



ACUTE MESENTERIC ISCHEMIA

Dr. Ana Maria González Castillo
Emergency Surgery Unit
Hospital del Mar. Barcelona (Spain)
FEBS Emergency Surgery

LET'S START



I.C.U → Starting abdominal pain + vomiting 23:00pm

67 year old female

Medical History:

- Laparoscopic Appendectomy in November 2013
- Leriche Syndrome → Axilobifemoral bypass and left femoropopliteal bypass 4 days ago + fasciotomy

Clinical Case



I.C.U → Starting abdominal pain + vomiting 23:00pm

67 year old female

Actual symptoms:

- Pain out of proportion, started suddenly and never had before...

Clinical Case



I.C.U → Starting abdominal pain + vomiting 23:00pm

67 year old female

Actual symptoms:

- Pain out of proportion, started suddenly and never had before...
.....Morphine is not effective....

Plan: optimisation of the painkillers and blood test control





DO YOU AGREE??



Those of you who disagree, WHY?

Message



Contemporary management of acute mesenteric ischemia: Factors associated with survival

Woosup M. Park, MD,^a Peter Gloviczki, MD,^a Kenneth J. Cherry, Jr, MD,^a John W. Hallett, Jr, MD,^a Thomas C. Bower, MD,^a Jean M. Panneton, MD,^a Cathy Schleck, BS,^b Duane Ilstrup, MS,^b William S. Harmsen, MS,^b and Audra A. Noel, MD,^a Rochester, Minn



95% Abdominal pain
44% Nausea
35% Vomiting
35% Diarrhea
16% Blood per rectum

Computed tomography angiography (CTA) should be performed without delay in any patient with suspicion of AMI

CT Diagnosis of Acute Mesenteric Ischemia from Various Causes

Akira Furukawa¹
Shuzo Kanasaki
Naoki Kono
Makoto Wakamiya
Toyohiko Tanaka
Masashi Takahashi
Kiyoshi Murata

OBJECTIVE. Acute mesenteric ischemia can be caused by various conditions such as arterial occlusion, venous occlusion, strangulating obstruction, and hypoperfusion associated with nonocclusive vascular disease, and the CT findings vary widely depending on the cause and underlying pathophysiology. The aim of this article is to review the CT appearances of acute mesenteric ischemia in various conditions.

CONCLUSION. Recognition of characteristic CT appearances and the variations associated with each cause may help in the accurate interpretation of CT in the diagnosis of mesenteric ischemia.



Message



Radiology

Diagnostic Accuracy of Multidetector CT in Acute Mesenteric Ischemia: Systematic Review and Meta-Analysis¹



Abdominal Imaging

© Springer Science+Business Media New York 2013
Published online: 9 January 2013

Abdom Imaging (2013) 38:714–719
DOI: 10.1007/s00261-012-9975-2

ACR appropriateness criteria[®] imaging of mesenteric ischemia

Isabel B. Oliva,¹ Amir H. Davarpanah,¹ Frank J. Rybicki,² Benoit Desjardins,³ Scott D. Flamm,⁴ Christopher J. Francois,⁵ Marie D. Gerhard-Herman,² Sanjeeva P. Kalva,⁷ M. Ashraf Mansour,^{8,9} Emile R. Mohler III,^{3,6} Matthew P. Schenke Clifford Weiss,¹⁰ Karin E. Dill¹¹

BERND HAMM
PABLO L. SOS
EDITORS
Abdominal Imaging

Sensitivity 93%

Specificity 100%

Positive Predictive Value 100%

Negative Predictive Value 94%

Message



ORIGINAL ARTICLE

OPEN

The implementation of a pathway and care bundle for the management of acute occlusive arterial mesenteric ischemia reduced mortality

Matti Tolonen, MD, PhD, Aurora Lemma, MD, Pirkka Vikatmaa, MD, PhD, Erno Peltola, MD, PhD, Panu Mentula, MD, PhD, Patrick Björkman, MD, PhD, Ari Leppäniemi, MD, PhD, and Ville Sallinen, MD, PhD. *Helsinki, Finland*

