



Short Communication

Intracoronary tenecteplase in STEMI with massive thrombus

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ABSTRACT

Primary percutaneous coronary intervention is the current standard of care in ST elevation myocardial infarction (STEMI). However, large thrombus is an independent predictor for stent thrombosis and major adverse cardiac events in patients undergoing primary angioplasty for STEMI. Here we report a series of STEMI patients with large thrombus burden treated successfully with low dose intracoronary thrombolysis. There was prompt and early ST resolution. There was improvement in thrombolysis in myocardial infarction (TIMI) flow and myocardial blush grade postlysis in all patients. Majority had recanalised infarct related coronary artery thus obviating the need for stenting. There was no in-hospital or 1 month mortality or bleeding events. Hence intracoronary thrombolysis is an option in patients with large thrombus burden.

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1. Introduction

Primary percutaneous coronary intervention (PPCI) is the current standard of care in ST elevation myocardial infarction (STEMI). During PPCI, presence of massive intracoronary thrombus is a challenging scenario. PPCI is then associated with adverse procedural results including failed aspiration, slow flow and unfavourable outcomes. In the current era strategies like thrombus aspiration is not routinely recommended. Thus newer modalities of treatment are necessary. In this context, option of intracoronary lysis is an alternative method as low dose intracoronary thrombolysis is safe and leads to improvement in epicardial flow and tissue level perfusion by dissolving thrombus. Here we report a series of STEMI patients who were taken up for PPCI. These patients had large thrombus burden and was treated successfully with low dose intracoronary thrombolysis.

2. Case series

2.1. Materials and methods

Nine STEMI patients who were taken up for PPCI was noticed to have massive thrombus according to the thrombolysis in myocardial infarction (TIMI) thrombus grading score. These patients were administered low dose intracoronary thrombolysis

via 6F-angioplasty guiding catheter. Intracoronary tenecteplase (TNK) administered was 1/5th of the systemic dose while remaining 4/5th was given through intravenous (IV) route and patients were maintained on heparin infusion for 24 h to keep APTT 1.5–2 times upper limit of normal. Patients were monitored in coronary care unit (CCU) watching for signs of reperfusion. Check coronary angiogram (CAG) was done after 4 h. The femoral sheaths were removed 12 h after TNK and radial sheaths soon after the check CAG. All patients were followed up for a month for mortality, ventricular function, TIMI major or minor bleeding and stroke.

3. Results

A total of 9 patients, 8 males and 1 female were studied (Figs. 1 and 2, Tables 1 and 2). Age varied from 27–55 yrs with mean age of 41.6 yrs. Three patients were diabetic, one had dyslipidemia, one was hypertensive and five patients were smokers. Mean symptom onset to hospital admission was 186 (min). Mean symptom onset to TNK injection time was 216 min. Majority patients were in Killip class II or III. All patients showed recanalized coronary artery except one patient who needed stenting for a residual lesion. TIMI flow grade improved from 1 at baseline to 2–3. Postlysis myocardial blush grade was 2/3. ST segment resolution of more than 50% was observed in all patients. There was no in-hospital mortality, stroke or major bleeding. Three patients developed VF (ventricular fibrillation) 30 mins to one hour after intracoronary TNK in CCU which was successfully cardioverted. At one month,

