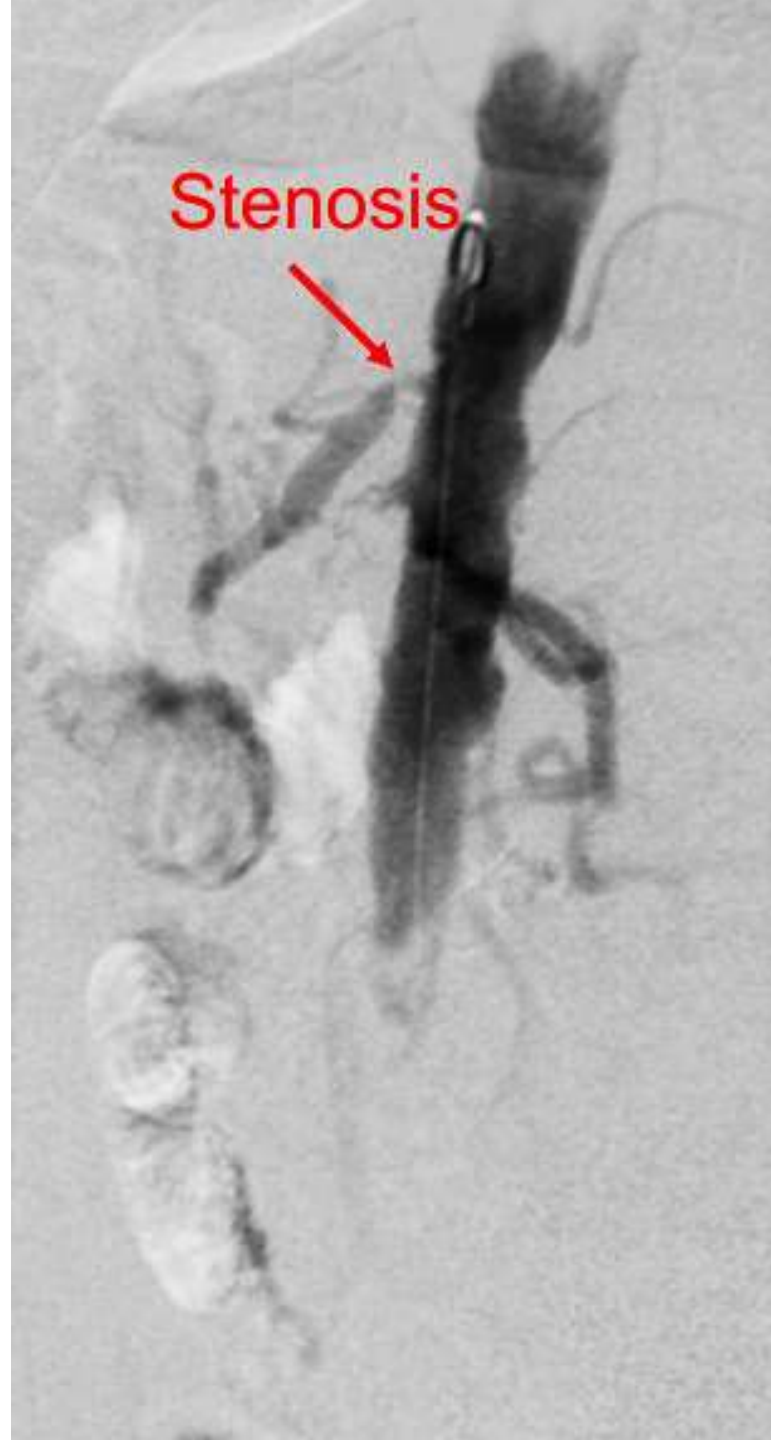
**SMA on
Angiography**

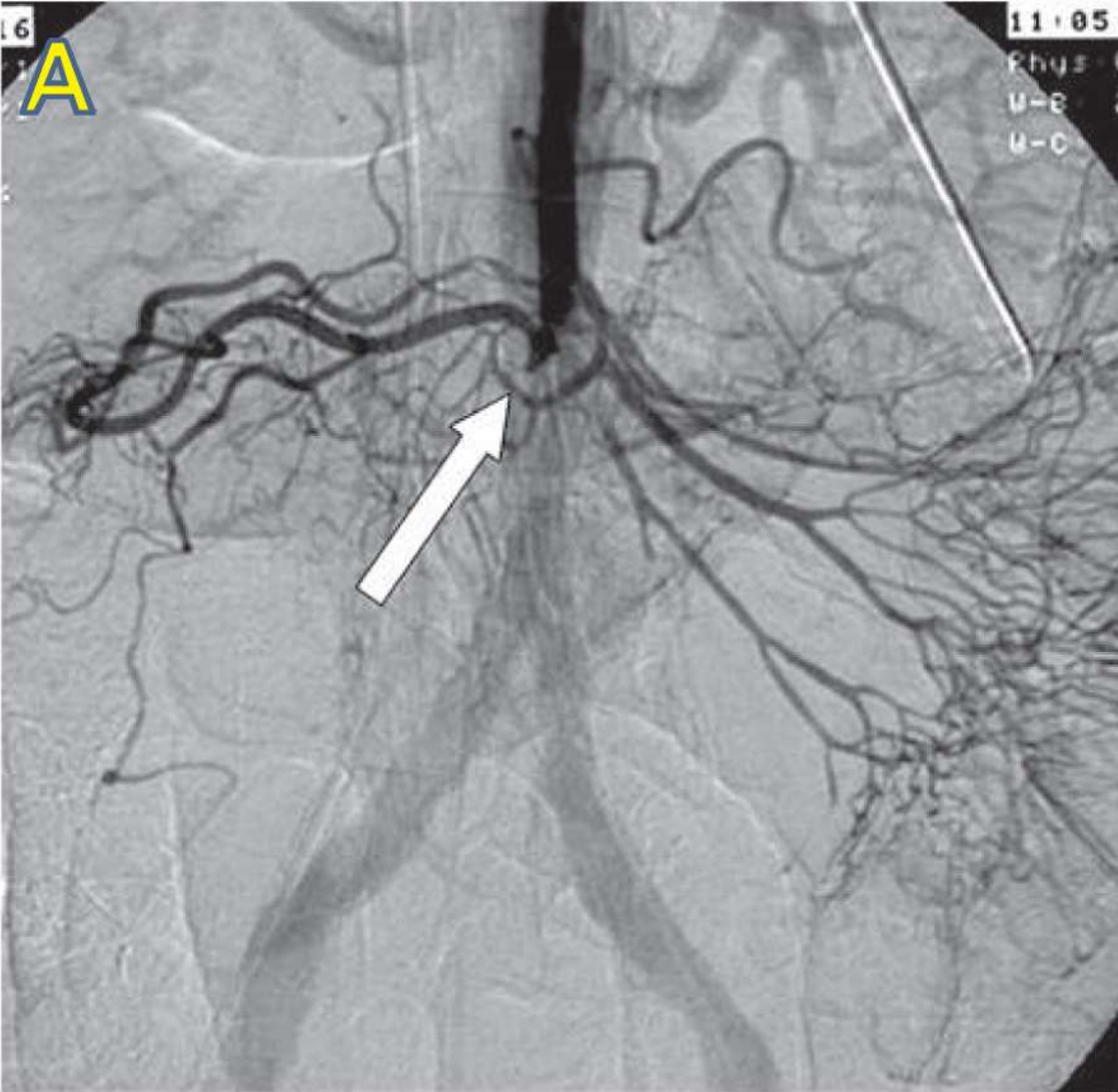


IMA on Angiography

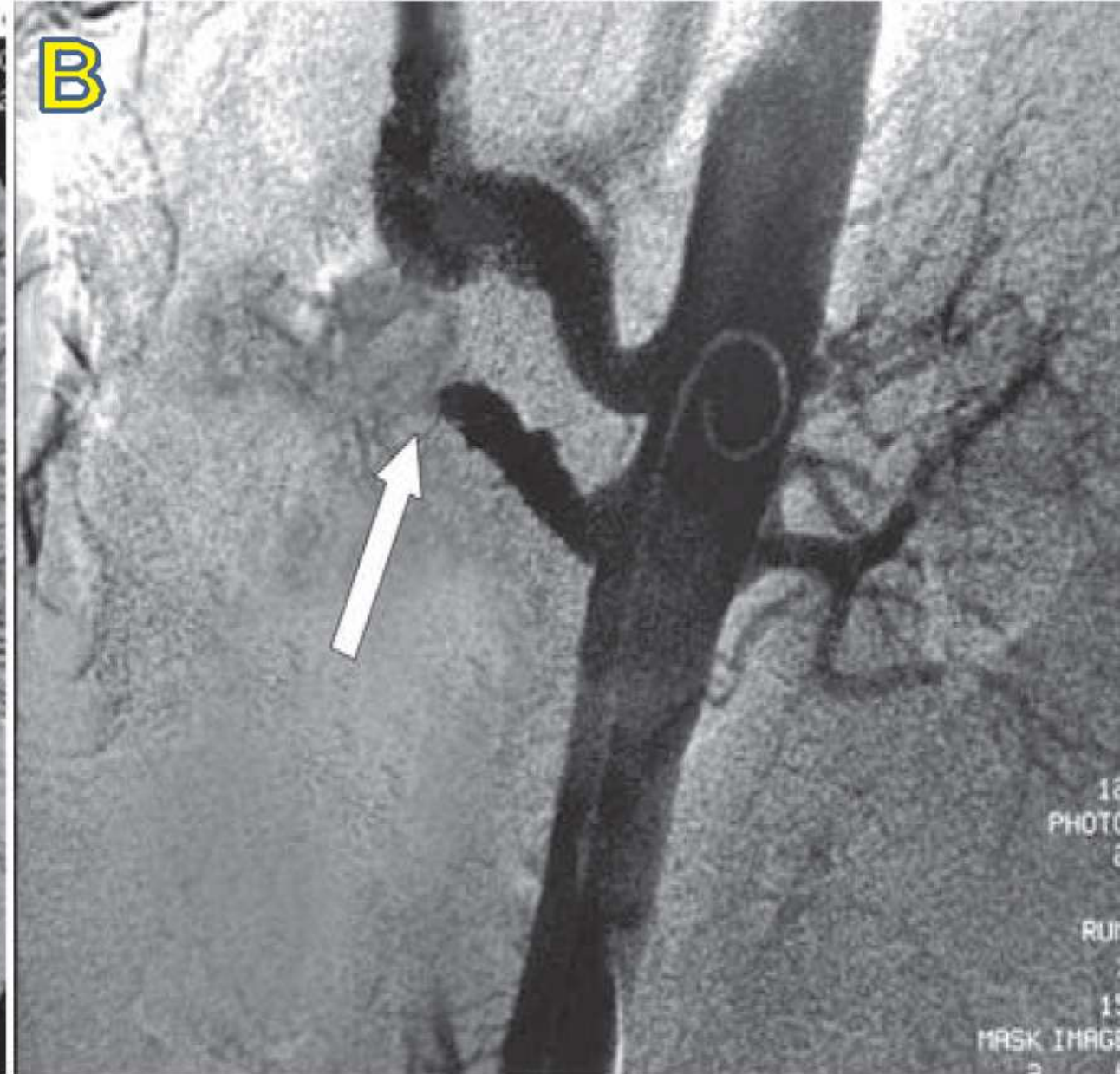


