Acta Cardiologia Indonesiana

pISSN:2460-5700
eISSN:2579-4345

Web page: jurnal.ugm.ac.id/v3/jaci

A Successful Fibrinolysis in Inferior St-Elevation Myocardial Infarction Patient Presenting with Hypertensive Crisis: A Management in Limited Settings

Fitrawan Silvano[1]*, Kelvin Supriami[1], Bambang Rahadi[2], Mayshia Prazitiya Shakti[1]

[1]Department of Emergency Services, Samarinda Medika Citra Hospital, East Kalimantan, Indonesia
[2]Department of Cardiology, Samarinda Medika Citra Hospital, East Kalimantan, Indonesia

ARTICLE INFO

*Corresponding author

Email:
fitrawans@gmail.com

Address:
Jl. Kadrie Oening No.85, RT.35, Air Putih,
Kec. Samarinda Ulu, Kota Samarinda
Kalimantan Timur 75124

Keywords:
Contraindication; Fibrinolysis; Hypertensive Crisis; Inferior STEMI; pPCI

Manuscript submitted: 9 March 2022
Revised and accepted: 22 August 2022

ABSTRACT

Background: Prompt reperfusion is the first-line step for preventing mortalities in STEMI and fibrinolysis is one of the strategies. However, the benefit of fibrinolysis in inferior STEMI is still controversial due to some conflicting evidence in those specific population in contrast to anterior STEMI and the probability of right ventricle involvement in high risk inferior STEMI. The presence of hypertensive crisis in STEMI provoked another reperfusion challenge.

Case Illustration: A 62-year old female presented to our ER with persistent 2-hour angina. She reported sudden symptoms of breathlessness and heavy retrosternal chest pain radiating to the back. In the ER, BP 200/130 mmHg, RR 20x/min, pulse 101bpm. A serial ECG within 1 hour post-admission revealed a prominent ST-segment elevation in II, III, and aVF leads. STEMI protocol and fibrinolysis following a prior antihypertensive therapy had been done. The pain relief and ≥50% reduction of ST-segment elevation within 30 minutes post-fibrinolysis, indicated a successful reperfusion.

Discussion: The current standard of care for any type of STEMI with onset <12 hours suggest performing pPCI within 120 minutes of transfer from non-pPCI centres. However, several studies found no advantage of transferring for pPCI over fibrinolysis in non-anterior STEMI. Our patient supported the latter, regardless of indicated for pPCI, she showed a successful outcome after fibrinolysis.

Despite being associated with a higher mortality rate, hypertensive crisis in STEMI should not hinder fibrinolysis, in which many Indonesian hospitals make it a contraindication. BP should be decreased to <160/110 mmHg before fibrinolysis. Our patient reached BP 150/94 mmHg.

Conclusions: In limited settings, fibrinolysis in a patient with inferior STEMI presenting with hypertensive crisis shows potentially successful reperfusion once the blood pressure is lowered.

INTISARI

Pendahuluan: Reperfusi yang cepat adalah lini pertama pencegahan kematian pada pasien STEMI dan salah satu strateginya adalah dengan fibrinolisis. Namun, manfaat fibrinolisis pada STEMI inferior masih kontroversial dikarenakan adanya beberapa bukti ilmiah dengan hasil yang bertentangan pada pasien tersebut bila dibandingkan dengan STEMI anterior dan kemungkinan keterlibatan ventrikel kanan pada populasi STEMI inferior dengan risiko tinggi. Krisis hipertensi yang terjadi bersamaan dengan kasus STEMI turut menciptakan sebuah tantangan tersendiri.

Laporan Kasus: Seorang wanita 62 tahun datang ke UGD dengan keluhan angina persisten 2 jam. Dilaporkan munculnya gejala yang tiba-tiba berupa

sesak napas dan nyeri dada retrosternal menjalar ke punggung. Di UGD, TD 200/130 mmHg, RR 20x/menit, nadi 101x/menit. EKG serial dalam waktu 1 jam setelah pasien masuk UGD menunjukkan elevasi segmen ST yang menonjol pada sadapan II, III, dan aVF. Protokol STEMI dan fibrinolisis yang dilakukan setelah pemberian terapi antihipertensi pun dilakukan di UGD. Hilangnya keluhan nyeri dan pengurangan 50% elevasi segmen ST dalam waktu 30 menit pasca-fibrinolisis, menunjukkan keberhasilan reperfusi.