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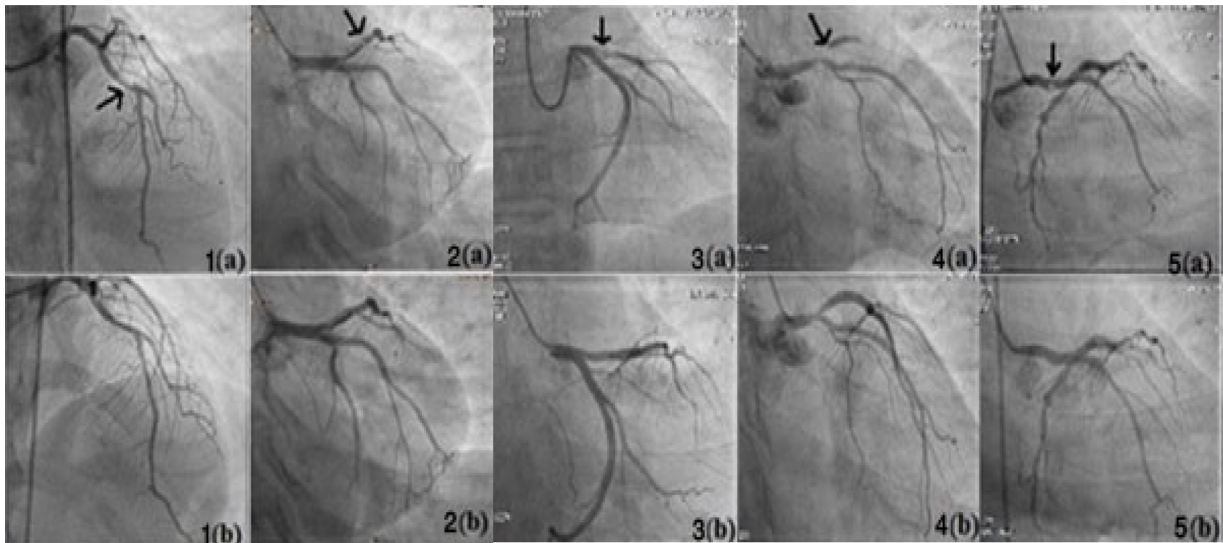


Fig. 1. (1a–5a) shows pre tenecteplase coronary angiogram & (1b–5b) shows corresponding post tenecteplase coronary angiogram. → indicates thrombus.

majority had improvement of left ventricular function with no adverse events (Table 2).

4. Discussion

PPCI is the current standard of care in STEMI. However, lytic therapy within 6 h is an accepted guideline based therapy for

STEMI. Large thrombus burden presents unique challenges during PPCI. Thrombus Aspiration in ST-Elevation Myocardial Infarction in Scandinavia (TASTE)¹ and Thrombectomy with PCI versus PCI Alone in Patients with STEMI (TOTAL)² trial did not show benefit with manual thrombectomy. High thrombus burden is the significant predictor of distal embolization during PPCI. Previous registry study³ has showed improved TIMI flow grade, myocardial blush grade and

