



Short-Term Outcomes of Tailored Endovascular Therapy Strategies for Acute Superior Mesenteric Artery Occlusion Based on Thrombus Location

Tatsuo Ueda¹, Fumie Sugihara¹, Hidemasa Saito¹, Toko Takagi¹, Misa Iwasaki¹, Ryutaro Fujitsuna¹, Sayaka Shirai¹, Takahiko Mine², Hiroyuki Tajima³, Hiromitsu Hayashi¹, and Shin-ichiro Kumita¹

¹**Department of Radiology, Nippon Medical School Hospital, Tokyo, Japan**

²Department of Radiology, Nippon Medical School Chiba Hokusoh Hospital, Chiba, Japan

³Department of Radiology, Saitama Medical University International Medical Center, Saitama, Japan

- ☑ The author has no conflict of interest to disclose with respect to this presentation.

Background

Acute Superior Mesenteric Artery Occlusion (ASMAO):

- Sudden interruption of mesenteric blood flow
→ Overall mortality 60–80%^{#1}

Revascularization options:

- Endovascular therapy (EVT): aspiration, thrombolysis, stenting, etc.
- Open surgery: embolectomy, bypass

ESVS 2025 Guidelines^{#2}:

- Systematic review: lower bowel resection and 30-day mortality with EVT
- Latest meta-analysis: significant reduction in bowel resection (OR 0.42)
- Recommendation (Class IIa B): **EVT recommended as first-line therapy**

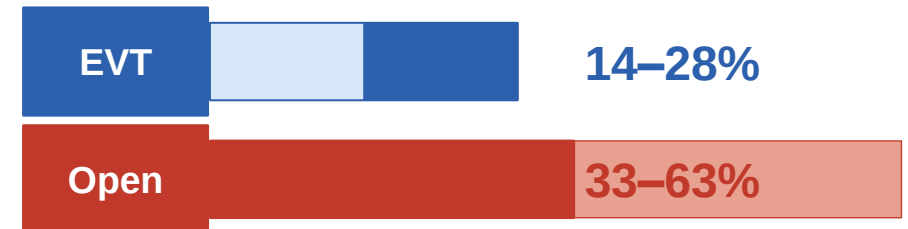
Unresolved issue:

- Optimal EVT technique varies depending on thrombus location
→ No standardized algorithm currently exists

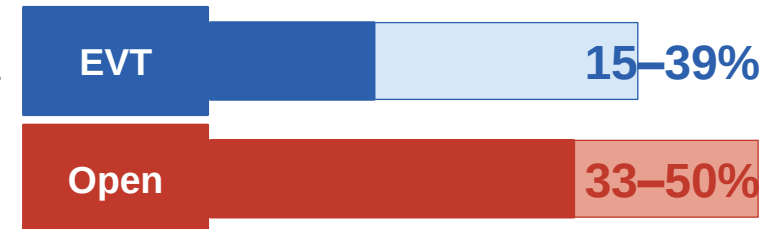
EVT vs Open Surgery

ESVS 2025 Guidelines

Bowel Resection Rate



30-Day Mortality



Meta-analysis (Shi et al. 2024)

Bowel resection: OR 0.42 (95% CI 0.20–0.88) significant

30-day mortality: OR 0.79 (95% CI 0.50–1.25) NS

Purpose

To evaluate the short-term outcomes of endovascular therapy (EVT) for acute superior mesenteric artery occlusion (ASMAO) using tailored EVT strategies based on thrombus location.

Materials & Methods / Patient Selection

Single-center retrospective study | January 2007 – December 2024 | N = 33 consecutive EVT patients

Inclusion

- ASMAO confirmed by CT or angiography
- Underwent EVT (single or combined technique)
- With or without necrotic bowel resection

Exclusion

- Dissection (N=10)
- Palliative care (N=2)
- Open surgery or medical therapy alone (N=31)

EVT techniques:

PAT
(Percutaneous
Aspiration
Thrombectomy)

CDT
(Catheter-
Directed
Thrombolysis)

**Stent
implantation**

**Balloon
angioplasty**

All ASMAO Jan 2007 – Dec 2024 N = 76

Dissection
N=10

Thrombus ASMAO N = 66

Palliative
N=2

With treatment N = 64

Open N=20
Med. N=11

EVT-treated N = 33 ← Study cohort

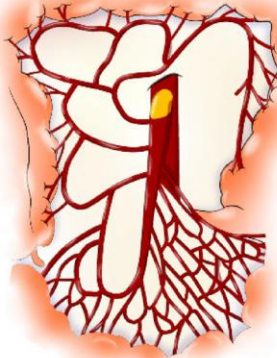
Classification of Thrombus Location

Type 1

Proximal

From SMA origin
to proximal to MCA
N = 2 (6.1%)

