Cardiology & Cardiovascular Research

Research Article

The STEMI Pharmaco-Invasive Therapy in Africa: Bridging the Gap

Emmanuel Auchi Edafe[1,3,4,5]*, Maclean Romokere Akpa[1] and Muhammad Nazir Shehu[2]

[1]*University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria.*
[2]*General Amadi Rimi Specialist Hospital, Katsina.*
[3]*Bayelsa specialist Hospital, Yenagoa.*
[4]*Cardiocare Multispecialty Hospital, Abuja.*
[5]*Save a Life Mission Hospital, Port Harcourt, Rivers.*

Abstract

Introduction: The pharmaco-invasive therapy, refers to the technique whereby there is a time elapse of 3-24 hours between thrombolysis (pharmaco) and PCI (invasive) when using fibrin specific thrombolytic agents. The aim of this study was to evaluate 74 patients with STEMI over 5-year period who were treatment with pharmaco-invasive therapy in 3 PCI centers in Nigeria.

Methods: This was a retrospective observational study. Three cardiac catheterization laboratories cases were searched. These cardiac catheterization laboratories included Bayelsa specialist Hospital, Yenagoa, Cardiocare Multispecialty Hospital, Abuja and Save a Life Mission Hospital, Port Harcourt, Rivers. These cases of pharmacoinvasive therapy from 1st of January 2018 to 28th February, 2023 were included. The data analysis was done with SPSS version

Results: There were 74 patients who had STEMI and underwent pharmacoinvasive therapy for the period. There were 38 males. The mean age of STEMI for both men and women 62.5 ± 12.6.The drugs used were Streptokinase, Alteplase and Tenecteplase.

Keywords

Pharmaco-invasive, Percutaneous coronary interventions, Therapy.

Corresponding Author Information

Emmanuel Auchi Edafe, University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria.

Received: October 20, 2023; **Accepted:** November 26, 2023; **Published:** December 03, 2023

Citation: Emmanuel Auchi Edafe, Maclean Romokere Akpa, Muhammad Nazir Shehu. The STEMI Pharmaco-Invasive Therapy in Africa: Bridging the Gap. Cardiol Cardiovasc Res. 2023;1(1):1-5.

Introduction

ST-elevation myocardial infarction (STEMI) refers to coronary ischemia associated with elevation OF THE ST region on the Electrocardiogram (usually due to acute total occlusion of an epicardial coronary artery) [1-3]. Timely intervention to revascularize the occluded coronary artery is the mainstay of treatment for patients with STEMI [4]. This should be achieved ideally as soon as possible in all patients presenting within 12 h of symptom onset. Benefit from revascularization can extend up to 24 h, especially if there is ongoing evidence of coronary ischemia [4].

The preferred means for reperfusion in STEMI is a primary percutaneous coronary intervention (PPCI). PPCI is the recommended therapy in all patients, provided it can be performed within 120 min of first medical contact [3,5]. When PPCI cannot be performed in this time frame, fibrinolysis is recommended within 30 min of arrival to the hospital [4].

The pharmaco-invasive therapy refers to the technique whereby there is a time elapse of 3-24 hours between thrombolysis (pharmaco) and PCI (invasive) when using fibrin specific thrombolytic agents. The aim of this study was to evaluate 74

patients with STEMI over 5-year period who were treatment with pharmaco-invasive therapy in 3 PCI centers in Nigeria.

Methods

This was a retrospective observational study. The medical records of three catheterization laboratories in Nigeria cases were reviewed. These laboratories are located at the [1] Bayelsa specialist Hospital, Yenagoa, [2] Cardiocare Multispecialty Hospital, Abuja and [3] Save a Life Mission Hospital, Port Harcourt, Rivers state. The patients managed by pharmaco-invasive therapy from 1st of January 2018 to 28th February 2023 were extracted from the records for this review.

The study population included patients presenting within 24 h of symptom onset with typical chest pain, ECG evidence of ST segment elevation and/or elevated levels of Troponin I or T.

Inclusion Criteria

The inclusion criteria were

1. Patients aged 18 years or above of both sexes
2. History of chest pain typical for myocardial infarction of at least 30 minutes duration.
3. Documented ST segment elevation in two contiguous leads with the cut-off points ≥0.2 mV in men or ≥0.15 mV in women in leads V2-V3 and/or ≥0.1 mV in other leads on the 12–lead ECG.
4. All patients were candidates for reperfusion therapy by immediate fibrinolysis if timely PPCI was confirmed to be unavailable for whatever reason.

