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CASE REPORT

A Case Series of Direct Oral AnticoagulantsUse in Post-Infarction Left Ventricular Thrombus

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Abstract

Left ventricular thrombus (LVT) is a known complication of acute myocardial infarction (AMI). Vitamin K antagonists such as Warfarin showed a reduction in associated mortality and morbidity and are indicated as anticoagulants of choice in current guidelines. Since their approval for clinical use, there has been a dramatic increase in off-label use of direct oral anti-coagulants (DOAC) for LVT. In this case series, the authors share their successful experience with DOAC in the treatment of LVT.

Keywords: Anti-coagulants, Heart diseases, Heart ventricles, Myocardial infarction, Thrombosis

Introduction

Left ventricular thrombus (LVT) is a known complication following acute myocardial infarction (AMI), which is associated with a significant risk of systemic embolization, morbidity, and mortality.[1]

Anterior ST elevation myocardial infarction (STEMI), large infarct size, LV aneurysm, suboptimal revascularization with [Thrombolysis in Myocardial Infarction (TIMI) 0-1 flow], and cardiogenic shock are the risk factors for the formation of LVT.[2] The incidence of LVT in the primary PCI (pPCI) era is between 2.9% and 15.2%, as compared to 40% and 28% in the pre-thrombolytic and thrombolytic eras, respectively. The decreased incidence is attributed to earlier reperfusion and aggressive use of an antithrombotic therapy.[3]

Current guidelines recommend vitamin K antagonist such as Warfarin as anticoagulation

therapy of choice for LVT post AMI.[3,4] Recently, the use of direct oral anti-coagulants (DOACs) is dramatically increasing and is preferred by physicians and patients for its ease of administration despite the lack of large trials to support such off-label indications.[4]

Here, a case series with successful resolution of post-infarction LV thrombus treated with triple antithrombotic therapy using dual antiplatelet therapy (DAPT) consisting of Aspirin 81 mg once a day (OD) and Plavix 75 mg OD in addition to DOAC has been presented. The duration of DAPT (determined according to ischemic and bleeding risk assessment) along with the choice and dose of DOAC were left to the discretion of the primary physician.

Case Presentations

CASE 1

A 52-year-old man was admitted with non-ST elevation acute coronary syndrome (NSTE-ACS) and underwent successful percutaneous intervention to mid left anterior descending artery. A transthoracic echocardiography (TTE) revealed two pedunculated mobile apical LV thrombi measuring 1.25 x 0.73 cm and 1.1 x 0.73 cm with ejection fraction (EF) of 35% and akinetic left ventricular apex (Figure 1A). He was discharged on DAPT + Rivaroxaban 20 mg OD. TTE was repeated after 10 weeks and showed complete resolution of left ventricular thrombus (Figure 1B) and normalization of LV systolic function.

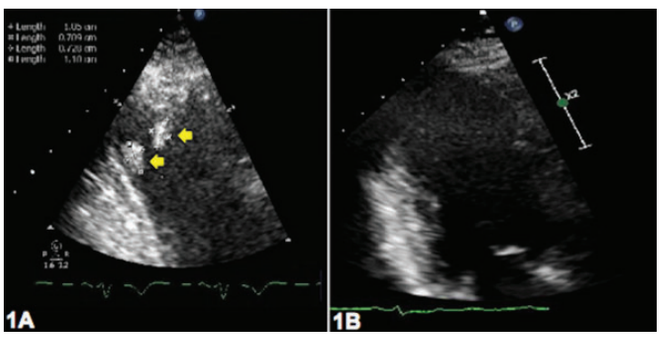

Figure 1A: Left ventricular thrombi (LVT); **1B:** Resolution of LVTi

CASE 2

A 38-year-old man was admitted with chest pain of 5 hours duration, diagnosed as acute anterior wall ST-elevation myocardial infarction (AW-STEMI). The patient underwent pPCI to (LAD) with drug eluting stent (DES). Rest of coronary angiogram revealed chronic total occlusion of left circumflex artery (LCX), subtotal occlusion of obtuse marginal I (OM1) artery and right coronary artery (RCA) had minor disease. TTE showed apical LVT measuring 0.8x1.9 cm in akinetic anterior wall, mid to apical anteroseptal wall and LV apex with EF of 30% (Figure 2A). The patient was discharged on DAPT and Rivaroxaban 15 mg OD with complete resolution of LVT at 10 weeks follow up despite no significant interval change in EF (Figure 2B).