**Angiogram (Aortogram)
showing Stenosis of SMA**





A. cut-off of the middle colic artery, due to emboli (arrow).

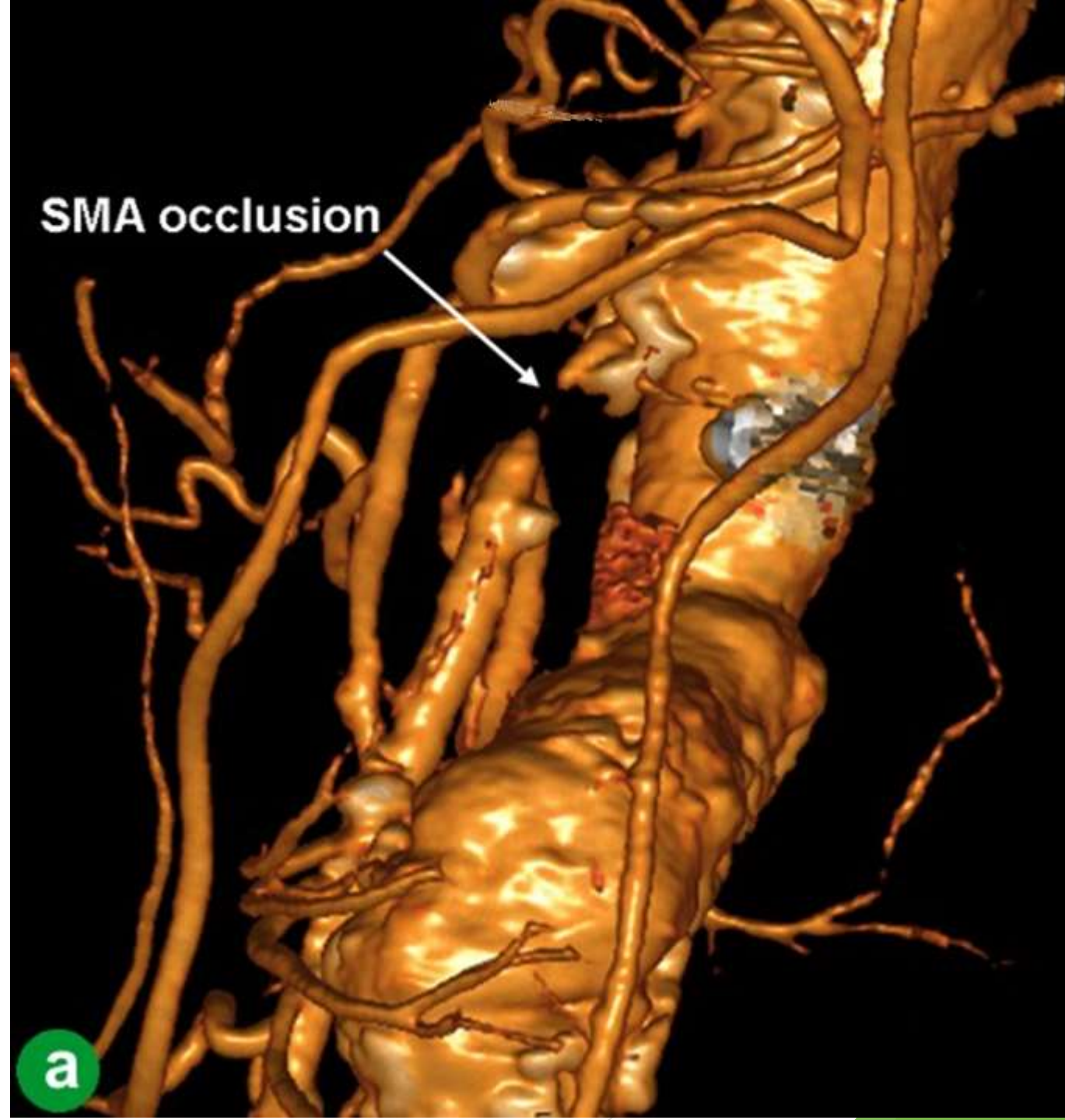


B. Embolism of SMA (arrow).

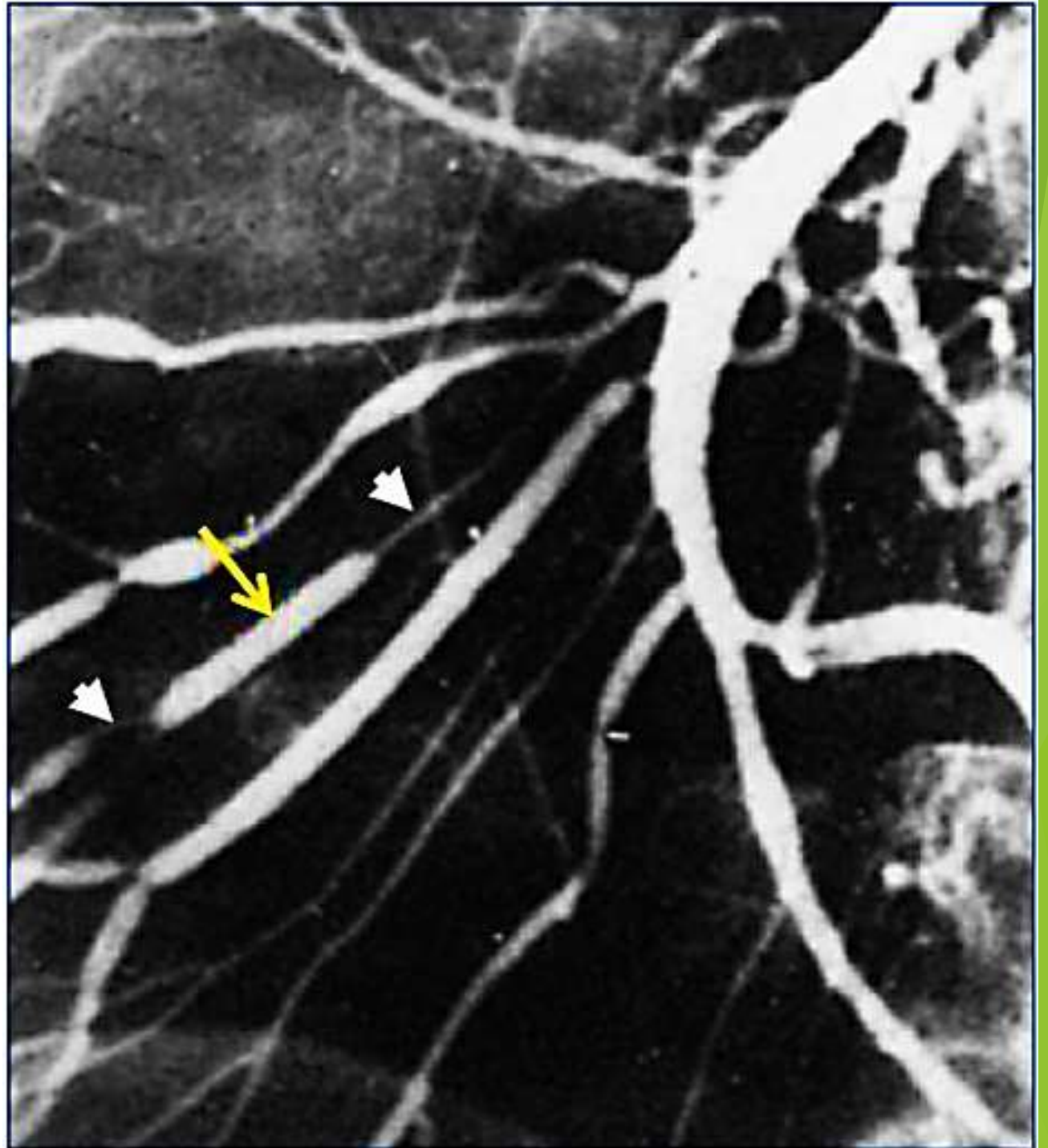
CT Angiogram showing partial thrombosis of SMA