Exclusion criteria

1. Those who had absolute or relative contraindications to fibrinolytic drugs, including such as prior intracranial hemorrhage, structural cerebral vascular lesion, ischemic stroke within 3 months,
2. Suspected aortic dissection, active bleeding or bleeding diathesis, significant closed head or facial trauma within 3 months, severe or orly controlled hypertension.
3. All patients who had primary PCI.
4. Those with STEMI and had only fibrinolytic therapy.
5. Those with incomplete records in their folders.

Criteria for Successful Reperfusion

A patient is said to have successful reperfusion if the following are documented:

1. Disappearance of chest pain after starting fibrinolytic agent infusion.
2. Resolution of ST-segment elevation by more than 50% after starting fibrinolytic infusion in the lead with maximum elevation on baseline ECG.
3. Earlier and higher peak of cardiac troponin I within the first 24 hours after onset of symptoms.
4. If there is documentation of reperfusion arrhythmias e.g. accelerated idioventricular rhythm (AIVR).

Data interpretation

The data analysis was done with SPSS version 25.0 for windows

Results

There were 74 patients who had STEMI and underwent pharmaco-invasive therapy for the period under review. There were 38 males. The mean age of patients with STEMI for both men and women was 62.5 ± 12.60years. The drugs used for pharmacological fibrinolysis were Streptokinase, Alteplase and Tenecteplase. Table 1 showed the demographic characteristics of the patients. There are patients with traditional risks such as type 2 diabetes, smoking, hypertension and dyslipidemia. In figure 1, there are 18 cases who presented in less than 4 hours, 46 presented in 5 to 12 hours, and 10 cases in 12 to 24 hours. Streptokinase was used in 46.5% of cases [figure 2].

Hypertension was present in 73.5% of cases. T2DM in 47.8% of cases, dyslipidemia in 42.3% of cases, Smoking in 16.1% of cases and family history in 4.6% [see table 2]. The distribution of STEMI was shown in table 3. There were 45.5% with anterior MI, 28.5% with inferior MI, and 13.5% presenting with lateral MI. Table 4 showed stent distribution. Zotarolimus drug eluting stents were used in 70.5%, Everolimus in 20.5% and Serolimus in 9% of cases. Common territory stented were LAD in 58.9%, RCA in 30.1% and Lcx in 11% of cases [see table 5]. The patients tolerated the fibrinolytic agents without complication in 95.8% [see figure 3]. There were no major bleeding, but minor bleeding from skin, site of cannula and gastro-interstinal in 4.2%.

Patient paramters	Male	Female
Age in years	60.2±15.6	64.5±10.7
Sex	38	26
Weight [kg]	89.7±7.12	100.3±9.4
Height [cm]	176.8±6.8	168.9±9.8
Blood pressure [mmHg]	138.0±10.6	139.0±12.8
Left ventricular ejection fraction %	59% [ranges from 30-72%]	56% [ranges from 29-74%]
Tropolin ng/l	5.6±0.6	3.6±0.4
Diabetes Mellitus	15	20
Hypertension	31	23
Dyslipidemia	9	22
Smoking	11	1

Table 1: Demographic profile of the Patients.

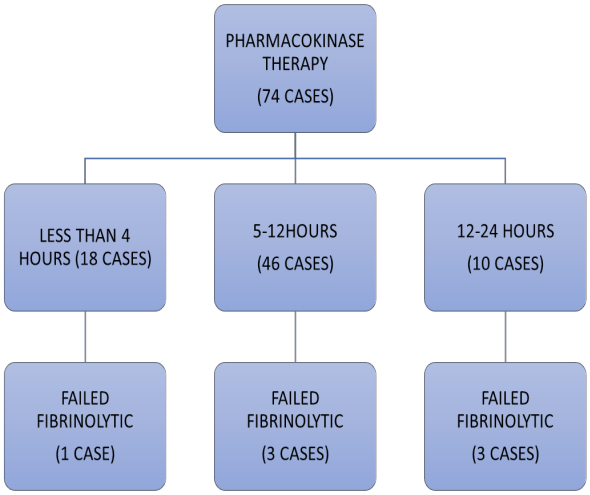

Figure 1: Timing of patient presentation.

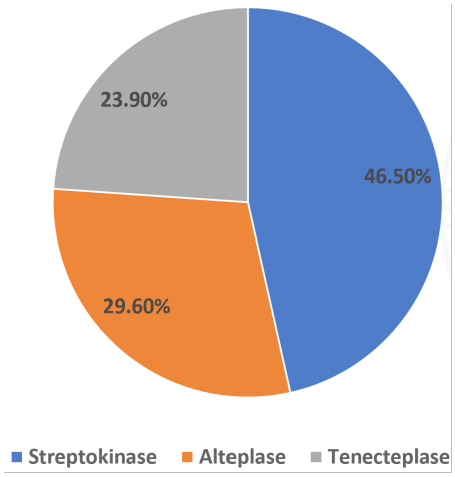

Figure 2: Various Fibrinolytic drugs used.