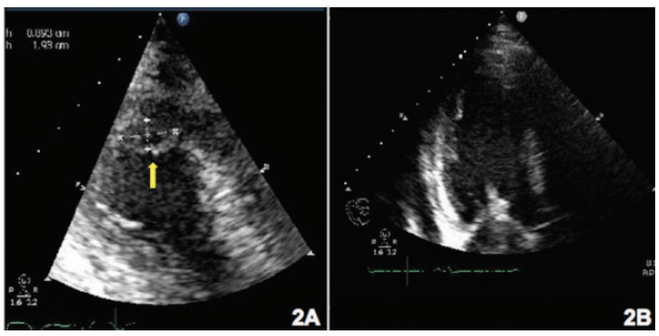

Figure 2A: Left ventricular thrombus (LVT)**;** **2B:** Resolution of LVT

CASE 3

A 48-year-old man was admitted with epigastric pain for two days as late presentation AW-STEMI. The patient underwent PCI to LAD with TIMI-I flow due to high thrombus burden at the distal segment. TTE revealed sessile pedunculated LVT measuring 1.2x0.6 cm in akinetic LV apex and mid to apical anteroseptal wall with EF 35% (Figure 3A). The patient was kept on Rivaroxaban 15 mg OD + DAPT. TTE was repeated after 12 weeks and revealed complete resolution of the LVT (Figure 3B) with slightly improved EF to 45%.

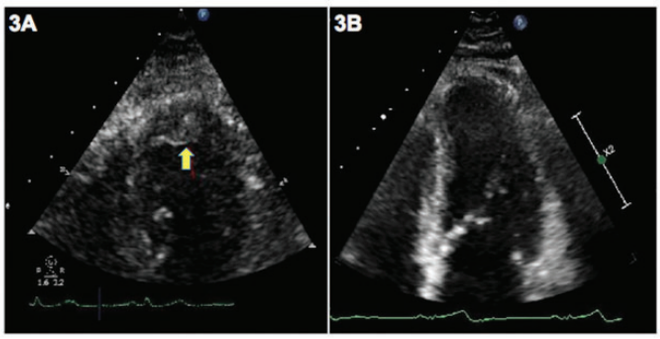

Figure 3A: Left ventricular thrombus (LVT); **3B:** resolution of LVT

CASE 4

A 29-year-old male was admitted with severe

retrosternal chest pain that started 4 hours prior to presentation. Electrocardiogram (ECG) showed an acute extensive AW-STEMI. Coronary angiography revealed a tight proximal to mid LAD disease that was stented with DES. TTE revealed two pedunculated apical thrombi measuring 1.3x0.9 cm and 1.2x1.0 cm in an akinetic anteroseptal, anterior wall and LV apex with an estimated EF of 35% (Figure 4A). The case was discharged on DAPT + Rivaroxaban 15 mg/day. Repeated echocardiography after 8 weeks revealed complete resolution of LVT (Figure 4B) with improved LVEF.

