



The dark side of the guidelines

1st Interventional Radiologist under 40 Meeting

Emergencies in Interventional Radiology



21-23 Novembre 2016

Bologna

Società Medica Chirurgica - Palazzo dell'Archiginnasio

Le ischemie gastrointestinali

*La Radiologia Interventistica
nell'Emergenza-Urgenza*

Andrea Discalzi / Torino



UNIVERSITÀ DEGLI STUDI DI TORINO
Scuola di Medicina
Dipartimento di Scienze Chirurgiche



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Dipartimento di Diagnostica per Immagini e Radioterapia
Radiologia 1 Universitaria

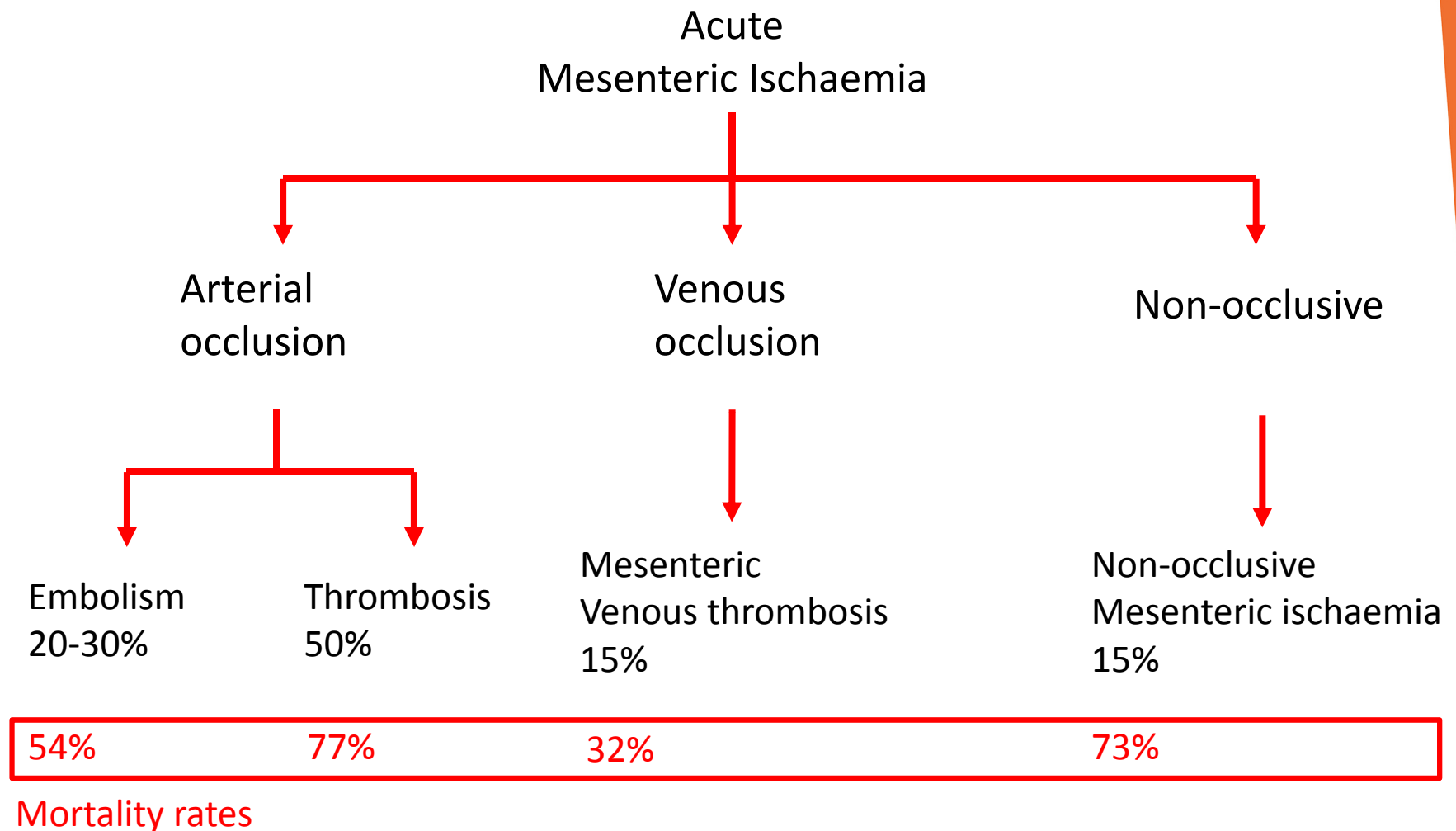


UNIVERSITA' DEGLI STUDI DI TORINO
Dipartimento di Scienze Chirurgiche

Introduction

- Overall incidence 0.63/100.000 person years
- Autopsy rate incidence more than twenty times higher 12.9/100.000 person years
- M=F
- Mean age 70 y.o.
- Mortality rates 50-70%

Pathophysiology



Clinical suspicion

Most symptoms and signs are non-specific and need to exclude other non-vascular emergencies

Past history of atherosclerotic diseases, hypertension and FA are the principal risk factor

- **Symptoms and signs**

- Abdominal pain 95%

Pain out of proportion of signs

- Nausea 44%

- Vomiting 35%

- Bloody Diarrhea 35%

- PR bleeding 16%

- Fever 46%

- Tachycardia 58%

- Abd distension 66%

- **Laboratory tests**

- Leukocytosis

- Elevated urea

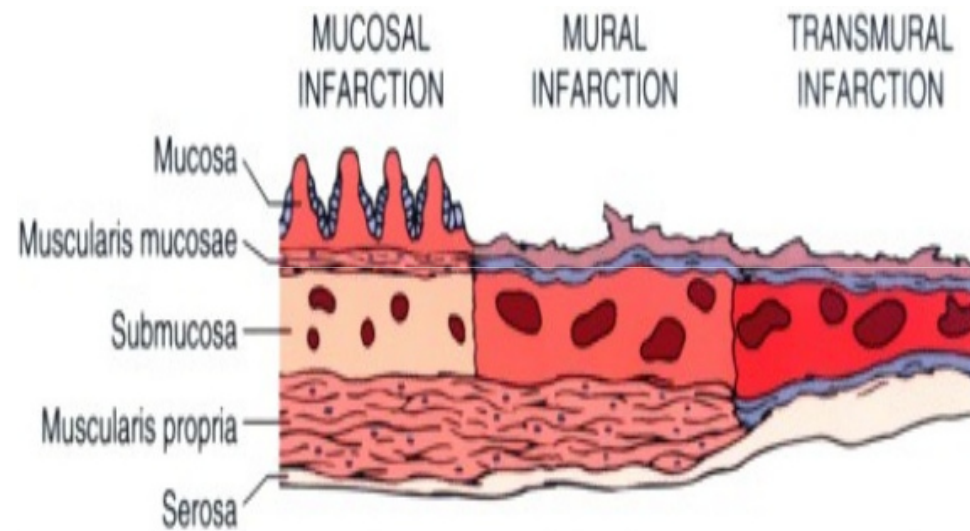
- Elevated creatinine

- Elevated lactate

- Metabolic acidosis

- DIC

Time critical



15 mins

Structural changes to intestinal villi

3 hours

- Mucosal sloughing
- Still reversible

6 hours

- Transmural necrosis
- Gangrene
- Perforation


15 mins

3 hours

6 hours

Time critical

Persisting Ischemia



SPASTIC PHASE

Widespread cramping pain, diarrhea nausea and vomiting. No signs of acute abdomen

