How To Classify Acute Aortic Intramural Hematomas (IMHs): How And When To Treat Them Safely By TEVAR: When And Why Are They So Dangerous

Jean M. Panneton, MD, FRCSC, FACS
Professor of Surgery,
Eastern Virginia Medical School
Norfolk, VA

Disclosures

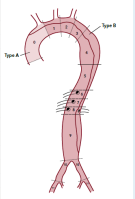
Consultant: Endospan, Getinge, Medtronic Inc, Penumbra, Terumo Aortic, Philips, WL Gore
Speakers' Bureau: Medtronic Inc., Penumbra, Terumo Aortic, WL Gore
Advisory Board: Endoron, Endospan, Medtronic Inc., Philips

IMH Classification

Society for Vascular Surgery (SVS) and Society of Thoracic Surgeons (STS) reporting standards for type B aortic dissections

Anatomic Classification

	Proximal Extent	Distal Extent
Ac Entry tear: Zone 0	0	0
	1	1
	2	2
Bnp Entry tear: ≥ Zone 1	3	3
	4	4
	5	5
	6	6
	7	7
	8	8
Iu Unidentified entry tear involving Zone 0	9	9
	10	10
	11	11
	12	12



Temporal Classification

Chronicity	Time from onset of symptoms
Hyperacute	<24 hours
Acute	1-14 days
Subacute	15-90 days
Chronic	>90 days

IMH should be classified like TBAD for the aortic zone extent and for the acuity of presentation

IMH Classification

Symptoms Classification for TBAD: How does it apply to IMH?

Table III. Aortic dissection acuity

Uncomplicated
No rupture
No malperfusion
No high-risk features
High risk
Refractory pain
Refractory hypertension
Bloody pleural effusion
Aortic diameter >40 mm
Radiographic only malperfusion
Readmission
Entry tear: lesser curve location
False lumen diameter >22 mm
Complicated
Rupture
Malperfusion

→ Uncomplicated

→ High Risk:
Refractory pain
Refractory HTN
Bloody pleural effusion
Readmission
Aortic diameter > 45 mm
IMH Thickness > 8-10 mm

→ Complicated

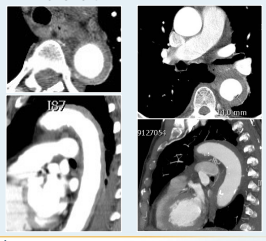
IMH: How to Treat

Best Medical Therapy

Admission to Vascular Intensive Care Unit
- Aggressive impulse control
- Goal of Systolic < 120 mmHg
- Combination of Esmolol & Cardene
- Pain control with opiates
- Repeat CTA if intractable pain
- CTA before discharge
- Carotid & Renal Duplex Studies

Thin IMH Limited involvement

Thick IMH with circumferential involvement



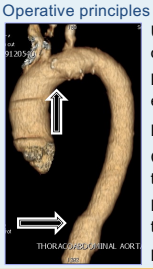
IMH: How to Treat

85 year old female patient
Presenting severe chest and epigastric pain
Described as a "lightning bolt through her back"
Admitted to VICU for BMT
Ruptured after 4 days

TEVAR with ISLF of the LSA

IMH: How to do TEVAR safely

Operative principles



Use IVUS for graft sizing and extent of coverage

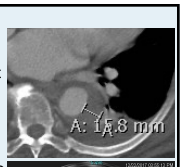
Keep the proximal edge of the endograft in healthy aorta

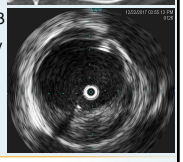
Do more zone 2 TEVAR than zone 3

Cover the PAU or presumptive entry tear

Extend distally to where the IMH is thinner

No oversizing, no ballooning





IMH: When to Treat with TEVAR

When is TEVAR indicated ?

OUR TREATMENT ALGORITHM PROTOCOL

EMERGENT TEVAR	DELAYED TEVAR
Aortic rupture	Intractable pain > 24-48 hours with good blood pressure control
Impending rupture	Uncontrollable hypertension
Severe pain, large aortic diameter (> 55 mm)	Changes on repeat imaging: IMH Thickness or new/worse CFEs
Malperfusion	Aortic enlargement

50.7% early failure rate (mean 5.2 days)

J Vasc Surg 2020;71:1088-96.

