Left Ventricular Thrombus

Background: Left ventricular thrombus (LVT) characteristically occurs in areas of dyskinesia or poorly contracting left ventricular muscle, caused by blood stasis and/or endocardial injury with associated inflammation. LVT can be a complication of myocardial infarction (MI) and occurs most often with large anterior MI[1]. The risk of embolization within three months among patients with MI complicated by mural thrombus is 10-20% in the absence of systemic anticoagulation. It appears the risk of embolization is highest during the first 1-2 weeks, with subsequent risk decline over three months as the residual thrombus becomes endothelialized[2]. Guideline recommendations regard warfarin as the treatment of choice for LVT, but this practice is mostly based on studies conducted on patients with MI before the era of PCI/stents. The role of DOACs in the management of LVT has not been clear. No randomized controlled trials (RCTs) regarding treatment of LVT have been conducted for either warfarin or DOACs to date. Below is a summary of current guideline recommendations regarding the treatment of LVT and a brief review of published literature reporting the use of DOACs in the treatment of patients with LVT.

Bottom Line: Although warfarin is the treatment of choice according to guidelines, there has been an increasing trend of off-label use of DOACs for LVT treatment. Multiple case studies and retrospective cohort studies published involving the use of DOACs in the treatment of LVT have yielded promising results as it relates to thrombus resolution. However, in the recent RED VELVT[10] study DOACs were associated with a higher risk of stroke or systemic embolism (SSE) than warfarin. These findings should be interpreted with caution given the study design (e.g. retrospective, observational), treatment crossovers, and unknown DOAC dosing regimens. Further, data from RED VELVT indicate that thrombus resolution may not correlate with reduced SSE risk. Given a lack of RCT data and considerable variability in presentation and associated complications of LVT, individualized approaches remain paramount. Further research on the efficacy and safety of warfarin and DOACs for the treatment of LVT is necessary. Patient-specific factors such as a history of labile INRs, time within therapeutic range, drug-drug interactions, end-organ function, bleeding risk, etc. should be considered when evaluating therapeutic options for LVT.

Guideline Recommendations

LVT Setting	Recommendation	Class of Recommendation / Level of Evidence
2012 CHEST Guidelines[1]		
LVT or high risk for LVT[b] + anterior MI with **NO STENT**	**Warfarin (INR 2-3) + low dose aspirin x3 months**[c] Then discontinue warfarin and continue DAPT for up to 12 months per ACS recommendations	Grade 1B
LVT or high risk for LVT[b] + anterior MI with **BMS**	**Warfarin (INR 2-3) + low dose aspirin + clopidogrel x1 month**[a]**;** 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[b] + anterior MI with **DES**	**Warfarin (INR 2-3) + low dose aspirin + clopidogrel x3-6 months**[a]**;** 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**[c]	Grade 2C
High risk for LVT[b] **withOUT** established CAD	No antiplatelet therapy or warfarin	Grade 2C
2013 ACC/AHA STEMI Guidelines[3]		
Asymptomatic LV mural thrombus or at high risk for LVT[b] + STEMI	**Warfarin (INR 2-3, or 2-2.5 in triple therapy) x3 months**[c]	Class IIa
2014 AHA/American Stroke Association Guidelines[2]		
Ischemic stroke or TIA in setting of acute MI complicated by LV mural thrombus	**Warfarin (INR 2-3) x3 months**[c]	Class I
Ischemic stroke or TIA in setting of acute MI complicated by LV mural thrombus **INTOLERANT** to VKA therapy	LMWH, dabigatran, rivaroxaban, or apixaban x3 months[c]	Class IIb
Ischemic stroke or TIA in setting of acute MI with high risk for LVT[b]	May consider warfarin (INR 2-3) x3 months[c]	Class IIb
Ischemic stroke or TIA in sinus rhythm who have left atrial or LVT	Warfarin (INR 2-3) x3 months[c]	Class I
Ischemic stroke or TIA in sinus rhythm at high risk for LVT[b]	Effectiveness of anticoagulation is uncertain, treatment choice should be individualized	Class IIb
2017 European Society of Cardiology STEMI Guidelines[4]		
LVT	Anticoagulation[d] for up to 6 months guided by repeated imaging	Class IIa