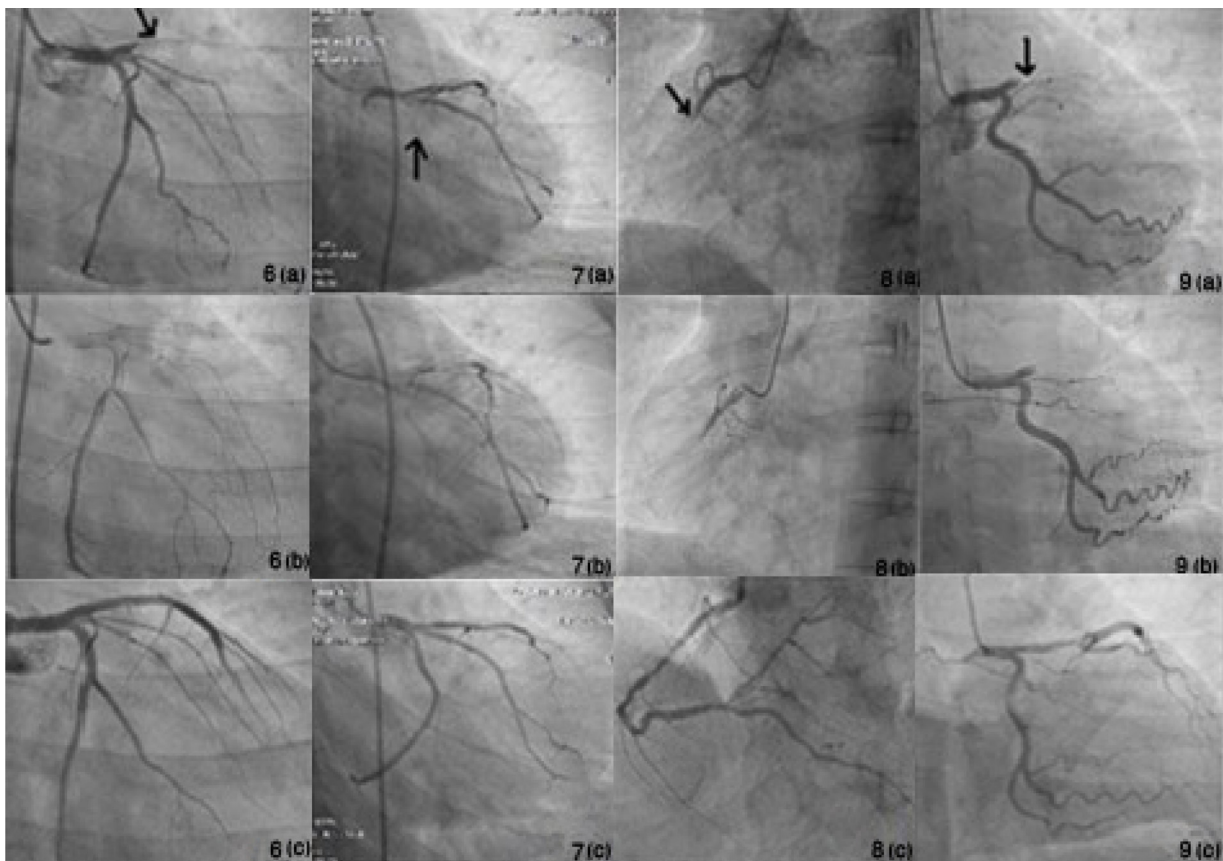


Fig. 2. Shows initial frames (6a–9b) pre tenecteplase coronary angiogram revealing TIMI 1 flow & (6c–9c) shows corresponding post tenecteplase coronary angiogram. → indicates thrombus.

Table 1
Characteristics of the study subjects- 1.

Sl. No	Age (Years)	Sex	Risk Factors				Chest Pain Onset To Hospital Admission (min)	Chest pain to TNK Injection time (Min)	MI	Killip Class	BP (mmHg)	Echo	TNK (mg)		Check CAG
			Diabetic mellitus	Smoker	Dyslipidemia	SHT							IC	IV	
1	27	Male	–	+	–	–	240	270	AWMI I	140/80	Mild LVD	6	24	Recanalized LAD	
2	50	Male	–	+	–	–	60	100	AWMI II	130/80	Mild LVD	6	24	Recanalized LAD	
3	45	Male	–	+	–	–	180	210	IWMI II	140/90	Mild LVD	6	24	Recanalized LCX	
4	41	Male	–	+	–	–	120	140	AWMI III	140/80	Moderate LVD	6	24	Recanalized LAD	
5	55	Male	–	–	–	–	120	150	IWMI III	150/90	Moderate LVD	6	24	Recanalized stent thrombosis in RCA	
6	40	Male	+	+	–	–	240	270	AWMI II	110/70	Mild LVD	6	24	Recanalized LAD	
7	40	Male	+	–	+	–	300	330	AWMI III	150/70	Moderate LVD	8	32	Recanalized LAD with 30–40% distal LMCA stenosis and ostial LAD 70% stenosis	
8	43	Male	+	–	–	+	240	270	AWMI II	170/80	Moderate LVD	6	24	Recanalized LMCA	
9	34	Female	–	–	–	–	180	210	AWMI III	120/90	Mild LVD	6	24	Recanalized LAD	

SHT- Systemic hypertension, MI- Myocardial infarction, BP: Blood pressure, ECHO: Echo cardiogram, LVD-Left ventricular dysfunction, TNK- Tenecteplase, IC- Intracoronary, IV- Intravenous, CAG- Coronary angiogram, LAD-Left anterior descending, LCX- Left circumflex coronary artery, RCA- Right coronary artery, LMCA-Left main coronary artery, AWMI- Anterior wall myocardial infarction, IWMI- Inferior wall myocardial infarction.

