

# The Effects of Thrombolysis on Left Ventricular Thrombus Formation After First Acute Anterior Myocardial Infarction

M A NADEEM T WASEEM R SOHAIL A H KHAN.

Department of Medicine, King Edward Medical College/Mayo Hospital, Lahore

Correspondence to Dr. Muhammad Arif Nadeem, Assistant Professor

The Left Ventricular Thrombus (LVT) after Acute Myocardial Infarction (AMI) is usually located in the Left Ventricle particularly at the apex and occurs much more frequently (98%) in anterior infarcts and in larger infarcts. Early thrombus formation is associated with worse LV wall motion and carries high long-term mortality, and a poor prognosis. We studied the occurrence of LVT in first episode of Acute Q wave Anterior Myocardial Infarction in patients presenting to Mayo Hospital during hospital stay and evaluated whether thrombolysis had any effects on the LVT formation in such setting. A total of 30 (24 males, 6 females) patients with first episode of anterior wall AMI were included in this study. The mean age of male patients was  $51.79 \pm 13.86$  years, and that of female patients was  $54.83 \pm 10.15$  years. Echocardiographic examination was done 6 days after presentation. Eight (6 males, 2 females) patients (26.66%) were found to have LVT. At presentation 16 patients (53.33%) were thrombolysed with intravenous Streptokinase infusion, out of which 2(12.5%) developed LVT and 14(87.5%) did not. Amongst the 14(46.66%) non-thrombolysed patients 6(42.7%) were found to have LVT. It showed a 70.79% reduction in relative risk for LVT in patients with first acute anterior wall MI. Amongst the thrombolysed patients 3(18.74%) developed cardiac failure. Out of those patients who were not thrombolysed (n =14), 8(57.1%) developed cardiac failure. The occurrence of cardiac failure in patients who were not thrombolysed at presentation was statistically significant. At Mayo Hospital, Lahore 26% of patients with first Q wave anterior wall myocardial infarction showed LVT on day 6 when examined echocardiographically. The effect of thrombolysis in reducing the occurrences of LVT is statistically insignificant. The development of cardiac failure after AMI is associated with increased occurrence of LVT and this is seen more in non-thrombolysed patients.

**Key Words:** Left Ventricular Thrombus, Acute Myocardial Infarction, Anterior wall, Thrombolysis.:

The occurrence of Left Ventricular Thrombus (LVT) after AMI carries a significant prognostic implication. LVT that occurs early after AMI is usually located in the Left Ventricle particularly at the apex, but can also occur along the septum.<sup>1</sup> LVT occurs much more frequently (98%) in anterior infarcts as compared to infarcts present at other areas of myocardium (2%), and in larger infarcts as compared to smaller ones.<sup>2-4</sup>

After anterior AMI 52.6% patients developed LVT and 60% of them were detected at 24 hours, 85% at 72 hours and 95% at 120 hours.<sup>1</sup> Similarly another study depicted LVT in the first week after MI in 97% patients.<sup>5</sup> Early thrombus formation is associated with worse LV wall motion and carries high long term mortality, and a poor prognosis.<sup>1,6</sup>

The following factors influence the LVT formation:

- Large Q wave anterior MI.<sup>7</sup>
- Signs of Congestive Heart Failure.<sup>7</sup>
- Killip Class >1.<sup>5</sup>
- Development of mitral regurgitation after AMI.
- Increased end-systolic volume.<sup>8</sup>

Two Dimensional (2D-) echocardiography has become the investigation of choice for detection of LVT, and is a useful clinical tool in the identification of patients who would benefit more from aggressive management.<sup>8</sup> Therefore the

search for mural thrombi is routinely done by 2D-Echocardiography during the hospital stay. Whether thrombolysis reduces the early formation of LV thrombus is not well established.<sup>9-13</sup>

## Aims and Objectives

1. To study the occurrence of left ventricular thrombus (LVT) in first episode of Acute Q wave Anterior Myocardial Infarction in patients presenting to Mayo Hospital during hospital stay.
2. To see whether thrombolysis has any effects on the LVT formation in such setting.