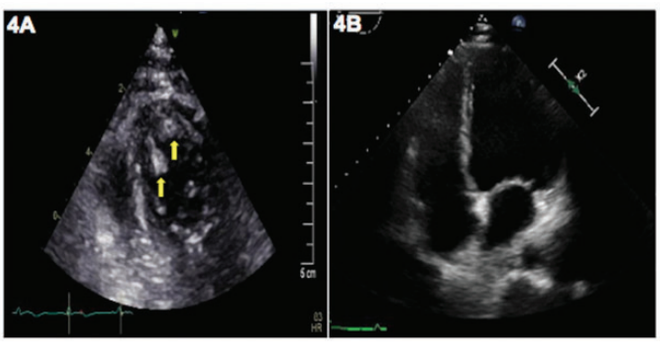

Figure 4A: Left ventricular thrombi (LVTi), **4B:** Resolution of LVTi

CASE 5

A 62-year male was admitted with chest pain that started more than 48 hours prior to admission. The ECG showed anterior STEMI with ST elevation from V1-V6 and Q waves in V1-V3. TTE showed akinetic apex, anteroseptal wall and mid anterior wall with an EF of 35% and an apical sessile thrombus measuring 1.2 x 0.7 cm. Coronary angiography revealed tight lesion proximal LAD which was tackled successfully by deployment of one DES. Complete resolution of LVT was documented 8 weeks after being discharged on DAPT + Rivaroxaban 15 mg OD.

CASE 6

A 54-year male was admitted with chest pain that started 12 hours prior to presentation. The ECG showed acute STEMI with STE V1-V6. Coronary angiogram showed significant angiographic lesion in LAD that was successfully stented with DES with good angiographic results. Transthoracic echocardiography revealed pedunculated sessile LV apical thrombus measuring 1.0 x 0.8 cm in an akinetic LV apex and anteroseptal segment with EF 30%. The patient was treated with DAPT + Apixaban 5 mg twice/day. Six weeks follow up with echocardiogram revealed complete resolution of LVT.

Discussion

Cardiovascular imaging can be used to diagnose left ventricular thrombus (LVT), cardiac magnetic resonance (CMR) has the highest diagnostic accuracy for LVT, followed by transthoracic echocardiography (TTE) with the use of echocardiographic contrast agents (ECAs).[4] Although anticoagulation is thought to reduce the risk of stroke or systemic embolism (SSE), there is currently no high-quality data on the efficacy of DOACs in LVT. LVT occurs at a rate of up to 15% in patients with AMI and up to 25% in patients with AWMI.[2] The major risk associated with LVT is systemic embolization with distal ischemia or infarction. The role of DOACs in preventing strokes in patients with non-valvular atrial fibrillation (AF) has been established and incorporated into the American Heart Association/ American Stroke Association's 2014 guidelines, which recommend either Warfarin or Apixaban for recurrent stroke prevention in AF patients. (Class I; Level of evidence A), while Rivaroxaban is classified as a class IIa medication (Level of evidence B). Warfarin, a vitamin K antagonist (VKA), is the drug of choice for patients with Acute MI complicated by LVT. (Class I; evidence level C). When patients are unable to tolerate VKA due to its adverse non-hemorrhagic effects, DOAC is considered an alternative.[5]

There is a dearth of literature regarding the use of DOACs in LVT. A single-center retrospective study published in 2018 found no significant difference in the rates of thromboembolism, major bleeding, or thrombus resolution between VKA and DOACs. Indeed, DOAC was found to be safe for these patients.[6] According to a meta-analysis of case reports, 87.9 percent of the population studied experienced resolution of the LV thrombus within 30 days.[7] Mohammed shokr, *et al*. published a case series of eight patients in 2018 who were successfully treated with Rivaroxaban and Apixaban for LVT post-myocardial infarction.[8] Azizi, *et al*. reported successful LVT dissolution in a post-MI patient

treated for three months with Rivaroxaban 20 mg, Aspirin 100 mg, and Clopidogrel 75 mg per day.[9]

In a systematic review, most patients with LV thrombi were treated with Rivaroxaban, resulting in an 81 percent success rate of resolution within a median of 40 days.[10]

In a recent systematic review and metanalysis DOACs appear to be non-inferior or at least as effective as warfarin in the treatment of left ventricular thrombus without any statistical difference in stroke or bleeding complications.[11]

Abdelnabi, *et al*. in a randomized trial demonstrated complete resolution of LVT in one month with Rivaroxaban and a lower rate of stroke in comparison to warfarin at six months without an increased risk of major bleeding.[12] Several prospective randomized trials comparing DOACs to Warfarin in LVT patients are currently underway, and their results are eagerly awaited.