The Journal of
Trauma and
Acute Care
Surgery

Implementing a clear pathway with an AMI Code

Mortality 51% → 25%

Clinical Case



Intense abdominal pain + vomiting

- Blood test results

RCP 50.39 mg/dL

Hb 9.1 g/dL

WCC 17,300 U/mcL

Lactate 3.07 mmol/L

Creatinine 1.72 mg/dL

CK 13,800 U/L

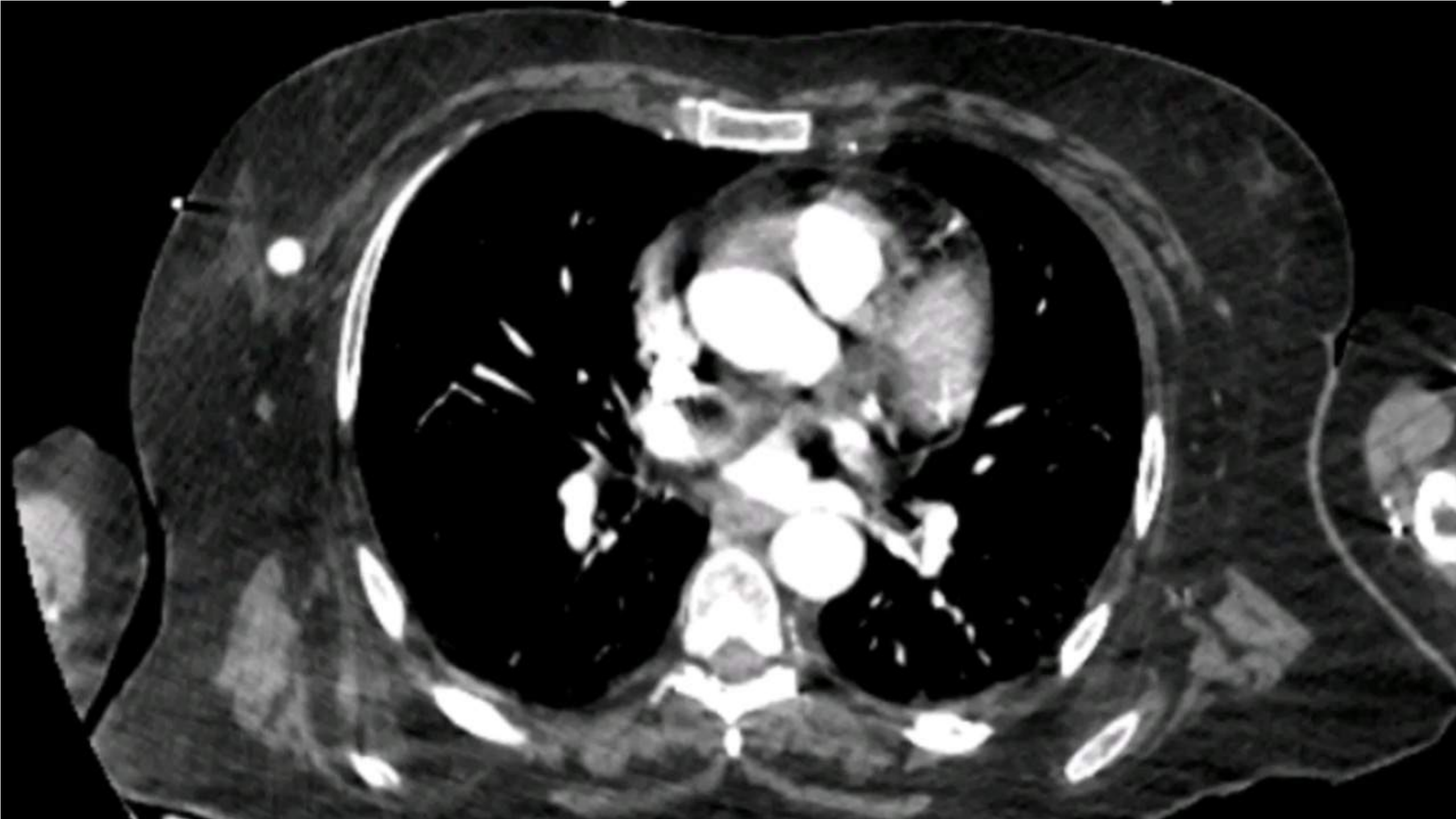
Procalcitonine 2.65 ng/mL

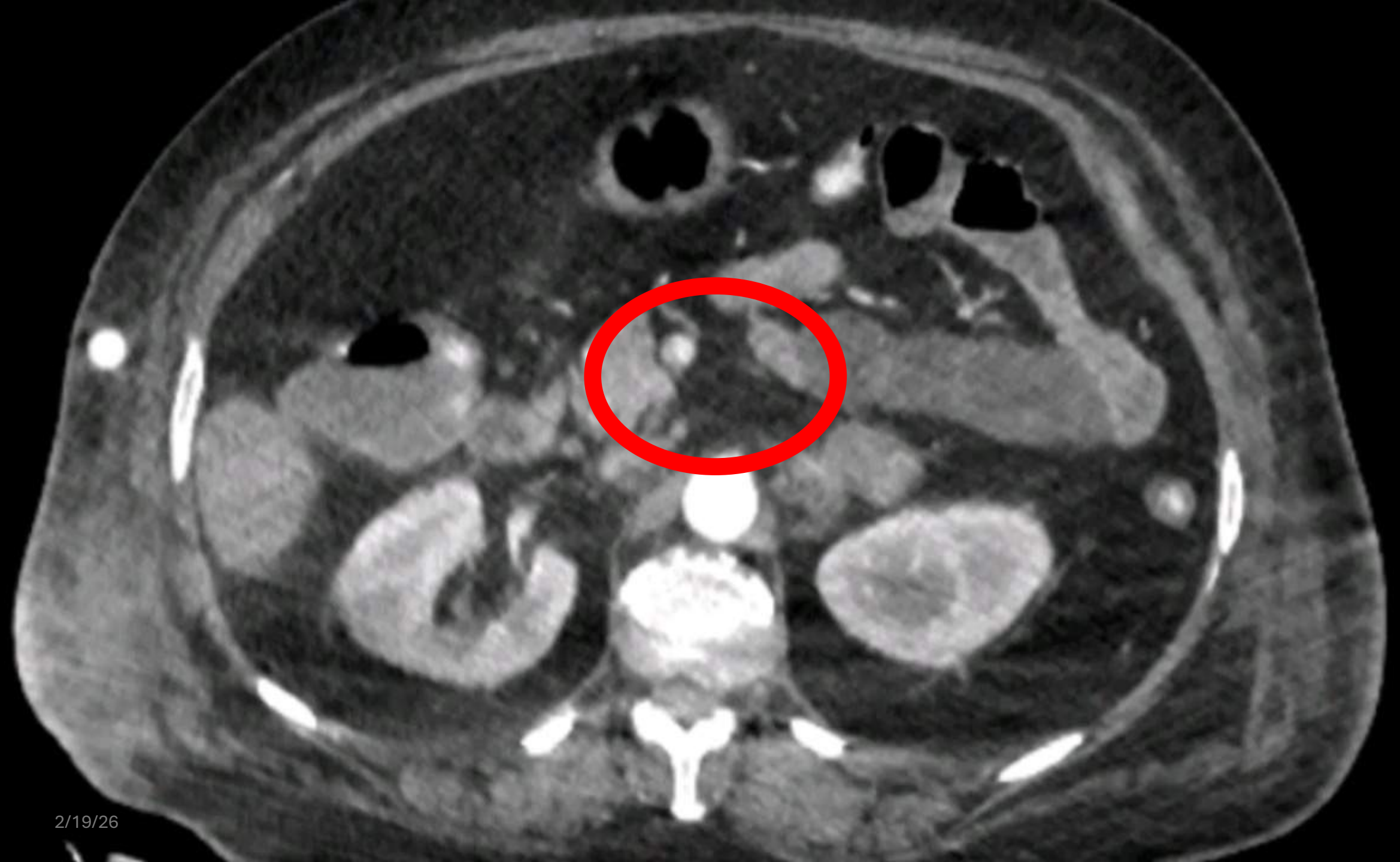
Clinical Case

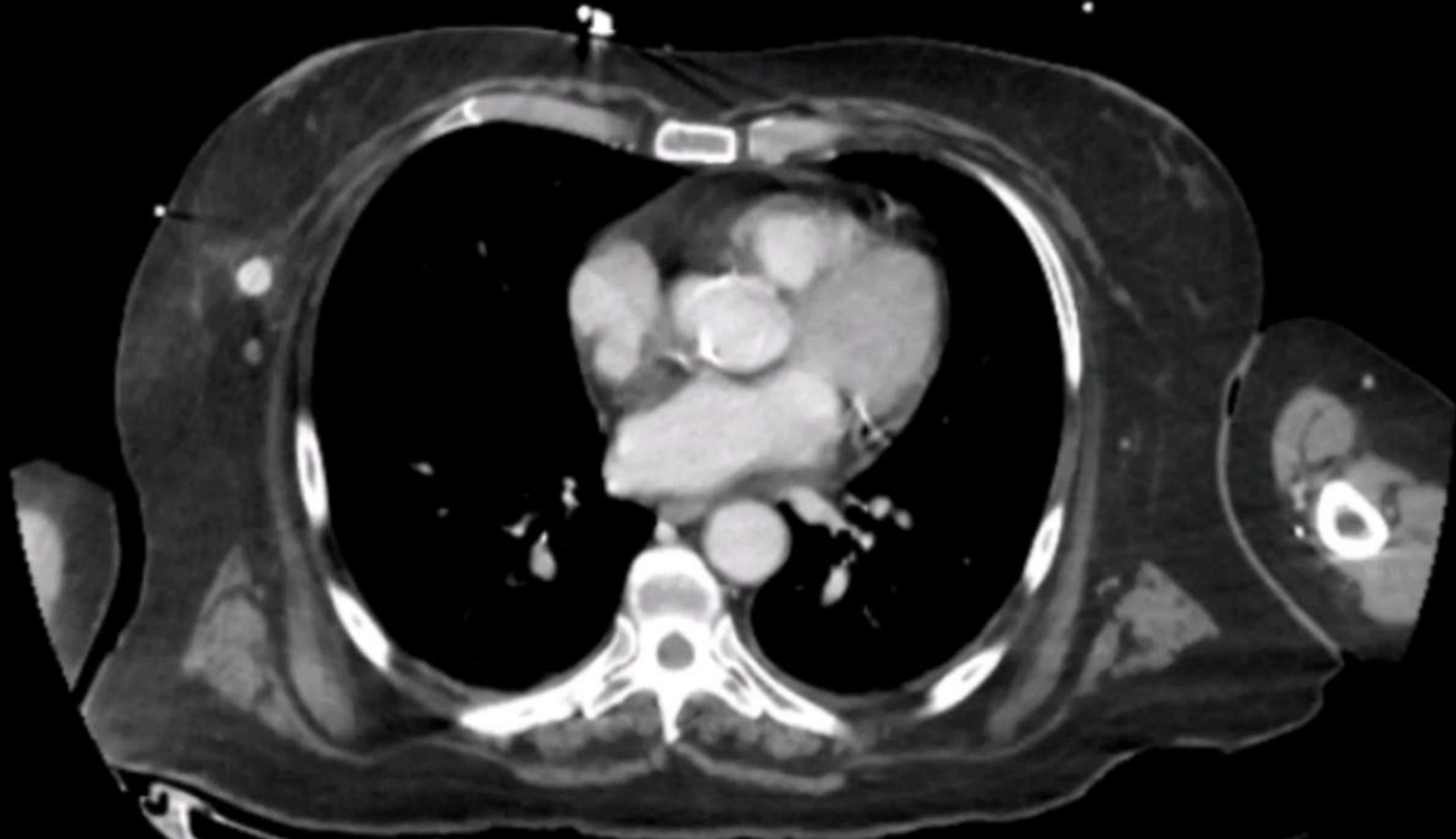
Intense abdominal pain + vomiting

- CTA ordered 10am → done 11:30am











PLAN??

Message



Bala et al. *World Journal of Emergency Surgery* (2022) 17:54
<https://doi.org/10.1186/s13017-022-00443-x>

World Journal of
Emergency Surgery

REVIEW

Open Access



Acute mesenteric ischemia: updated guidelines of the World Society of Emergency Surgery

There are NO Laboratory parameters that are sufficiently accurate to identify the presence of absence of AMI (LoE 2B)

Message



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Panu Merilinen, MD, PhD, Ari Leppäniemi, MD, PhD

The Journal of
Trauma and
Acute Care
Surgery

Implementing a clear pathway with an AMI Code and minimize delays in all phases

Mortality 51% → 25%

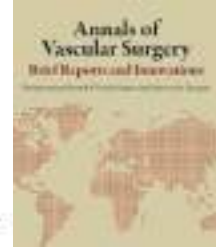
Message

Evolution in the Presentation, Treatment, and Outcomes of Patients with Acute Mesenteric Ischemia

Elizabeth L. Chou, MD^{1,*}, Linda J. Wang, MD, MBA^{1,*}, Rachel M. McLellan, BA¹, Zach M. Feldman, MD¹, Christopher A. Latz, MD¹, Glenn M. LaMuraglia, MD¹, W. Darrin Clouse, MD², Matthew J. Eagleton, MD¹, Mark F. Conrad, MD, MMSc¹

¹Division of Vascular and Endovascular Surgery, Massachusetts General Hospital Boston, MA

²Division of Vascular and Endovascular Surgery, University of Virginia



Treat the cause of the AMI
Higher mortality in non-revascularized patients

Bala et al. *World Journal of Emergency Surgery* (2022) 17:54
<https://doi.org/10.1186/s13017-022-00443-x>

REVIEW

Open Access

Acute mesenteric ischemia: updated guidelines of the World Society of Emergency Surgery



Laparoscopy can be useful in doubtful cases of NOMI or suspicion of massive AMI

Message



Review Article

Vascular

Outcomes of different acute mesenteric ischemia therapies in the last 20 years: A meta-analysis and systematic review

Li Hou^{1,2,*}, Tiehao Wang^{2,*}, Jiarong Wang², Jichun Zhao² and Ding Yuan²

Vascular
2021, Vol. 0(0) 1–12
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DOI: 10.1177/17085381211024503
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SAGE

Outcome Comparison of Endovascular and Open Surgery for the Treatment of Acute Superior Mesenteric Artery Embolism: A Retrospective Study

Wenrui Li¹, Salsai Cao², Zhiwen Zhang¹, Renming Zhu¹, Xueming Chen¹, Bin Liu¹ and Hai Feng^{1*}

¹ Affiliated Beijing Friendship Hospital, Capital Medical University, Beijing, China; ² Peking University People's Hospital, Beijing, China

From the Eastern Vascular Surgery

Comparison of open and endovascular treatment of acute mesenteric ischemia

Robert J. Beaulieu, MD,^a K. Dean Arnaoutakis, MD,^a Christopher J. Abularrage, MD, FACS,^b David T. Efron, MD, FACS,^c Eric Schneider, PhD,^d and James H. Black III, MD, FACS,^b Baltimore, Md





Review Article

Vascular

Vascular
2021, Vol. 0(0) 1–12

Outcome
Comparison of
Endovascular and Open Surgery for
Treatment of Acute Superior
Mesenteric Artery Embolism: A
Prospective Study

Li
Director

IT DEPENDS ON:

PATIENT'S PHYSIOLOGY

ETHIOLOGY OF THE OCCLUSION

“ARTHERIES CHARACTERISTICS”

“ON CALL TEAM”

Outcome
Comparison of
Endovascular and Open Surgery for
Treatment of Acute Superior
Mesenteric Artery Embolism: A
Prospective Study

Robert J. Beaulieu, MD,^a K. Dean Arnaoutakis, MD,^a Christopher J. Abularrage, MD, FACS,^b
David T. Efron, MD, FACS,^c Eric Schneider, PhD,^d and James H. Black III, MD, FACS,^b *Baltimore, Md*