## Material and Methods

### Inclusion Criteria

1. Patients with first acute Q wave anterior MI.
2. Patients who gave informed consent.
3. EKG evidence of ST segment elevation of >1mm in two contiguous chest leads.

### Exclusion Criteria

1. Patients with previous history of myocardial infarction.
2. Patients with history of Rheumatic Heart Disease and Dilated Cardiomyopathy.
3. Patients with history of prior mural thrombus

## The Effects of Thrombolysis on Left Ventricular Thrombus Formation

4. Patients with a history of systemic embolism (including cerebrovascular accident).
5. Patients with end-stage or chronic debilitating disease.

### Methods

The study was carried out at Mayo Hospital, Lahore on 30 consecutive patients presenting with first episode of Q wave Anterior Myocardial Infarction. A twelve lead ECG was carried out daily and cardiac enzymes were estimated. Routine treatment, as deemed fit by the attending physician was given to the patient, including thrombolysis if indicated and afforded. The diagnosis of LVT was made by Echocardiography, which was done 6 days after admission. The echocardiographic criterion used to diagnose LVT was to observe echodense mass with defined margins:<sup>9</sup>

1. Adjacent to asynergic myocardium.
2. Identifiable throughout the cardiac cycle.
3. Distinguishable from chordal structures, muscle trabeculations, or false masses.
4. Doubtful cases to be considered negative for thrombus in order to minimize false positive diagnosis.

Student's *t* Test and Chi-square Test were the statistical measures employed to evaluate the observations and results.

### Results

A total of 30 (24 males, 6 females) patients with first episode of acute anterior wall myocardial infarction were included in this study. The mean age of male patients was  $51.79 \pm 13.86$  years, and that of female patients was  $54.83 \pm 10.15$  years.

Echocardiography was performed 6 days after presentation as maximum number of LVT after AMI were reported at 120 hours (day 5) by Dale et al.<sup>2</sup> on serial echocardiographic examinations. Patients were divided in two groups. Sixteen patients received thrombolytic therapy and 14 did not. The two groups were comparable for age, sex and other baseline characteristics. The non-thrombolysed group was selected either due to non-affordability or non-availability of Streptokinase. Eight patients, 6 males and 2 females, (26.66%) were found to have LVT, on two-dimensional echocardiography.

Table 1 Comparison of Occurrence of LVT in Patients with respect to Treatment with Thrombolytics

Thrombolytic Therapy	LVT Present	LVT Absent	Total
Streptokinase			
Given (n = 16)	2	14	16
Streptokinase			
Not given (n = 14)	6	8	14
Total	8	22	30

At presentation 16 patients (53.33%) were thrombolysed with intravenous Streptokinase infusion. In this sub-group 2 (12.5%) patients developed LVT and 14 (87.5%) did not. Among the 14 (46.66%) patients who were not thrombolysed, 6 (42.7%) were found to have LVT on the 6 day after presentation. It showed a 70.79% reduction in relative risk for LVT in patients with first acute anterior wall MI, who were treated with Streptokinase. Though, it

seems to be a significant reduction in relative risk for LVT after thrombolysis, it was found to be statistically insignificant (table 1).

Amongst the thrombolysed patients 3 (18.74%) developed cardiac failure. Out of those patients who were not thrombolysed (n = 14), 8 (57.1%) developed cardiac failure. The occurrence of cardiac failure in patients who were not thrombolysed at presentation was statistically significant (Table 2).