Type 1

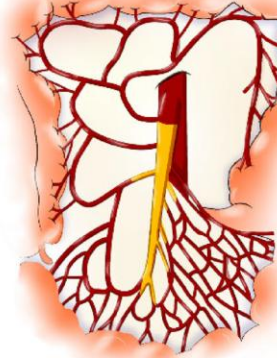


Type 2

Middle

From distal to MCA
to the first-order
SMA branch
N = 5 (15.2%)

Type 2

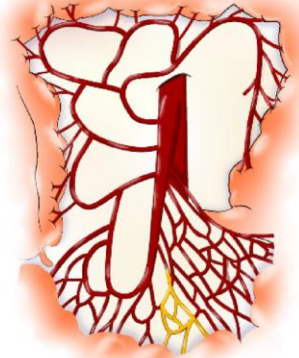


Type 3

Peripheral

Beyond the first-
order SMA branch
N = 2 (6.1%)

Type 3

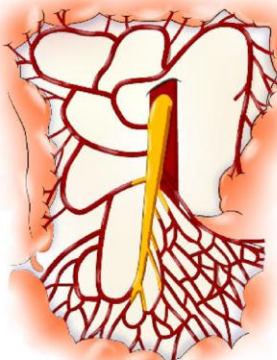


Type 4

Proximal– Middle

Spanning proximal
and middle
N = 2 (6.1%)

Type 4

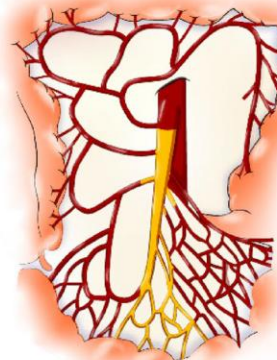


Type 5

Middle– Peripheral

Spanning middle
and peripheral
N = 16 (48.5%)

