Long-term clinical outcomes of the left ventricular thrombus in patients with ST elevation anterior myocardial infarction

Mahmoud Ebrahimi[(1)], Afsoon Fazlinezhad[(2)], Masoomeh Alvandi-Azari[(3)], Morteza Abdar Esfahani[(4)]

Original Article

Abstract

BACKGROUND: This study was performed to determine the size of left ventricular thrombus (LVT), risk of systemic embolization and response to medical treatment during 18 months of follow up in the patients with anterior-ST elevation myocardial infarction (aSTEMI).

METHODS: This cross-sectional study was performed on thirty-five patients with anterior myocardial infarction (MI), in Emam Reza Hospital and Ghaem Hospital, Mashhad, Iran, from August 2008 to January 2011. Warfarin was prescribed for all the patients. Transthoracic echocardiographic study was performed on the 1st, 2nd, 4th, 6th, 12th and 18th months. Outcomes included rate of death, MI, stroke, systemic embolization, major bleeding and change in thrombus size following treatment.

RESULTS: The resolve rate of clot on the 2nd, 4th, 6th, 12th and 18th months was 64.7, 86.6, 81.4, 81.4 and 100 percent, respectively. In five patients with complete clot resolution, clot reformation occurred after warfarin discontinuation. In these patients, left ventricular ejection fraction (LVEF) improvement was poor. During the study period, five patients died due to severe heart failure. One patient developed hematuria whereas non-experienced thromboembolic events. The mean LVEF at study initiation was 30.8 ± 0.92%, which improved to 42 ± 0.84% ($P < 0.05$) at the end.

CONCLUSION: All LVT was resolved with a combination therapy of antiplatelet and warfarin without any thromboembolic event. In patients with a poor improvement in the LV function, due to the risk of LVT reformation, lifelong warfarin therapy was recommended.

Keywords: Echocardiography, Left Ventricular Thrombosis, Myocardial Infarction

Date of submission: 27 Aug 2013, ***Date of acceptance:*** 27 Sep 2014

Introduction

Left ventricular thrombus (LVT) is a known complication of anterior ST-elevation myocardial infarction (aSTEMI), developing a median of 5 days after the acute event.[1] In the Pre-thrombolytic era, the incidence of LVT has been reported to range from 20 to 56% after aSTEMI. In the reperfusion era, despite aggressive reperfusion treatment and anti-aggregant use, the incidence of LVT remained high after anterior ST-elevation anterior myocardial infarction (AMI) (23.5%).[2-5] Post myocardial infarction (MI) LVT increases the risk of embolization significantly,[6] particularly if anticoagulation treatment is not used.[7] For these patients choosing the best treatment strategy for thrombus [Coronary artery bypass graft with surgical thrombectomy or percutaneous coronary intervention (PCI) with medical follow-up] has always been challenging. A major goal of our study was to identify the risks and benefits of anticoagulant therapy in patients with left ventricular (LV) mural thrombi during the 18 months follow-up period.

Materials and Methods

This cross-sectional study was performed on 35 patients with AMI, in Emam Reza Hospital and Ghaem Hospital, Mashhad, Iran, from August 2008 to January 2011. The demographic and clinical characteristics of patients were (88.57%) male, (34.28%) smoker, (45.71%) hypertension, (37%)

1- Atherosclerosis Prevention Research Center, Imam Reza Hospital, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran
2- Cardiologist, Advanced (3D) Echocardiologist, Ghaem Hospital, Mashhad University of Medical Sciences, Mashhad, Iran
3- Cardiologist, Imam Reza Hospital, Mashhad University of Medical Sciences, Mashhad, Iran
4- Associate Professor, Cardiologist, Advanced (3D) Echocardiologist, Isfahan University of Medical Sciences, Isfahan, Iran
Correspondence to: Masoomeh Alvandi-Azari, Email: patient1368@yahoo.com

diabetes, and (44%) dyslipidemia. Inclusion criteria were history of aSTEMI that accompanied visible clot in LV. patients with any contraindications for anticoagulant therapy or history of a previous thromboembolic event was excluded from the study. Transthoracic echocardiographic follow-up was performed on the 2nd, 4th, 6th, 12th and 18th months after admission. For all the patients warfarin was administered for at least 4 months. Patients undergoing PCI received clopidogrel as well. The studied outcomes included the rate of death, MI, stroke, systemic embolization, major bleeding and change in thrombus size following treatment. The patients' demographic data, clinical findings, cardiac risk factors and echocardiographic data [including primary ejection fraction (EF) and EF at the end of the follow-up period, localization of the clot and presence of aneurysm] were analyzed descriptively.