Diskusi: Standar terkini untuk semua jenis STEMI awitan <12 jam menyarankan untuk melakukan IKP dalam waktu 120 menit setelah merujuk dari rumah sakit yang tidak mampu melakukan IKP. Namun, beberapa penelitian tidak menemukan keuntungan merujuk pasien dibandingkan fibrinolisis pada STEMI non-anterior. Terlepas dari indikasi untuk mendapatkan terapi IKP, pasien kami menunjukkan hasil yang baik pasca-fibrinolisis.

Meskipun dikaitkan dengan angka kematian yang lebih tinggi, krisis hipertensi pada STEMI seharusnya tidak menghalangi fibrinolisis, di mana banyak rumah sakit di Indonesia menjadikannya sebagai kontraindikasi. TD harus diturunkan menjadi <160/110 mmHg sebelum fibrinolysis dan pasien kami mencapai TD 150/94 mmHg.

Kesimpulan: Dalam kondisi terbatas, fibrinolisis yang dilakukan setelah penurunan tekanan darah pada pasien STEMI inferior dengan krisis hipertensi berpotensi menunjukkan keberhasilan reperfusi.

.

Introduction

Prompt reperfusion is a first-line step for preventing mortalities in ST-elevation myocardial infarction (STEMI) patients[1]. The current standard of care for any type of STEMI with onset <12 hours suggest performing primary Percutaneous Coronary Intervention (pPCI) within 120 minutes of transfer from non-pPCI centers. However, not every region has a pPCI-capable center. Even in a region with that facility, such as in Samarinda, East Kalimantan, the lack of human resources available in a timely manner is also an issue. Thus, if patients come to a non-pPCI center, it is recommended to perform fibrinolysis when referral within 120 min is improbable.

According to a study, the benefit of fibrinolysis in inferior STEMI is still controversial[2]. Inferior STEMI is caused by the occlusion of the right coronary artery, or less commonly the left circumflex artery, leading to inferior wall infarction[3]. Although inferior STEMI has a generally favourable prognosis, in some patients with advanced atrioventricular block, right ventricular involvement, or precordial ST depression patterns on their Electrocardiogram (ECG) are considered to be at higher risk. These risks, however, are not accompanied by an evidence-based specific recommendation of reperfusion therapy for inferior STEMI. The efficacy of either fibrinolysis or pPCI in reducing mortality of these patients has not been properly studied[2].

The presence of hypertensive crisis in STEMI patients also provoked another reperfusion challenge. The prevalence of hypertension in STEMI patients is 30-40% and even higher in NSTEMI with up to 70%[4]. Many hospitals in Indonesia include hypertensive crisis as one of the contraindications for fibrinolysis. As stated in Indonesian Acute Cardiac Life Support (ACLS) Guideline, systolic blood pressure (SBP) of >180 mmHg and diastolic blood pressure (DBP) of >110 mmHg is a relative contraindication for fibrinolysis. Thus, it is recommended to be included in one of the pre-fibrinolysis contraindication checklists that should be routinely fulfilled by Indonesian physicians before deciding to perform fibrinolysis[5]. The aim of this study was to present a case of resolution from an inferior STEMI complicated with hypertensive crisis following fibrinolysis in a non-pPCI center.

Case Presentation

A 62-year-old female patient was admitted to our Emergency Room (ER)–a non-pPCI capable hospital, due to persistent two-hour angina. She reported symptoms during a mild intensity morning exercise with breathlessness and sudden onset of dull, heavy retrosternal chest pain radiating to the back. Prior history of similar symptoms was denied by the patient. Her associated metabolic and cardiovascular risk factors included a history of type 2 diabetes mellitus with metformin 500mg three times daily as her routine medication and uncontrolled primary hypertension.