Type 5

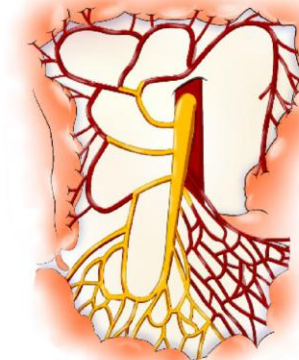


Type 6

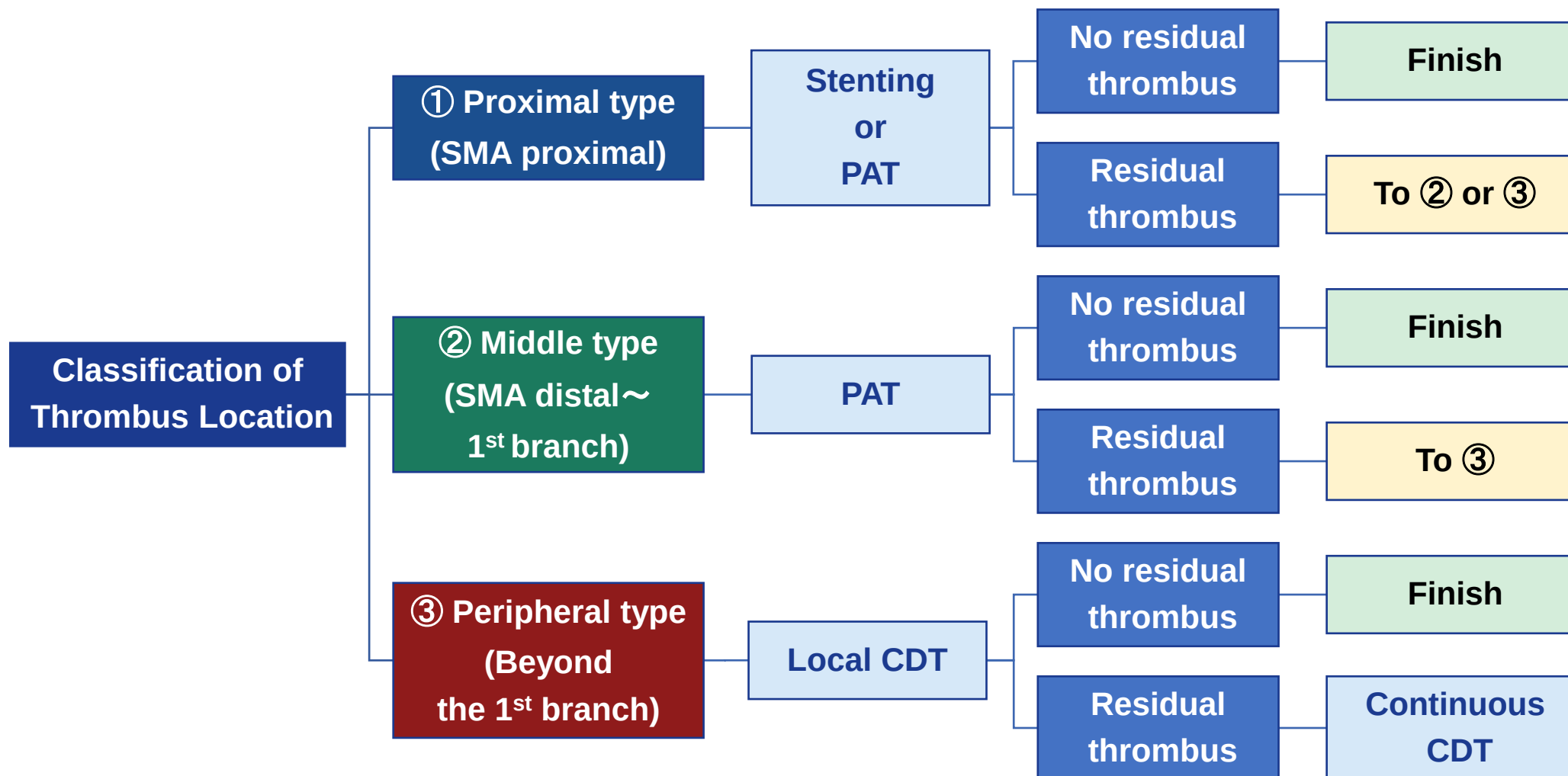
Proximal– Peripheral

Spanning all
regions
N = 6 (18.2%)

Type 6



EVT Strategy Based on Thrombus Location



- For multi-segment thrombus: the initial strategy was determined by the most proximal segment.
- Balloon angioplasty was reserved as a last resort due to the high risk of distal embolization.

Results (patient characteristics)

Patients		33
Age (years, mean $\pm$ SD)		76.0 $\pm$ 8.9
Sex (male / female)		20 / 13
Cause N (%)	Embolism	27 (81.8) [Cardiac; 26, Aortic; 1]
	Atherothrombosis	4 (12.1) [atherosclerosis; 2, iatrogenic; 2]
	Unknown	2 (6.1)
Time from onset N (%)	≤ 6 hours	7 (21.2)
	6-24 hours	8 (24.2)
	≥ 24 hours	18 (54.5)
Synchronous emboli N (%)		7 (21.2) [brain 3, lower limb 2, kidney 2]

Results (procedure and clinical outcomes)

Factors		N = 33 (%)
EVT techniques	PAT	24 (72.7)
	Local CDT	17 (51.5)
	Continuous CDT	11 (33.3)
	Stent implantation	10 (30.3)
	Balloon angioplasty	3 (9.1)
Technical success		33 (100)
Procedure related complications		5 (15.2)^{#1}
Bowel necrosis / Bowel resection		12 (36.4) / 11 (33.3)^{#2}
All-cause 30-day mortality		5 (15.8)
ASMAO-related 30-day mortality		3 (9.3)

#1 Procedure related complications (N = 5)

- **Four arterial injuries due to PAT** (bleeding 3, dissection 1)
- **One distal embolization due to balloon angioplasty**

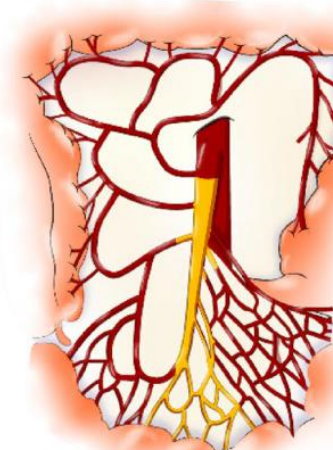
#2 One patient could not receive necrotic bowel resection due to severe general condition.

