

Intracoronary Tirofiban and Deferred Angioplasty in the Management of STEMI with Large Thrombus

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Abstract

Tirofiban is an anti GPIIb/IIIa drug that has been widely used to decrease thrombus burden during ST elevation myocardial infarction (STEMI) angioplasty. However, the co-administration of an intravenous and intracoronary dose of Tirofiban, along with a deferred angioplasty strategy is rarely adopted. Herein, we present a case series of 6 STEMI patients with large thrombus burden, treated by deferred stenting and Tirofiban administration. The clinical outcome of those patients can so be improved by reducing the risk of slow and no flow.

Keywords: Tirofiban; Deferred angioplasty; Intracoronary; STEMI

Introduction

One of the major causes of morbidity worldwide is ischemic heart disease due to atherosclerosis [1]. And the key to treating ST-segment elevation myocardial infarction (STEMI) is early revascularization [2].

However, myocardial reperfusion following percutaneous coronary intervention (PCI) is often suboptimal due to distal embolization of the thrombus. This event impairs microvascular perfusion and increases infarct size, particularly in patients with a high thrombus burden [3]. These complications, called “slow, and no-flow”, unfortunately remain common and are associated with undesirable results [4].

In order to avoid these complications, several centers have adopted a delayed angioplasty strategy which consists of reducing the thrombotic load first and performing angioplasty of the culprit artery second. This course of action, sometimes adopted in our center, encourages us to publish this series of 6 STEMI patients treated by intracoronary Tirofiban and delayed angioplasty. The minimal mechanical intervention strategy was adopted in all patients, to restore satisfactory blood flow in the culprit artery, allowing reduction of the ST segment, complete disappearance of pain and hemodynamic stabilization.

We obviously assume that reducing the thrombotic load poses the greatest challenge. We then injected an intracoronary loading dose of Tirofiban followed by an intravenous maintenance dose over 24 hours. The dosage used is 25 µg/kg for the bolus, and 0.15 µg/kg/min for the maintenance dose [5].

The loading dose was injected through the guide catheter upstream of the culprit artery or by a micro-catheter directly upstream of the thrombus. These patients were selected for a coronary angiography control after a few days for placement of a stent on the underlying lesion, provided that the latter was sufficiently tight.

In fact, glycoprotein IIb/IIIa inhibitors such as Tirofiban prevent platelet aggregation and have been administered intravenously to reduce periprocedural ischemic events in patients undergoing percutaneous coronary intervention [6].

Case Description

Patients with the following characteristics were selected:

Adults (>18 years) with symptoms consistent with myocardial ischemia and ST segment elevation ≥ 1 mm in ≥ 2 contiguous limb leads, or ≥ 2 mm in ≥ 2 precordial leads on electrocardiogram.

High thrombotic load.

No history or indication of revascularization by coronary artery bypass graft at the time of the first coronary angiography.

No fibrinolytic therapy indication.

The detection of large thrombi is possible angiographically by several criteria, such as persistent contrast product stasis downstream of the occlusion, the presence of a floating thrombus upstream of the lesion, an internal diameter of the culprit artery > 4 mm, a total occlusion aspect [7].

But ultimately the selection of patients with a high thrombotic load was based on the “TIMI thrombus grade” score.

TIMI thrombus score	
Grade 0	No angiographic evidence of thrombus
Grade 1	Possible thrombus as suggested by: Reduced contrast density Haziness Irregular lesion contour Smooth convex “meniscus” at the site of total occlusion
Grade 2	Definite thrombus, largest dimension $\leq \frac{1}{2}$ the vessel diameter
Grade 3	Definite thrombus, largest dimension $> \frac{1}{2}$ but < 2 vessel diameters
Grade 4	Definite thrombus, largest dimension ≥ 2 vessel diameters
Grade 5	Total occlusion

Figure 1: “TIMI thrombus grade”.

Sianos G et al, suggested that when a grade 5 thrombus is encountered, a guidewire or a 1.25 to 1.5 mm balloon is used to recanalize the artery. As soon as antegrade flow is restored, the underlying residual thrombus can be categorized as follows: grade 0 (no residual thrombus), grade 1 to 3 (small residual thrombus) and grade 4 to 5 (large residual thrombus) [9]. We therefore only take patients with a grade 4 thrombus, or large residual thrombi obtained after recanalization of an artery with a grade 5 thrombus.

Discussion

Tirofiban is a non-peptide glycoprotein IIb/IIIa receptor antagonist usually administered intravenously to inhibit fibrinogen-dependent platelet aggregation. On the other hand, we opted for an intracoronary injection of the loading dose, thus allowing an increase in its concentration in the culprit artery and therefore a better saturation of the receptors. Platelet anti-aggregation and anti-inflammatory effect were then intensified [8].

