

some extent; however, this method can increase the likelihood of plaque detachment and fragmentation of the remaining thrombus, leading to distal embolization (5, 20). Furthermore, in our case, the use of balloon angioplasty along with intracoronary thrombolysis was aimed at manipulating a partially lysed thrombus.

Intracoronary Thrombolysis

Before coronary stents became widely used, intracoronary thrombolysis using plasminogen activator was used in almost all patients with various types of coronary artery disease (31). The principle of thrombolytic therapy is that the use of streptokinase, alteplase, or tenecteplase increases the conversion of plasminogen to active plasmin, resulting in a cascade that culminates in fibrin lysis. However, as primary PCI with stent implantation has become routine, followed by studies with disappointing results regarding excess bleeding rates, intracoronary thrombolysis has been used less and less in clinical practice (32, 33). In recent years, intracoronary thrombolysis has regained popularity as an adjunctive therapy for primary PCI, as studies using different thrombolytic agents and better antiplatelet regimens have proven this method to be safe and effective. In a pilot study by Sezer et al., 41 patients undergoing primary PCI were randomized to receive intracoronary streptokinase (250,000 units) or placebo. An evaluation two days later showed a significant increase in coronary flow reserve and a decrease in TIMI frame count when compared with placebo (34). Subsequently, 54 patients were added to the cohort to allow long-term assessment. After six months, there was a smaller infarct size on SPECT evaluation (22.7% vs. 32.9%, $p = 0.003$) and a higher LVEF (57.2% vs. 51.8%, $p = 0.018$) in the streptokinase group compared with placebo, with marked reductions in end-diastolic and systolic volumes on echocardiography (3).

In a small study involving 34 ACS patients with the no-reflow phenomenon, distal embolization, or intracoronary thrombus findings at PCI, Kelly et al. reported that the addition of intracoronary tenecteplase adjuvant therapy (mean dose = 10.2 ± 5.2 mg) proved safe and effective for thrombus dissolution and/or improving flow in 91% of patients. Seventy-six percent of patients in this study received GPI therapy, with major and minor bleeding events

found in one and three cases, respectively (35). Boscarelli et al. also reported that in cases of STEMI with a high thrombus burden that were unsuccessful on MAT, low-dose intracoronary adjuvant alteplase therapy (5 mg, 5-min intervals, maximum 30 mg) significantly reduced the TIMI thrombus grade and increased coronary epicardial outflow. In this study, although alteplase was given with GPI in half of the patients, there were no reports of major bleeding events, demonstrating the safety of this strategy (36).

Bleeding and Ischemic Risk

In contrast to elective procedures, primary PCI is associated with higher bleeding rates because of the need for potent antithrombotic and antiplatelet agents. GPIs, in combination with thrombolytic agents, can significantly increase the risk of bleeding events. However, the doses of thrombolytic agents administered by the intracoronary route are usually much lower than those used by the intravenous route. Kelly et al. reported only one case of major bleeding (2.9%) among 34 patients receiving intracoronary tenecteplase, which did not differ from the rate of major bleeding events in ACS cases in the GRACE data (3.9%) (35, 37). In fact, our patient did not receive GPI therapy.

Ischemic risk management must be considered after undergoing a PCI procedure. Thrombus manipulation and evidence of residual thrombus after stent implantation in our patients carry a high risk for microvascular obstruction or even acute stent thrombosis (20). To address this issue, the 2018 ESC/EACTS guidelines on myocardial revascularization recommend triple therapy for 1–6 months in patients at ischemic risk due to ACS or other anatomic or procedural characteristics that are higher than the risk of bleeding (Class IIa; LOE A) (38). With a low bleeding risk (PRECISE-DAPT score = 10), warfarin was added to DAPT therapy using aspirin and ticagrelor and was discontinued immediately on the fourth day after the results of angiographic evaluation showed no residual thrombus with grade 3 TIMI flow.

Conclusion

Intracoronary thrombi in cases of STEMI may result in a poorer clinical outcome, apart from successful PCI with normal epicardial vascular flow. Although there is no gold-stand-

ard therapy for intracoronary thrombus, combined pharmacological and mechanical treatment options are being explored. MAT is not recommended to be performed routinely in STEMI cases, but may be helpful in certain cases at the discretion of the operator and intervention team. Intracoronary thrombolysis can be a safe and effective alternative reperfusion strategy when the MAT procedure alone fails to achieve adequate coronary blood flow in an IRA with a high thrombus load. The management of intracoronary thrombus in STEMI cases continues to be a challenge in interventional cardiology, so a case-by-case approach is needed in order to obtain better results.

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Informed Consent

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Author contribution

IGDS and RZ conceived the idea and mainly designed the report. RZ was involved in patient management of this case and was a major contributor to writing the manuscript. RZ and FT edited the manuscript for publication. IGDS and FT contributed to artwork editing and grammar correction. IGDS reviewed the article before submission. All authors have read and approved the final manuscript.

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