**3D
CT-Angiography**



Superior Mesenteric
Angiography showing the string
of “**Sausages Sign**” in a
patient of Non-occlusive
mesenteric ischaemia



Management

Patient presents with severe abdominal pain consistent with ischemic bowel

Peritoneal sign is present



Laparotomy
+/- Revascularisation
+/- Bowel Resection

Obtain history and perform physical examination.
Pain is out of proportion to physical findings is a significant clue.
Look for risk factors for acute mesenteric ischemia.
Order investigative studies:
Laboratory tests: WBC count, lactate, AST
Imaging: abdominal X-ray, Doppler USG, CT-Angiography, MRA

Peritoneal sign is absent



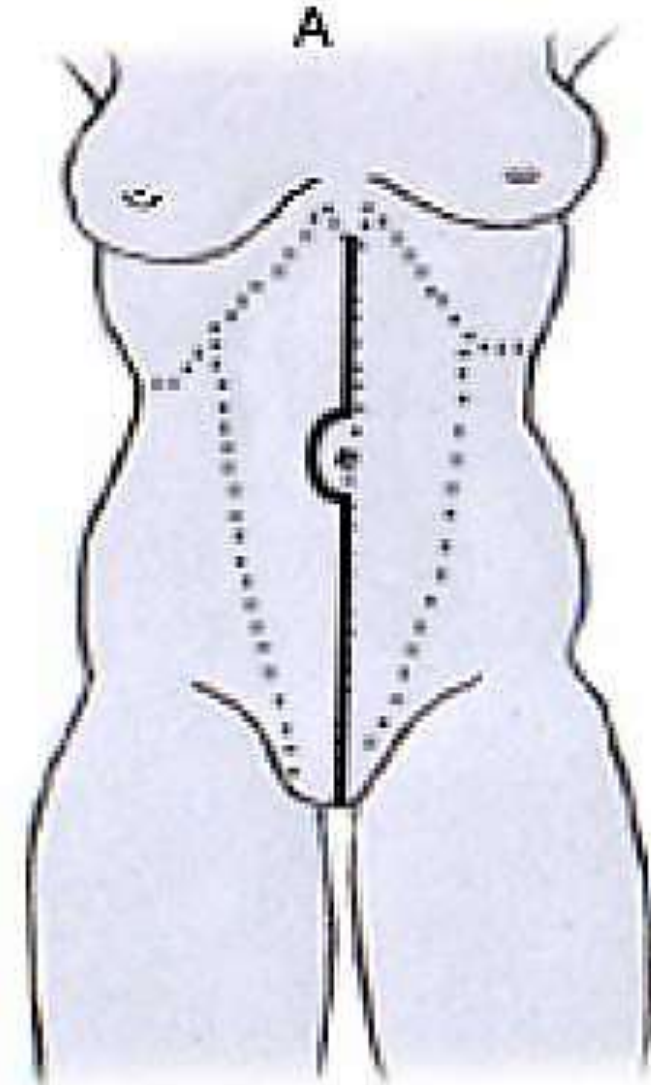
Acute mesenteric ischemia established

Treat with: Moist O2 , Fluid Resuscitation, Naso-Gastric decompression, Broad Spectrum Antibiotics, Bowel rest, Stop Vasopressor drugs/Digitalis, Invasive haemodynamic monitoring, Treat Arrhythmia or Heart failure, **IV HEPARIN 5000IU**

Definitive surgical exploration

Midline laparotomy

1. Assessment of bowel viability
2. Determination of underlying cause
3. Mesenteric revascularization
4. Resection of necrotic bowel
5. Second look laparotomy



Assessment of bowel viability

1. Clinical Judgment

- pink serosa
- visible peristalsis
- positive pulsations
- bleeding from cut edges

2. Doppler USG

- hand-held Doppler (Detects anti-mesenteric blood flow)

3. Fluorescein

- Injection of IV Sodium fluorescein (1gm) and inspection under Wood's lamp (Viable bowel has smooth, uniform fluorescence)