Results (Bowel necrosis)

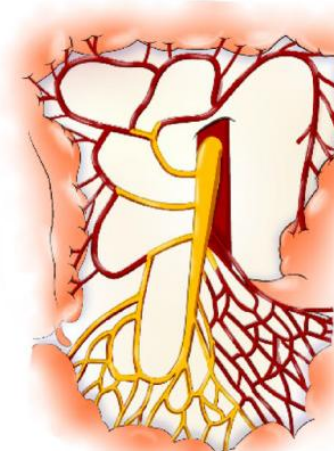
Details of all bowel necrosis

Case	Age	Sex	Thrombus location	Bowel necrosis	Bowel resection range
1	77	M	Type 5	Yes	130 cm of small intestine
2	68	M	Type 5	Yes	50 cm of jejunum
3	87	M	Type 5	Yes	140 cm of ileum
4	83	M	Type 5	Yes	130 cm of ileum
5	85	M	Type 5	Yes	total small intestine + A-colon
6	66	F	Type 5	Yes	400 cm of small intestine + A-colon
7	90	F	Type 5	Yes	100 cm of jejunum
8	71	M	Type 5	Yes	130 cm of small intestine
9	79	F	Type 5	Yes	50 cm of small intestine
10	76	M	Type 5	Yes	total ileum + A-colon
All cases involved the multi-segment with peripheral type					
12	79	F	Type 6	Yes	— (unable to perform bowel resection)