In our ER, the patient was fully alert. Vital signs examination showed blood pressure (BP) was 200/130 mmHg, respiratory rate was 20 beats per minute, heart rate was 101 beats per minute, and oxygen saturation was 98% room air. Physical examination including cardiopulmonary, abdominal and neurological screening showed no abnormal results.

ECG record initially showed a suspect of inferior wall STEMI. Within 1 hour after admission, a serial ECG revealed a prominent ST-segment elevation in II, III, and

aVF leads accompanied by reciprocal ST-segment depression in I and aVL leads without involvement of right cardiac leads as shown in Figure 1 and 2.

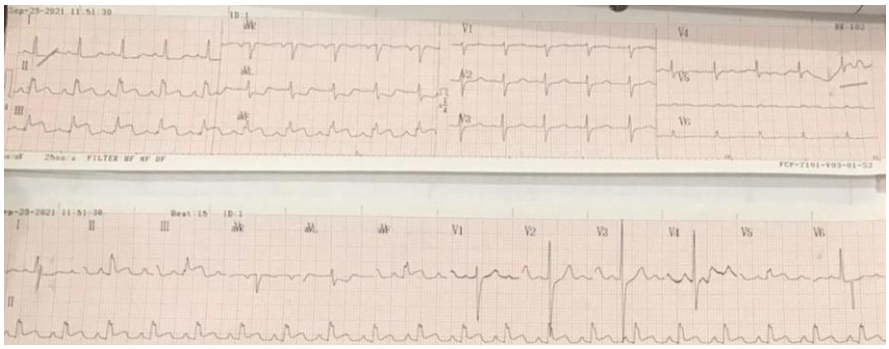

Figure 1. Anterior Electrocardiogram Results (1 hour post admission)

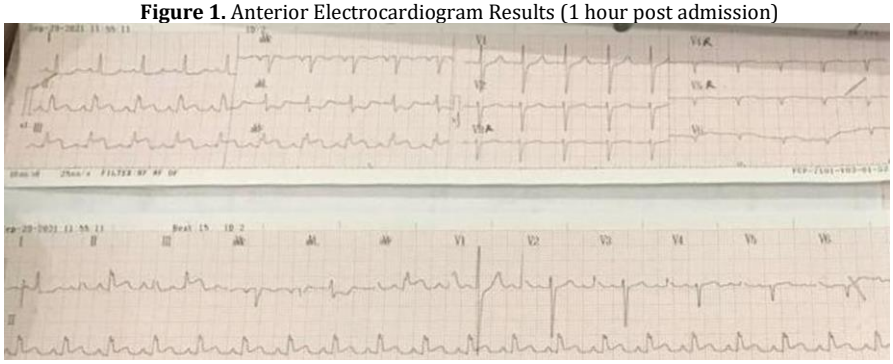

Figure 2. Right Electrocardiogram Results (1 hour post admission)

Routine on-admission laboratory data as shown in Table 1 revealed an elevated random blood glucose level and mild anaemia. Cardiac enzyme measurement was improbable due to our limited resources. Chest x-ray result was unremarkable as shown in Figure 3.

Table 1. Laboratory results of the patient

Laboratory Tests	Results	Note	Reference Range
Haemoglobin	11.2	L	13,2 – 17,3 mg/dL
Leucocyte	3.6		4,5 – 11 103/ uL
Hematocrit	33.3	L	40.0 – 52.0 %
hrombocyte	98.000		150 – 350 103/ uL
Natrium	131,05		135,00-147,00 mmol/l
Potassium	3,42		3,50-5,00 mmol/l
Chloride	96,14		95,00-105,00 mmol/l
Ureum	43.8		10-50 mg/dl
Creatinine	0.9		0.6-1.2 mg/dl
Random blood glucose	385	H	70-200 mg/dl

