INTERNATIONAL RESEARCH JOURNAL OF PHARMACY
www.irjponline.com
ISSN 2230 – 8407

Research Article

IMPACT OF STREPTOKINASE AND TENECTEPLASE ON ELECTROCARDIOGRAM (ST-SEGMENT) AND TWO DIMENSIONAL-ECHOCARDIOGRAPHY (REGIONAL WALL MOTION ABNORMALITIES) IN ST ELEVATED MYOCARDIAL INFARCTION

Prashanthi Naini [1], Rashmitha Punzuri [1], Mamatha Reddy Chandupatla [2], Nagesh Adla [3]*
[1]Student, Vaagdevi College of Pharmacy, Hanmakonda, Warangal, Telangana, India
[2]Department of Cardiology, Kakatiya Medical College, Mahatma Gandhi Memorial Hospital, Warangal, Telangana, India
[3]Department of Clinical Pharmacy, Vaagdevi College of Pharmacy, Hanmakonda, Warangal, Telangana, India
*Corresponding Author Email: nagesh.adla@gmail.com

Article Received on: 11/12/18 Approved for publication: 19/01/19

DOI: 10.7897/2230-8407.100395

ABSTRACT

Background: One of the most striving problem among coronary artery disease is ST elevated myocardial infarction. It is the infarction in which entire wall of coronary artery gets occluded and is associated with ST segment elevation (>2mm in atleast 2 chest leads or >1mm in precordial leads or limb leads) on ECG. The impact of Streptokinase and Tenecteplase on ECG and 2D-echo in patients with ST elevated myocardial infarction and the effect of timing of thrombolytic therapy were compared. Material and methods: Patients presented with chest pain within 12 hours diagnosed with st elevated myocardial infarction and received thrombolytic therapy is included in our study. Results: 40 patients were recruited for our study. 20 patients were excluded because of their advice to higher centres due to their critical condition and not available for follow up. ST elevated myocardial infarction patients who were taking streptokinase 1.5 million units and tenecteplase 40 mg completed the study. Among 20 patients 13 (65%) patients treated with streptokinase and 7 (35%) patients treated with tenecteplase. After 30 days follow up 2D echo reveals regional wall motion abnormalities in 10 patients of Streptokinase group and 2 patients of Tenecteplase group. Regional wall motion abnormalities was absent in 3 patients of Streptokinase group and 5 patients of Tenecteplase group. Conclusion: From this study we demonstrate that tenecteplase was more efficacious than streptokinase in terms of ECG readings (ST resolution), 2D-echo. Patients who were presented within 6 hours have benefited more.

Keywords: Tenecteplase, Streptokinase, ST segment, regional wall motion abnormalities, time of presentation.

INTRODUCTION

ST elevation myocardial infarction is one of the challenging problems among the acute coronary syndromes**.** In a year about 3 million STEMI cases are predicted to occur in India. STEMI management protocols was first done in India in the year 2011. Cardiovascular disease is one of major cause of death in India which has been projected between 1990 and 2020 and it has been accounted approximately 21% of deaths in 2010, of which almost 10% of deaths are due to coronary artery disease. More over in our study it is estimated that NSTEMI is more than STEMI[1].

STEMI is a type of acute coronary syndrome with symptoms characteristic of chest pain, shortness of breath, sweating and associated with ST segment elevation in the ECG. It is defined universal definition of myocardial infarction as new ST segment elevation at J point of at least two of >2mm of chest leads or > 1mm in any other contiguous precordial leads or limb leads[2].

12 lead ECG is important diagnostic tool because it plays an important role in decision pathway for STEMI management. Serum cardiac biomarkers are obtained to differentiate unstable angina from NSTEMI and also to assess the extent of severity of STEMI[3]. Troponin elevation is more specific and sensitive than myoglobin and creatinine kinase in myocardial infarction[4]. Typical pattern of rise and fall of CKMB are seen only in MI. Elevated levels of CKMB is also seen in other conditions but this typical pattern of rise and fall cannot be demonstrated. CKMB is first elevated in first 3-12 hours after onset of chest pain, peaks in 24 hours and returns to baseline in 48-72 hours[5].

It is class I recommended by AHA enhance of trained echocardiogram technicians to investigate regional wall motion abnormalities. The goal is to identify patients with RWMAs likely representing a significant occult coronary artery occlusion which is not evident by symptoms, ecg or initial cardiac biomarkers[6]. Apart of STEMI, ST segment elevation is also seen in other conditions like ventricular aneurysm, pericarditis, benign early repolarisation, hypothermia, hyperkalemia, hypercalcemia, LBBB and RBBB with associated repolarisation but with different patterns so carefully diagnosis should be made[7]. The treatment for STEMI includes revascularization and medical therapy.