IMHs: When are they more dangerous?

IMH Thickness is the only factor related to risk of BMT Failure

Cox Multivariate:
Risk Factors for BMT Failure

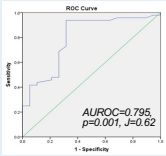
Cut off IMH thickness: 8.0 mm
Sensitivity: 90.6%
Specificity: 71.4%
Odds ratio for AREM if IMH ≥ 8.0 mm
18.86 [95%CI: 4.72 – 75.29], p<0.001

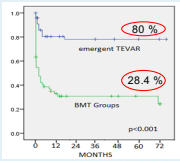
FREEDOM FROM AORTIC-RELATED ADVERSE EVENTS

Table III. Multivariate regression analysis of risk factors associated with failure of best medical therapy (BMT)

	OR	95% CI	P value
IMH thickness	1.082	1.003-1.168	.041
IMH thickness >8.0 mm	6.810	1.921-24.146	.002
IMH extension in abdominal aorta	0.880	0.474-1.632	.684
Antiplatelet therapy on admission	1.610	0.854-3.036	.141
ΔIMH[†]	1.304	0.974-1.746	.074
ΔFCE[†]	1.362	0.624-2.979	.719
No. of days on continuous intravenous therapy[*]	0.785	0.925-1.621	.785

CI, Confidence interval; FCE, focal contrast enhancement; IMH, intramural hematoma; OR, odds ratio.
*Analysis performed on a cohort of 41 patients with available follow-up computed tomography before any surgical intervention.



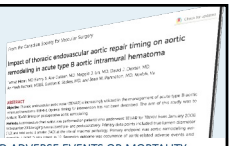


IMHs: When are they more dangerous?

Thicker IMH
Larger Aortic Diameter
TEVAR in Hyperacute Phase

Group variable	Emergent TEVAR (group 1; n = 25)	BMT (groups 2 and 3; n = 67)	P value
Age, years	68.2 ± 11.3	67.7 ± 12.7	.859
Male sex	14 (56.2)	28 (41.8)	.223
SBP, mm Hg	162.5 ± 29.2	173.1 ± 38.4	.308
Heart rate, beats/min	81.2 ± 30.0	78.1 ± 22.7	.632
IMH thickness, mm	12.9 ± 3.7	10.1 ± 4.1	.014
MAD, mm	45.4 ± 14.7	36.6 ± 6.0	.001
IMH extent into abdominal aorta	11 (44.0)	33 (49.3)	.654

IMH, Intramural hematoma; *MAD*, maximal aortic diameter; *SBP*, systolic blood pressure.
Categorical variables are presented as number (%). Continuous variables are presented as mean ± standard deviation.

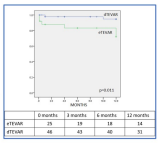


AORTIC-RELATED ADVERSE EVENTS OR MORTALITY

•eTEVAR (24.0%):
- Postop aortic rupture & death (1)
- Re-do TEVAR (3)
- Retrograde AD (1)
- Endoleak requiring embolization (1)

•dTEVAR (4.3%):
- Conversion to TBAD (1),
- Re-do TEVAR (1)

Freedom from AREM at 12 months: 76.0% vs. 95.7%, p=0.011



	0 months	3 months	6 months	12 months
eTEVAR	25	19	18	14
dTEVAR	46	43	40	31

EVMS

IMH: Summary

- The updated classification for TBAD can be applied to IMH, but the High Risk group needs to be better defined.
- In Acute type B IMH, TEVAR is indicated emergently for rupture and malperfusion and urgently for failure of best medical therapy.
- In the absence of emergent indications, avoiding TEVAR during the Hyperacute phase of IMH will lead to improved aortic remodeling and decreased AREM
- IMHs are more dangerous with increasing thickness and larger aortic diameter