

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

ScienceDirect

journal homepage: [www.elsevier.com/locate/radcr](http://www.elsevier.com/locate/radcr)

## Case Report

# Hemorrhagic stroke during the acute phase of myocardial infarction: a rare and difficult situation to manage <sup>☆</sup>

Abdelaziz Boudihi, MD<sup>a,b,\*</sup>, Mohammed El-azrak, MD<sup>a,b</sup>, Ikram Tahani, MD<sup>a,b</sup>, Nabila Ismaili, MD<sup>a,b</sup>, Noha El Ouafi, MD<sup>a,b</sup>

<sup>a</sup>Department of Cardiology, Mohammed VI University Hospital of Oujda, First Mohammed University of Oujda, Morocco

<sup>b</sup>Faculty of Medicine and Pharmacy, Oujda University Mohammed I, Morocco

## ARTICLE INFO

## Article history:

Received 8 August 2022

Revised 20 October 2022

Accepted 23 October 2022

## Keywords:

STEMI

Hemorrhagic stroke

Thrombolysis

Percutaneous coronary intervention (PCI)

Dual antiplatelet therapy

## ABSTRACT

Given the ischemic risk due to the hypercoagulability associated with acute coronary syndromes, the administration of antiplatelet and antithrombotic agents is necessary to prevent intracoronary and postprocedural thrombosis during percutaneous coronary interventions. However, the risk of bleeding, hemorrhagic stroke included, is real, although it has a lower prevalence, and it complicates the management of the coronary event if it happens.

We report the case of a 66 years old patient with no prior pathological history who was initially admitted for acute coronary syndromes, complicated by paroxysmal atrial fibrillation that was successfully thrombolysed. Subsequently, the patient benefited from a drug-eluting stent angioplasty of the proximal circumflex artery, performed within 24 hours after the symptomatology onset. Following angioplasty, the patient presented with a left parietal intraparenchymal hematoma not indicating surgery. The double antiplatelet therapy was consequently withdrawn. Two days later, the patient presented with an ST-segment elevation infarction recurrence, inciting the resumption of the dual antiplatelet aggregation therapy. On evolution, the neurological state was still stable with a stationary aspect of the hematoma on cerebral imagery but without angina recurrence or electrocardiographic modifications.

Hemorrhagic complications' occurrence following thrombolysis or angioplasty for ST-segment elevation infarction challenges the short and long-term management of the disease and must push practitioners to better weigh the risks and benefits before any medication administration decision.

© 2022 The Authors. Published by Elsevier Inc. on behalf of University of Washington.

This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

<sup>☆</sup> Competing Interests: The authors have no conflicts of interest to declare.

\* Corresponding author.

E-mail address: [docazizfmpo@gmail.com](mailto:docazizfmpo@gmail.com) (A. Boudihi).

<https://doi.org/10.1016/j.radcr.2022.10.078>

1930-0433/© 2022 The Authors. Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

## Introduction

ST segment elevation infarction (STEMI) is a major public health problem that requires rapid reperfusion. Fibrinolysis remains the recommended revascularization strategy when primary percutaneous coronary intervention (PCI) cannot be performed rapidly. Its beneficial effect on coronary artery reperfusion is still significant, as reported by several studies [1].