Type 5

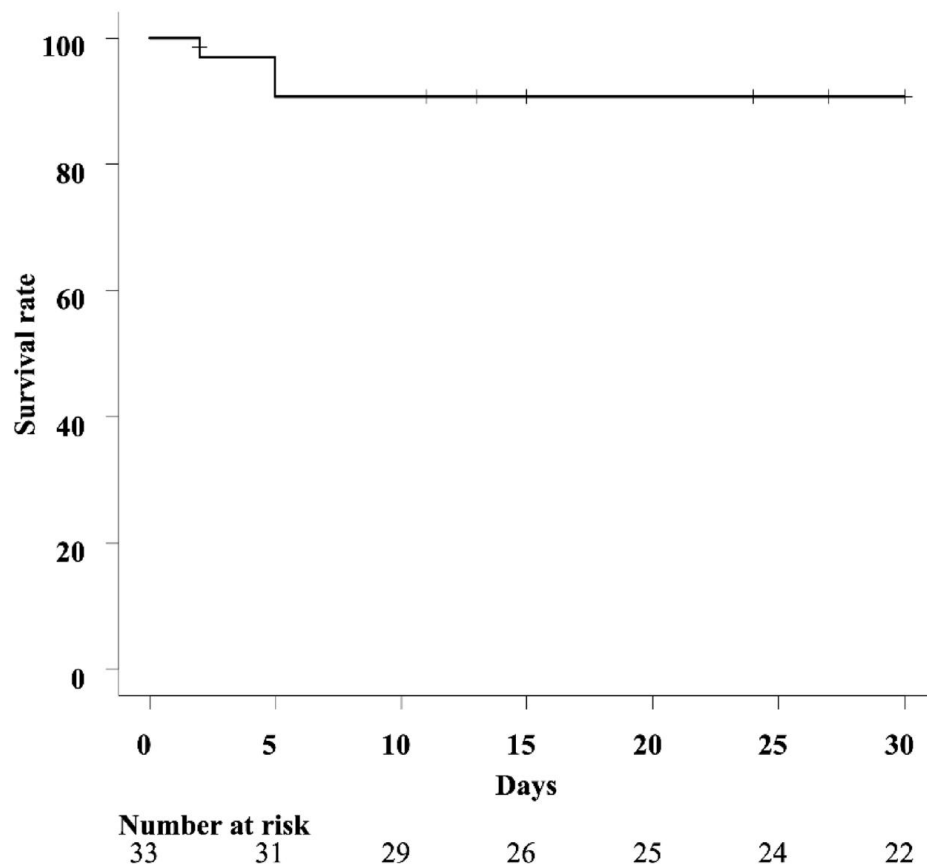


Type 6

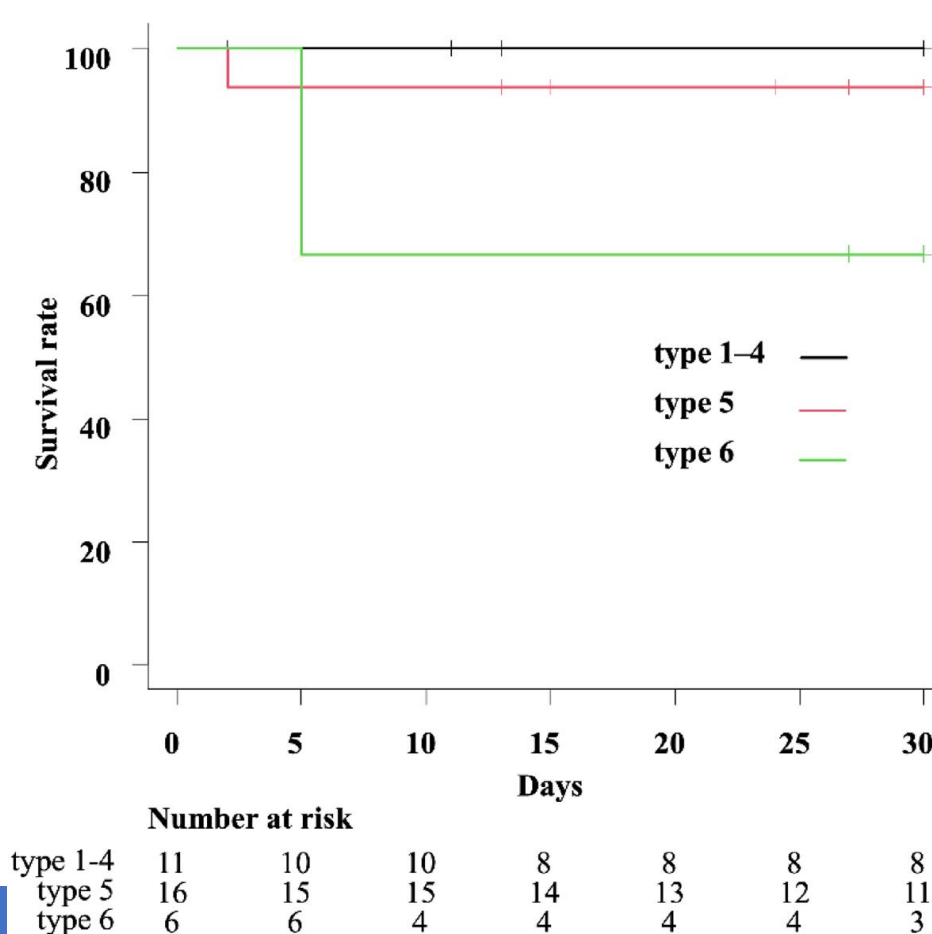


Results (ASMAO-related 30-day survival)

Overall Cohort (N = 33)



By Thrombus Location

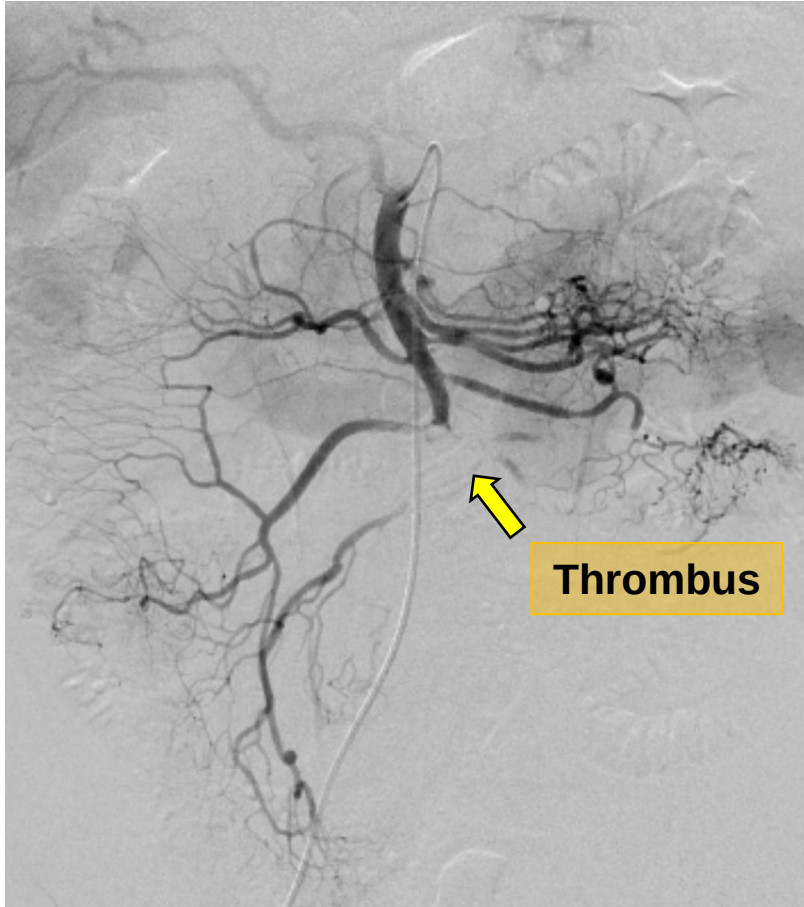


Factors associated with ASMAO-related death:

Bowel necrosis: $p = 0.02$ | Type 6: $p = 0.03$ (log-rank)

