CORONARY ANGIOGRAPHIC PROFILE IN PATIENTS WITH FAILED THROMBOLYSIS –CASE CONTROL STUDY

Dr. Ravi Shankar.V [1] , Dr. K.A. Sharath Chandra [2]

1, Associate Professor, Department of Emergency Medicine, Sree Mookambika Institute of Medical Sciences Kanyakumari, Tamil Nadu, India.

2.Junior Resident, Department of Emergency Medicine Sree Mookambika Institute of Medical Sciences College Kanyakumari, Tamil Nadu, India.

Corresponding Author: Dr. K.A. Sharath Chandra ,Junior Resident, Department of EmergencyMedicine Sree Mookambika Institute of Medical Sciences College Kanyakumari, Tamil Nadu, India.

ABSTRACT :

Background: Acute myocardial infarction one of the common cause death and diseases disability through out the world. india, thromboysis remains the main mode of treatment as compared to PTCA. The prognosis of patients with poor response to failed thrombolysis or percutaneous coronary intervention is poor.

Methods: This study was conducted in Sree mookambika institute of medical sciences hospital in the Department of emergency during the year 2023-2024. About 59 patients with acute myocardial infarction who presented to the red zone, who were thrombolysed where included in the study Sample size total case of 59 patients

Results: Among the total patient in the successful lysis group the comparison was made whether successful thrombolysis is more common in LAD , RCA, LCX. 26 patients in the LAD group patients only 15.4% had successful thrombolysis. In failed thrombolysis of the left coronary artery was more common and seen in 78.6% of patients . In this study population of 59 patients, based on electrocardiography patients where divided in to successful group and the failure of thrombolysis group .52.5% of patients had successful thrombolysis group and only 47.5% had failure to thrombolysis.the percentage of patients who had failed thrombolysis where more common in anterior wall myocardial infarction than in inferior wall myocardial infarction which was stastically significant. Patients who had inferior wall myocardial infarction were more like to have successful thrombolysis based on electrocardiography than patients with failed thrombolysis

Conclusion: The prevalence of no reflow phenomenon in the failed thrombolysis patient in this study was 5% .29% of patients with persistant STelevation where symptom free after thrombolysis.

Keywords: Thrombolysis,Percutaneous coronary angiography.

INTRODUCTION:

Acute myocardial infarction one of the common cause death and diseases disability through out the world. Despite considerable advances in the management of infarction there is a considerable space for the improvement of the outcome of the patients mainly patients of elderly, women, patients with low education and low socioeconomic status.

The main treatment protocol in the past for infarction was thrombolysis with fibrin non specific agents , subsequently with more fibrin specific agents the patency rate of the infarct artery was better
;compared to the fibrin nonspecific agent . The patency rate and the TIMI flow after thrombolysis was based the on the agent used, whether it was a fibrin specific or non specific agent. Several factors predicted the response to thrombolytic . Throughout the world 30-70% of patients with myocardial infarction , still receive thrombolysis as the initial strategy. Failure of thrombolysis in Indian scenario was seen in 30-40% of patients.(3)

The present treatment guidelines for myocardial infarction was primary percutaneous intervention. Primary percutaneous intervention is preferred especially if done by an operator who has done > 75 pci procedures / year and team with atleast 200 pci / year including at least 36 primary pci procedure / yr. The patency rate and grade of TIMI flow was better with primary percutaneous intervention, when compared to that of the thrombolytic used. Patent artery has a better prognosis than patients with occluded vessel.(5-8)

Though primary percutaneous intervention is the first line of treatment in patients with acute myocardial infarction , it is not routinely practiced due to various factors like delay in presentation of the patients, nonavailability of the cath lab, the cost factor involved in it . so still thrombolysis remains the most common practiced treatment in patients with acute myocardial infarction. Even with the recently available thrombolytic treatment drugs the patency of the thecoronary artery was 60% (9). about one third of patients develop spontaneous recanalization of the occluded infart related artery beginning at 12-24 hrs . decrease in mortaliy is more, by the shorter time taken to reperfuse the myocardium. Time delay is more important in thrombolysis than in percutaneous intervention, because the fibronolytic is less effective as the coronary thrombi mature. Similarly every 30 minute delay in the symptom onset to percutaneous intervention increases the relative risk of 1 yrmotality by 8%. Fibrinolysis has been shown to improve both short term and long term survival.(10,11)

This study was analysis of various demographic factors associated with failed thrombolysis. The coronary angiographic profile of patients with failed thrombolysis that is the lesion characteristics , in the coronary artery. The prevalence of no reflow phenomenon in patients with thrombolysis. Is there is any variation in the response to the thrombolysis to different coronary artery lesion.

The ultimate goal of reperfusion in acute myocardial infarction is tissue perfusion, whether is due to primary coronary intervention or due to fibrinolytic therapy. This study also assess the critical lesion characterictic and stenosis in coronary artery in patients with acute myocardial infarction . In india, thromboysis remains the main mode of treatment as compared to PTCA. The prognosis of patients with poor response to failed thrombolysis or percutaneous coronary intervention is poor.