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Li Cai Cao^a, Zhiwen Zhang^a, Renming Zhu^a, Xueming Chen^a, Bin Liu^a and

^a Friendship Hospital Capital Medical University, Beijing, China; ^b Peking University People's Hospital, Beijing,



Clinical Case

Intense abdominal pain + vomiting



- Surgery ordered at 11:41h → Started at 13:37h

Meropenem + Linezolid

Clinic



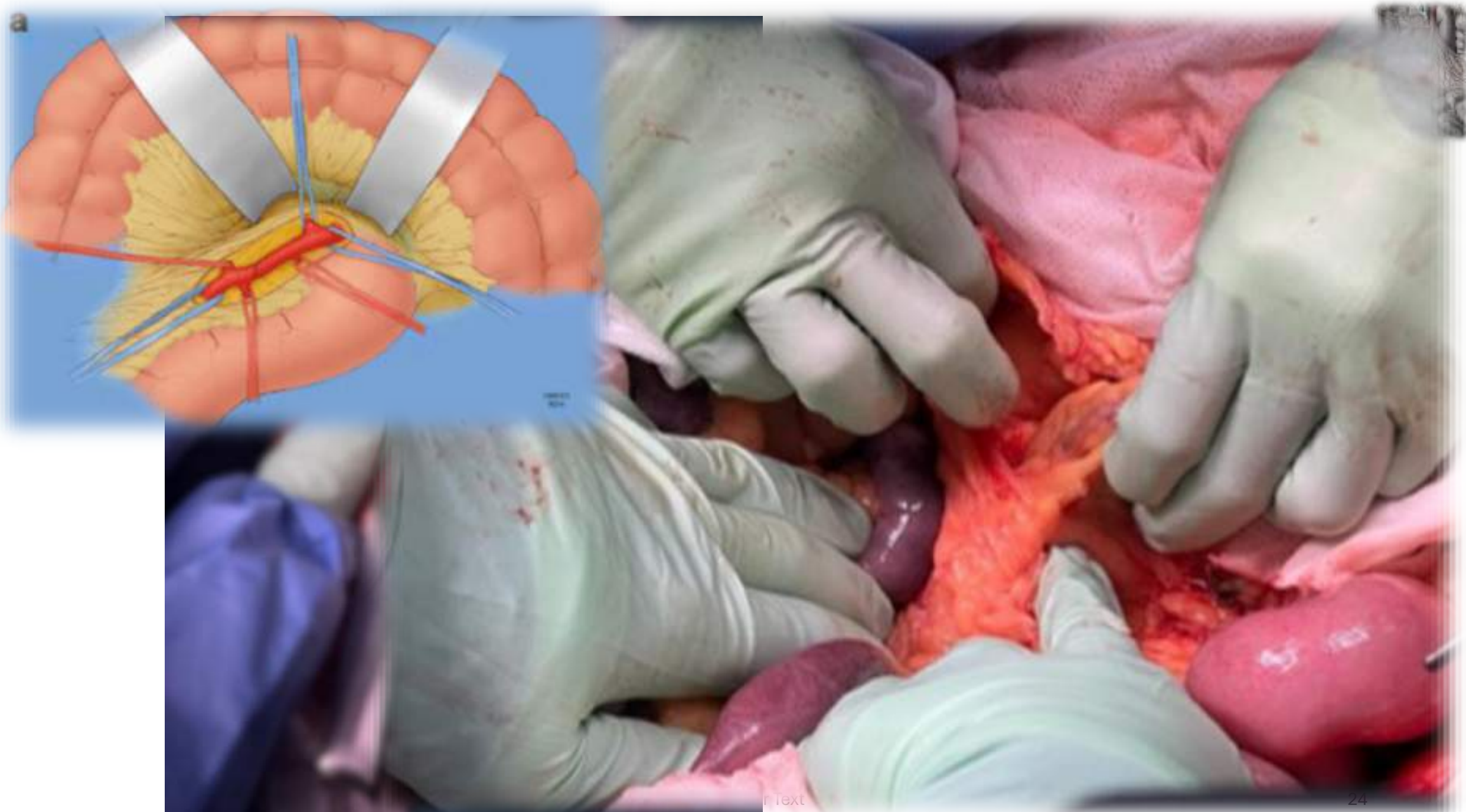
pain + vomiting

Meropenem + Linezolid

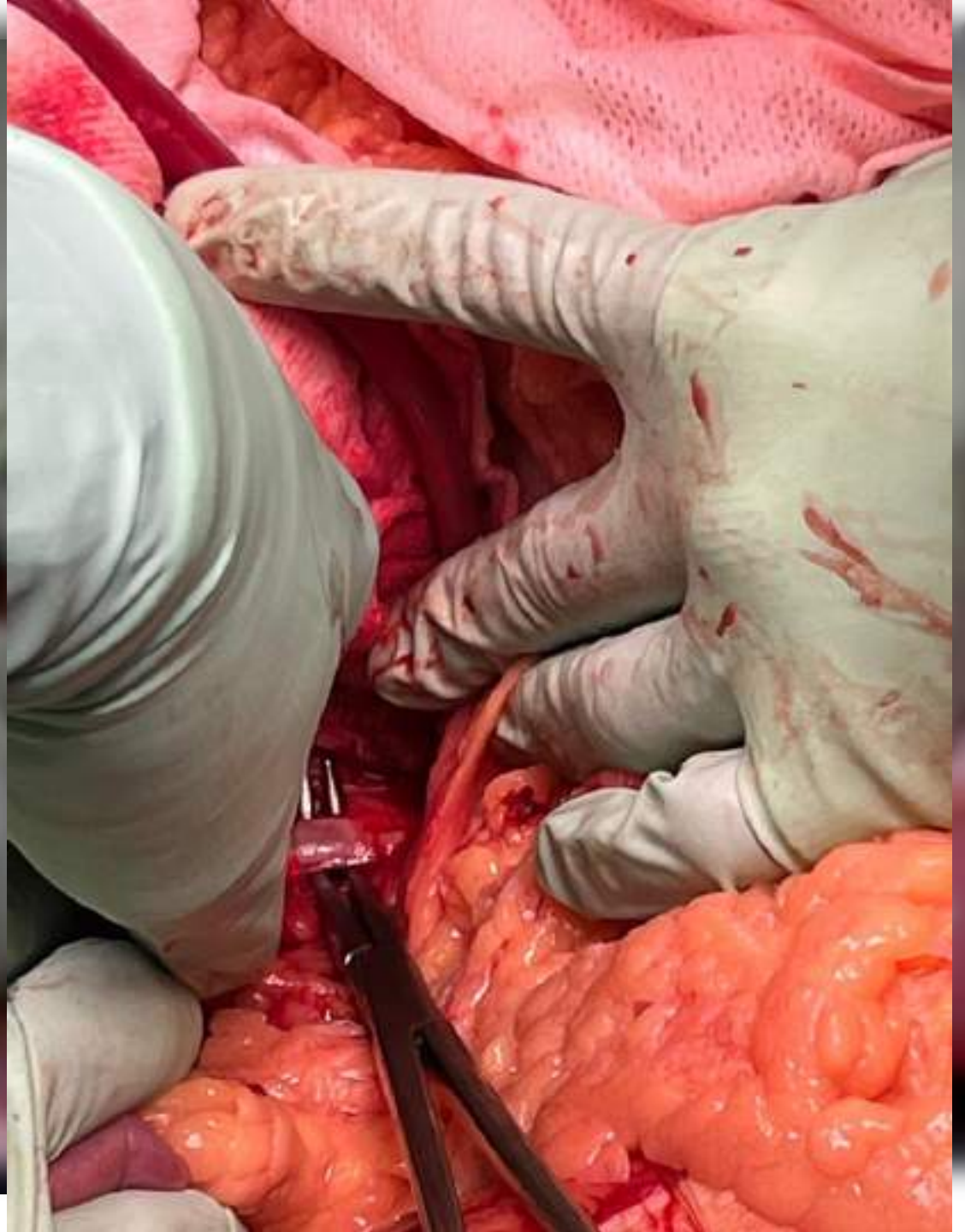


Clinical Case

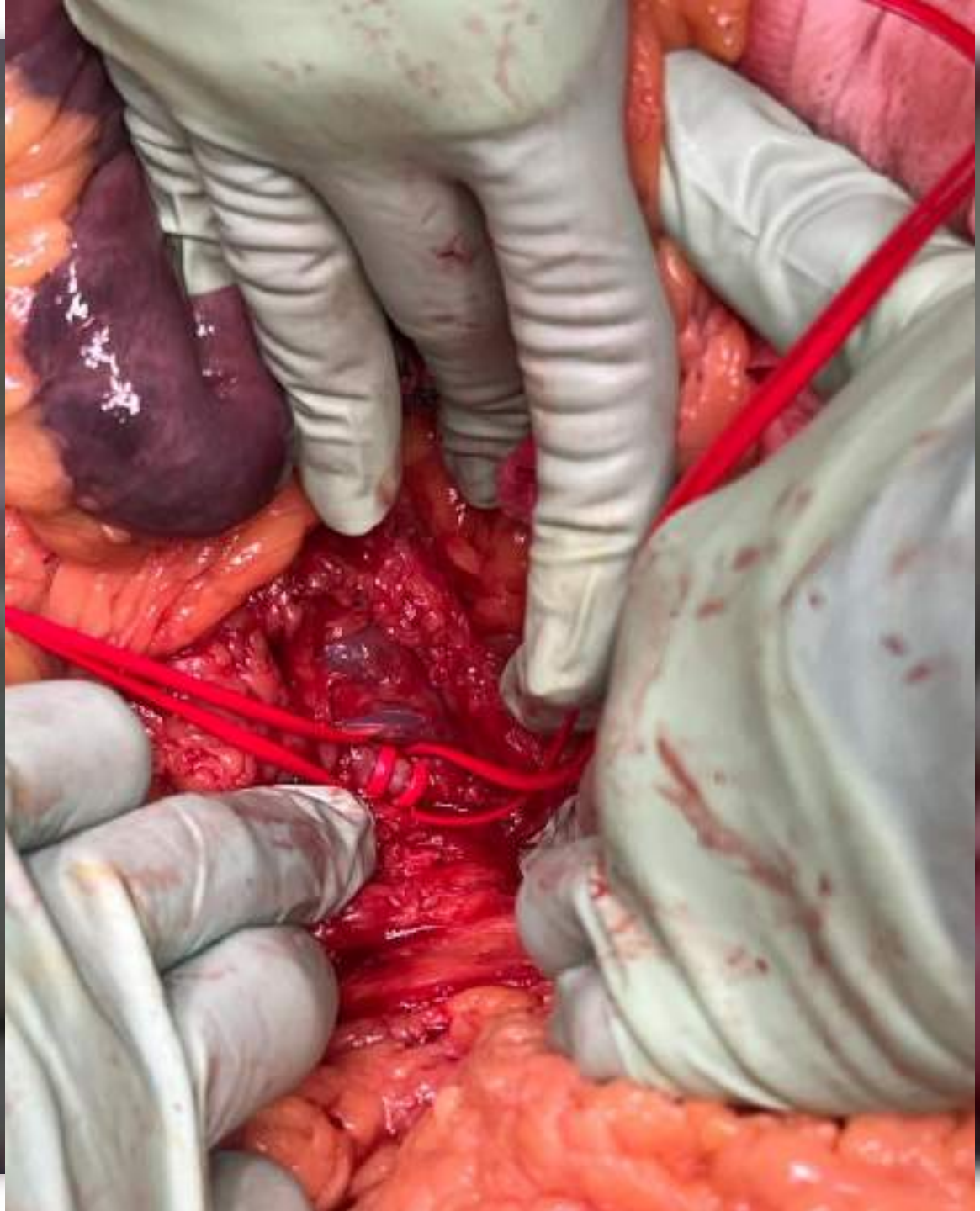




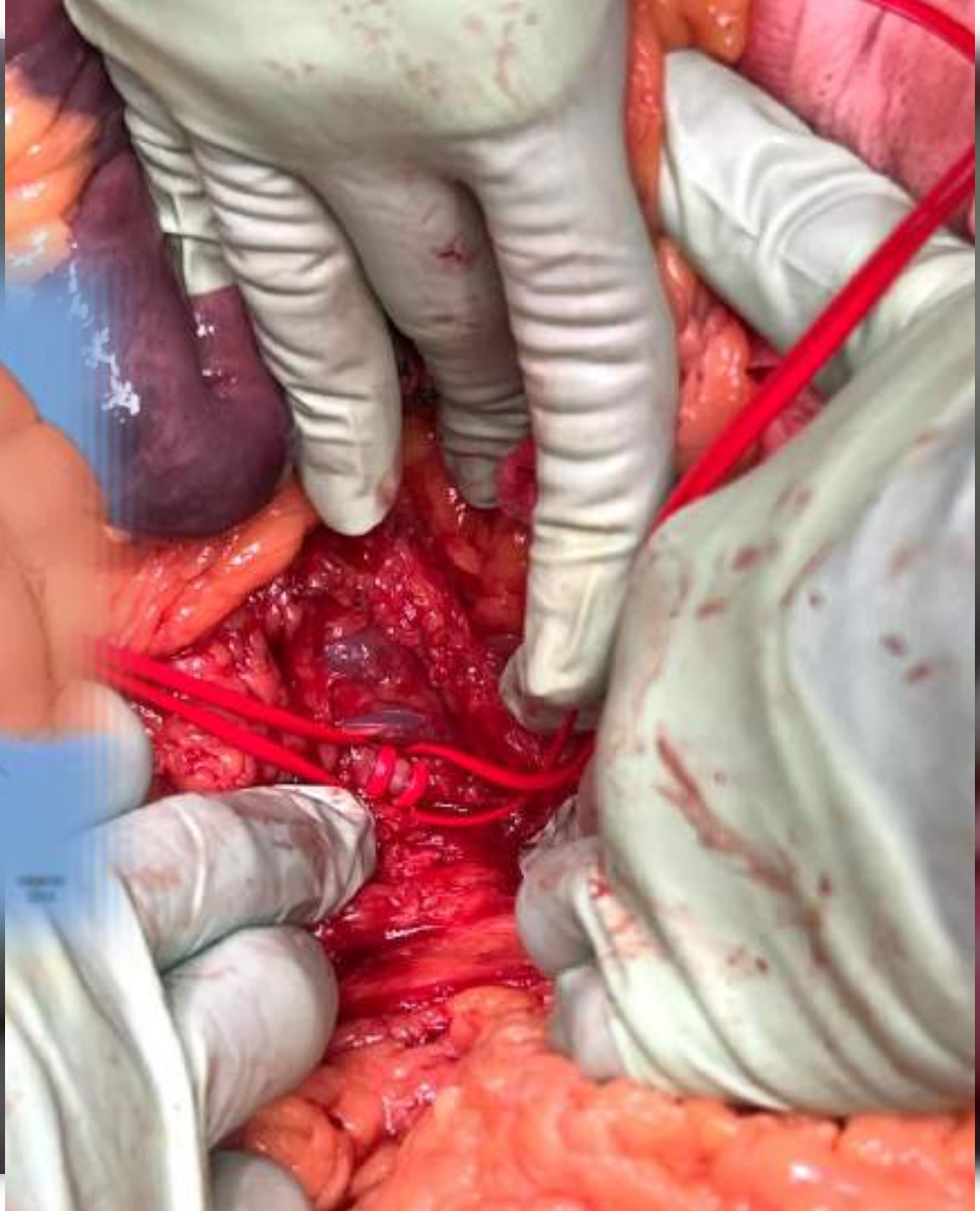
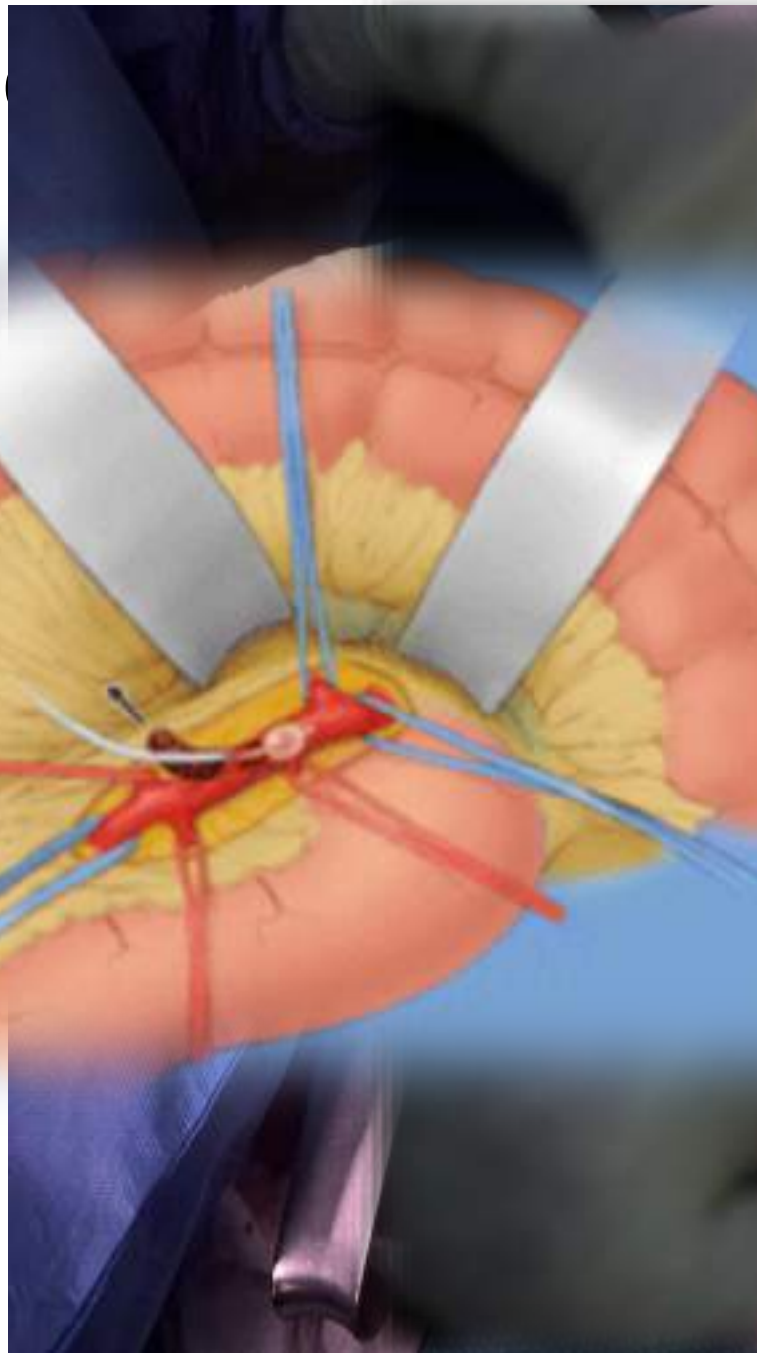
Clinical Case