Reperfusion strategies include pharmacologic reperfusion which is done by fibrinolytic therapy and mechanical reperfusion which is done by primary percutaneous coronary intervention. Fibrinolytic therapy remains viable option for reperfusion therapy due to limited availability of primary PCI. The most commonly used fibrinolytic agents are streptokinase, tenecteplase, reteplase, alteplase. Streptokinase is a single chain polypeptide derived from β-haemolytic streptococcus, it is antigenic in nature.

Most commonly prescribed dose of streptokinase is 1.5 million international units over 60minutes.Aspirin (325mg/day) should also be taken with streptokinase. High doses are necessary to neutralize the plasma levels of anti-streptococcal antibodies.

Alteplase is recombinant tissue plasminogen activator. It has short half life of 3-4 minutes. As a concomitant therapy intravenous heparin is recommended to maintain vessel patency and to prevent reocclusion. Reteplase is a recombinant plasminogen activator; it is less fibrin specific and has longer life (13-16 minutes) than alteplase. Tenecteplase is genetically engineered; multiple point mutant of recombinant plasminogen activator[8]. Fibrinolytic therapy remains too effective if it is instituted within 24 hours of symptom onset[9].

Recommended dose of alteplase is based upon bodyweight it should not exceed 100mg[10].

Most commonly prescribed doses of reteplase are 10units IV bolus over 2 minutes then 2nd dose is given after 1st dose[11].

Tenecteplase has longer half life. Commonly prescribed dose of tenecteplase is 30-50mg over 5sec based on weight[12].

All drugs work by common mechanism. Initiates activation of endogenous fibrinolytic system upon binding to plasminogen, thus producing the complex thus possesses activator properties and accelerates the further transformation of plasminogen into the proteolytic and fibrinolytic plasmin.The most common risks reported with thrombolytic drugs are bleeding, damage to blood vessel, kidney damage, and hemorrhagic stroke[13].

MATERIAL AND METHODS

It is a prospective observational study conducted in patients from cardiology department of Mahatma Gandhi memorial Hospital located at Warangal, Telangana state. Patients were explained about the study and informed consent forms were sought by explaining them in their local language. Institutional human ethics committee endorsement was obtained after submission of protocol and Institutional human ethics committee approval number is MGM/VCOP/PHARM D/V/13/2018. All parameters were expressed as MEAN±SD. Data analyses were performed by paired t-test using MS Excel 2007.

Inclusion criteria

Patients with Chest pain presenting within 6-12 hours, diagnosed with STEMI, treated with thrombolytics were included in the study.

Exclusion criteria

Patients with recent major trauma. Surgery or burns, history of pacemaker implantation. Patients with peptic ulcer disease, bleeding disorders and uncontrolled hypertension.

RESULTS

Mean change in ECG readings for streptokinase is 1.85±0.2.

Mean change in ECG readings for tenecteplase is 1.58±0.47. This is presented in figure 1.

Mean change in ECG readings who presented within 6 hours 1.64±0.28.

Mean change in ECG readings who presented within 6-12 hours 2±0.23. This is presented in figure 2.

ST-Segment elevation resolution was calculated as the initial sum of ST segment elevation minus the sum of ST segment elevation on the second ECG divided by initial sum of ST-segment elevation and expressed as percentage. This is presented in figure 3a and 3b.

Time of presentation	Complete resolution	Partial resolution	No resolution
Within 6 hours	5(36%)	7(50%)	2(14%)
6-12 hours	1(17%)	2(33%)	3(50%)

This is presented in figure 4a and 4b.

14 patients presented within 6 hours. In that 5 completely resolved,7 partially resolved and no resolution for 2 in ST elevation.

6 patients presented between 6-12 hours. In that 1 completely resolved, 2 partially resolved and no resolution for 3 in ST elevation.