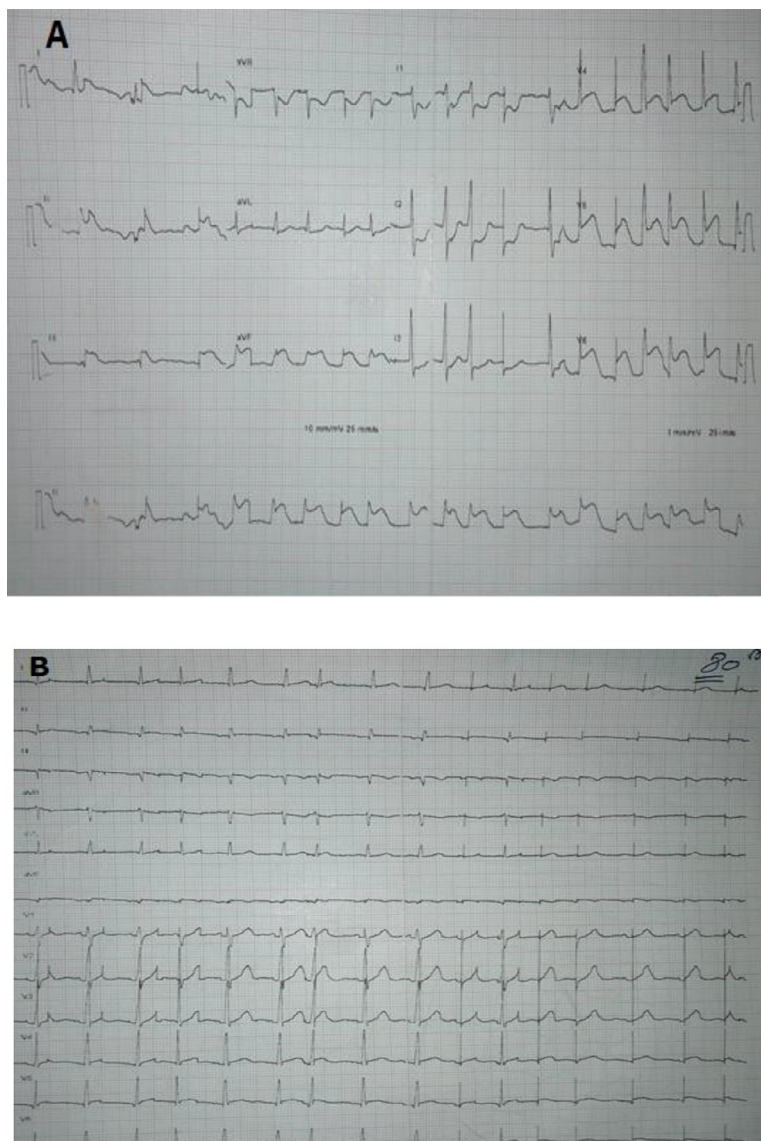
Indeed, antithrombotic drug administration aids fibrinolysis efficiency, but this is offset by the occurrence of hemorrhagic complications, which makes it difficult to manage. We present a case of a patient admitted for STEMI who benefited from fibrinolysis therapy, followed by drug-elute stent angioplasty, complicated by a hemorrhagic stroke onset. A STEMI recurrence was caused 2 days later by the withdrawal of

antithrombotic drugs. Consequently, dual antiplatelet therapy was resumed with good outcomes on evolution.

## Case description

We report the case of a 66-year-old patient with no pathological history, who was initially admitted to the emergency department for acute STEMI complicated by paroxysmal atrial fibrillation, who successfully benefited from fibrinolysis therapy because PCI couldn't be performed precisely.

On admission, the patient was hemodynamically stable, with a blood pressure (BP) of 140/70 mm Hg, a heart rate of 100 beats per minute (bpm), and an oxygen saturation of 98%. The electrocardiogram showed an AF rhythm with a heart rate at 104 bpm and an acute ST segment elevation in the inferior and apicolateral leads (Fig. 1).



**Fig. 1** – Electrocardiogram showing (A) AF with HR at 104 with acute STEMI in inferior and apicolateral territory, (B) disappearing of ST elevation after thrombolysis, (C) a recurrence of the ST-segment elevation.