Case 1 (Type 5: middle-peripheral type)

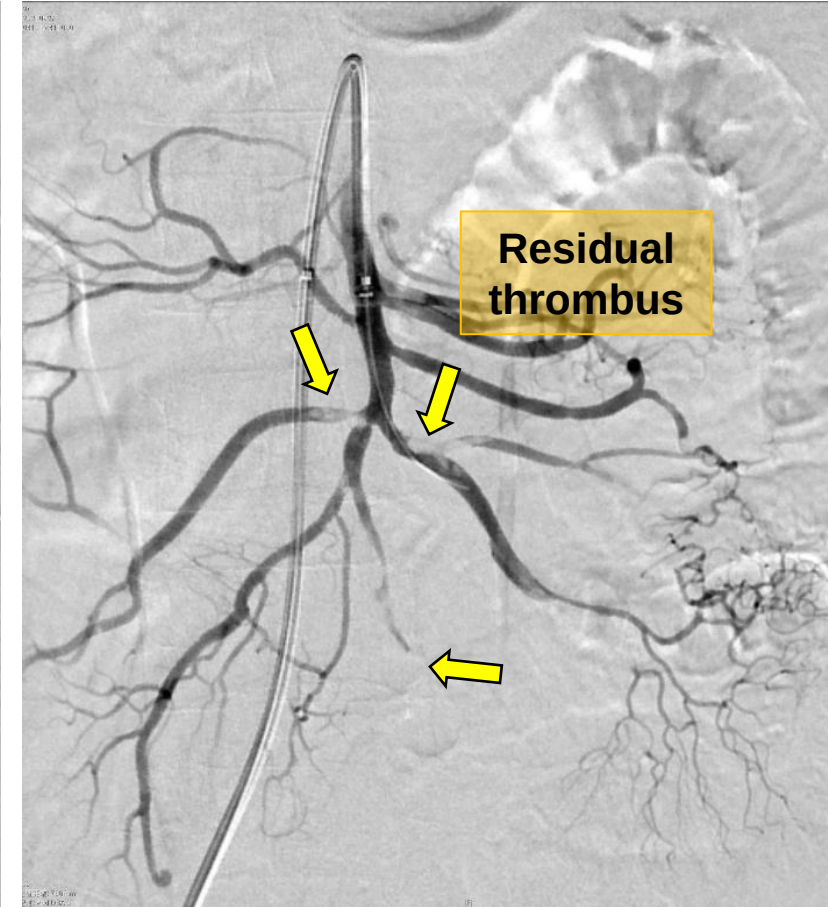
Male in his 70s, ASMAO due to embolism



**Pre-treatment
SMA angiogram**



PAT using a 6Fr catheter



Post-PAT

Case 1 (Type 5: middle-peripheral type)