Figure 3. Anterior chest x-ray

Inferior wall STEMI, hypertensive crisis, diabetes mellitus, and mild anemia were diagnosed for the patient. Acute coronary syndrome initial drugs were loaded before cardiologist consultation was available. Since referral for primary PCI could not be achieved within ≤ 120 min, fibrinolytic strategy was preferred by the cardiologist for this patient. After careful examination of contraindication

for fibrinolysis was conducted, hypertensive crisis was known to be one of the contraindications. The cardiologist then advised to administer several antihypertensive regimens, waiting for the blood pressure to be lowered, then followed by STEMI protocol in the ER using the fibrinolytic agent of Streptokinase 1.5 million IU over 60 minutes. The chronological order of the medication given in the ER as well as the bedside vital signs and electrocardiogram monitoring to assess the side effects of fibrinolysis were shown in Table 2.

Table 2. Medication and Bedside Monitoring in the ER

Time	Bleeding	Arrhythmia	Allergy	BP (mmHg)	Medication
11.40	-	-	-	200/130	Loading PO aspirin 150mg, PO clopidogrel 320mg, SL ISDN 5mg, PO Amlodipine 10mg, start IV Nitroglycerin 20 mcg/min
12.40	-	-	-	150/94	Continue IV nitroglycerine 20 mcg/min, start fibrinolysis with IV streptokinase 1.5 million IU within 60 min
12.50	-	-	-	104/53	Stop IV nitroglycerine, continue fibrinolysis
13.00	-	-	-	149/86	Continue fibrinolysis
13.10	-	-	-	157/93	Continue fibrinolysis
13.20	-	-	-	140/80	Continue fibrinolysis
13.30	-	-	-	140/80	Continue fibrinolysis
13.40	-	-	-	140/80	Fibrinolysis was done

The immediate relief of chest pain and breathlessness, accompanied by ≥ 50% reduction of ST-segment elevation within 30 minutes following fibrinolysis as shown in Figure 4, indicated a successful reperfusion on this patient.

Discussion

The current standard of care for patients presenting with any type of STEMI and onset <12 hours suggests pPCI to be performed within 90 minutes in a pPCI capable hospital and otherwise within 120 minutes of transfer. However, a randomized open-label study suggests no advantage of transferring for pPCI over fibrinolysis in patients with non-anterior STEMI arriving at hospitals without a pPCI facility[2]. Our patient supported the later suggestion, despite being indicated to receive a pPCI, she showed a successful reperfusion outcome after fibrinolysis.

We should be aware that the current treatment guideline on STEMI patients does not distinguish the outcome of each infarct location separately, instead it was based on all comers of STEMI i.e. anterior, lateral, and inferior combined. In the Strategic Reperfusion Early after Myocardial Infarction study, the relative risk of the primary end point (death from any cause, shock, congestive heart failure, or reinfarction up to 30 days) favoured fibrinolysis over pPCI for patients with inferior STEMI and was neutral for anterior STEMI[6]. Even a pooled analysis of 22 randomized clinical trials comparing pPCI and in-hospital fibrinolysis in STEMI patients showed that there was no significant advantage of pPCI on mortality in patients with non-anterior, in contrast to anterior STEMI[7]. Thus, our patient presenting with inferior STEMI receiving fibrinolysis in our ER instead of being referred to a pPCI-capable hospital is an example showing the importance of identifying the location of myocardial infarct before deciding on the next treatment.

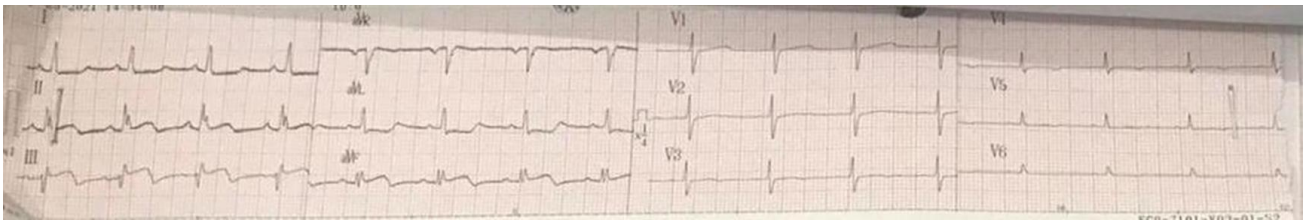

Figure 4. Anterior Electrocardiogram Results (30 minutes post fibrinolysis)