Results

From the 35 patients with the eligible criteria, 16 (45.71%) had been previously reperfused with PCI, 3 (8.58%) had only received streptokinase whereas 16 (45.71%) had not received any kind of reperfusion therapy before. Clinical and laboratory characteristics of the cases are presented in table 1. According to electrocardiographic (ECG) criteria, the location of MI was anterior in 31.43% (11), anteroseptal in 28.57% (10), whereas 40% (14) had extensive AMI. In total 21 (60%) patients had a true aneurysm. The primary mean LV systolic ejection fraction (LVEF) was 30.8 ± 0.92% and the mean clot area size was 3.73 ± 2.1 cm^2. The location of the clot in all patients was in the LV apex. The proportion of patients with a persistent thrombus after 2, 4, 6, 12 and 18 months were 35.3% (12 from 34), 13.3% (4 from 30), 18.5% (5 from 27), 18.5% (5 from 27) and 0%, respectively. The dropping number of patients in each month was due to surgery or death. Most thrombi resolved during the 2nd month, whereas lifelong continuation of warfarin therapy was required in five patients due to the reformation of the LVT after discontinuing warfarin administration. The important predicting factor for LVT occurrence after stopping warfarin therapy was severe LV dysfunction with akinesia or aneurysm of the apex. However, no thromboembolic events took place. Nineteen patients showed systolic function improvement (15-25%) and nine of them were re-vascularized by PCI. After 18 months of follow-up, the mean LVEF raised to 42 ± 0.84% and none of the cases experienced any thromboembolic events. One patient developed gross hematuria on the 6th month of treatment due to warfarin overdose.

Table 1. Demographic and clinical characteristics of patients

Characteristics	Percent (%)
Mean age (year)	44.22
Gender (male)	31 (88.57)
Smoking	12 (34.28)
Hypertension	16 (45.71)
Diabetes	13 (37.00)
Dyslipidemia	15 (44.00)
Mean LVEF	30.8
Clot size	1.2-9.88 cm^2 (mean 3.73 ± 2.1 cm^2)
True aneurysm	21 (60)

LVEF: Left ventricular ejection fraction

Discussion

LVT are the major sources of embolic stroke after ST segment elevation MI.[6-10] At present, despite the routine use of early revascularization and dual antiplatelet therapy, LVT is a common complication of aSTEMI.[11]

Weinreich et al. followed 43 patients with LVT for a mean duration of 15 months with serial echocardiography. None of the 25 patients who received anticoagulation treatment experienced an embolic event. Embolization occurred only in 7 of the 18 patients who had not received anticoagulation treatment. All embolic events occurred within four months of infarction. This quite remarkable outcome point that in patients with AMI especially in those with a low EF, serial echocardiography will be necessary for the diagnosis, immediate treatment and follow-up of ventricular thrombi.[12] Transthoracic echocardiography has a very high sensitivity and specificity in LVT diagnosis possibly even higher than 92% and 86-88% respectively.[4]

Nihoyannopoulos et al. determined that within 12 weeks of follow-up, patients with a thrombus had severe LV dysfunction compared with the patients without thrombus.[1]

In our study, all LVTs with any size (between 1.2 and 9 cm^2) were resolved by warfarin and aspirin therapy within 6 months, none of the patients experienced embolic events under anticoagulant therapy, which is consistent with other studies. Reformation of clot in 18.51% (5 from 27 remained patients) necessitates the readministration of warfarin therapy for a longer duration.

Clot reformation is accompanied by sever regional wall motion abnormality of the apex (apical

akinesia or aneurysm) and severe LV dysfunction (LVEF < 35%). Therefore, it seems that in patients with AMI in order to reducing the rate of clot formation and also clot reformation, the level of LVEF and regional wall motion abnormalities should be improved. These would best achieved by early reperfusion and intensive ischemic heart failure therapy.

In our study, the administration of aspirin plus warfarin did not increase the incidence of a major bleeding event in an international normalized ratio (INR) range of 2-3, even when clopidogrel was added.

Limitation

Contrast and the harmonic echocardiography which could have a higher sensitivity for the main purpose of the current study[13] were not used. Optimum time duration of anticoagulation therapy in patients with reforming clot after warfarin cessation is not clear. Furthermore, the authors recommend that in order to obtain more promising results, longer follow up periods are required.

Conclusion

In patients with AMI especially in those with a low EF, the application of serial echocardiography for the early detection and immediate administration of anticoagulant therapy of ventricular thrombi is vital in the prevention of thromboembolic complications. In this study, all LVTs resolved following combination therapy of aspirin and warfarin without any thromboembolic events or major bleeding.

Due to the probable risk of LVT reformation in patients with poor LV function, despite primary resolution, the continuation of warfarin therapy is highly recommended.

Effective ischemic treatment (early coronary reperfusion) is also essential for preventing ischemic heart failure and decreasing the rate of clot formation.

Acknowledgments

Hereby, we acknowledge personnel's of Echocardiography Wards in Ghaem and Emam Reza Hospitals, Mashhad University of Medical Sciences, Iran.

Conflict of Interests

Authors have no conflict of interests.

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How to cite this article: Ebrahimi M, Fazlinezhad A, Alvandi Azari M, Abdar Esfahani M. **Long-term clinical outcomes of the left ventricular thrombus in patients with ST elevation anterior myocardial infarction.** ARYA Atheroscler 2015; 11(1): 1-4.