Six patients were included in this case series, and all had follow-up echocardiography showing complete resolution of LVT. In this case series, no patient required blood transfusion due to gastrointestinal or other types of bleeding. Four patients were monitored for more than a year and no evidence of stroke or systemic embolism (SSE) was reported.

Conclusion

DOAC therapy appears as a promising therapy of choice for the treatment of post-infarction LVT. DOAC may be used in place of Warfarin following myocardial infarction with LVT. A large, prospective study is warranted to confirm these results.

Ethical Approval

The manuscript was approved by Research and Training committee of Muhammed bin Khalifa bin sulman Al-Khalifa specialist Cardiac Center, Bahrain.

Potential Conflicts of Interest

None.

Competing Interest

None.

Sponsorship

None.

References

1. McCarthy CP, Murphy S, Venkateswaran RV, et al. Left Ventricular Thrombus: Contemporary Etiologies, Treatment Strategies, and Outcomes. *J Am Coll Cardiol*. 2019;73(15):2007-2009.
2. Driesman A, Hyder O, Lang C, Stockwell P, et al. Incidence and predictors of left ventricular thrombus after primary percutaneous coronary intervention for anterior ST-segment elevation myocardial infarction. *Clin Cardiol*. 2015;38(10):590-597.
3. Seecheran R, Seecheran V, Persad S, et al. Rivaroxaban as an antithrombotic agent in a patient with ST-segment elevation myocardial infarction and left ventricular thrombus: a case report. *J Investig Med High Impact Case Rep*. 2017;5 2324709617697991.
4. Cruz Rodriguez JB, Okajima K, Greenberg BH. Management of left ventricular thrombus: a narrative review. *Ann Transl Med*. 2021 ;9(6):520. doi: 10.21037/atm-20-7839. PMID: 33850917; PMCID: PMC8039643.
5. Kernan WN, Ovbiagele B, et al. Guidelines for the prevention of stroke in patients with stroke and transient ischemic attack. *Stroke*. 2014; 45:2160-2236.
6. Jaidka A, Zhu T, Lavi S, Johri A. Treatment of left ventricular thrombus using warfarin versus direct oral anticoagulants following anterior myocardial infarction. *Can J Cardiol* 2018; 34: S143.
7. Leow AS, Sia CH, Tan BY, *et al*. A meta-summary of case reports of non-vitamin K antagonist oral anticoagulant use in patients with left ventricular thrombus. *J Thromb Thrombolysis*. 2018; 46:68–73.
8. Shokr M, Ahmed A, Abubakar H, *et al.* Use of direct oral anticoagulants in the treatment of left ventricular thrombi: A tertiary center experience and review of the literature. *Clin Case Rep*. 2018 135-142. doi: 10.1002/ccr3.1917. PMID: 30656027; PMCID: PMC6332814.

9. Azizi A, Puricel S, Cook S, *et al.* Rivaroxaban dissolves postinfarction left ventricular thrombus. *Cardiovascular Medicine*—Kardiovaskuläre Medizin—Médecine Cardiovasculaire 2016; 19:25–7.

10. Kajy M, Shokr M, Ramappa P. Use of Direct Oral Anticoagulants in the Treatment of Left Ventricular Thrombus: Systematic Review of Current Literature. *Am J Ther*. 2020;27(6): e584-e590. doi: 10.1097/MJT.0000000000000937. PMID: 30730331.

11. Dalia T, Lahan S, Ranka S, *et al*. Warfarin versus direct oral anticoagulants for treating left ventricular thrombus: a systematic review and meta-analysis. *Thromb J*. 2021;19(1):7. doi: 10.1186/s12959-021-00259-w. PMID: 33517885; PMCID: PMC7849079.

12. Abdelnabi M, Saleh Y, Fareed A, Nossikof A, Wang L, Morsi M, *et al*. Comparative Study of Oral Anticoagulation in Left Ventricular Thrombi (No-LVT Trial). *J Am Coll Cardiol*. 2021 ;77(12):1590-1592. doi: 10.1016/j.jacc.2021.01.049. PMID: 33766266.