Based on the ECG pattern, the appearance of ST depression on reciprocal leads of I and aVL made our patient classified into a high risk inferior STEMI, which is associated with a worse prognosis compared to the low risk ones. However, this condition should not be a reason to favour only on pPCI instead of doing in-hospital fibrinolysis as the efficacy of either fibrinolysis or pPCI in reducing mortality of patients with these ECG patterns of inferior STEMI has not been well studied2.

Regardless of being associated with a significantly higher in-hospital mortality rate[4,8], the presence of hypertensive crisis in STEMI patients should not hinder fibrinolytic therapy - in which many Indonesian hospitals tend to make hypertensive crises as one of the contraindications. As in our ACLS guideline, our patient presenting with systolic blood pressure of >180 mmHg and diastolic blood pressure of >110 mmHg is considered to have a relative contraindication of fibrinolysis[5]. The possible risk of intracranial hemorrhage in Acute Coronary Syndrome (ACS) patients is the rationality behind this recommendation[9,10]. Moreover, hypertensive condition impairs fibrinolytic mechanism due to increased PAI-1 and t-PA complexes, thus leading to a decreased endogenous fibrinolytic state and ineffective fibrinolysis procedure done for STEMI patients[11].

The key management of hypertension in patients presented with ACS is the modification to reach an equilibrium between myocardial oxygen supply and demands[10]. Decreasing BP should be carefully conducted because rapid and excessive lowering of the DBP is

unwise as it has the potential to disturb the coronary blood flow and oxygen supply. Therefore, selecting a well-established evidence-based antihypertensive is indispensable. Current AHA/ACC guidelines recommend a BP target of <140/90 mmHg and <130/80 mmHg for patients with CKD or diabetes mellitus, but this applies more appropriately for secondary prevention than the management of hypertension in the acute phase of MI[10]. Another study by Lip G et al recommended that BP should be reduced to <160/110 mmHg (which was the cut-off in many trials of fibrinolytic therapy) before administering fibrinolysis[12]. Our patient reach a BP of 150/94 before fibrinolysis.

Beta blockers (BBs) are the vital agent for ACS treatment because they can reduce heart rate and BP leading to decreased myocardial oxygen demand. Intravenous BBs represent the first choice therapy in hypertensive patients with ACS and no signs of acute heart failure or hypotension[13]. Nitroglycerin has also been a cornerstone hypertensive therapy with ACS to moderately lower arterial BP. Even though the ACC/AHA guidelines only gave this agent a Level of Evidence C, a study by Prasanna et al recommended nitroglycerin infusion as a first line for BP control in ACS due to its advantageous effect in reducing preload and cardiac output[14]. Its usage should be meticulously considered in patients with inferior STEMI and is contraindicated if there is a presence of right ventricular infarction due to the lowering preload effects[10].

Since beta-blocker infusion is not widely available in Indonesia's healthcare facilities, including in our center, nitroglycerin IV was considered as a safely used agent in the patient with a considerable effect on lowering BP. The absence of right ventricular infarction in our patient further added another robust justification for using nitroglycerin agent. But whatever the drug class of antihypertensive agents, it must be taken into consideration that rapidly and uncontrollably lower BP levels should be avoided.

Conclusions

In limited settings, fibrinolysis in inferior STEMI patients presenting with hypertensive crisis shows potentially successful reperfusion once the blood pressure is lowered. Physicians should adhere to the current treatment guideline whenever possible but more importantly, should also be aware of the most recent evidence based studies to ensure a better management of their patients.

Acknowledgements

We are indebted to all the emergency department crews and treating physicians at Samarinda Medika Citra Hospital, Samarinda, East Kalimantan, Indonesia.