Treatment of LVT with DOACs in the Literature[e]

Publication Date/Type	# Pts	Anticoagulant	Treatment Outcomes
Feb 2018; Systematic Review[5]	15	**Rivaroxaban**	73% resolved; Duration ranged 7-436 days
Jan 2019; Systematic Review[6]	41	**Apixaban**;11 pts **Rivaroxaban**; 21 pts **Dabigatran**; 9 pts	**Apixaban**: 100% resolved; median 36 days **Rivaroxaban**: 81% resolved; median 40 days **Dabigatran**: 89% resolved; median 24 days
April 2019; Systematic Review[7]	52	**Apixaban**; 10 pts **Rivaroxaban**; 30 pts **Dabigatran**; 12 pts	**Apixaban**: 100% resolved; median 36 days **Rivaroxaban**: 90% resolved; median 90 days **Dabigatran**: 75% resolved; median 28 days
April 2019; Retrospective cohort study[8]	108	**Apixaban**; 3 pts **Rivaroxaban**; 1 pt **Warfarin**; 94 pts **LMWH**; 10 pts	**Apixaban**: 100% resolved at 1yr. **Rivaroxaban**: 100% resolved at 1yr. **Warfarin**: 75% resolved at 1yr. **LMWH**: 40% resolved at 1yr. Duration varied.
May 2019; Retrospective cohort study[9]	35	**Apixaban**; 16 pts **Rivaroxaban**; 17 pts **Dabigatran**; 2 pts	**Apixaban**: 76% resolved **Rivaroxaban**: 76% resolved **Dabigatran**: 50% resolved; Duration and f/u varied
April 2020; Retrospective cohort study[10] (RED VELVT)	514	**DOAC**; 121 pts **Warfarin**; 236 pts (64 pts switched between treatment groups, 93 pts not treated)	**DOAC**: 17 SSE events, 14 deaths, 8 bleeds **Warfarin**: 14 SSE events, 32 deaths, 19 bleeds; Duration and f/u varied

Key: **ACS**–Acute coronary syndrome; **BMS**–Bare metal stent; **CAD**–Coronary artery disease; **DAPT**–Dual antiplatelet therapy; **DES**–Drug eluting stent; **DOAC**–Direct oral anticoagulant; **INR**–International normalized ratio; **LMWH**–Low molecular weight heparin; **MI**–Myocardial infarction; **RCT**–Randomized controlled trials; **SAPT**–Single antiplatelet therapy; **STEMI**–ST elevated MI; **TIA**–Transient ischemic attack; **VKA**–Vitamin K antagonist

[a] Must weigh potential risks vs. benefits of adding warfarin to DAPT. Duration of triple therapy, if chosen, should be minimized. For pts with large anterior STEMI and demonstrated LV thrombus, addition of warfarin to DAPT would be expected to result in 44 fewer nonfatal strokes and 15 more nonfatal extracranial bleeds per 1,000 patients treated. For pts with large anterior STEMI and no LV thrombus, adding warfarin to DAPT would prevent 7 nonfatal strokes at a cost of 15 nonfatal extracranial bleeds per 1,000 patients treated.
[b] EF <40%, antero-apical wall motion abnormality.
[c] Patients with persistent mobile or protruding thrombus visualized by echo or another imaging modality may remain at increased risk for stroke and other embolic events beyond 3 months.
[d] No recommendation on type of OAC. Bleeding risk and need for concomitant antiplatelet therapy should be considered.
[e] Referenced literature employed various dosing strategies. (e.g. standard vs. initial VTE treatment DOAC dosing or warfarin with or without heparin overlap). Specific dosing recommendations are outside the scope of this review and have been omitted from this document. However, factors that should be considered when selecting a strategy include whether thrombus is mobile/protruding, appears "new" in nature, and patient bleeding risks.

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Produced by: Hillary Parkin, PharmD, VA Salt Lake City Health Care System, Salt Lake City, UT

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