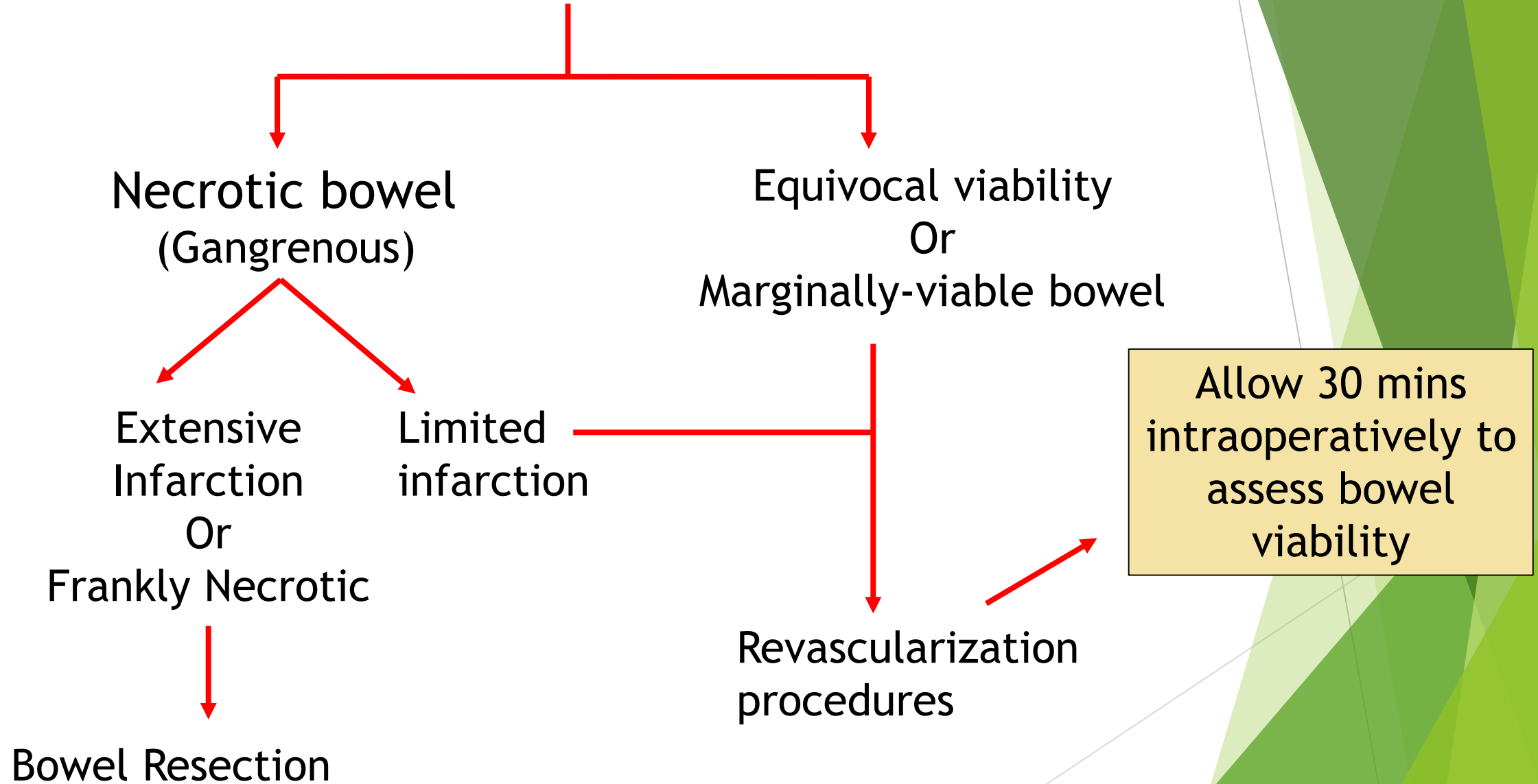


VIABLE BOWEL