Male in his 70s, ASMAO due to embolism



**Pre-treatment
SMA angiogram**



**Heparin-coated
catheter**

Continuous CDT
(UK 240,000 units/day)
for 3 days

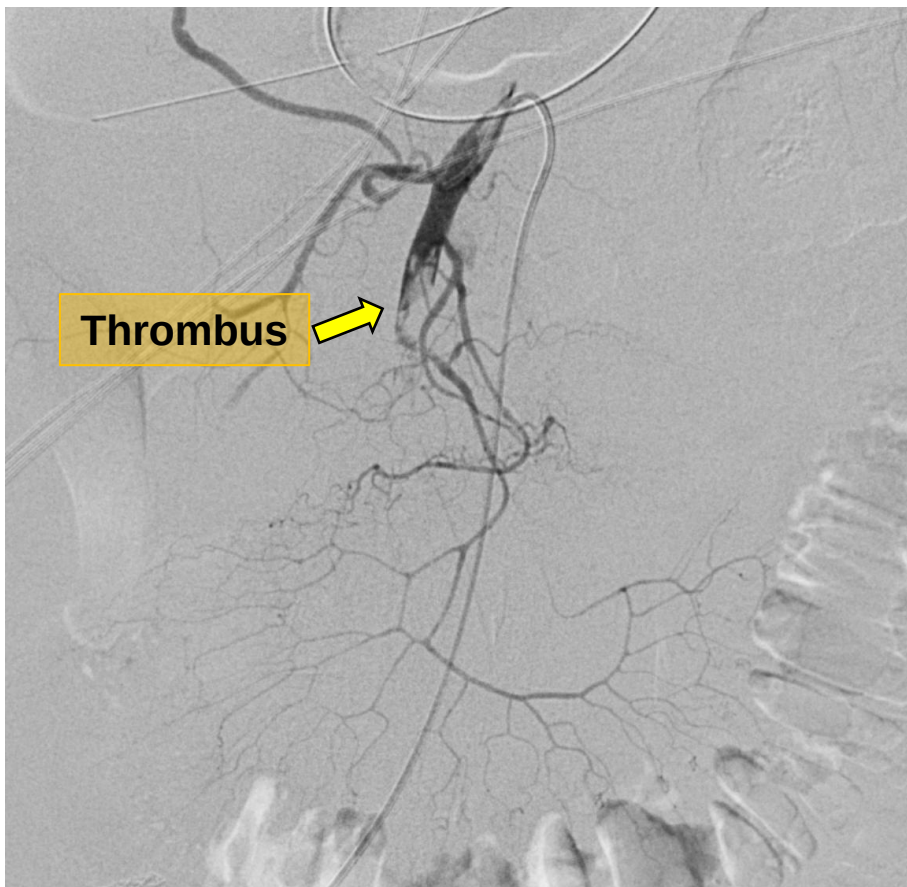


**Post-treatment
SMA angiogram**
(No bowel necrosis by laparotomy)

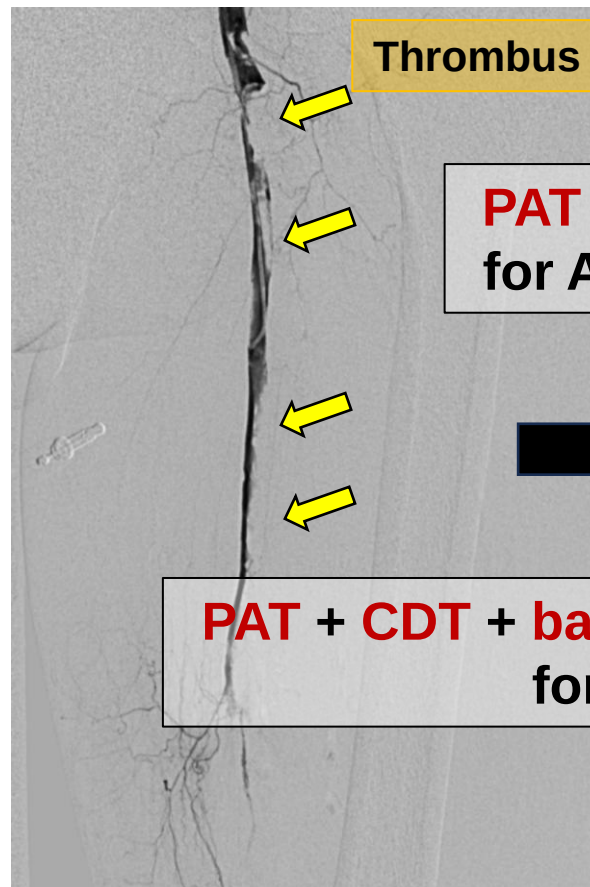
Case 2 (Type 6: proximal-peripheral type)

Male in his 70s, ASMAO with synchronous acute limb ischemia (ALI)

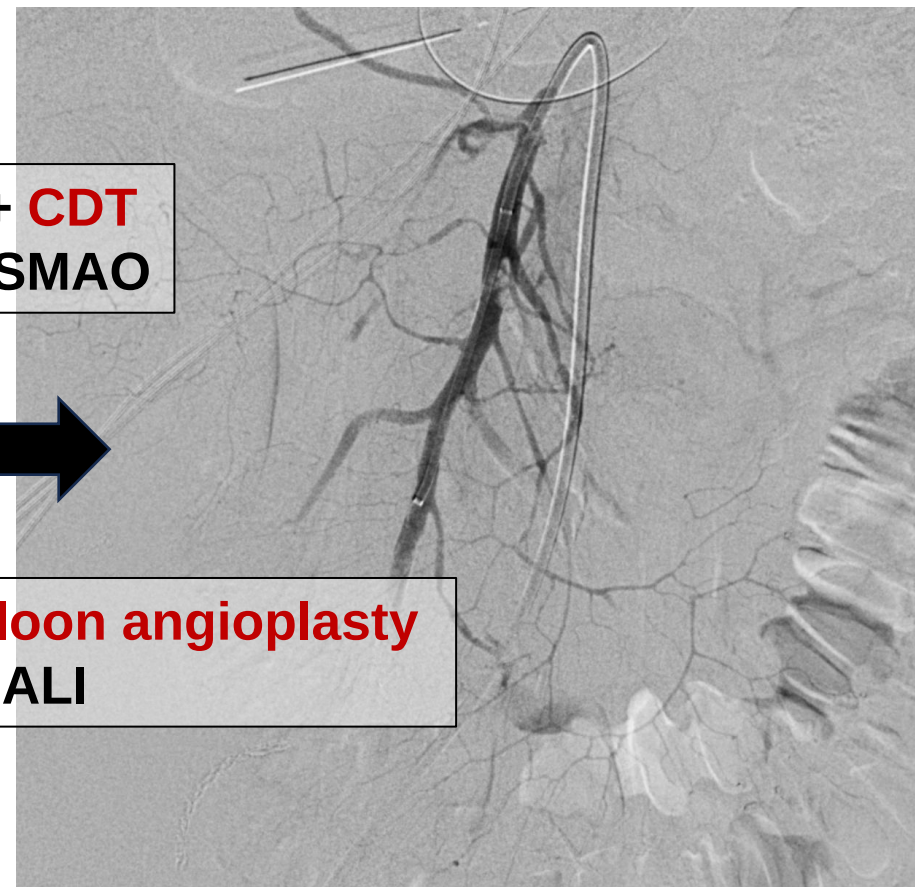
→ **Resection of the entire ileum and A-colon was performed before EVT.**