References

1. Tsigkas G, Kasimis G, Theodoropoulos K, et al. A successfully thrombolysed acute inferior myocardial infarction due to type A aortic dissection with lethal consequences: the importance of early cardiac echocardiography. Journal of Cardiothoracic Surgery 2011; 6: 101. DOI: 10.1186/1749-8090-6-101.
2. Birnbaum Y, Levine GN, French J, et al. Inferior ST-Elevation Myocardial Infarction Presenting When Urgent Primary Percutaneous Coronary Intervention Is Unavailable: Should We Adhere to Current Guidelines? Cardiovasc Drugs Ther 2020; 34: 865-870. 2020/07/17. DOI: 10.1007/s10557-020-07039-0.
3. Whalen D, Dunne C, Dubrowski A, et al. Diagnosis and Management of an Inferior ST-elevation Myocardial Infarction: A Simulation Scenario. Cureus 2019; 11: e3995. 2019/04/17. DOI: 10.7759/cureus.3995.
4. Konstantinou K, Tsioufis C, Koumelli A, et al. Hypertension and patients with acute coronary syndrome: Putting blood pressure levels into perspective. J Clin Hypertens (Greenwich) 2019; 21: 1135-1143. 2019/07/14. DOI: 10.1111/jch.13622.
5. Achyar MD, et al. Panduan Kursus Bantuan Hidup Jantung Lanjut. 2021 ed.: Perhimpunan Dokter Spesialis Kardiovaskular Indonesia, 2021.
6. Armstrong PW, Gershlick AH, Goldstein P, et al. Fibrinolysis or Primary PCI in ST-Segment Elevation Myocardial Infarction. New England Journal of Medicine 2013; 368: 1379-1387. DOI: 10.1056/NEJMoa1301092.
7. Boersma E. Does time matter? A pooled analysis of randomized clinical trials comparing primary percutaneous coronary intervention and in-hospital fibrinolysis in acute myocardial infarction patients. Eur Heart J 2006; 27: 779-788.
8. Picariello C, Lazzeri C, Attanà P, et al. The Impact of Hypertension on Patients with Acute Coronary Syndromes. International journal of hypertension 2011; 2011: 563657. DOI: 10.4061/2011/563657.
9. Zonneveld TP, Algra A, Dippel DWJ, et al. The ThRombolysis in UnconTrolled Hypertension TRUTH) protocol: an observational study on treatment strategy of elevated blood pressure in stroke patients eligible for IVT. BMC Neurology 2015; 15: 241. DOI: 10.1186/s12883-015-0493-z.
10. Rosendorff C, Lackland DT, Allison M, et al. Treatment of hypertension in patients with coronary artery disease: a scientific statement from the American Heart Association, American College of Cardiology, and American Society of Hypertension. Hypertension 2015; 65: 1372-1407. 2015/04/02. DOI: 10.1161/HYP.0000000000000018.
11. Saluveer O, Larsson P, Ridderstråle W, et al. Profibrinolytic Effect of the Epigenetic Modifier Valproic Acid in Man. PLOS ONE 2014; 9: e107582. DOI: 10.1371/journal.pone.0107582.
12. Lip GY, Lydakis C and Beevers DG. Management of patients with myocardial infarction and hypertension. Eur Heart J 2000; 21: 1125-1134. 2000/08/05. DOI: 10.1053/euhj.1999.2206.
13. Tocci G, Figliuzzi I, Presta V, et al. Therapeutic Approach to Hypertension Urgencies and

Emergencies During Acute Coronary Syndrome. High Blood Pressure & Cardiovascular Prevention 2018; 25. DOI: 10.1007/s40292-018-0275-y.

14. Prasanna N, Dissanayake H and Constantine G. Sublingual nitroglycerin for early blood pressure control in hypertensive emergencies: Observations from an emergency department clinical audit in Sri Lanka. BMC Research Notes 2018; 11. DOI: 10.1186/s13104-018-3460-0.