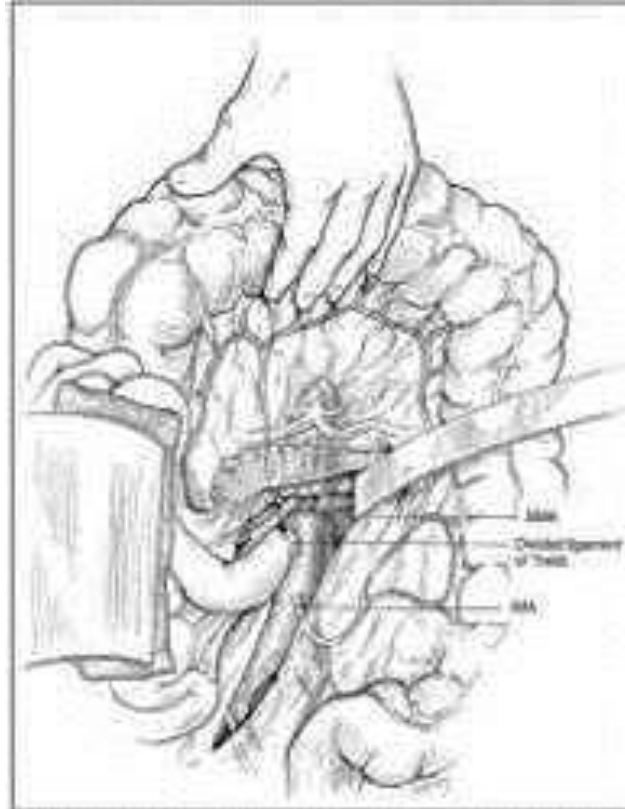
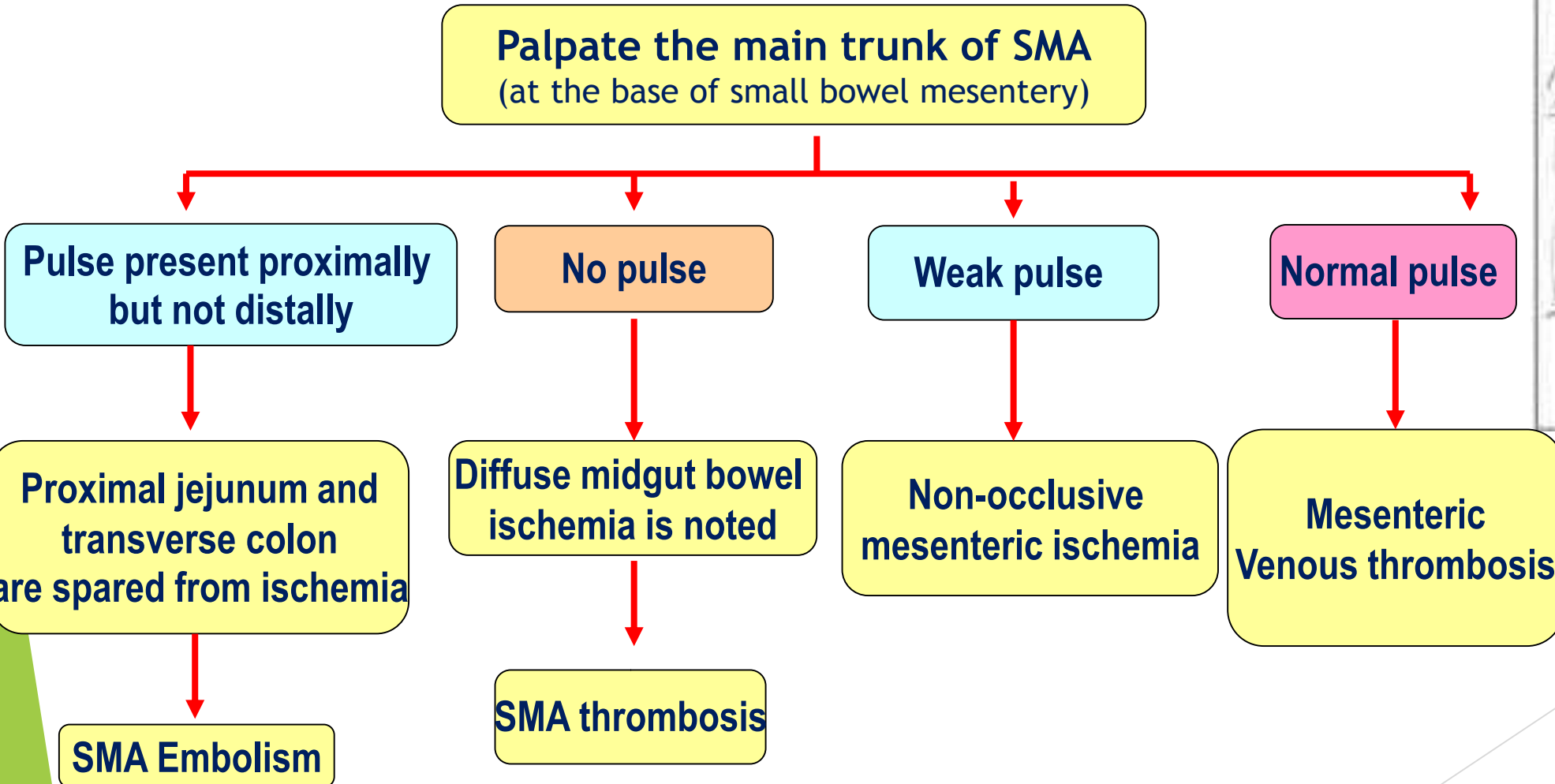