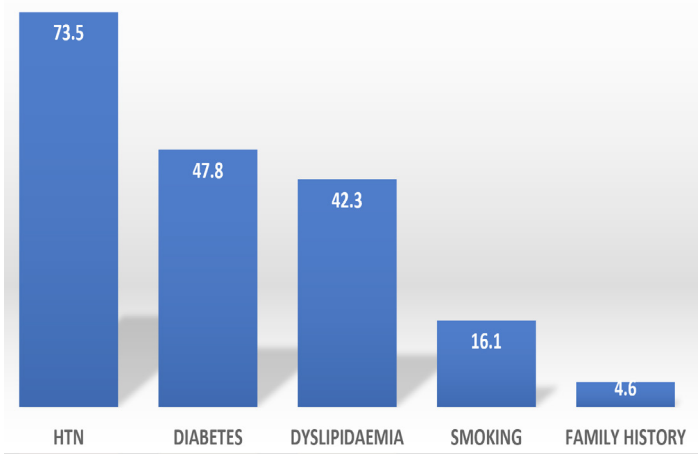

Table 2: Percentage distribution of coronary artery risk factors.

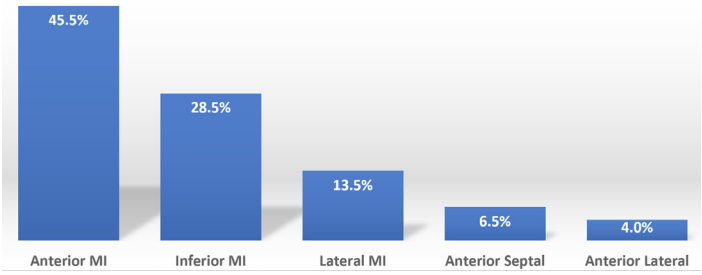

Table 3: Distribution of STEMI.

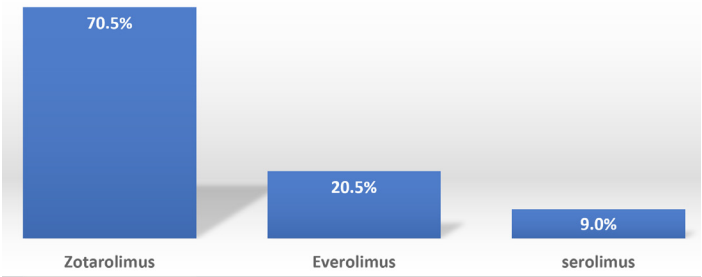

Table 4: Stent Distribution.

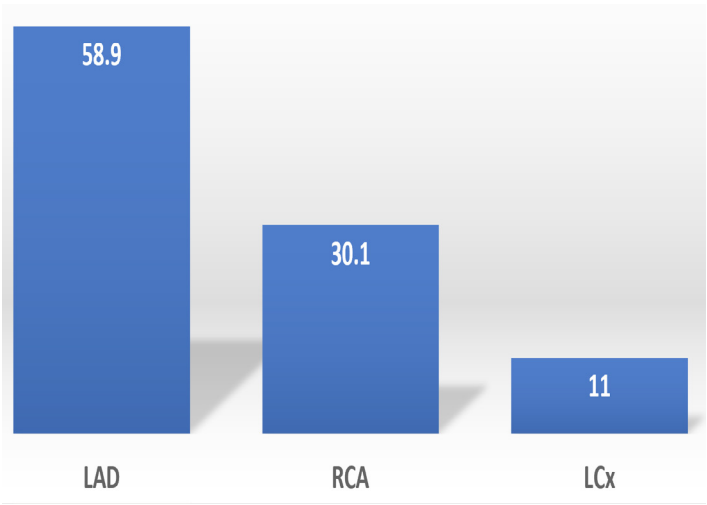

Table 5: Common stented territories.

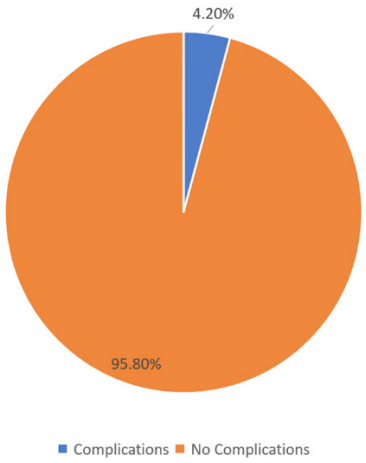

Figure 3: Complication and Non-complication.