Clini

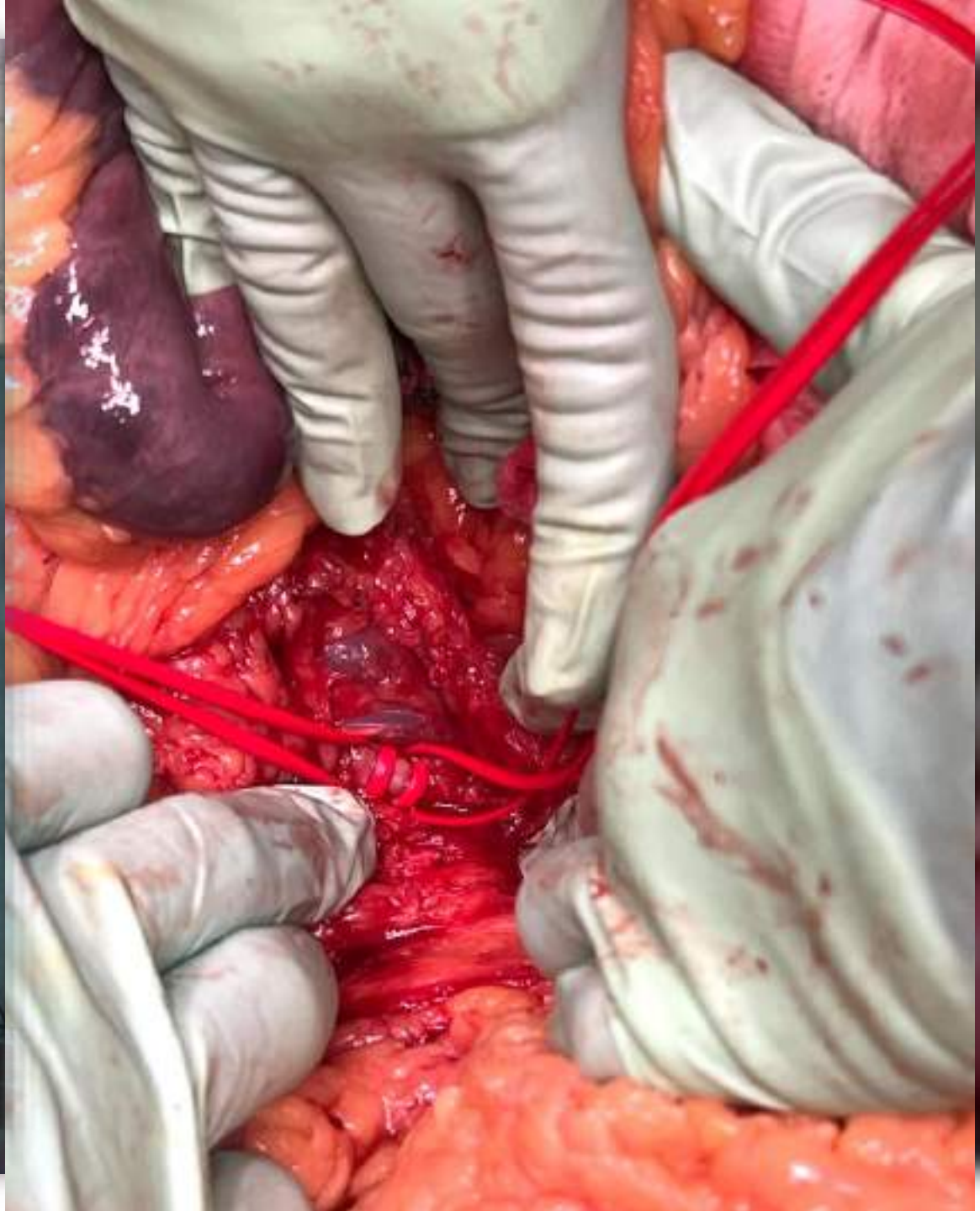


Clini





2/19/26



28

Clinical Case

Start time at 13:37h → End 14:50h

Delayed abdominal closure



Clinical Case

Start time at 13:37h → End 14:50h

Delayed abdominal closure



Ischemia-reperfusion Injury

Norepinephrine 40ml/h

Unfractionated Heparin Protocol



Clinical Case

Postoperative evolution next 48h:

Norepinephrine 40 → 10ml/h

Anuric → Infusion of Furosemide

Serous exudate in abdomen



RCP 50.39 → 41.75 mg/dL

Hb 9.1 → 9.4 g/dL

WCC 17,300 → 32,270 U/mcL

Lactate 3.07 → 1.51 mmol/L

Creatinine 1.72 → 2.82 mg/dL

CK 13,800 → 6886 U/L

Procalcitonine 2.65 → 9.86ng/dL

Clinical Case

Start time at 13:52h → End 14:35h

Abdominal closure and
time of death at 20:48h

**....TREATMENT AFTER 14H OF
SMA OCCLUSION....**



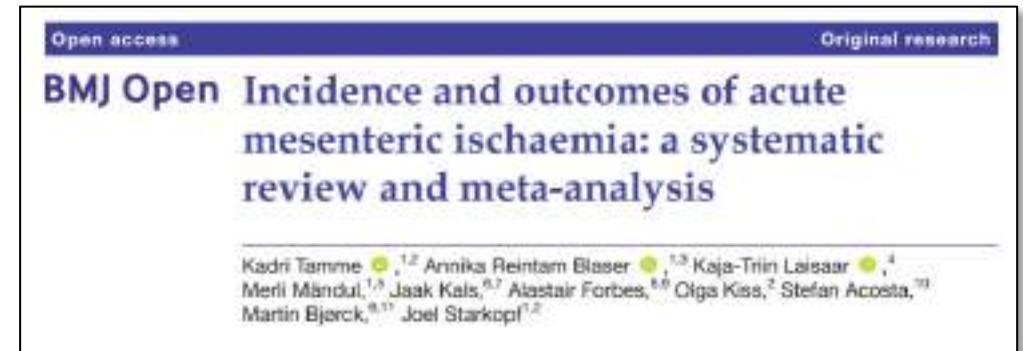


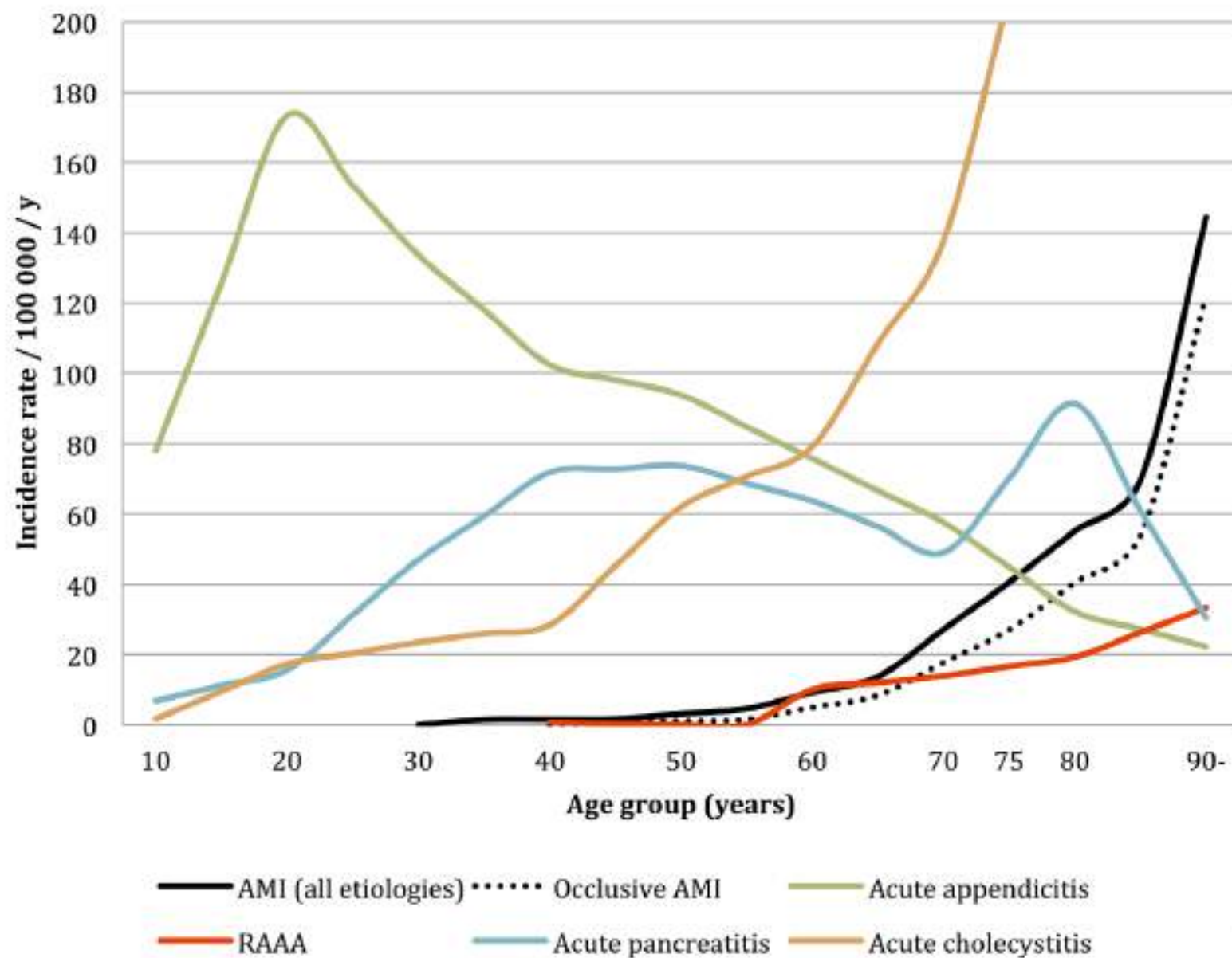
Message



- Uncommon but highly lethal (50-80%)
- Incidence 0.63 per 100,000 hab/year
 - x20 autopsies (12.9 x 100,000 hab/year)
- 1% acute abdomen
 - 10% older than 70 y/o

6.2 per 100,000 hab/year





Acute mesenteric ischemia - from epidemiology to improvements in treatment and outcomes

Auora Lemm

DOCTORAL DISSERTATION

To be presented for public discussion with the permission of the Faculty of Medicine of the University of Helsinki, in lecture room PDE, Porthaven, on the 9th of December, 2024 at 12 o'clock.

research

Message



ORIGINAL ARTICLE

OPEN

The implementation of a pathway and care bundle for the management of acute occlusive arterial mesenteric ischemia reduced mortality

Matti Tolonen, MD, PhD, Aurora Lemma, MD, Pirkka Vikatmaa, MD, PhD, Erno Peltola, MD, PhD, Panu Mentula, MD, PhD, Patrick Björkman, MD, PhD, Ari Leppäniemi, MD, PhD, *and* Ville Sallinen, MD, PhD, *Helsinki, Finland*

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- Retrospective. Meilahti Tower Hospital, Helsinki
- 1.7 milion of habitants
- Group analysis 2014-2017 vs. 2018-2020
- N=145

Message



ORIGINAL ARTICLE

OPEN

TABLE 1. Patient Characteristics and Preoperative Data

	All, n (%)	Pregroup, n (%)	Postgroup, n (%)	<i>p</i>
Preoperative imaging				
No CT	7 (5)	7 (9)	0 (0)	0.015**
CT, noncontrast	17 (12)	13 (17)	4 (6)	0.046
CT, venous phase contrast	63 (43)	41 (53)	22 (33)	0.017
CT, triple phase	58 (40)	17 (22)	41 (61)	<0.001
CT, any contrast	121 (83)	58 (74)	63 (94)	0.001
AMI suspected in CT referral	60 (43)	26 (37)	34 (51)	0.039
Diagnostic CT in the referring center	67 (46)	30 (38)	37 (55)	0.044
Delay ED-OR in study hospital, hours	5.5 (2.25–12)	7 (3.5–12.5)	3 (2–11)	0.023*
Etiology embolism / thrombus	54/91 (37/63)	33/45 (42/58)	21/46 (31/69)	0.173

Continuous variables are presented as median (interquartile range). Boldface indicates statistical significance.