Table 2 Relationship of Development of Cardiac Failure with respect to Receiving Thrombolytic therapy

Thrombolytic Therapy	Killip Class > 1	Killip Class 1	Total
Given (n = 16)	3	13	16
Not given (n = 14)	8	6	14
Total	11	19	30

$p < 0.05$  (Statistically significant)

### Discussion

Ischaemic Heart Disease (IHD) is one of the major causes of morbidity and mortality throughout the world. Advances have been made in the better management of the acute coronary syndrome with thrombolysis and other invasive techniques, but it still remains responsible for most years of life lost before age 65.<sup>10</sup>

Amongst the sequel of Acute Myocardial Infarction, LVT carries a grave prognostic significance. It occurs early after AMI, predominantly after large anterior AMI and very rarely after inferior AMI.<sup>1, 3, 11-12</sup>

The current study was undertaken to find the occurrence of LVT in patients presenting with first episode of Q wave anterior wall MI. All patients were echocardiographically examined on the sixth day after MI for the presence of LVT.<sup>1</sup> LVT was found in 26.66% patients (n = 8). It was also found that there was a 70.79% reduction in relative risk of LVT after treatment with thrombolytic (Streptokinase) therapy, although it seemed significant but statistically turned out to be non-significant because of small sample size and if this had a larger one, then the statistical evaluation might have revealed a similar significant decrease in the incidence of LVT after thrombolysis (table 1). Some studies have documented a statistically significant decrease in the incidence of LVT after thrombolytic therapy.<sup>9-13</sup>

Bhatnagar et al. in 1991 found 12.5% prevalence of LVT in patients with first Q wave anterior MI, 3% were thrombolysed with Recombinant Tissue-Type Plasminogen Activator (rt-PA), and 18% were not.<sup>13</sup> The important difference between their study and the present one is that they did echocardiographic examination on the third day after AMI, whereas we performed on the sixth day. As the formation of LVT is a dynamic process, this variation in the time of echocardiographic examination might have caused the difference in the observation of LVT occurrence.<sup>14</sup> As the post-MI cardiac failure has a strong association with subsequent LVT formation,<sup>5</sup> this marked difference between the two studies, may also have contributed to the difference in the observed occurrence of LVT.<sup>13</sup>

Domenicucci et al.<sup>9</sup> found 44% patients having LVT, as opposed to 26.66% in this study. In their study 27% of the thrombolysed patients had LVT (12.5% in our study, n = 2), and 57% of the non-thrombolysed patients had it (42.8% in this study, n = 6). The difference in the results can be explained by the fact that in our study the patients underwent only one echocardiographic examination on the day 6 after MI, whereas their patients underwent serial echocardiographic examinations, during the hospital stay, and thereafter every month for at least one year after infarction, followed by every 6 months.<sup>9</sup> The mean echocardiograms recorded in their patients were 18.9. Any LVT observed at any of these examinations was included in the study. The mean day of development of LVT in their study was 120 ± 47. This explained why they observed a higher incidence of LVT in their study. Their observation of a decreased incidence of LVT after thrombolytic therapy corresponds with our observation.

Moore et al. found LVT in 22% of all thrombolysed patients after acute anterior MI by doing echocardiography on the third day after MI.<sup>7</sup> Out of these patients 69% demonstrated resolution of the LVT on the second examination (pre-discharge echocardiography), though the overall incidence of LVT on the second examination increased to 31.5%. Although the incidence of LVT observed by them was close to our study, it cannot be used for comparison because only 53% of our patients received thrombolytic therapy and only one echocardiogram was performed on our patients. In another study, Moore et al. found LVT after anterior AMI in 40% of the thrombolysed patients and in 46% of non-thrombolysed.<sup>15</sup> These results are higher than ours (26.66%). The second important difference is that Moore et al. included patients with previous MIs in their study, which had strong association with the occurrence of LVT, whereas in our study we selected only patients with first MI. These differences could have resulted in the increased occurrence of LVT observed in their study. Another significant study related to LVT after AMI is The Healing and Early Afterload Reducing Therapy (HEART) study,<sup>14</sup> where the incidence was 0.6% at day one, 3.7% at day 14, and 2.5% at day 90, because all patients with acute MI were included irrespective of the site of infarct and with previous MIs and not the patients with anterior MI only, as in present study. This could account for the lower incidence of LVT in that study, as the occurrence of LVT in infarcts other than anterior is very rare.<sup>16</sup> Only 20.77% patients in the study by Greaves et al. developed cardiac failure (Killip class >1), whereas 57.89% patients in our study developed cardiac failure, this could also be one of the reasons for higher incidence of LVT in our study.<sup>14</sup> They found LVT most frequently on day 14 after MI whereas we performed echocardiography in our patients on the sixth day after MI.<sup>5</sup>

It appears that most common reason for not offering thrombolysis was late presentation, which might have been responsible for a large infarct and poor Killip class at presentation.