Pre-treatment SMA angiogram



Left femoral artery angiogram



Post-treatment SMA angiogram
→ **Died 2 days after treatment**

Discussion (Outcomes)

Previous literature evaluating EVT for ASMAO

Author	Year	Patients (N)	Technical success (%)	Bowel Resection (%)	30 days Mortality (%)
Pengerma et al. ^{#1}	2023	50	88	33	32
Altintas et al. ^{#2}	2021	67	79	45	16
Raupach et al. ^{#3}	2016	37	91.9	40.5	27
Karkkainen et al. ^{#4}	2015	50	88	34	32
Our study ^{#5}	2026	33	100	33.3	9.3

#1 Pengerma P et al. J Vasc Surg. 2023.

#2 Altintas O et al. Eur J Vasc Endovasc Surg. 2021.

#3 Raupach J et al. Cardiovasc Intervent Radiol. 2016.

#4 Karkkainen JM et al. Cardiovasc Intervent Radiol. 2015.

#5 Ueda T et al. Jpn J Radiol. 2026.

- Favorable technical success (100%) and lower mortality (9.3%) compared with previous reports.
- We performed EVT with multiple EVT techniques depending on thrombus location.

EVT strategy depending on thrombus location may be crucial to achieve favorable outcomes.

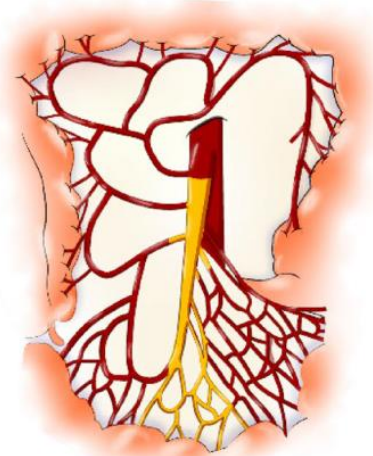
Discussion (Thrombus location)

➤ Types 5 (multi-segment thrombus with peripheral involvement)

- are unlikely to develop collateral flow through marginal arteries.
- Insufficient blood flow may lead to bowel necrosis.

EVT for type 5 may be important for preventing bowel necrosis.

Type 5

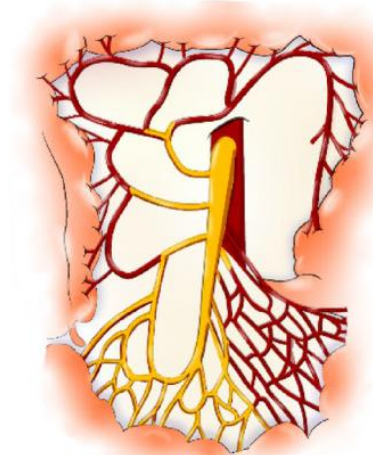


➤ Type 6 (large thrombus burden)

- may cause extensive bowel necrosis (resection).
- Extensive bowel necrosis may cause ASMAO-related death.

EVT for type 6 may help reduce ASMAO-related death.

Type 6



Conclusion

Tailored endovascular therapy (EVT) strategies based on thrombus location may contribute to favorable clinical outcomes in patients with Acute Superior Mesenteric Artery Occlusion (ASMAO).

Progress in Radiology 2008 in Tokyo



Progress in Radiology 2023 in Stockholm



Progress in Radiology 2018 in Bergen



Thank you for your attention