PARALYTIC PHASE

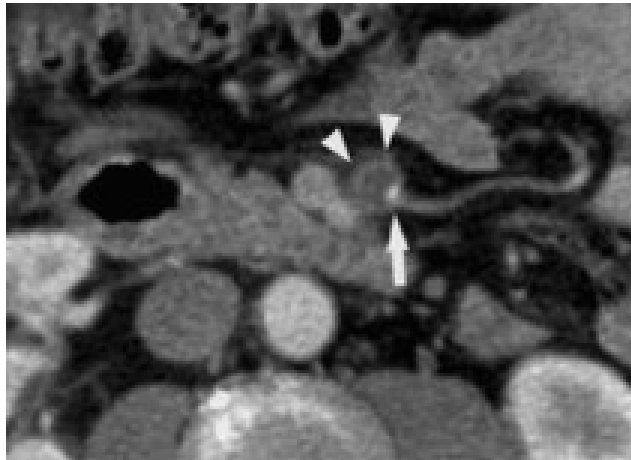
Severe ischemic pain, stopping diarrhea and cramping. Initial signs of acute abdomen

PERITONITIS PHASE

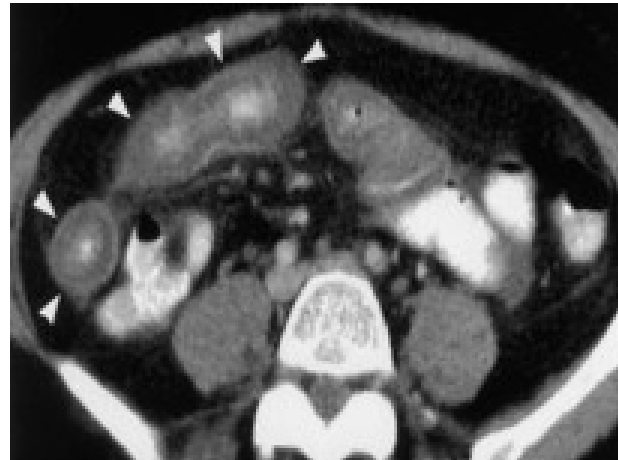
Acute abdomen associated to rapid worsening of general condition and shock