### Conclusions

1. At Mayo Hospital, Lahore 26% of patients with first Q wave anterior wall myocardial infarction showed LVT on day 6 when examined echocardiographically.
2. The effect of thrombolysis in reducing the occurrences of LVT is statistically insignificant.
3. The development of cardiac failure after AMI is associated with increased occurrence of LVT and this is seen more in non-thrombolysed patients.

### References

1. Kontny-F, Dale-J, et al.: Left Ventricular thrombus formation and resolution in acute myocardial infarction. *Int-J-Cardiology*. 1998 Sep 30; 66(2): 169-74.
2. Eugene Braunwald et al.: Braunwald, *Heart Disease: A Textbook of Cardiovascular Medicine*, 1997, page 1257.
3. Carrillo-AM et al.: Effectiveness of anticoagulant oral treatment in patients with thrombus in left ventricle after acute MI. *Arch-Inst-Cardiol-Mex*. 1997 May-Jun; 67(3): 217-22.
4. Kontny-F et al.: Fragmin in acute myocardial infarction (FRAMI) Study. *J-Am-Coll-Cardiol*. 1997 Oct; 30(4): 962-9.
5. Neskovic-AN et al.: Predictors of left ventricular thrombus formation and disappearance after anterior wall MI. *Eur-Heart-J*. 1998 Jun; 19(6): 908-16.
6. Moore-T et al.: Long-term follow-up of patients with anterior MI complicated by left ventricular thrombus in the thrombolytic era. *Heart*. 1996 Mar; 75(3): 252-6.
7. Moore-T et al.: Dynamics of left ventricular thrombi in patients with acute anterior MI treated with thrombolytics. *Coron-Artery-Dis*. 1995 Sep; 6(9): 703-7.
8. Vaitkus-PT.: Left ventricular mural thrombus and the risk of embolic stroke after acute MI. *J-Cardiovasc-Risk*. 1995 Apr; 2(2): 103-6.
9. Domenicucci S, Chiarella F et al.: Long term prospective assessment of left ventricular thrombus in anterior wall acute myocardial infarction and implications for a rational approach to embolic risk. *The Am J Cardiol* 1998, Volume 83, Issue 4, Pages 519-524.
10. Berton E. Sobel. Acute Myocardial Infarction. Bennet and Plum, *Cecil Textbook of Medicine*. 20<sup>th</sup> Edition 1996, Page 302.
11. Pizzetti-G et al.: Thrombolytic therapy reduces the incidence of left ventricular thrombus after anterior MI. Relationship to vessel patency and infarct size. *Eur-Heart-J*. 1996 Mar; 17(3): 421-8.
12. Keeley-EC et al.: Left ventricular mural thrombus after acute myocardial infarction. *Clin-Cardiol*. 1996 Feb; 19(2): 83-6.
13. Bhatnagar SK and Al-Yusuf AR.: Effects of intravenous tissue-type plasminogen activator therapy on the incidence and associations of left ventricular thrombus in patients with a first acute Q wave anterior myocardial infarction, *Am Heart J* 1991; 122: 1251.
14. Greaves SC, Guang Zhi, et al.: Incidence and natural history of left ventricular thrombus following anterior wall acute myocardial infarction. *Am J Cardiol* 1997, 80: 442-448.
15. Moore T, Teien D, et al.: Left ventricular thrombus after anterior myocardial infarction with and without thrombolytic treatment. *J Int Med* 1995, 237: 6: 563-9.
16. DiTullio M, Sacco RL, et al.: Patent foramen ovale as a risk factor for cryptogenic stroke. *Ann Intern Med* 1992, 117: 461-465.