NON VIABLE BOWEL

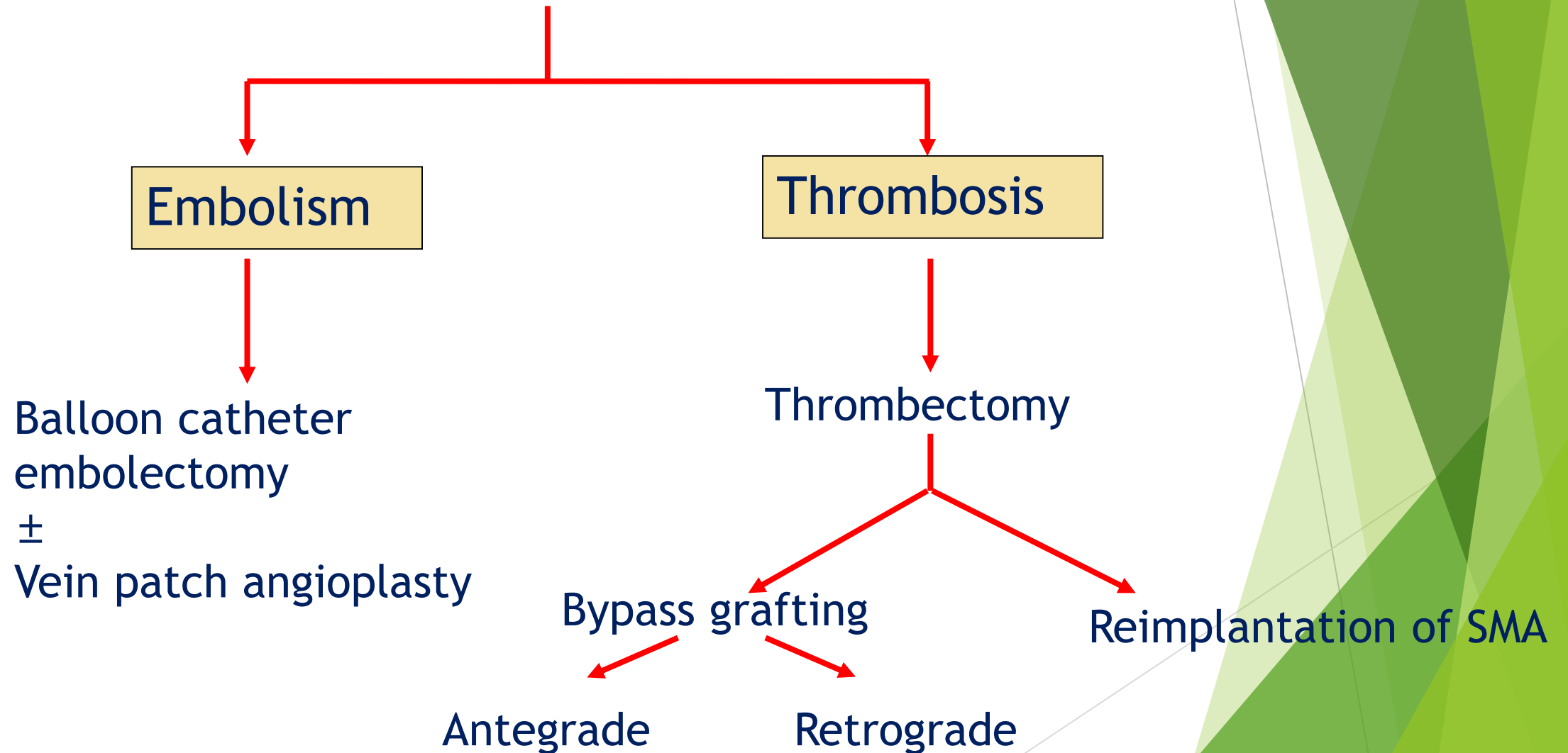
Assessment of bowel viability



Determination of underlying Pathology: Thrombosis or embolism?



Mesenteric Revascularization



Resection of Necrotic Bowel

- ▶ **Frankly necrotic bowel segments**
 - ▶ Resection
- ▶ **Marginal-viable bowel (Equivocal viability)**
 - ▶ may improve over hours
 - ▶ consider second-look laparotomy



After revascularization

(embolectomy or bypass)

- ▶ Consider postrevascularization papaverine. (arterial spasm may persist even after embolectomy or thrombectomy)

Who should have second look laparotomy?

- ▶ **Some surgeons advocate routine second-look laparotomy at 24-48hr**
 - ▶ Claimed reduced mortality rate
- ▶ **Other adopt a selective approach and perform a second laparotomy when patient deteriorates clinically.**
 - ▶ Can avoid unnecessary second operation if patient remains well

Alternative to surgery... Endovascular therapy

Limited use in acute situations
Cannot assess bowel viability
Only indicated in early cases without
bowel infarction

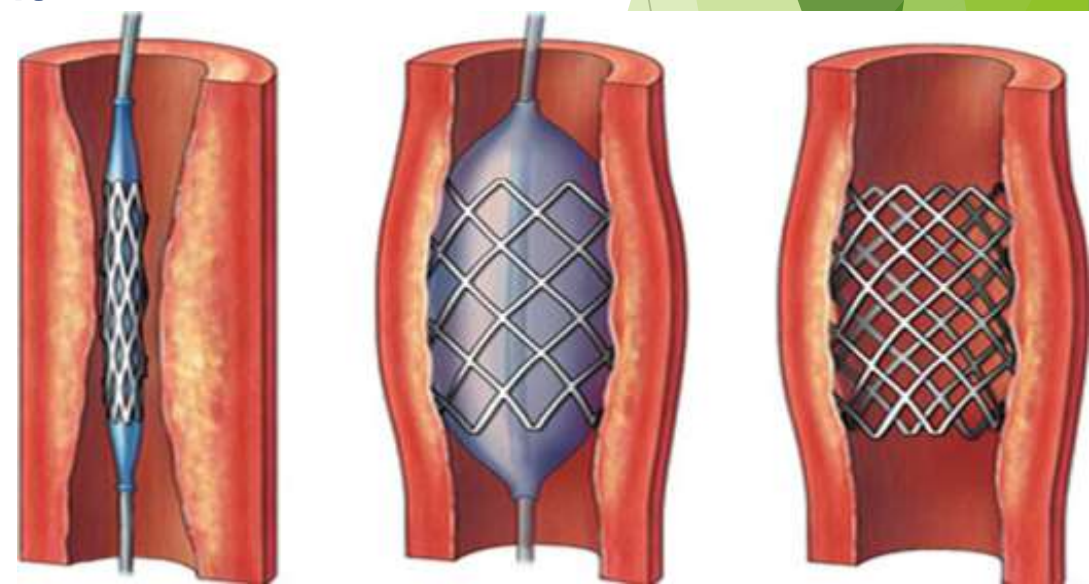
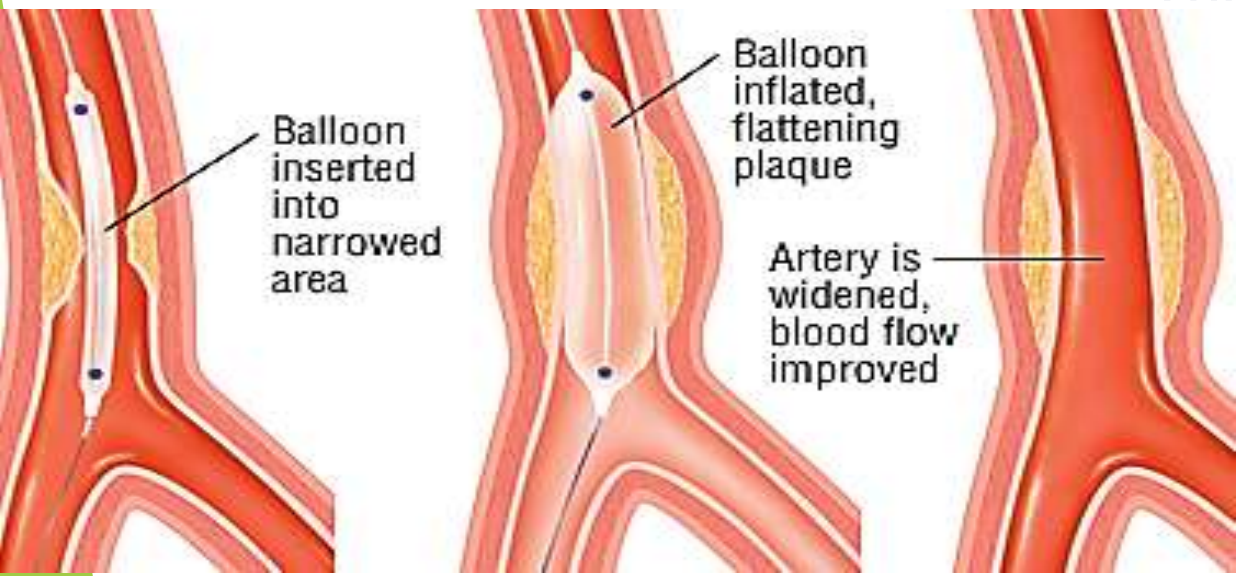
Acute SMA thrombosis