CT scan

SMA thrombus



Bowel wall thickening



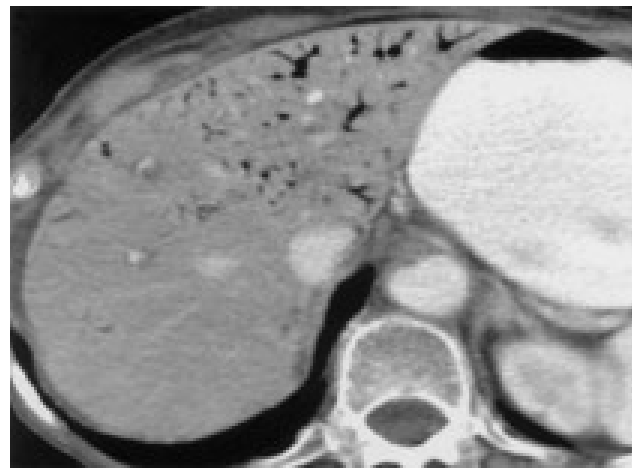
Non-enhanced bowel wall



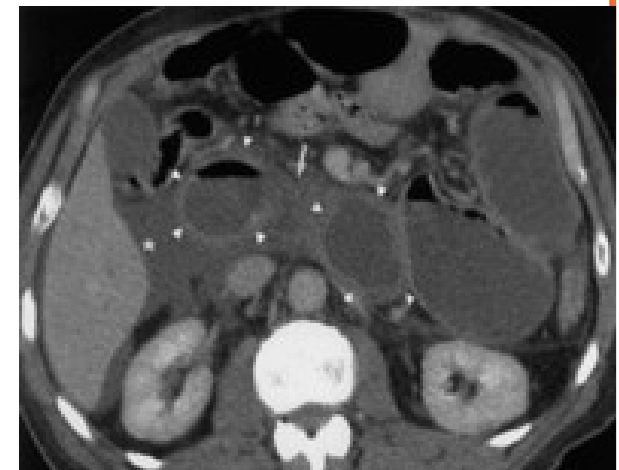
Pneumatosis intestinalis



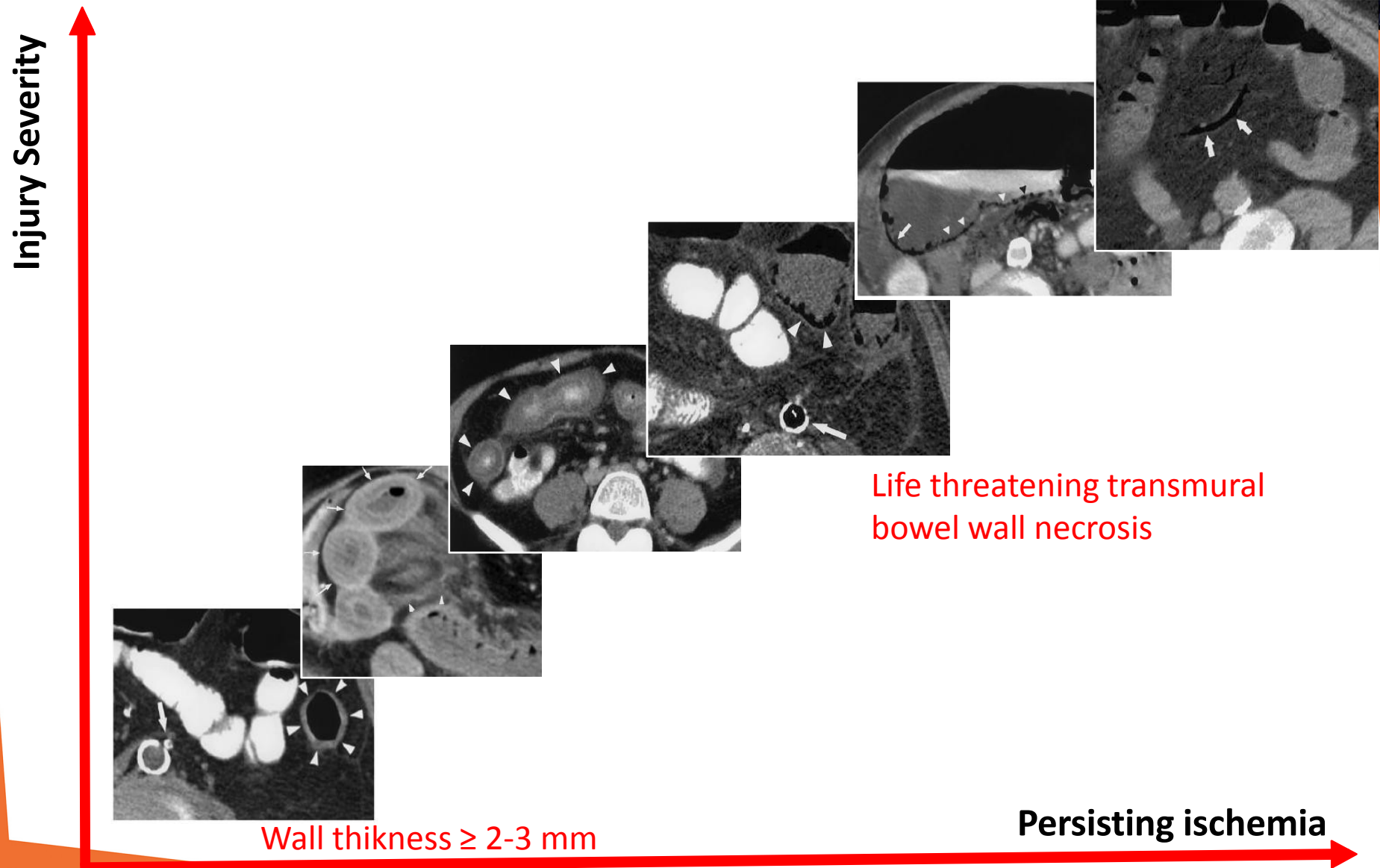
Portal venous gas



Fluid collection



The dark side of the guidelines



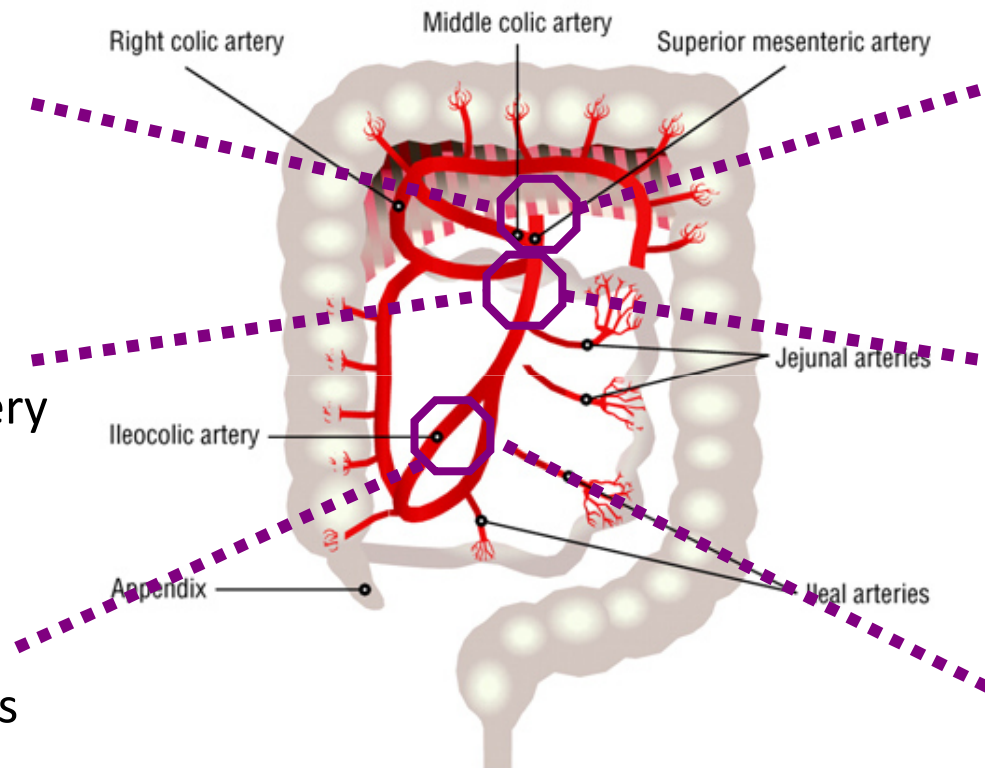
Acute SMA occlusion

SMA Embolism

Aortic ostium
~15%

Around
Middle colic artery
~40%

Distal branches
~45%



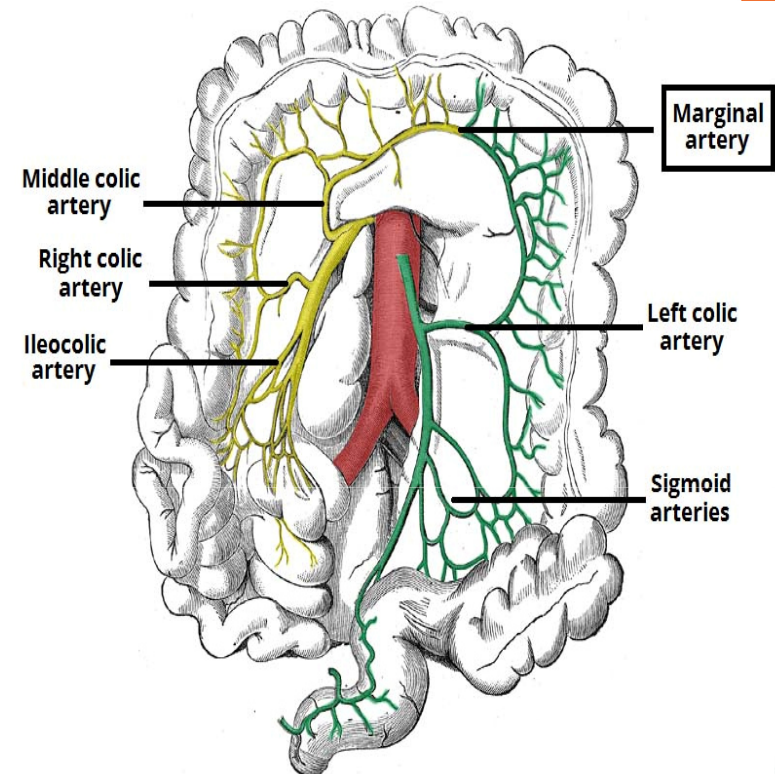
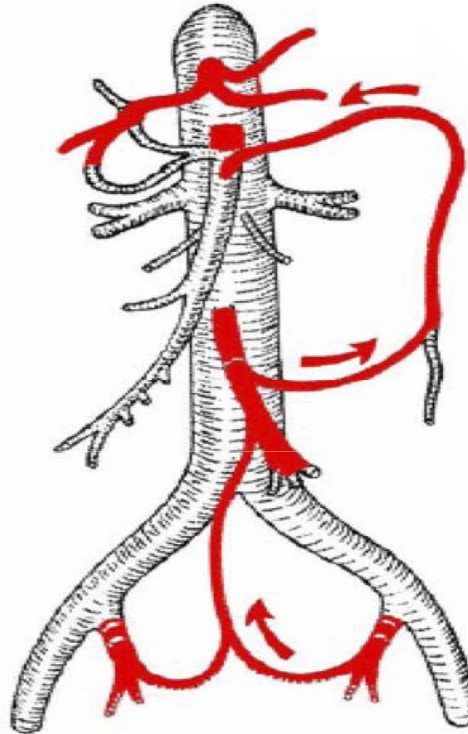
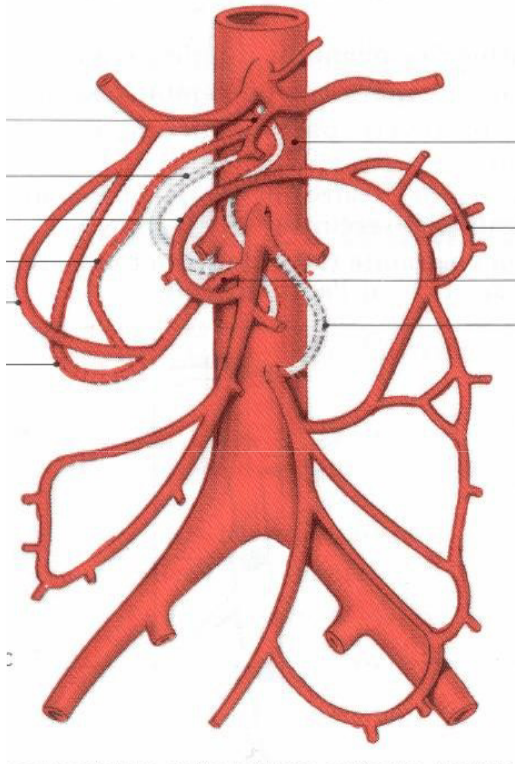
SMA Thrombosis