Tirofiban was started directly at the end of the intervention, and the duration of the intravenous maintenance dose was generally 24 hours. Prolonging GP IIb/IIIa longer did not prove a significant improvement in the clinical condition of patients with STEMI with no/slow flow [9].

In order to intensify the antithrombotic effect, curative anticoagulation with unfractionated heparin or low molecular weight heparin was maintained until the completion of the second procedure.

Souteyrand et al demonstrated a progressive regression of the thrombus during the first seven days of the acute event [10]. Thus, all delayed angioplasties were performed within 7 days of infarction.

The coronary angiogram carried out in the second time often showed a reduction in the thrombotic load, and even allowed us to completely dispense with the placement of a stent in some patients. The culprit lesions that were practically not found could be secondary to a non-significant plaque rupture, or more likely to erosion. Intra-hospital follow-up was complicated in one patient by cardiogenic shock, but no death was recorded.

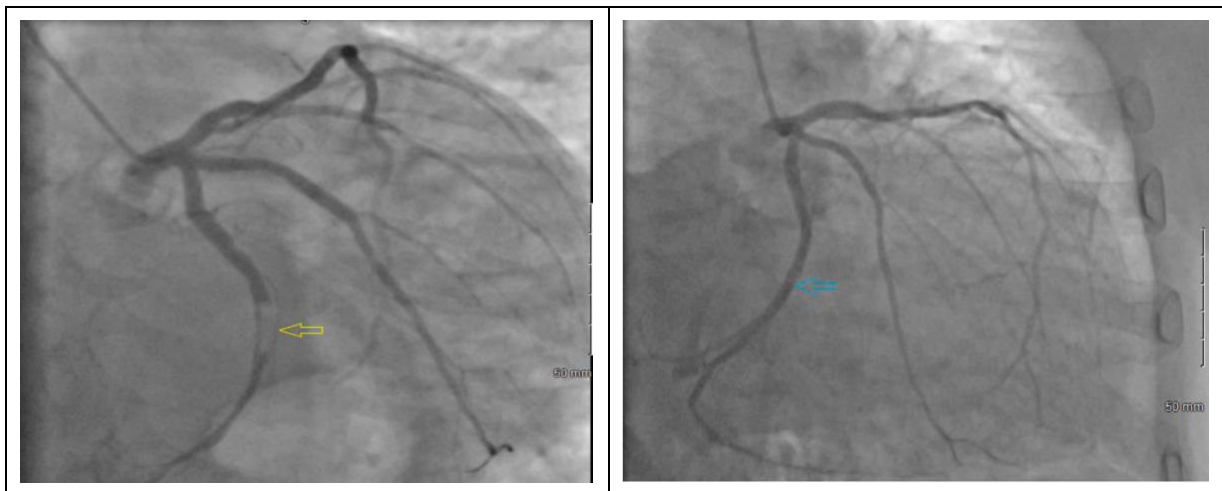


Figure 2: The image on the left shows a large thrombus (yellow arrow) at the level of the circumflex artery in the acute phase of a STEMI. Four days later, the coronarography control shows complete disappearance of the thrombus (blue arrow) and the absence of underlying residual stenosis after intracoronary and intravenous antithrombotic treatment. No stent was placed.

Among the various studies conducted on this subject, the DEFER-STEMI study showed a lower rate of no/slow flow with delayed angioplasty compared to primary angioplasty in patients with one or more risk factors for no flow [11]. Long-term follow-up was not performed and the thrombotic burden was not taken into consideration.

The MIMI study suggests a deleterious effect of delayed angioplasty on microvascular obstruction. The MACE at 6 months was comparable in the two groups [12]. On the other hand, large thrombi were excluded from this study.

The super-MIMI study demonstrated that in patients with a high thrombus load, delayed stenting was safe in the context of GPI treatment [13]. This has mainly been studied in terms of culprit artery re-occlusions between two procedures. But long-term follow-up has not been done. On the other hand, a recently published sub-analysis showed that conservative management of culpable non-stenotic lesions after a SUPER-MIMI strategy was associated with a high rate of re-thrombosis [14].

The DANAMI 3-DEFER study showed that routine delayed angioplasty did not reduce death, heart failure and myocardial infarction at two years of follow-up [15]. Tirofiban was not systematically used in this study.

Finally, the small number of patients included does not allow definitive conclusions to be drawn. We find that a randomized multicenter study on a larger scale with a longer follow-up would be interesting to validate the use of this angioplasty strategy.

Conclusion

In the management of STEMI with large thrombus, injection of an intracoronary loading dose of tirofiban followed by an intravenous maintenance dose, with delayed angioplasty, may be useful. Randomized studies are recommended.

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