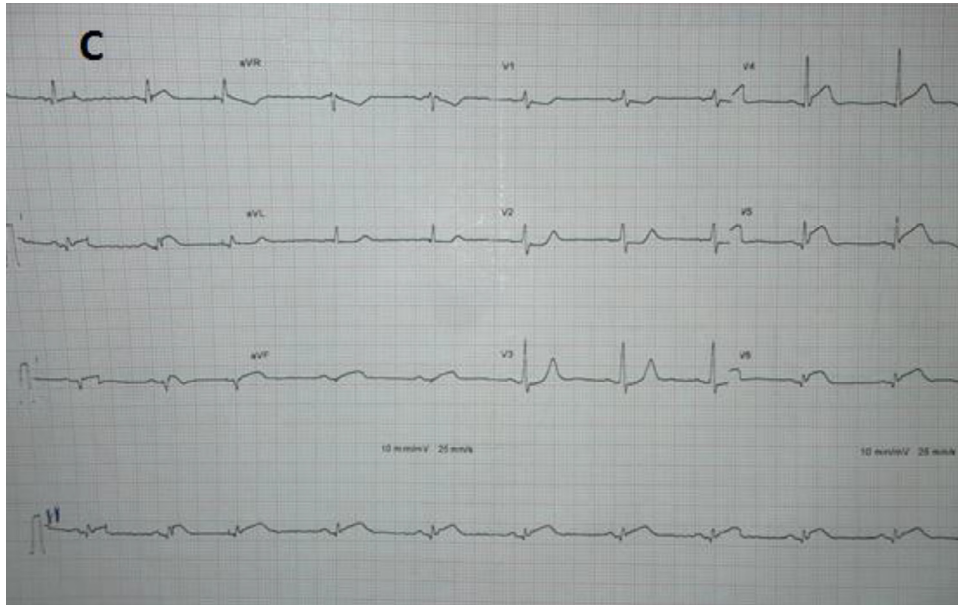


Fig. 1 – Continued