Aortic ostium
~60-80%

Around
Middle colic artery
~15%

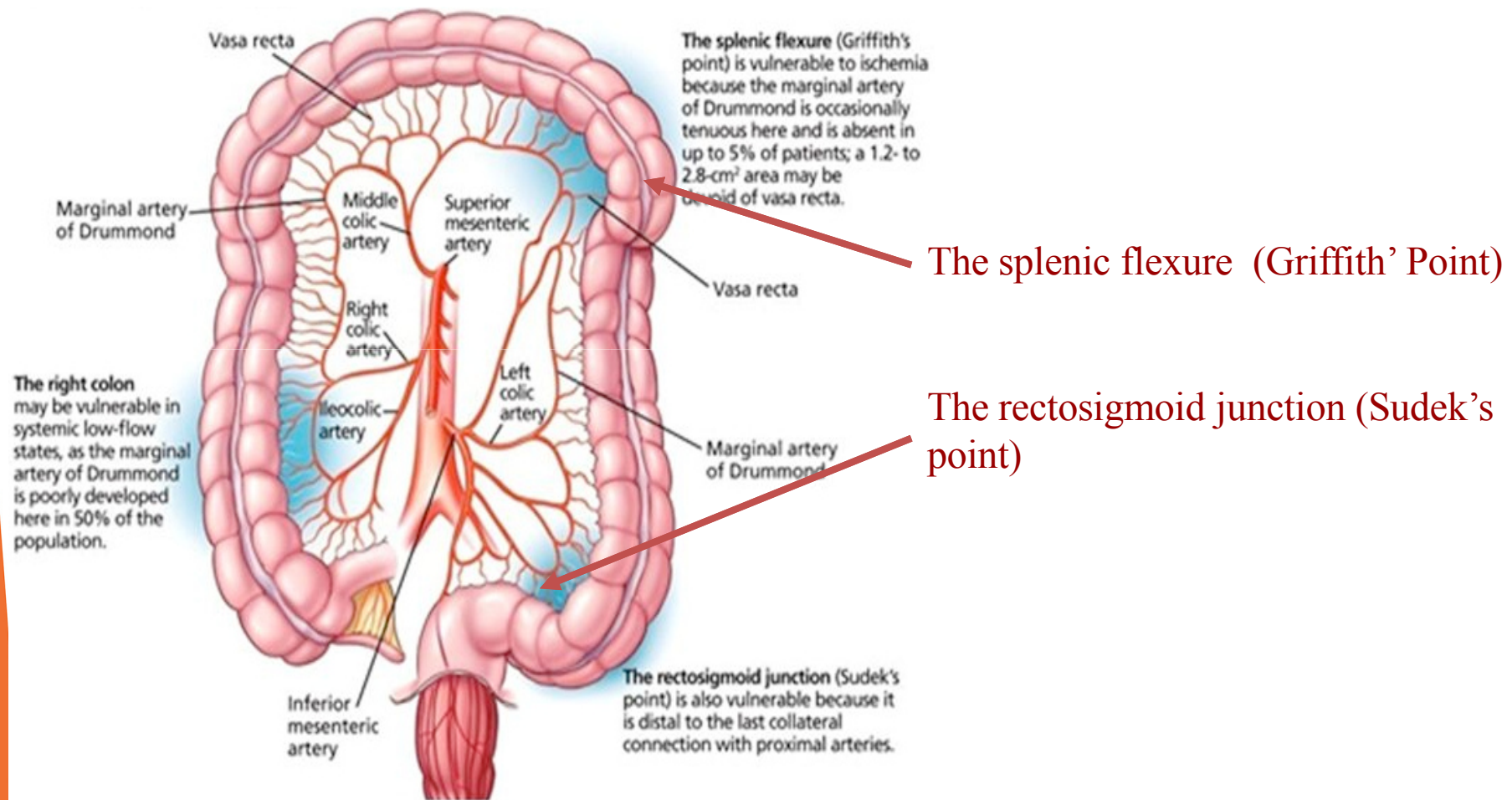
Distal branches
~5%

Vascular anastomosis

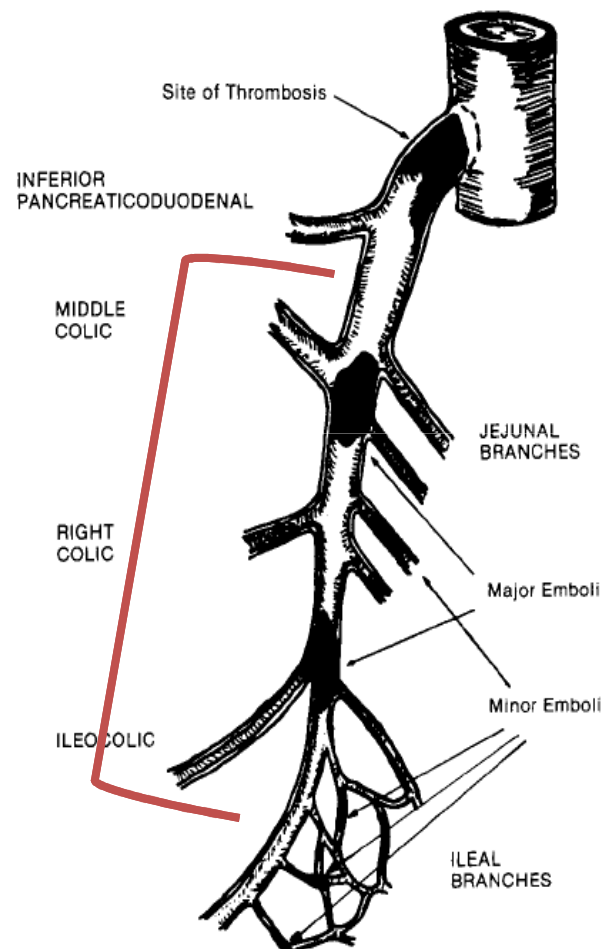


RIOLANO'S ARCH
DUODENAL PANCREATIC ARCHES
HEMORRHOID ARTERY
DRUMMOND'S ARCH (Marginal artery)

Weak points



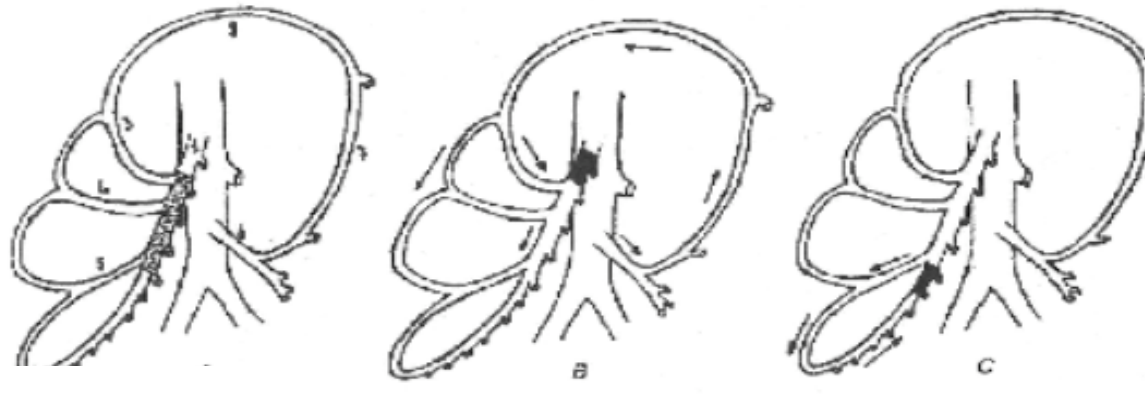
Reiner's Critical Segment



The point of Reiner is a segment of the superior mesenteric artery between the point before the origin of the second intestinal artery and middle colic and a point downstream dell'ileocolic artery.