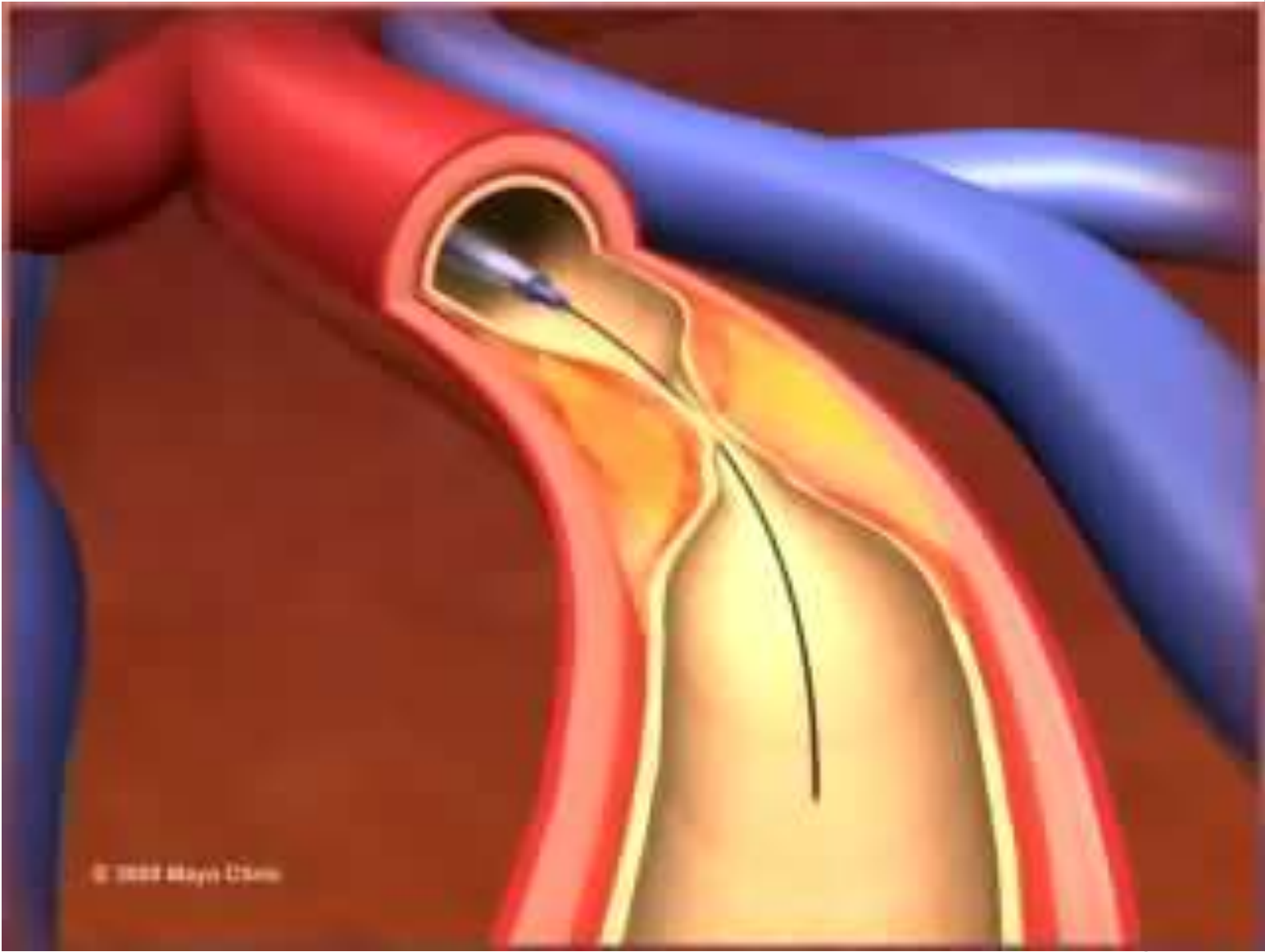
NOMI

Percutaneous transluminal
Balloon angioplasty ± stenting

Transarterial
Thrombolysis

Transarterial infusion
of vasodilator





Management of non-occlusive mesenteric ischemia

- ▶ Correct underlying condition.
- ▶ Optimize fluid status, improve cardiac output, and eliminate vasopressors (alpha-blocker)
- ▶ Consider catheter-directed intra-arterial infusion of vasodilator (papaverine 30-60mg/hr)
- ▶ Laparotomy if peritoneal signs develop



Management of Mesenteric venous thrombosis

- ▶ Anticoagulation with Heparin is mainstay of treatment
- ▶ Workup for hypercoagulability .
- ▶ Laparotomy if peritoneal signs develop.

Summary

- ▶ **Acute Mesenteric Ischaemia is an abdominal emergency both if physical signs are present or absent.**
- ▶ **We have very less time for investigation, so assessing clinically is important.**
- ▶ **Every minute we waste is every centimeter of small bowel we loose.**
- ▶ **Angiography is diagnostic as well as therapeutic.**
- ▶ **Preoperative heparin infusion and postoperative papaverine infusion is must.**
- ▶ **Still Prognosis is Poor & Mortality is High as 80%**



We don't mind being ripped apart,
but don't rip the songs apart.
They're like our kids.

— Maurice Gibb —

Thank

You