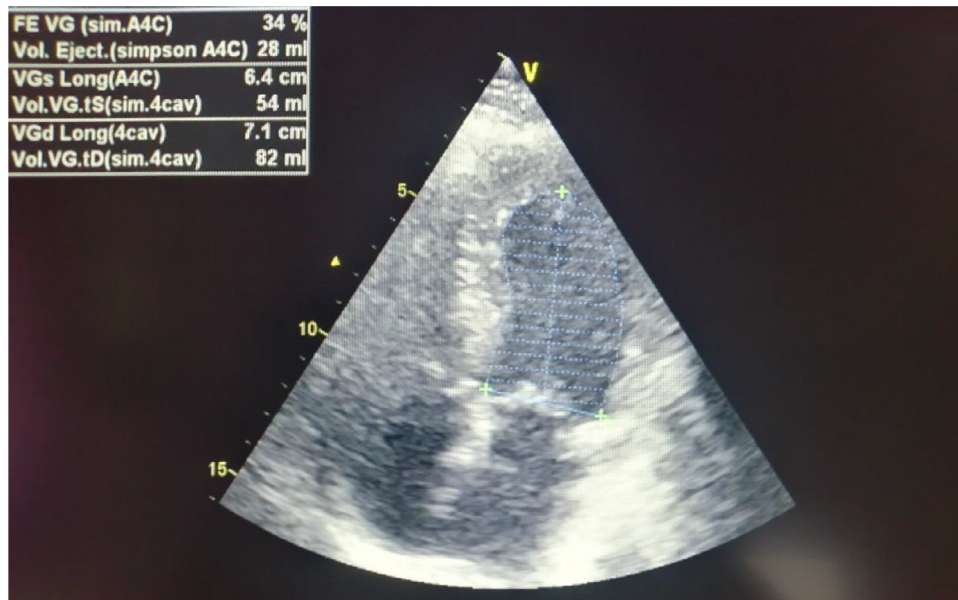
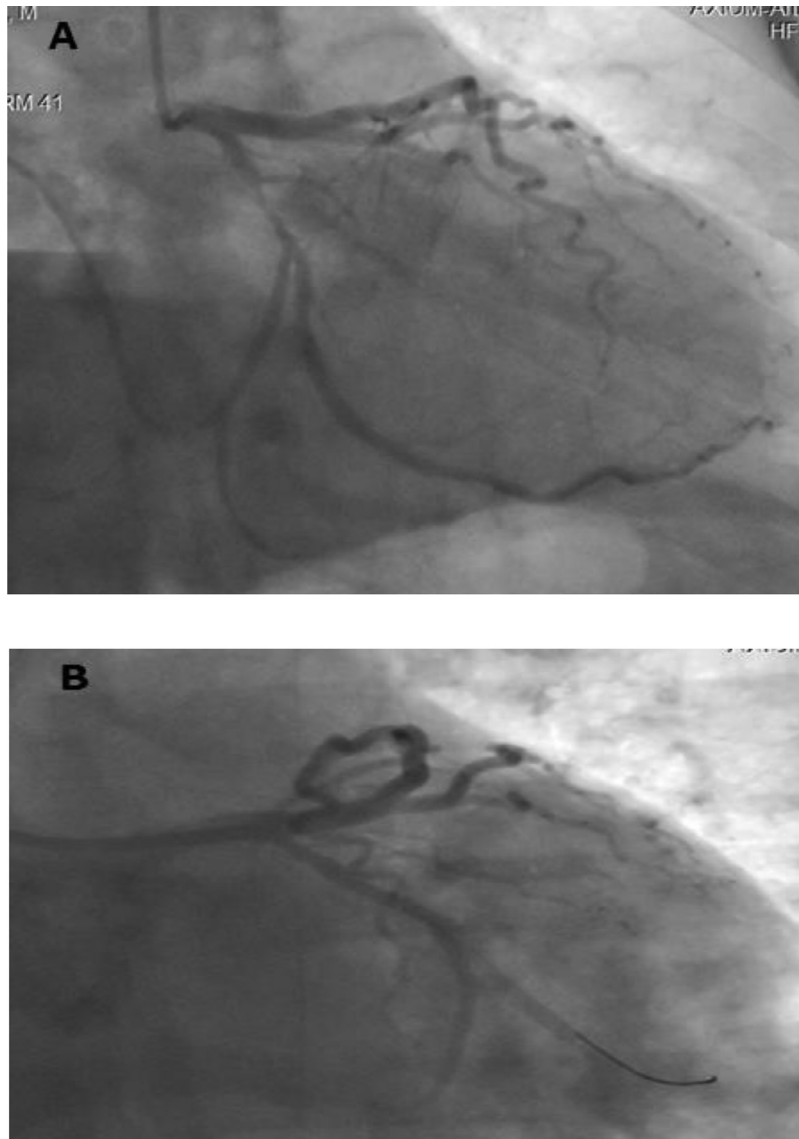