The occlusion is frequent in case of emboli ischemia and this event undermine the Drumond arch.

Reiner's Critical Segment



Injury extension in case of obstruction of the **Reiner segment**. The ischemia is extended from **the Traiz legament to the splenic colon flexure**.

Treatment

Traditional management of AMI was open surgery especially for acute abdomen.

- Embolectomy
 - Thrombo-endarterectomy
 - Aorto-mesenteric bypass
- +/- Bowel resection of necrotic parts

Mortality and intestinal resection rate remains high (37%-59%)

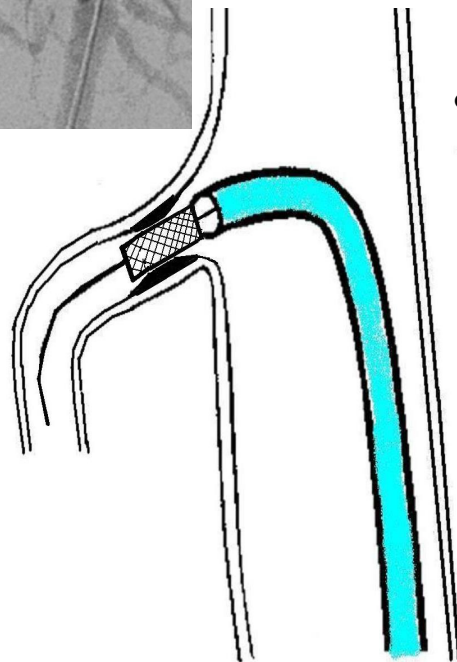
Alternative treatment: Endovascular

Endovascular treatment

- PTA and stenting
- Primary stenting
- Mechanical aspiration (manual or automated systems)
- Pharmacological therapy (urokinasis, rTPA, 2b–3a antagonists...)
- Combined technique



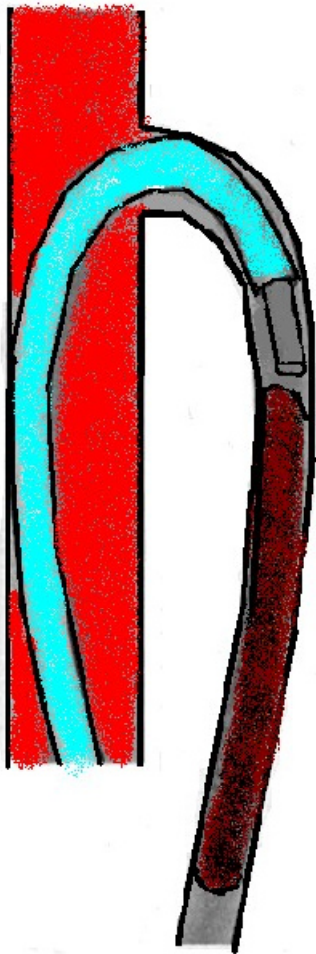
ET: SMA stenting



- Brachial vs femoral
- Occlusions stump
- Lateral view
- Heparin 2500 U.I.
- Vasodilators
- Long sheath
- Occasionally, a .014" and low-profile balloons are needed to cross and predilate the lesion
- Balloon-expandable stents should be preferred for proximal lesions and self-expandable to compliance better to SMA angulations for distal ones
 - dual anti-platelets (aspirin for life/clopidogrel 3-6 months)
 - restenosis/occlusion 16-20%/1 year

Raupach et al. CIRSE 2016 Workshop: acute mesenteric ischemia
Acosta S, Sonesson B, Resch T (2009) Endovascular therapeutic approaches for acute superior mesenteric artery occlusion. Cardiovasc Intervent Radiol 32:896–905

Aspiration embolectomy



- 7F angled guiding catheter, (*Destinaton, RDC, Terumo*) removable haemostatic valve
- 5-7F aspiration catheter manual aspiration 20 ml/60 ml syringe
- Automatic thromboaspiration Penumbra Indigo System (CAT5-CAT6)

Tromboembolectomy

- **Thrombectomy by AngioJet** (Boston Scientific)
- **Thrombectomy by Rotarex** (*Straub Medical AG*)
- **Thrombectomy with carotid filter**
- **Thrombectomy with stent retriever**



7-8F guiding cath for treat by mechanical fragmentation (e.g. Aspirex, Straub)
or aspiration by several passes

Raupach et al. CIRSE 2016 Workshop: acute mesenteric
ischemia

S.Acosta, Cardiovasc Intervent Radiol (2009) 32:896–905

Thrombolysis infusion

Femoral access with a 6-8F introducer.

Heparin up to ACT 250-300".

The SMA must be deeply engaged and a 7F 60cm introducer with removable hub (Destination, Terumo).

Local thrombolysis should be performed with **rtPA at a rate of 0.25 to 1 mg/h or 0.02 – 0.1 mg/kg/h.**

Angiographic control of cath position and thrombolytic effect should be carried out every 12 hours.



Raupach et al. CIRSE 2016 Workshop: acute mesenteric ischemia

S.Acosta, Cardiovasc Intervent Radiol (2009) 32:896–905

Nilesh et al CIRSE Quality Improvement Guidelines for Percutaneous Management of Acute Lower-extremity Ischemia

Evidence

- No randomized controlled trials to guide treatment
- High ratio of case reports and small retrospective series

Eur J Trauma Emerg Surg (2016) 42:253–270
DOI 10.1007/s00068-016-0634-0



ESTES GUIDELINE

ESTES guidelines: acute mesenteric ischaemia

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Review

Management of Acute Mesenteric Ischemia: A Critical Review and Treatment Algorithm

Yang Zhao, MD¹, Henghui Yin, MD, PHD¹, Chen Yao, MD, PHD¹, Jiong Deng, BS¹, Mian Wang, MD, PHD¹, Zilun Li, MD, PHD¹, and Guangqi Chang, MD¹