*Mann-Whitney *U* test.

**Fischer's exact test (others, χ^2).

ASA, American Society of Anesthesiologists; CRP, C-reactive protein; ED, emergency department.

Message



ORIGINAL ARTICLE

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TABLE 3. Outcomes

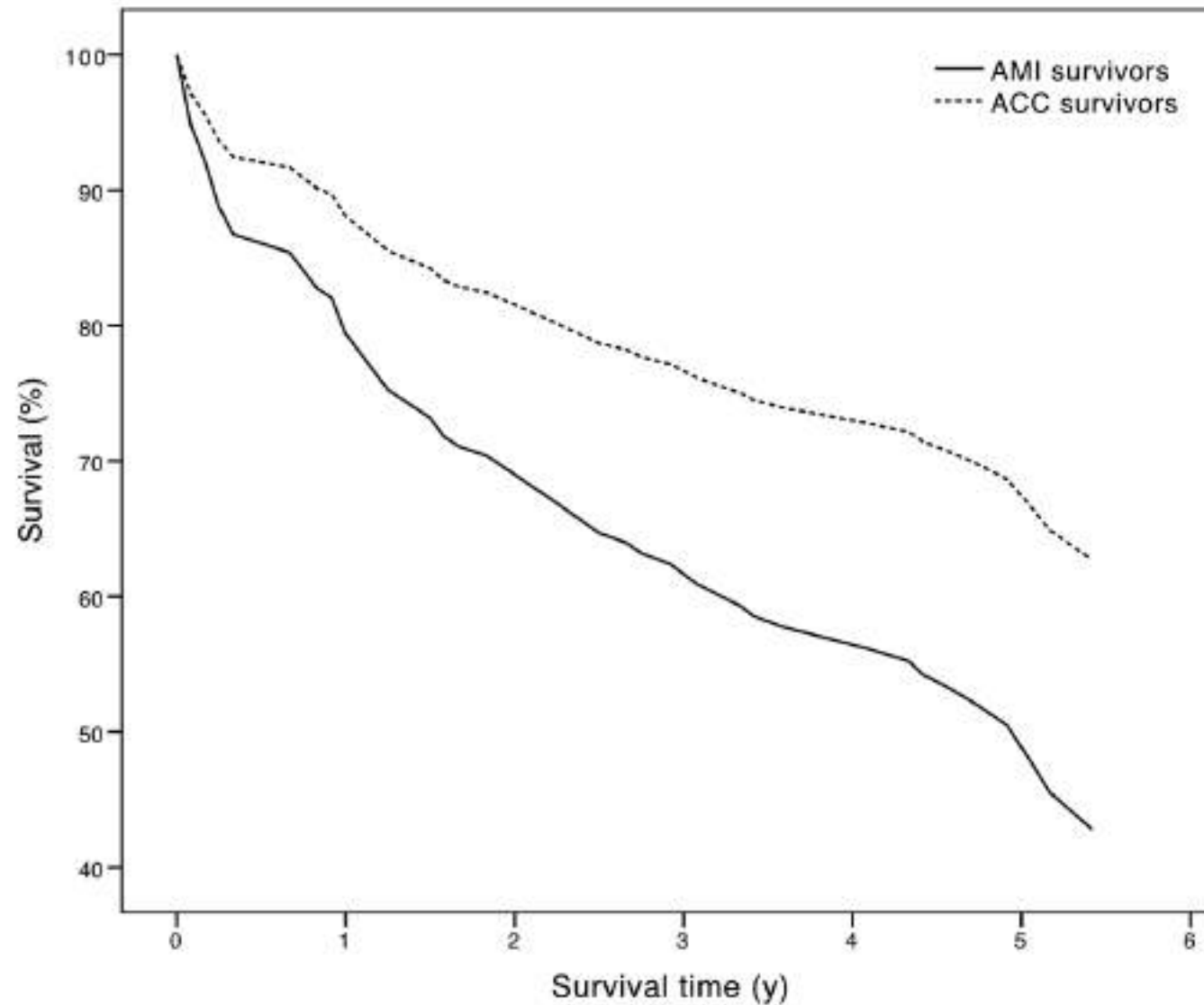
	All (n = 145), n (%)	Pregroup (n = 78), n (%)	Postgroup (n = 67), n (%)	<i>p</i>
ICU admission	59 (41)	23 (30)	36 (54)	0.003
ICU-free days*	22 (0–28)	10 (0–28)	23 (16–28)	0.018**
Hospital-free days*	12 (0–22)	0 (0–22)	13 (0–23)	0.039**
Mortality, 30 d	57 (39)	40 (51)	17 (25)	0.001
Mortality, 90 d	62 (43)	41 (53)	21 (31)	0.010
Mortality, 30 d, embolism (n = 54)	24 (44)	17/33 (52)	7/21 (33)	0.190
Mortality, 30 d, thrombus (n = 91)	33 (36)	23/45 (51)	10/46 (22)	0.004
Mortality, 30 d, diagnostic CT in the study center (n = 78)	35 (45)	28/48 (58)	7/30 (23)	0.002
Mortality, 30 d, diagnostic CT in the referring center (n = 67)	22 (33)	12/30 (40)	10/37 (27)	0.261
Mortality, 30 d, patients who had laparotomy (n = 125)	57 (46)	40/71 (56)	17/54 (31)	0.006

Continuous variables are presented as median (interquartile range). Boldface indicates statistical significance.

*Days alive and out of ICU/hospital within 28 postoperative days.

**Mann-Whitney *U* test.

Message



Message



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Panu Mentula, MD, PhD, Patrick Björkman, MD, PhD,
Ari Leppäniemi, MD, PhD, and Ville Sallinen, MD, PhD, Helsinki, Finland



Message



ORIGINAL ARTICLE

OPEN

The implementation of a pathway and care bundle for the management of acute myocardial infarction

Matti Tolonen, MD, PhD, Aurora Lemma, MSc, PhD,
Panu Mentula, MD, PhD, Ari Leppäniemi, MD, PhD, and



Hospital del Mar, el primero en implantar un código para la atención de la isquemia mesentérica en urgencias

Este protocolo, similar al que ya se aplica en ictus e infarto de corazón, tiene como objetivo reducir el tiempo de diagnóstico para iniciar el tratamiento de forma precoz y reducir así la mortalidad



▲Equipo responsable del proyecto: las doctoras Alina Velescu, Leyre Lorente, Ana Mª González y Laura Calsina Hospital del Mar