Fig. 2 – Apical view of TTE showing a reduced ejection fraction (34%).

Transthoracic echocardiography revealed a preserved global left ventricular systolic function with a left ventricular ejection fraction of 34%, associated with wall motion abnormalities in the inferior and lateral territories (Fig. 2). The coronary angiography, performed within 24 hours after the symptomatology onset, showed a subocclusive stenosis of the proximal circumflex artery treated by PCI (Fig. 3).

The patient had had acute frontal headaches for 24 hours following angioplasty. Cerebral computed tomography (CT) showed a left parietal intra parenchymal hematoma measur-

ing 42/27 mm (Fig. 4), but that didn't indicate a surgical procedure according to the neurosurgeons. Therefore, dual antiplatelet therapy was withdrawn. As a consequence of that, the patient experienced chest pain 2 days later with an elevation of the ST segment on ECG (Fig. 1C). After a discussion with the medical staff, it was decided to resume the dual antiplatelet therapy prescription. Afterward, there was no angina recurrence and a stable neurological state with a stationary aspect of the hematoma on the cerebral CT scan without signs of rebleeding (Fig. 4).



**Fig. 3 – Coronary images showing a subocclusive stenosis of the proximal Circumflex artery (A) stented with placement of an active stent (B).**

---

## Discussion

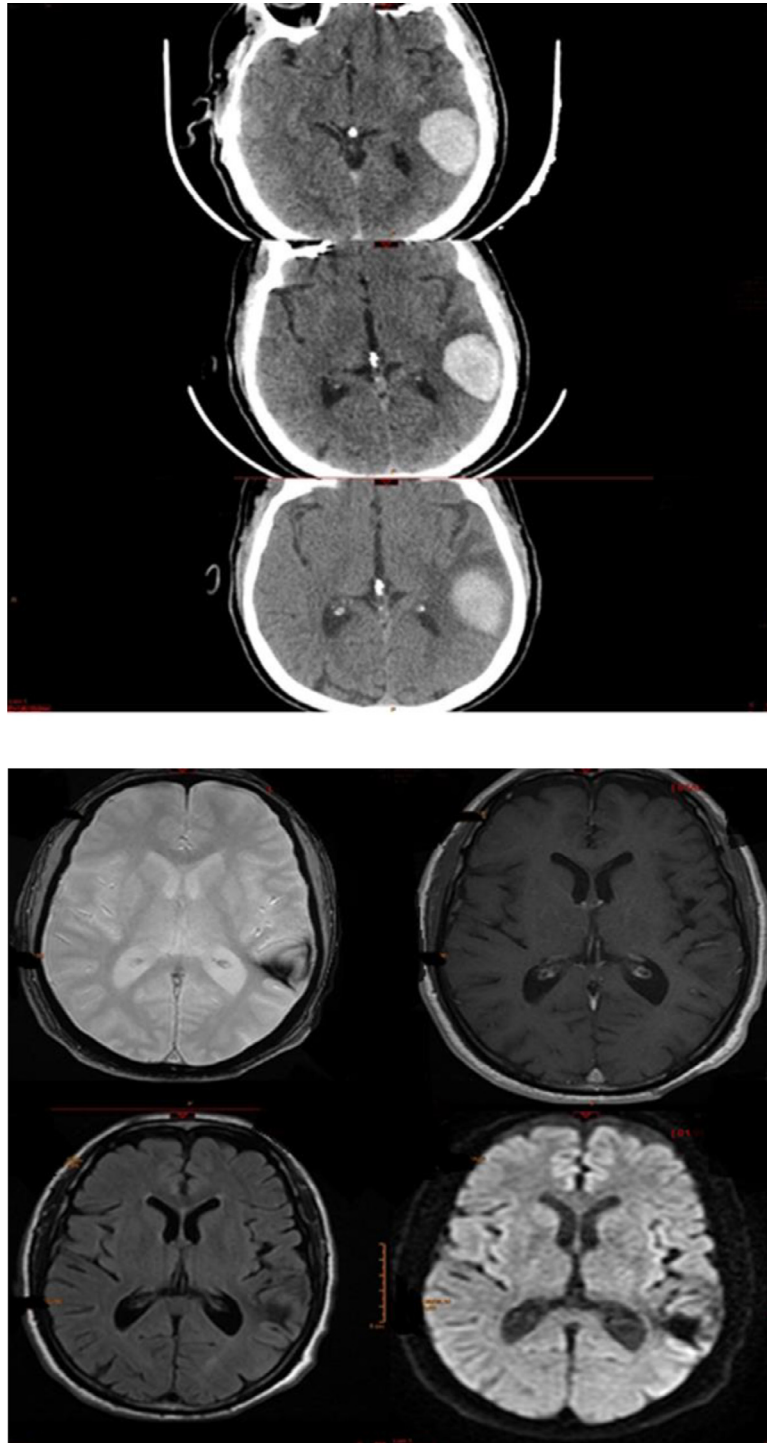
In patients with ST-elevation myocardial infarction, PPCI is the recommended reperfusion strategy. Intravenous fibrinolysis is still, though, the alternative strategy with proven efficiency. It is used when PPCI cannot be performed rapidly [2].

In patients with STEMI, anticoagulant and antiplatelet therapies remain class 1 recommendations, especially in the case of planned PCI [3]. Indeed, the known hypercoagulable state in the setting of ACS and the high thrombogenic risk associated with foreign bodies present in the coronary artery lumen (such as intracoronary wires, balloons, and stents) make their use incontrovertible for thrombus formation prevention [4].