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Morbidity

	ET (n = 234)		OS (n = 856)		P
	Data Available (n)	Number of Events, n (%)	Data Available (n)	Number of Events, n (%)	
Overall complications	209	100 (47.9% \pm 6.8%)	644	400 (62.1% \pm 3.8%)	.0001
Wound infection	209	0	284	11 (3.9% \pm 2.2%)	.003
MODS	188	3 (1.6% \pm 1.8%)	323	56 (17.3% \pm 4.1%)	.0001
Reocclusion of SMA	188	1 (0.5% \pm 1.0%)	284	8 (2.8% \pm 1.9%)	.15
SMA dissection	209	4 (1.9% \pm 1.9%)	405	0	.013
SMA perforation/bleeding	188	2 (1.1% \pm 1.5%)	405	0	.1
Emboli in distal branches	199	2 (1.0% \pm 1.4%)	405	0	.11
Short bowel syndrome	209	11 (5.3% \pm 3.0%)	405	37 (9.1% \pm 2.8%)	.09
Septicemia	188	7 (3.7% \pm 2.7%)	405	25 (6.2% \pm 2.3%)	.22
Acute renal failure	188	16 (8.5% \pm 3.9%)	284	18 (6.3% \pm 2.8%)	.371
Pulmonary infection	188	16 (8.5% \pm 3.9%)	323	49 (15.2% \pm 3.9%)	.029
Myocardial infarction	188	1 (0.5% \pm 1.0%)	284	19 (6.7% \pm 2.9%)	.003
Anastomotic leakage	188	0	284	10 (3.5% \pm 2.1%)	.007
Urinary infection	188	0	284	7 (2.5% \pm 1.8%)	.045
Access site bleeding	199	11 (5.5% \pm 3.2%)	405	0	.0001
Bowel ischemia/infarction	188	19 (10.1% \pm 4.3%)	337	36 (10.7% \pm 3.3%)	.84
Stroke	188	2 (1.1% \pm 1.5%)	284	3 (1.1% \pm 1.2%)	1
In-hospital mortality	234	63 (26.9% \pm 5.7%)	859	346 (40.3% \pm 3.3%)	.0001
Primary patency	89	84 (94.4% \pm 4.8%)	181	95 (52.5% \pm 7.3%)	.0001

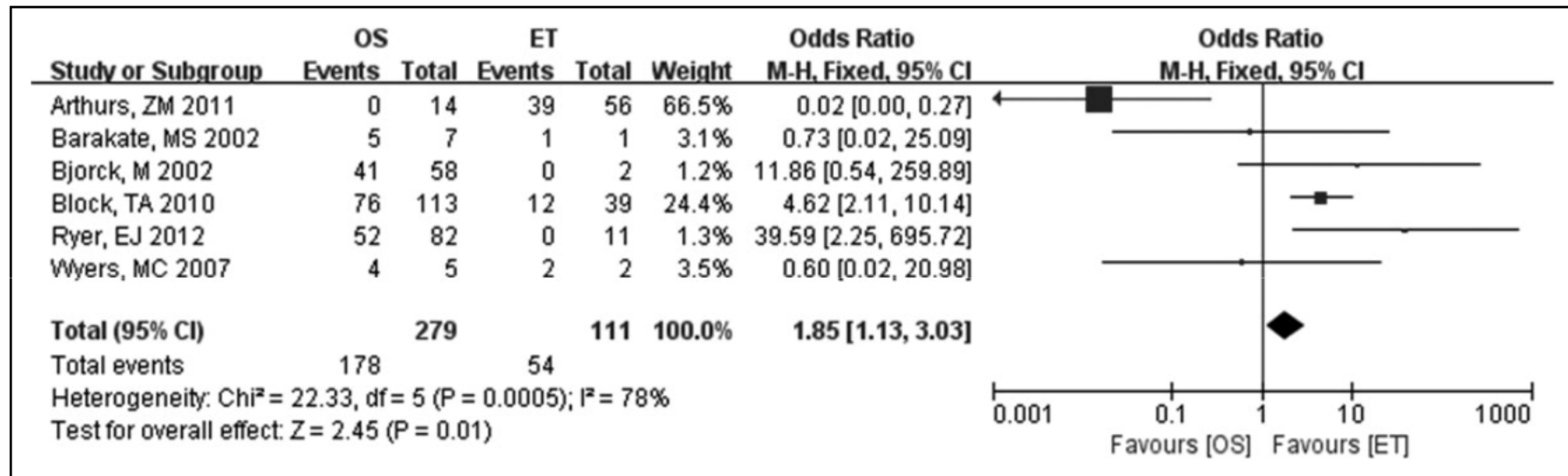
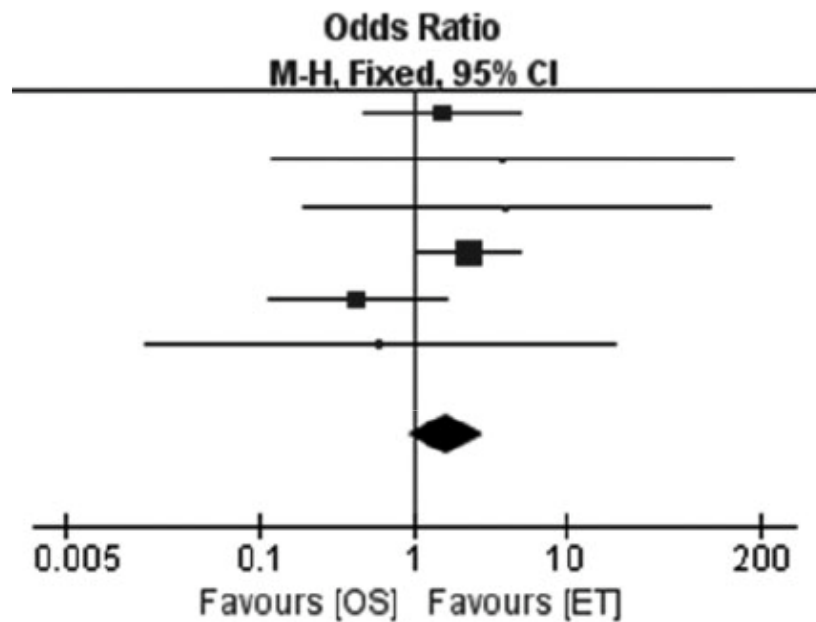
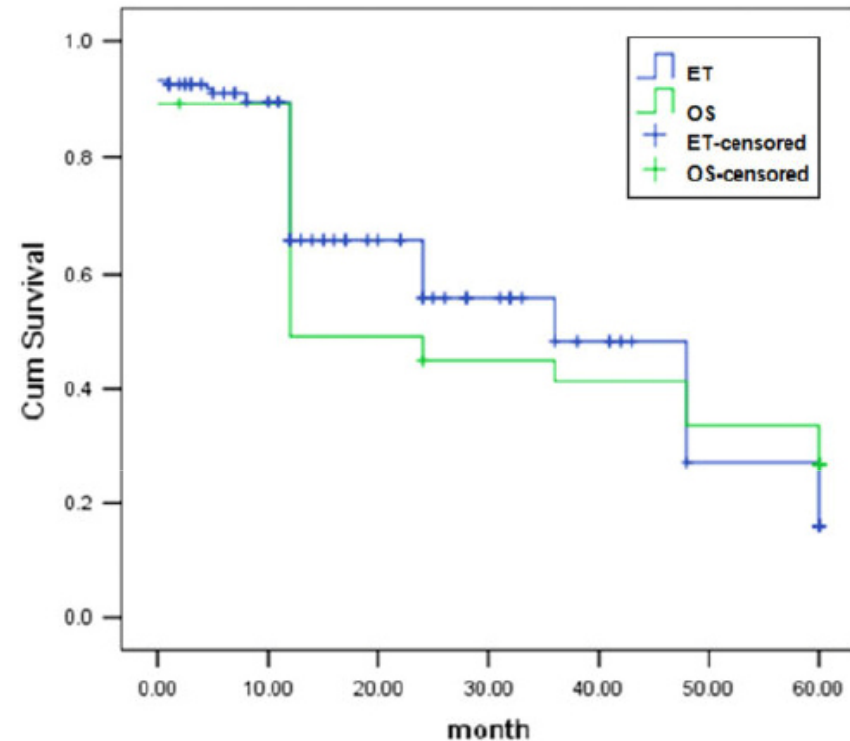