Table 2
Characteristics of the study subjects- 2.

TIMI flow grade		Myocardial blush grade	ST Resolution	In Hospital Events				At 1 month follow up				
Baseline	Post TNK			Yes/No	Adverse Events	Bleeding	Stroke	Mortality	Echo	Bleeding	Stroke	Mortality
2	3	3	Yes	No	No	No	No	No	Adequate LV	No	No	No
2	3	2	Yes	No	No	No	No	No	Mild LVD	No	No	No
2	3	3	Yes	VT/VF - Cardio Verted	No	No	No	No	Adequate LV	No	No	No
2	2	2	Yes	No	No	No	No	No	Adequate LV	No	No	No
2	3	3	Yes	No	Yes, from Urethra and later becomes clear	No	No	No	Mild LVD	No	No	No
1	3	2	Yes	VF-Cardio Verted	No	No	No	No	Mild LVD	No	No	No
1	3	2	Yes	No	No	No	No	No	Mild LVD	No	No	No
1	3	2	Yes	VT/VF - Cardio Verted	No	No	No	No	Moderate LVD	No	No	No
1	3	2	Yes	No	No	No	No	No	Adequate LV	No	No	No

TNK-Tenecteplase, VF- Ventricular fibrillation, VT- Ventricular tachycardia, LVD- Left ventricular Dysfunction.

decrease in hospital mortality with no major bleeding events with low dose intracoronary thrombolysis with TNK and alteplase. Intracoronary (6.2 mg) and intravenous (24.8 mg) dose of TNK used was similar to previous study.^{4,5} When huge thrombus is documented by coronary angiogram, lytic therapy by intracoronary routes could be administered through the guiding catheter immediately with better chance of early restoration of blood flow. Moreover distal embolization by wire crossing, balloon dilatation and thrombus aspiration could be avoided.⁶ ST resolution in ECG is a useful surrogate indicator of both macro and microvascular perfusion and is therefore especially valuable in evaluating the success of myocardial reperfusion therapy. Resolution of ST elevation occurred in ≤ 90 min in all the patients. Angiography images after 4 h demonstrated improvement in patency of coronary vessels and myocardial blush grade due to dissolution of thrombus with TNK. These findings were similar to previous studies.^{3,5} Better restoration of flow in acute phase has been seen with combined therapy (preceding thrombolysis and subsequent angioplasty) when compared with primary angioplasty in patients of STEMI with

intracoronary thrombus.⁷ There was a lower incidence of adverse events with TNK and only one patient developed bleeding from urethra which resolved in a short while indicating safety of intracoronary lysis. In-hospital ventricular fibrillation was seen in few patients and attributed to reperfusion. Hence intracoronary thrombolysis might have a role in the current era of PPCI especially in young STEMI, huge thrombus burden and in those who present relatively early after chest pain, thereby avoiding unnecessary stenting and its complications.

5. Limitations

- The main limitation is case series with a very small number of patients.
- Mean total ischemic time was more than 120 min.
- Imaging studies such as intravascular ultrasound/optical coherence tomography were not done due to non availability.
- This is applicable only to subset of patients with massive thrombus clearly visible on angiogram.

Hence, randomized control trials with large sample volume is needed to confirm the safety and efficacy of intracoronary thrombolysis in patients of STEMI.

6. Conclusions

Intracoronary thrombolysis is an option in young patients with large thrombus burden and with ectatic coronaries and obviates the need for stenting in these patients.

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