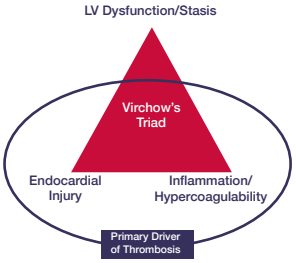
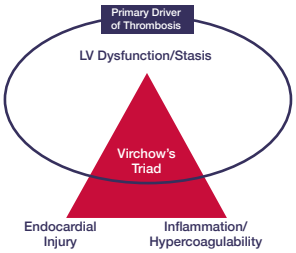
Left Ventricular Thrombus (LVT)

The Two Primary Settings of Left Ventricular Thrombus Formation

Acute Myocardial Infarction		Dilated Cardiomyopathy
	Etiology	
10-20% in first 3 months without systemic anticoagulation. The greatest risk in first two weeks.	Embolization Risk	Not well defined; impacted by thrombus morphology and presence of high-risk features.
Weigh risks versus benefits of adding OAC to antiplatelet therapy. If anticoagulating, consider a duration of three months.	Prevention (No thrombus)	Consider only in the setting of additional risk factors such as takutsubo syndrome, amyloidosis, chagas, left ventricular non-compaction, etc. If anticoagulating, consider continuing as long as high risk conditions remain.
Echo or CMR should be obtained after 3 months of anticoagulation to assess for LV thrombus resolution and inform decision-making on anticoagulation duration.	Treatment Duration (Confirmed thrombus)	Typically give 3-6 months of anticoagulation with consideration of indefinite anticoagulation if thrombus and depressed EF persist. Discontinue anticoagulation if LV thrombus resolves and EF significantly improves.

Thrombus Characteristics

LV thrombus may be classified as mural/laminal or protuberant/mobile, although both should be treated the same initially if newly found on cardiac imaging. The thromboembolic potential of mural thrombi remains considerable, despite a higher risk with protuberant thrombi. Secondly, protuberant thrombi are more likely to have quicker thrombus resolution while mural thrombi may be more persistent long-term and may require a risk-benefit discussion for indefinite anticoagulation.

IMAGING

Transthoracic echo (echo contrast) should be performed to screen for LV thrombus following acute MI or if suspicion of cardioembolic event (e.g., stroke)

Cardiac MRI (CMR) is useful for inconclusive or non-diagnostic echocardiogram exams when LV thrombus is suspected. CMR can also differentiate thrombus from other intracardiac masses (e.g. tumor)

Direct Oral Anticoagulant **VS** **Vitamin K Antagonist**

Guidance for treatment has been derived primarily from data collected in the post-STEMI population in a pre-PCI, pre-DOAC era. DOACs are an attractive treatment strategy as recent meta-analyses of randomized and non-randomized data support equivalent efficacy with DOACs for LVT resolution and SSE, with lower overall bleeding. However, DOAC dosing strategy remains unclear.

Literature Summary

Guidelines Summary

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BOTTOM LINE

DO	DON'T	CONSIDER	CAUTION
Screen for LVT post-MI	DON'T Assume all LVT should be treated the same	DOACs as a reasonable alternative to VKA	Caution stopping anticoagulation after LVT resolution if significant high risk features persist.[1]
Treat LV thrombus with anticoagulation for at least 3 months	DON'T use repeat imaging alone to drive decisions about duration of OAC for LVT	CONSIDER limiting triple therapy to no more than 1 to 4 weeks, after which a P2Y12 inhibitor *(preferably clopidogrel)* in addition to OAC *(preferably DOAC)* is preferred in patients with LV thrombus who have undergone PCI	DOAC dosing remains unclear. Randomized prospective trials have used atrial fibrillation dosing, however, dosing in observational studies has been inconsistent. Professional judgement should be used regarding the use of loading doses *(as used in acute VTE treatment).*

1. Risk factors for SSE and LVT recurrence are not well understood. Limited data exist from follow-up of the No-LVT trial, in which approximately 10% of subjects had recurrence of LVT within 90 days following discontinuation of anticoagulation. Of evaluated risk factors, only low EF was identified as a significant predictor for recurrent LVT. An individualized approach and risk assessment may still be required. Other high-risk features include significant apical wall motion abnormalities, Takotsubo, LV noncompaction, hypertrophic cardiomyopathy, amyloidosis, Chagas disease, eosinophilic myocarditis, or LV thrombus occurring in the peripartum state.