Figure 3. Secondary operation for patients treated with OS versus ET. CI indicates confidence interval; ET, endovascular therapy; OS, opening

Mortality



In hospital mortality
ET 27% vs OS 40%

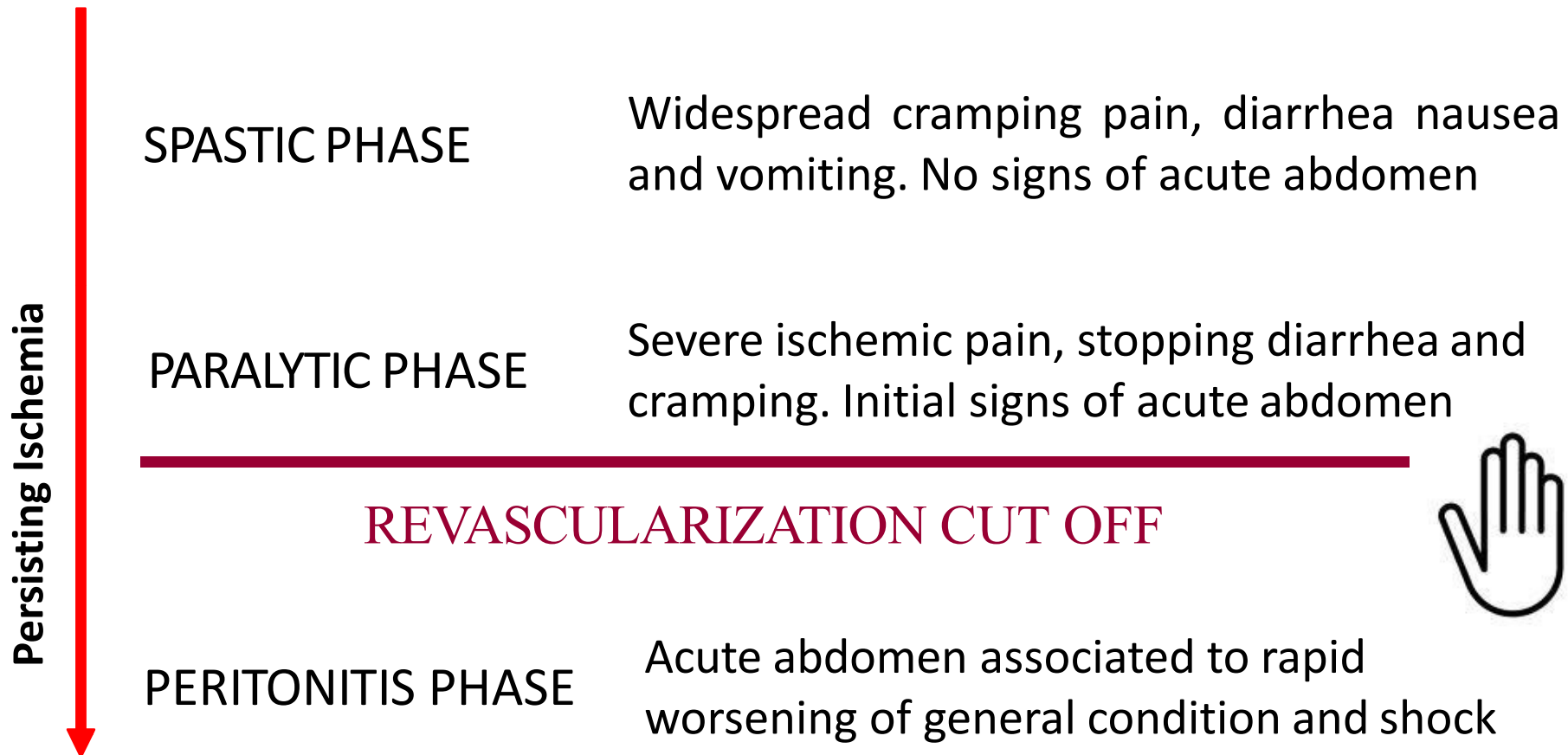


5-year Mortality
1 year ET 90% vs OS 65%
2 years ET 56% vs OS 50 e 55%

But selection bias...

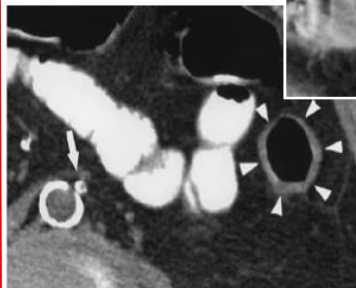
Time critical

No presence of peritonitis or suspicions of intestinal necrosis!

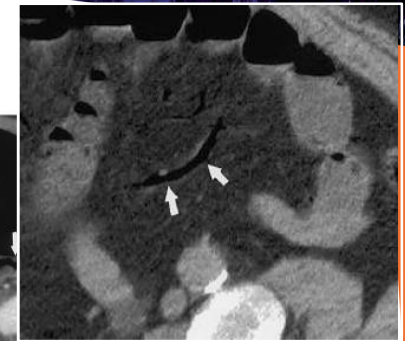
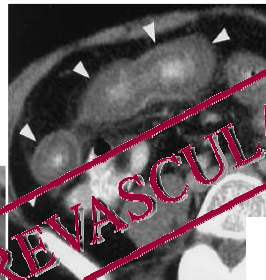


Time critical

Injury Severity



Wall thickness $\geq 2-3$ mm



REVASCULARIZATION CUT OFF



Life threatening transmural bowel wall necrosis

Persisting ischemia

Anatomical suitability

Anatomic suitability is one of the most important factors for determining choice of endovascular intervention

- Main trunk of SMA is not angular or tortuous
- Proximal and distal landing zones are ≥ 10 mm
- No main branches located within the section of proximal or distal landing zone

Guidelines?

What is the specific treatment for AMI?

Arterial thrombosis (TAMI)

Answer: Endovascular treatment should be the first choice for TAMI whenever possible.

Recommendations: When bowel integrity has not been compromised, endovascular techniques should be performed as first line treatment for TAMI (LOE: III).

When a laparotomy has been performed for TAMI the choice of vascular intervention will depend on available resources and expertise (LOE: IV).

When vascular expertise is not available it may be reasonable to resect the necrotic bowel first and transfer the patient for urgent interventional angiography or vascular surgery (LOE: III).

Guidelines?

What is the specific treatment for AMI?