However, the prescription of these treatments is not always safe; it can result in serious complications, especially hemorrhagic ones, which is why they are contraindicated in cases of cerebral hemorrhage, for example.

According to a prospective randomized double-blind trial (CIAO trial) that compared the standard anticoagulation treatment plan with no anticoagulation for elective PCI with the use of dual antiplatelet therapy [5], elective PCI can be conducted securely without systemic anticoagulation and is associated with a lower incidence of hemorrhagic complications.

According to a study evaluating the safety and effectiveness of intravenous thrombolysis in stroke patients on prescribed antiplatelet therapy in the WAKE-UP trial, the therapeutic benefit of injectable alteplase and post-treatment hemorrhagic transformation rates in patients with unknown on-



**Fig. 4 – Cerebral imagery showing a stationary aspect of the hematoma with absence signs of rebleeding.**

set were not affected by previous antiplatelet therapy. This study suggests that the difficulties seen in patients on antiplatelet therapy may be due to their increased cardiovascular risk [6]. Another study found that proUK (urokinase) fibrinolysis was efficient and had a very low incidence of hemorrhagic effects [7].

With the exception of heart failure, which is significantly more frequent with thrombolysis treatment and for which

primary PCI lessens the risk, major cardiovascular events occurring in hospitals after STEMI treated with thrombolysis and those treated with primary PCI are not significantly different. However, there were no appreciable differences between major and minor bleeding [8].

The value of thrombolysis is also shown in the prehospital setting. In patients with acute STEMI, prehospital administration of reduced-dose fibrinolytics in conjunction with urgent

PCI was linked to earlier patency of the ischemic artery, a lower incidence of cardiogenic shock, and also decreased in-hospital mortality when compared with PPCI alone [9].

Concerning the management of intracerebral hemorrhages (ICHs), when compared to medical care alone, minimally invasive techniques for the evacuation of supratentorial ICHs and intraventricular hemorrhages have been shown to reduce mortality. However, there is no definitive clinical trial proof that these operations improve functional outcomes. Indications for immediate surgical evacuation with or without an external ventricular drain for patients with cerebellar hemorrhage now include larger volume (>15 mL) in addition to previously advised indications of neurological deterioration, brainstem compression, and hydrocephalus. This is done to reduce mortality [10].

Finally, the main question that needs to be answered in this context is: when should ICH patients resume their treatment? When clinicians decide whether and when to restart antiplatelet medication for patients with cardiovascular disease, the risk of substantial bleeding, which is high for certain subgroups of patients such as those with previous stroke or transient ischemic attack [11], must be weighed against the advantage of ischemia protection. The best time to resume antiplatelet medication after an ICH is not yet well established.

Patients in the RESTART trial (Restart or Stop Antithrombotics Randomized Trial), who had intracerebral bleeding while receiving antithrombotic medication, were given the option to restart antiplatelet therapy or refrain from it [12]. Patients were often put back on single antiplatelet therapy 2.5 months following their initial intracerebral bleed on average. There was no difference in the frequency of symptomatic recurrent spontaneous intracerebral hemorrhage between the 2 groups. In actuality, patients who resumed antiplatelet medication tended to have decreased bleeding rates.

The data base for this important therapeutic challenge will increase as a result of ongoing randomized studies, including RESTART-Fr [NCT02966119] and STATICH [Study of Antithrombotic Treatment After IntraCerebral Haemorrhage; NCT03186729].

## Conclusion

The management of STEMI is not always easy, and the occurrence of acute intracranial hemorrhage, which is a major bleeding complication, worsens the prognosis. Indeed, the administration of antiplatelet and antithrombotic agents is contraindicated in this situation, whereas these treatments are necessary to prevent the formation of intracoronary thrombus due to the hypercoagulation state associated with STEMI and the introduction of foreign bodies such as wires, balloons, and stents.

Our case demonstrates the importance of weighing the risks and benefits before any decision. In the case of major bleeding complications post thrombolysis or post angioplasty, the reintroduction of antiplatelet therapy was beneficial for our patient.