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Literature Summary:
Addendum to Left Ventricular Thrombus (LVT) Rapid Resource

RETURN TO Rapid Resource

Literature Summary: DOACs for Treatment of Left Ventricular Thrombus (LVT)

Study	Population %	Sample Size / Treatment Groups	Summary of Findings
April 2020; Retrospective cohort study **(RED VELVT)**	Ischemic (59.9) NICM NOS (25.3) Other (14.8)	**N=514; Warfarin;** 236 pts; **DOAC;** 121 pts; (64 pts switched between treatment groups; 93 not treated)	DOAC treatment was associated with a higher risk of ischemic SSE compared to warfarin (adjusted HR: 2.64, 95% CI 1.28-5.43, p=0.01)
Jan 2021; Retrospective cohort study **(Bass)**	Not reported	**N=949 ; Warfarin:** 769 pts; **DOACs:** 180 pts (R: 77 pts; A: 79 pts; D: 29 pts)a	The incidence of thromboembolic stroke was no different between DOAC and warfarin-treated pa-tients (7.8% vs. 11.7%, p=0.13)
March 2021; Prospective, open-label, multicenter, RCT **(No-LVT)**	Ischemic (78.5) Other (21.5)	**N=79** **Warfarin;** 40 pts **Rivaroxaban;** 39 pts	Rivaroxaban significantly improved LVT resolution at 1 month compared to warfarin, however rates were similar at 3 and 6-month evaluation; Fewer SSE occurred in rivaroxaban-treated patients at 6 months compared to warfarin (0% vs. 15%, p=0.01). No difference in major bleeding was observed.
2020; Prospective, single-blinded, single-center, pilot RCT **(Isa)**	Not reported	**N=27 (Warfarin;** 13 pts; **Apixaban;** 14 pts)	Apixaban and warfarin had similar effectiveness for LVT resolution.
July 2021; Prospective, open-label, multicenter, RCT **(Alcalai)**	Post-MI (100)	**N=35** **Warfarin;** 17 pts **Apixaban;** 18 pts	Apixaban was non-inferior to warfarin for LVT resolution at 3 months in a post-MI population.
March 2021; Systematic Review and Meta-Analysis **(ELECTRAM)**	N/A	**N=867 (12 studies); VKA;** 528 pts; **DOAC;** 339 pts (R: 54.5%; A: 41.3%; D: 3.2%; E: 1.1%)a	No significant difference in terms of thromboembolic events, major bleeding, or failure of LVT resolution between DOACs and VKA; However, any bleeding was significantly reduced in DOAC-treated patients (OR 0.33, 95% CI 0.14–0.81, p = 0.02)
July 2022; Systematic Review and Meta-Analysis **(Huang)**	N/A	**N=3172 (21 studies – 18 cohort, 3 RCT);VKA;** 2284 pts; **DOAC;** 888 pts;	DOACs have a lower risk of bleeding events compared to VKA (RR = 0.73; 95% CI = 0.58-0.90, p = 0.009; I2=0%) and lower risk of stroke (RR = 0.72; 95% CI = 0.54-0.96, p = 0.03; I2=0%). No significant differences in mortality, SSE or LVT resolution.
Dec 2022; Prospective, open-label, multicenter, RCT **(Youssef)**	Post-MI (100%)	**N=50** **Apixaban;** 25 pts **Warfarin;** 25 pts	Apixaban was noninferior to warfarin for LVT resolution at 3 months

DOAC, direct oral anticoagulant; LVT, left ventricular thrombus; MI, myocardial infarction; NICM NOS, non-ischemic cardiomyopathy not otherwise specified; RCT, randomized controlled trial; SSE, stroke or systemic embolism; VKA, vitamin K antagonist [a]A—apixaban, D—dabigatran, E—edoxaban, R—rivaroxaban

References:
1. Robinson AA, Trankle CR, Eubanks G, et al. Off-label Use of Direct Oral Anticoagulants Compared With Warfarin for Left Ventricular Thrombi. JAMA Cardiol. 2020;5:685-692.
2. Bass ME, Kiser TH, Page RL, et al. Comparative effectiveness of direct oral anticoagulants and warfarin for the treatment of left ventricular thrombus. J Thromb Thrombolysis. 2021;52:517-522.
3. Abdelnabi M, Saleh Y, Fareed A, et al. Comparative Study of Oral Anticoagulation in Left Ventricular Thrombi (No-LVT Trial). J Am Coll Cardiol. 2021;77:1590-1592.
4. W. Isa WyH, Hwong N, Mohamed Yusof A, et al. Apixaban versus warfarin in patients with left ventricular thrombus: a pilot prospective randomized outcome blinded study investigating size reduction or resolution of left ventricular thrombus. J Clin Prev Cardiol. 2020;9:150.
5. Alcalai R, Butnaru A, Moravsky G, et al. Apixaban vs. warfarin in patients with left ventricular thrombus: a prospective multicentre randomized clinical trial. Eur Heart J Cardiovasc Pharmacother. 2022;8:660-667.
6. Shah S, Shah K, Turagam MK, et al. Direct oral anticoagulants to treat left ventricular thrombus-A systematic review and meta-analysis: ELECTRAM investigators. J Cardiovasc Electrophysiol. 2021;32:1764-1771.
7. Huang L, Tan Y, Pan Y. Systematic review of efficacy of direct oral anticoagulants and vitamin K antagonists in left ventricular thrombus. ESC Heart Fail. 2022;9:3519-3532.
8. Youssef AA, Alrefae MA, Khalil HH, et al. Apixaban in Patients With Post-Myocardial Infarction Left Ventricular Thrombus: A Randomized Clinical Trial. CJC Open. 2022;5:191-199.