Discussion

ST-elevation myocardial infarction (STEMI) refers to a complete occlusion of the arterial territory with resulting coronary ischemia associated with ST elevation [6-10]. The management goal of STEMI is to reperfusion the infarct occluded coronary artery as soon as possible, to reduce myocardial cell death as much as possible [11]. Timely intervention to revascularize the occluded coronary artery is the mainstay of treatment for patients with STEMI and should be achieved ideally as soon as possible in all patients presenting within 12 h of symptom onset [7]. This benefit from revascularization can extend up to 24h, especially if there is ongoing evidence of coronary ischemia [6,11-14].

The preferred means for reperfusion in STEMI is a primary percutaneous coronary intervention (PPCI), and this is the recommended therapy in all patients, provided it can be performed within 120 min of first medical contact [6,7]. When primary PCI cannot be performed in this time frame, fibrinolysis is recommended within 30 min of arrival to the hospital. There

are several barriers to achieving these targets in Nigeria [6]. In Sub-Saharan Africa, there are many reasons why primary PCI may not work for many of our STEMI patients. Awareness about symptoms related to acute myocardial infarction and regarding the importance of seeking early medical attention is low. The means for timely and safe transfer (such as in a well-equipped ambulance) to a hospital for primary PCI or fibrinolysis are limited in most cases [6]. 24-h primary PCI facilities are available in a very few centers. Access to primary PCI is even not available in many cities and capitals of the 36 states in Nigeria. Furthermore, primary PCI remains a costly intervention, which is beyond the means of the majority of the population of Nigeria. Religious believes, cultural believes, accessibility to the cardiac catheterization laboratories and availability of the interventional cardiologist are also significant hindrance to achieving primary PCI [6].

As a result of these factors, primary PCI within 120 min is often a difficult target to achieve for many patients presenting with STEMI in Nigeria. To overcome many of these challenges and bridge the gap, pharmaco-invasive therapy is the way to go in Nigeria and other parts of Sub-Saharan Africa. This involves Fibrinolysis at the point of contact with a non-percutaneous coronary intervention (PCI) center, followed by transfer to PCI capable center for coronary angiography/PCI within 24 h of fibrinolysis [6-8].

Clinical trials and registry data have shown that clinical outcomes with pharmaco-invasive strategy are comparable to the outcomes with primary PCI [8-10]. STREAM study is a well powered multicenter randomized (open-label) clinical trial, which showed that there was no statistically significant difference in the rate of primary composite outcome (death, shock, congestive cardiac failure, or re-infarction at 30 days) between primary PCI versus pharmaco-invasive strategy in patients in whom PPCI could not be achieved within 1 h of presentation. All patients in the study presented within 3 h of symptom onset [11]. The main clinical adverse outcome to pharmaco-invasive approach in this study was a higher risk of an intracranial bleed in older patients (>75 years of age) who were treated with full dose thrombolysis with Tenecteplase. This was not seen in our study. This may probably due to the numbers of patients and age of the patients on Tenecteplase. The increased risk of intracranial bleed was no longer observed after reducing the dose of tenecteplase for age >75 years. In the STREAM trial, the pharmaco-invasive group underwent PCI after transfer to PCI-capable center either emergently, if there was evidence of the failure of thrombolysis, or in 6–24 h after randomization if patients were clinically stable [11]. In our study, we compared the effectiveness of fibrinolytic followed with PCI within 24 h of thrombolysis.

This observational study presents further data from 138 patients treated in a tertiary care center in India, who showed that patients managed with a pharmaco-invasive strategy had similar clinical outcomes at 30 days compared to those treated with PPCI [14]. The study included patients presenting within 24 h of symptom onset [14]. The STREAM study only included patients presenting within 3 h of symptoms onset [7]. The median time delay between symptoms onset and presentation in this study was 4h, which may have diminished the benefit from either intervention in the study [7,14]. One of the limiting factors in selecting primary PCI as a treatment modality in this study was whether patients had sufficient financial resources/insurance coverage available immediately for proceeding with PPCI, as is the case also for a large percentage of the population in Nigeria.

There is evidence to suggest that pharmaco-invasive strategy may be an effective treatment option for patients presenting with STEMI in Nigeria, where delay in presentation to the hospital from onset of symptoms as well as in completing PPCI from first medical contact is common due to factors mentioned above [6].