## Patient consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal and request.

## REFERENCES

- [1] Durdana S, Malik MA, Hasan A, Rabbani MU. Angiographic outcomes in STEMI patients receiving fibrinolysis with guideline directed optimal antithrombotic therapy. *Indian Heart J* 2021;73(1):125–8 Epub 2020 Nov 13. PMID: 33714398; PMCID: PMC7961247. doi:10.1016/j.ihj.2020.11.011.
- [2] Kala P. Thrombolysis in ST-elevation myocardial infarction is not dead. *EuroIntervention* 2021;16(14):1129–30 PMID: 33605881. doi:10.4244/EIJV16I14A203.
- [3] Ibanez B, James S, Agewall S, Antunes MJ, Bucciarelli-Ducci C, Bueno H, et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). *Eur Heart J* 2018;39:119–77.
- [4] Jafary FH. *Anticoagulants and -primary PCI. Primary angioplasty: a practical guide*, 543578. Singapore: Springer; 2018.
- [5] Stabile E, Nammias W, Salemme L, Sorropago G, Cioppa A, Tesorio T, et al. The CIAO (Coronary Interventions Antiplatelet-based Only) study: a randomized study comparing standard anticoagulation regimen to absence of anticoagulation for elective percutaneous coronary intervention. *J Am Coll Cardiol* 2008;52(16):1293–8 PMID: 18929239. doi:10.1016/j.jacc.2008.07.026.
- [6] Frey BM, Boutitie F, Cheng B, Cho TH, Ebinger M, Endres M, et al. Safety and efficacy of intravenous thrombolysis in stroke patients on prior antiplatelet therapy in the WAKE-UP trial. *Neurol Res Pract* 2020;2:40 PMID: 33324940; PMCID: PMC7678217. doi:10.1186/s42466-020-00087-9.
- [7] Zhao L, Zhao Z, Chen X, Li J, Liu J, Li G, et al. Safety and efficacy of prourokinase injection in patients with ST-elevation myocardial infarction: phase IV clinical trials of the prourokinase phase study. *Heart Vessels* 2018;33(5):507–12 Epub 2017 Dec 5. PMID: 29209778. doi:10.1007/s00380-017-1097-x.
- [8] Arso IA, Setianto BY, Taufiq N, Hartopo AB. In-hospital major cardiovascular events between STEMI receiving thrombolysis therapy and primary PCI. *Acta Med Indones* 2014;46(2):124–30 PMID: 25053685.
- [9] Bhatt NS, Solhpour A, Balan P, Barekain A, McCarthy JJ, Sdringola S, et al. Comparison of in-hospital outcomes with low-dose fibrinolytic therapy followed by urgent percutaneous coronary intervention versus percutaneous coronary intervention alone for treatment of ST-elevation myocardial infarction. *Am J Cardiol* 2013;111(11):1576–9 Epub 2013 Mar 12. PMID: 23490028. doi:10.1016/j.amjcard.2013.01.326.
- [10] Greenberg SM, Ziai WC, Cordonnier C, Dowlatshahi D, Francis B, Goldstein JN, et al. Guideline for the management of patients with spontaneous intracerebral hemorrhage: a guideline from the American Heart Association/American Stroke Association. *Stroke* 2022;53(7):e282–361 Epub 2022 May 17. PMID: 35579034. doi:10.1161/STR.0000000000000407.

- 
- [11] Ha ACT, Bhatt DL, Rutka JT, Johnston SC, Mazer CD, Verma S. Intracranial hemorrhage during dual antiplatelet therapy: JACC review topic of the week. *J Am Coll Cardiol* 2021;78(13):1372–84 PMID: 34556323. doi:[10.1016/j.jacc.2021.07.048](https://doi.org/10.1016/j.jacc.2021.07.048).
- [12] RESTART Collaboration: effects of antiplatelet therapy after stroke due to intracerebral haemorrhage (RESTART): a randomized, open-label trial. *Lancet* 2019;393:2613–23.