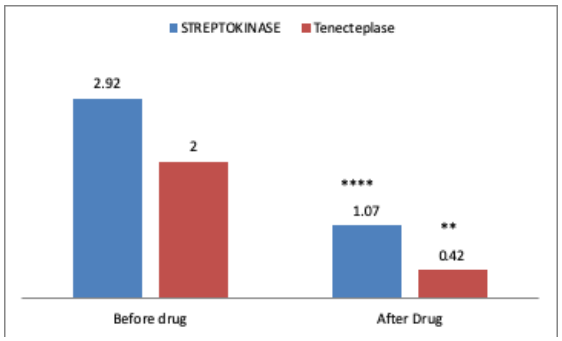

Figure 1: comparison of ECG readings between streptokinase and tenecteplase

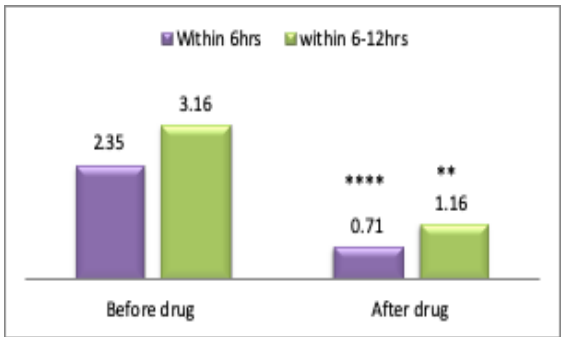

Figure 2: mean changes of ECG readings who presented within 6hrs and who came within 6-12 hours.

Figure 3a: ST segment resolution for STK group

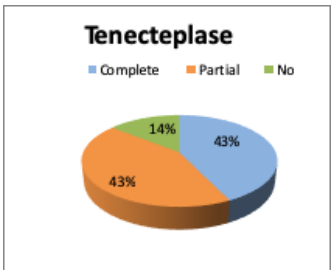

Figure 3b: ST segment resolution for TNK group

Figure 4a: ST segment resolution for patients presented within 6 hours

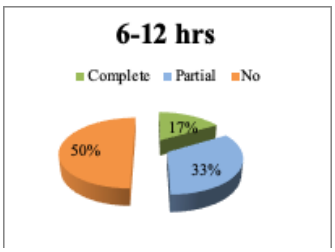

Figure 4b: ST segment resolution for patients presented between 6-12 hours

DISCUSSION

A part from the percutaneous intervention thrombolysis is well recognized and effective treatment for STEMI patients. The main goal of thrombolysis in STEMI is early and complete reperfusion[14].

In our study 13 (75%) patients were treated with streptokinase and 7 (25%) patients were treated with tenecteplase which was similar to the study conducted by Ehsan Khalilipur were 88(62%) were treated with streptokinase and 54(38%) with tenecteplase[15]. ST resolution in the 2 groups after thrombolytic therapy was 1.07mm in streptokinase group and 0.42mm in tenecteplase group (P value=0.06) which was complementary to study conducted by Amir Hossein Yazdi et.al.,[16]gave the result that ST resolution in 2 groups after thrombolytic therapy is 0.81mm in streptokinase group and 1.02 mm in tenecteplase group (P value=0.340).

In the study conducted by Adnan khan et.al. those who were thrombolysed within 12 hours (i.e.,59 patients), 43 (72.88%) had complete resolution of st elevation on ecg, 9 (15.25%) had partial resolution and 7(11.86%) failed to resolve. Those who received thrombolytic therapy after 12 hours (i.e., 24 patients), none of them had complete resolution, 12 (50%) had partial resolution and 12(50%) failed to resolve (P value=<0.001) which was contradictory to our study where we found that those thrombolysed within 6 hours (i.e., 14 patients), 5(36%) had complete resolution, 7(50&) had partial resolution. 2 (14%) failed to resolve. Those who were thrombolysed within 6-12 hours (i.e., 6 patients), 1 (17%) had complete resolution, 2 (33%) had partial resolution, 3 (50%) failed to resolve. In our study patients who received tenecteplase and streptokinase had 43% and 23% of complete resolution respectively which is similar to study where Pranas Serpytis et.al. [16] had showed that tenecteplase restores the blood flow better than streptokinase.

CONCLUSION

Our study demonstrates Tenecteplase was more efficacious than Streptokinase in terms of ECG readings (ST resolution) and 2D echo. The results of our study suggest that patients who receive thrombolysis within 6hrs of onset of chest pain benefited more than the patients who received thrombolysis within 6-12hrs.

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Cite this article as:

Prashanthi Naini *et al*. Impact of streptokinase and tenecteplase on electrocardiogram (ST-segment) and two dimensional-echocardiography (regional wall motion abnormalities) in ST elevated myocardial infarction. Int. Res. J. Pharm. 2019;10(3):154-157 http://dx.doi.org/10.7897/2230-8407.100395

Source of support: Nil, Conflict of interest: None Declared