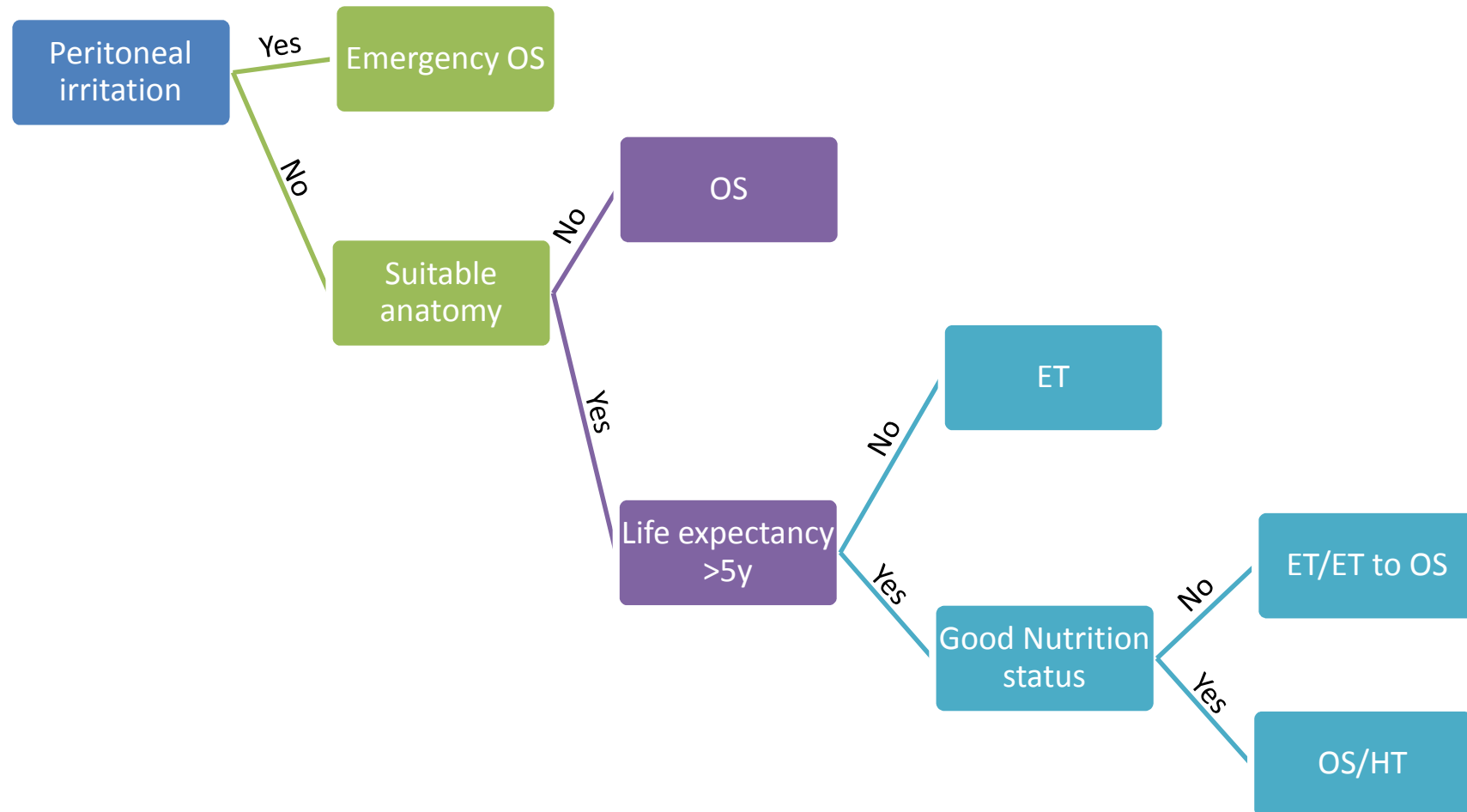
Arterial embolism (EAMI)

Answer: Open embolectomy is widely used in this scenario. However, if expertise and appropriate resources are available, and there is no evidence of bowel necrosis, endovascular techniques should be attempted.

Recommendation: In cases where immediate surgical intervention is not required the decision to perform endovascular or open vascular surgery for EAMI should be determined by the personal experience and technical capabilities of the surgeon and the available resources (LOE: IV).

When EAMI is identified during a laparotomy an open embolectomy should be performed (LOE: IV).

Treatment algorithm



Mesenteric Venous Thrombosis

Younger patients

Primary MVT (40%)

- any hypercoagulable states

Secondary MVT (60%)

- Portal hypertension
- Intraabdominal sepsis
- Intraabdominal neoplasia
- Pancreatitis
- Trauma

Symptoms

- Less severe
- Slower onset [weeks]

Mainstay therapy

- Anti-coagulation
- Surgical resection

Endovascular treatment

SMA thrombolytic infusion

Portal vein or SMV:

- Percutaneous hepatic/splenic
- Trans-jugular trans-hepatic
- Thrombolysis
- Mechanical

When?

- Anti-coagulation failure
- Severe pain without infarction
- Infarction/surgery excludes thrombolysis
- Options discussion



Guidelines?

What is the specific treatment for AMI?

Venous ischaemia (VAMI)

Answer: The first line treatment for mesenteric venous thrombosis is anticoagulation.

Recommendations: Systemic anticoagulation should be started as soon as possible in VAMI (LOE: III).

Endovascular intervention should be offered to patients with VAMI who deteriorate during medical therapy (LOE: IV).

Non-occlusive Mesenteric Ischaemia

The dark side of the guidelines

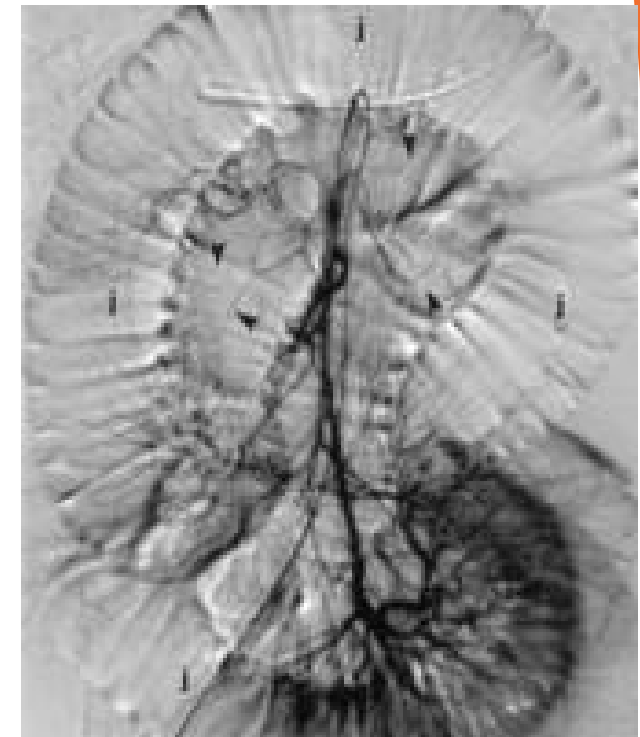
Conditions resulting in splanchnic vasoconstriction

ICU – elderly

- Septic or cardiogenic shock
- Vasoconstrictive drugs/poisoning
- Infarction established
- Exclude SMV thrombosis

Management

- Treat shock
- Spasm-local vasodilators [poisoning]
- Laparotomy/laparoscopy



Guidelines?

What is the specific treatment for AMI?

Non-occlusive mesenteric ischaemia (NOMI)

Answer: The first line treatment for NOMI is medical therapy with direct infusion of vasodilators into the SMA.

Recommendation: NOMI should be managed by correcting the underlying cause wherever possible and improving mesenteric perfusion by direct infusion of vasodilators. Infarcted bowel should be excised (LOE: III).

*“Occlusion of the mesenteric vessels is apt to be regarded as one of those condition of which
...the diagnosis is impossible,
...the prognosis hopeless,
...and the treatment almost useless”*

A.J. Cokkinis 1926

Grazie!