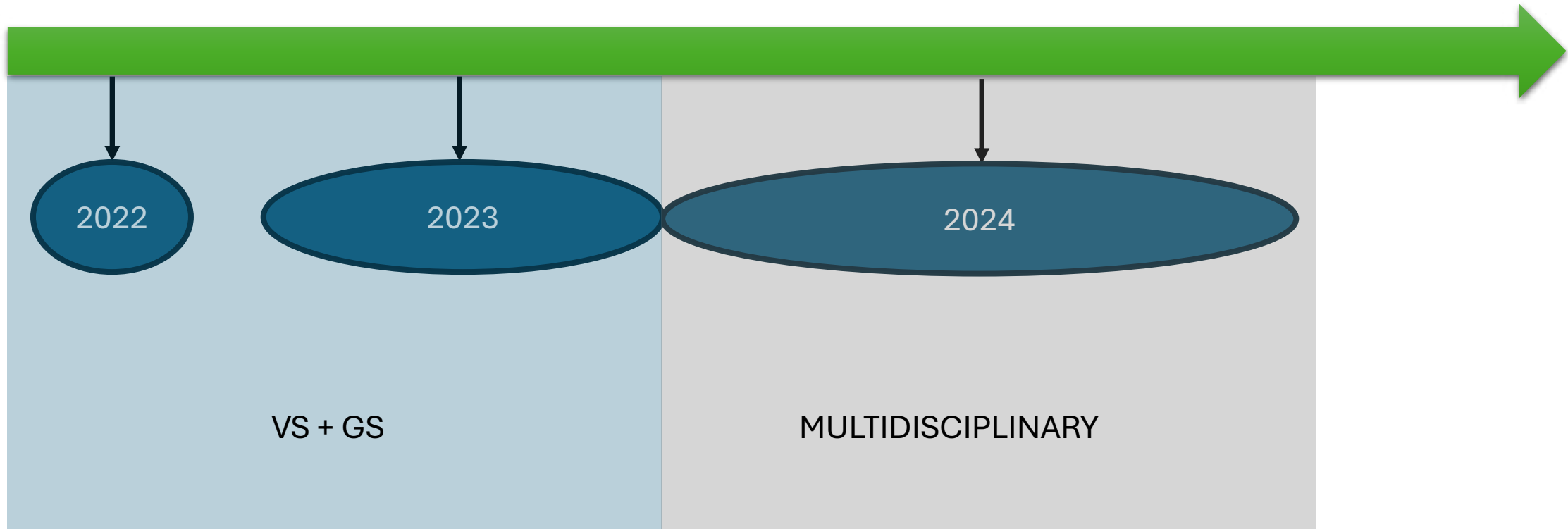


nd care bundle for the
en



Text

Message



GENERAL SURGERY+ VASCULAR SURGERY

RADIOLOGY + INTERVENTIONAL RADIOLOGY+ ICU

EMERGENCY + GASTROENTEROLOGY + NEPHROLOGIST

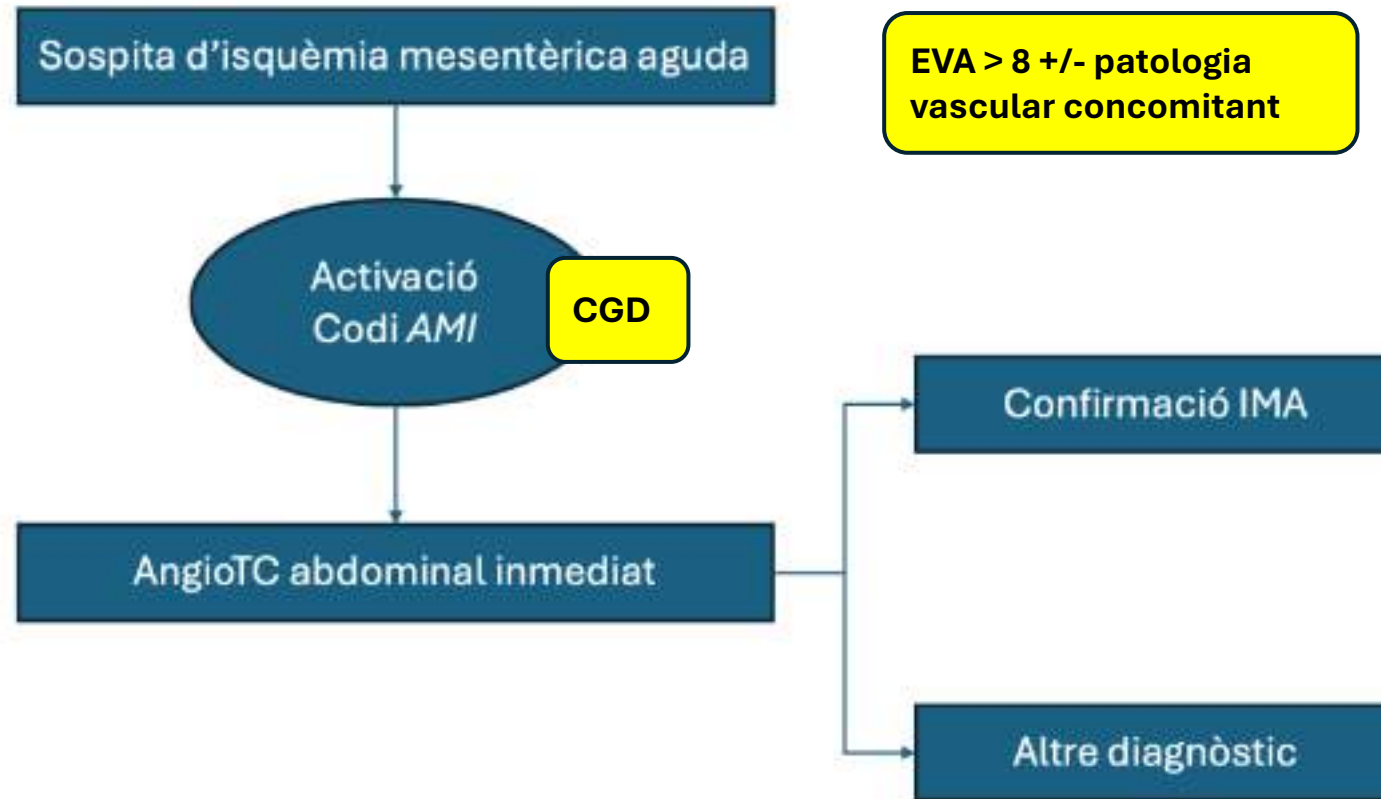
COORDINATION STROKE CODE

NURSING LEADS: ICU + EMERGENCY DEPARTMENT + INTERVENTIONAL RADIOLOGY

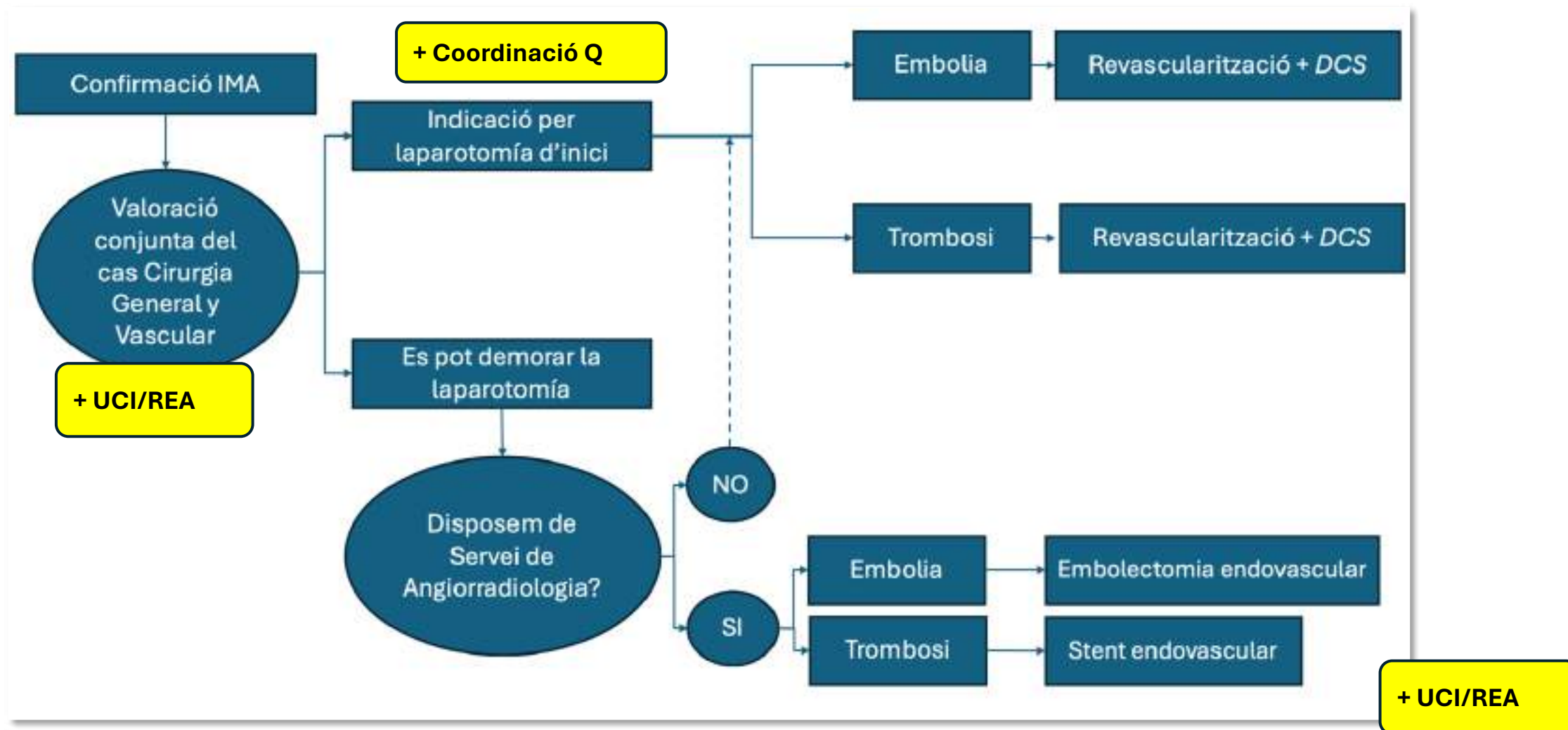
NURSING LEADS: WARD, OPERATING THEATRE
PATIENT TRANSPORT SUPERVISOR

SURGICAL BLOCK DIRECTORS + MEDICAL DIRECTORATE

H. Mar Protocol



H. Mar Protocol



PROTOCOL Audit First Year - AMI Code H.Mar

Grup de treball IMA H.Mar



DOCUMENT D'AVALUACIÓ INTERNA DEL PRIMER ANY D'IMPLEMENTACIÓ DEL CODI AMI

Desembre 2025. Versió: V1.1

*Document destinat a: Direcció Mèdica, Comitè de Qualitat i Seguretat del Pacient,
Serveis implicats en el Codi AMI*

PROTOCOL Audit First Year - *AMI* Code H.Mar

- 35 code activation
- Time activation – diagnostic: from 6 to 35 minutes (median 17min)
- Time diagnostic – treatment: from 58 to 137 minutes
- No need of bowel resection in Occlusive AMI
- Mortality 33%

PROTOCOL Audit First Year - *AMI* Code H.Mar

- 35 code activation
- Time activation – diagnostic: from 6 to 35 minutes (median 17min)
- Time diagnostic – treatment: from 58 to 900 minutes (344 min)
- No need of bowel resection in Occlusive AMI with code activation
- Mortality 25% (17% in the code activation)

PROTOCOL Audit First Year - AMI Code H.Mar

- 35 codes
- Time act
- Time dia
- No need
- Mortality

Abordatge

- Laparotomies: 7 casos (els inclosos al codi *AMI* no varen requerir resecció intestinal)
- Tractament sense cirurgia: 2 casos

Tractament de la etiologia

- Via endovascular: 1 aspiració d'èmbol i 3 col·locacions de stent
- Via quirúrgica: 1 embolectomia, 1 bypass, 1 ROMS i 1 trombectomia

Aquestes dades confirmen que, gràcies al codi, la proporció de pacients que arriben a temps per optar a revascularització ha augmentat de manera clara, però encara ens queda feina en escurçar la segona fase entre diagnòstic i la revascularització.