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Guideline Summary:
Addendum to Left Ventricular Thrombus (LVT) Rapid Resource

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Left Ventricular Thrombus (LVT) Guideline Summary

LVT Setting	Recommendation	Class of Recommendation/ Level of Evidence
2012 CHEST Guidelines		
LVT or high risk for LVT + anterior MI with **NO STENT**	Warfarin (INR 2-3) + low dose aspirin x3 months. Then discontinue warfarin and continue DAPT for up to 12 months per ACS recommendations.	Grade 1B
LVT or high risk for LVT + anterior MI with **BMS**	Warfarin (INR 2-3) + low dose aspirin + clopidogrel x1 month. Then warfarin + SAPT for 2nd and 3rd month. Then discontinue warfarin and continue DAPT for up to 12 months per ACS recommendations.	Grade 2C
LVT or high risk for LVT + anterior MI with **DES**	Warfarin (INR 2-3) + low dose aspirin + clopidogrel x3-6 months. Then discontinue warfarin and continue DAPT for up to 12 months per ACS recommendations.	Grade 2C
LVT + systolic LV dysfunction **withOUT** established CAD	Warfarin (INR 2-3) for at least 3 months.	Grade 2C
High risk for LVT **withOUT** established CAD	No antiplatelet therapy or warfarin.	Grade 2C
2013 ACC/AHA STEMI Guidelines		
Asymptomatic LV mural thrombus or at high risk for LVT + STEMI	Warfarin (INR 2-3, or 2-2.5 in triple therapy) x3 months.	Class IIa
2017 European Society of Cardiology STEMI Guidelines		
LVT	Anticoagulation for up to 6 months guided by repeated imaging.	Class IIa
2021 AHA/American Stroke Association guidelines		
In patients with stroke or TIA and LV thrombus, anticoagulation with therapeutic warfarin for at least 3 months is recommended to reduce the risk of recurrent stroke.		Class 1/B-NR
In patients with stroke or TIA in the setting of acute MI, it is reasonabln patients with stroke or TIA in the setting of acute MI, it is reasonable to perform advanced cardiac imaging (eg, contrasted echocardiogram or cardiac MRI) to assess for the presence of LV thrombus.le to perform advanced.		Class 2a/C-EO
In patients with stroke or TIA and new LV thrombus (<3 months), the safety of anticoagulation with a direct oral anticoagulant to reduce risk of recurrent stroke is uncertain.		Class 2b/C-LD
In patients with stroke or TIA in the setting of acute anterior MI with reduced ejection fraction (EF; <50%) but no evidence of LV thrombus, empirical anticoagulation for at least 3 months might be considered to reduce the risk of recurrent cardioembolic stroke.		Class 2b/C-EO

References:
1. Guyatt GH, Akl EA, Crowther M, Gutterman DD, Schuunemann HJ. American College of Chest Physicians Antithrombotic Therapy and Prevention of hrombosis Panel. Executive summary: antithrombotic therapy and prevention of thrombosis, 9th ed.: American College of Chest Physicians evidence-based clinical practice guidelines. Chest 2012; 141:7S–47S.
2. Ibanez B, James S, Agewall S, et al; ESC Scientific Document Group. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: the task force for the management of acutemmyocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). Eur Heart J. 2018;39(2):119-177.
3. Kleindorfer DO, Towfighi A, Chaturvedi S, et al; 2021 Guideline for the Prevention of Stroke in Patients With Stroke and Transient Ischemic Attack: A Guideline From the American Heart Association/American Stroke Association. Stroke. 2021;52:e364–e467.
4. O'Gara PT, Kushner FG, Ascheim DD, et al. 2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction: a report of the American College of Cardiology Foundation/American Heart Association task force on practice guidelines. Circulation. 2013;127(4):362-425.

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