Conclusion

The pharmaco-invasive strategy appears most suitable for sub-Saharan Africa countries or similar countries or similar situations. There should be sufficient time for transferring the patient (does not have to be within 3 hours or more) and sufficient time to perform PCI within 24 hours.

References

1. Alpert JS, Thygesen K, Antman E, et al. Myocardial infarction redefined a consensus document of The Joint European Society of Cardiology American College of Cardiology Committee for the redefinition of myocardial infarction. J Am Coll Cardiol. 2000; 36: 959-969.
2. Hartikainen TS, Sörensen NA, Haller PM, et al. Clinical application of the 4th Universal Definition of Myocardial Infarction. Eur Heart J. 2020; 41: 2209-2216.
3. Thygesen K, Alpert JS, Jaffe AS, et al. ESC Scientific Document Group. Fourth universal definition of myocardial infarction (2018). Eur Heart J. 2019; 40: 237-269.
4. Byrne RA, Rossello X, Coughlan JJ, et al. 2023 ESC Guidelines for the management of acute coronary syndromes Developed by the task force on the management of acute coronary syndromes of the European Society of Cardiology (ESC). Eur Heart J. 2023; 38: 3720-3826.
5. Amsterdam EA, Wenger NK, Brindis RG, et al. 2014 AHA/ACC Guideline for the Management of Patients with Non-ST-Elevation Acute Coronary Syndromes: a report of the American College of Cardiology American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol. 2014; 64: e139-e228.
6. Edafe EA, Jumbo J. Pharmaco-Invasive Therapy is a Critical Option in Nigerian Stemi Treatment a Review. Journal of Advances in Medical and Pharmaceutical Sciences. 2023; 25: 6-17.
7. Gara PT, Kushner FG, Ascheim DD, et al. 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction: A report of the American College of Cardiology Foundation American Heart Association Task Force on Practice Guidelines. Circulation. 2013; 127: e362-425.

8. Larson DM, McKavanagh P, Henry TD, et al. Reperfusion options for st elevation myocardial infarction patients with expected delays to percutaneous coronary intervention. Interv Cardiol Clin. 2016; 5: 439-450.
9. Siontis KC, Barsness GW, Lennon RJ, et al. Pharmacoinvasive and primary percutaneous coronary intervention strategies in st-elevation myocardial infarction from the Mayo Clinic STEMI Network Am J Cardiol. 2016; 117: 1904-1910.
10. Danchin N, Coste P, Ferrières J, et al. Comparison of thrombolysis followed by broad use of percutaneous coronary intervention with primary percutaneous coronary intervention for ST-segment-elevation acute myocardial infarction Data from the french registry on acute ST-elevation myocardial infarction FAST-MI. Circulation. 2008; 118: 268-276.
11. Armstrong PW, Gershlick AH, Goldstein P, et al. Fibrinolysis or primary PCI in ST-segment elevation myocardial infarction. N Engl J Med. 2013; 368: 1379-1387.
12. Victor SM, Vijayakumar S, Alexander T, et al. Two-year follow-up data from the STEPP-AMI study: A prospective, observational, multicentre study comparing tenecteplase-facilitated PCI versus primary PCI in Indian patients with STEMI. Indian Heart J. 2016; 68: 169-173.
13. Alexander T, Mullasari AS, Kaifoszova Z, et al. Framework for a National STEMI Program Consensus document developed by STEMI INDIA, Cardiological Society of India and Association Physicians of India. Indian Heart J. 2015; 67: 497-502.
14. Alex AG, Lahiri A, Devika, et al. Observational study on pharmacoinvasive strategy and primary percutaneous coronary intervention in ST elevation myocardial infarction patients at a tertiary care center in India. J Postgrad Med. 2018; 64: 80-85.
15. Lemkes JS, Janssens GN, van der Hoeven NW, et al. Timing of revascularization in patients with transient ST-segment elevation myocardial infarction a randomized clinical trial. Eur Heart J. 2019; 40: 283-291.
16. Menon V, Ruzyllo W, Carvalho AC, et al. Infarct artery distribution and clinical outcomes in occluded artery trial subjects presenting with non-ST-segment elevation myocardial infarction from the long-term follow-up of Occluded Artery Trial [OAT]. Am J Cardiol. 2013; 111: 930-935.
17. Keeley EC, Boura JA, Grines CL. Primary angioplasty versus intravenous thrombolytic therapy for acute myocardial infarction: a quantitative review of 23 randomised trials. Lancet. 2003; 361: 13-20.