PROTOCOL Audit First Year - *AMI* Code H.Mar

- Colateral benefits of the Code: early identification of other Surgical Pathologies that requires a Surgeon urgently

PROTOCOL

- Colateral ben
- Pathologies t

Diagnòstics de les activacions realitzades

Les activacions han permès diagnosticar precoçment patologies greus, no només relacionades amb l'isquèmia:

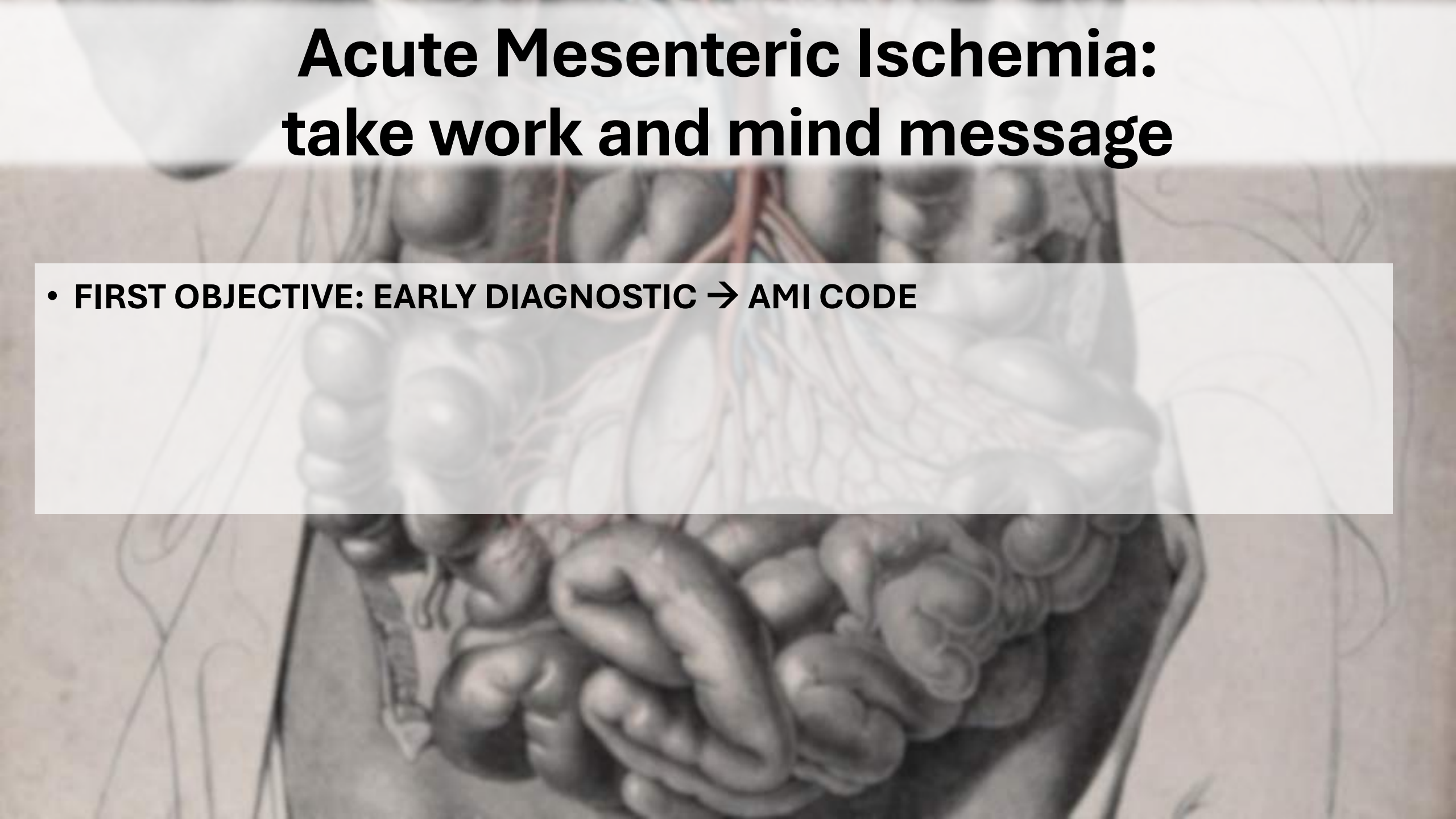
- 7 isquèmies mesentèriques agudes oclusives
- 4 colitis isquèmiques
- 3 NOMI
- 2 angors intestinals
- 1 isquèmia mesentèrica venosa
- 4 hemorràgies actives (retroperitoneu i múscul recte abdomen)
- 4 oclusions intestinals amb intestí isquèmic
- 2 perforacions de víscera buida
- 2 pancreatitis greus
- 2 colecistitis greus
- 1 edema de reperfusió post-stent a l'AMS
- 3 casos sense diagnòstic quirúrgic (dolor post-cateterisme cardíac, còlic nefrític, un cas sense diagnòstic definitiu. Tots EVA 9-10)

Amb aquesta informació es confirma que el codi beneficia també altres patologies greus, ja que el flux diagnòstic i en conseqüència tractament precoç.

cal

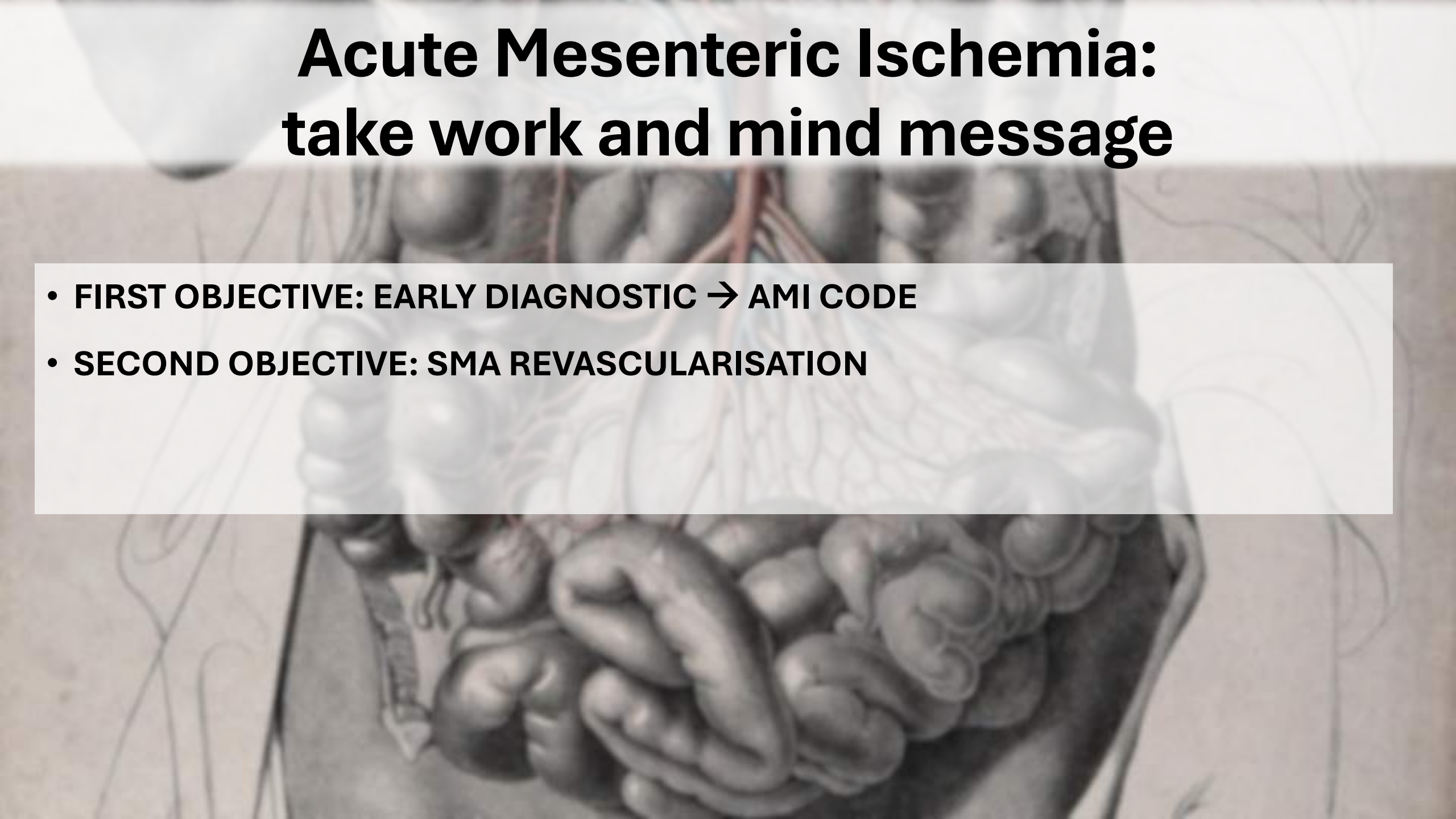
Acute Mesenteric Ischemia: take work and mind message

- **FIRST OBJECTIVE: EARLY DIAGNOSTIC → AMI CODE**



Acute Mesenteric Ischemia: take work and mind message

- **FIRST OBJECTIVE: EARLY DIAGNOSTIC → AMI CODE**
- **SECOND OBJECTIVE: SMA REVASCULARISATION**



Acute Mesenteric Ischemia: take work and mind message

- **FIRST OBJECTIVE: EARLY DIAGNOSTIC → AMI CODE**
- **SECOND OBJECTIVE: SMA REVASCULARISATION**
- **THIRD OBJECTIVE: BOWEL VIABILITY**



Acute Mesenteric Ischemia: take work and mind message

- **FIRST OBJECTIVE: EARLY DIAGNOSTIC → AMI CODE**
- **SECOND OBJECTIVE: SMA REVASCULARISATION**
- **THIRD OBJECTIVE: BOWEL VIABILITY**

TRANSVERSAL TRAINING AND EDUCATION

MULTICIDICIPLINARY APPROAH

DATA REGISTRY

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