AIM AND OBJECTIVES OF THE STUDY:

- To assess the demographic profile of patients with successful and failed thrombolysis .
- To access the angiographic lesion characteristic in patients with failed thrombolysis , in comparision with patients with successful thrombolysis.
- To assess any predilection of an infarct artery for successful or failed thrombolysis.
- To access the prevalence of no reflow phenomenon in patients with successful thrombolysis.

MATERIALS AND METHODS:

This study was conducted in Sree mookambika institute of medical sciences hospital in the Department of emergency during the year 2023-2024. About 59 patients with acute myocardial infarction who presented to the red zone, who were thrombolysed where included in the study Sample size total case of 59 patients.

Institutional ethics committee clearance was obtained to conduct this study in our hospital .all patients provides written informed consent in the language known to participiate in the study. Exclusion criteria are Patient with contraindication for thrombolysis,Patient with evolved myocardial infarction,Patient with history of old myocardial infarction,Patient with associated left bundle branch block with myocardial infarction,Patient who are dying with 60 minutes of streptokinase theraphy, Patients with acute myocardial infarction with chronic kidney diseases who cant undergo coronary angiogram

Patients who were admitted in who had meet the criteria for acute myocardial infarction where included in the study. Patients who had electrocardiographic evidence of acute myocardial infarction. Patients classified in to successful thrombolysis if there was a more 50% ST segment resolution in the lead with maximum ST elevation from at the time of presentation to 60 minutes after thrombolysis compared to electrocardiogram taken, with resolution of the chest pain. Failure of thrombolysis patients where grouped as those patients who ST segment failed to show greater than 50% resolution of ST segment in the lead with the maximum ST elevation at the time of presentation with that compared to the electrocardiogram taken 60 minutes after the onset of the thrombolysis. Patient where also included in the failed thrombolysis if the patient continued to have persitant chest pain.

Statistical analysis was done using the statistical package for social sciences (SPSS).Different statistical methods were used as appropriate. Mean ± SD was determined for quantitative data and frequency for categorical variables. The independent t- test was performed on all continuous variables. The normal distribution data was checked before any t-test. The Chi-Square test was used to analyze group difference for categorical variables.A p- value < 0.05 was considered significant.

RESULTS:

All patients in the study group was analysed statically in the study. The study group was divided in to two groups as those patients with successful and failed thrombolysis. The total number of patients selected in the study was 59 patients .the selection of the patients was based on inclusion and exclusion criteria. All patients in the study underwent thrombolysis with streptokinase of the total number 59 patients in the study group, 31 patients belonged to successful thrombolysis group and 28 patients belonged to the failed thrombolysis group. All patients in the study group were categorised based on the age, sex, the region of myocardial infarction, time to lysis, presence of diabetes mellitus, hypertension, whether patient had risk factor like smoking, alcoholism, hyperchlolestremia, ejection fraction by echocardiography. Angiographically the variables included in the study where, number of coronary artery involved, the percentage of stenosis in the artery, the lesion characterescitic of the coronary artery, whether it is a type A, B, C lesion. All patients in the study underwent coronary angiogram within a week of admission in to hospital for acute myocardial infarction.

In the 59 patients included in the study 53 % of patients where in the successful thrombolysis group and 47 % of patients where in included in the failed thrombolysis group. Patients presenting with myocardial infarction was more common in the age group between 40- 60 yrs of age. There was no significant difference in the age wise variable of presentation between the failed thrombolysis and the successful thrombolysis group with the p value of (0.535). which was not statistically significant.

	Successful thrombolysis	Failed thrombolysis	
Age in yrs<4o	71.4%	28.6%	
Age in yrs 40-60	64.5%	51.2%	P value <0.535
Age > 60 yrs	54.5%	45.5%	

Among the total 59 patients , 58 patients where male and only one female was present in the study after analysing the data, this female patient was in successful thrombolysis group. Sex variable comparision between the successful thrombolysis and the failed thrombolysis was not statically significant with a p value of (0.338).

	Successful lysis	Failed lysis	

Male	51.7%(30)	48.3%(28)	P value <0.338
female	100%(1)	0%(0)	

With a total of 59 patients, 40 patients had an anterior wall myocardial infarction, with the remaining 19 patients had acute inferior wall myocardial infarction. In the patients within the anterior wall myocardial infarction, about 42.5% patients had successful thrombolysis and, 57.5% patients had failed thrombolysis in the anterior wall myocardial infarction group. patients with anterior myocardial infarction had more thrombolysis failure than patients with inferior wall myocardial infarction which was statically significant with a p value of 0.025. among the patients with inferior wall myocardial infarction. patients who had inferior wall myocardial infarction where 19 patients, among the patients 15 patients had successful thrombolysis, while 4 patients had failed thrombolysis. In patient with inferior wall myocardial infarction , 75% of patients had successful thrombolysis, while 25 % of patients had failed thrombolysis, which was statically significant with a p value of <0.013. comparing the significance of p value, patient with inferior wall myocardial infarction where more significantly associated with successful thrombolysis than patient who had anterior wall myocardial infarction.(p<.013 vs p<.025).

	Successful thrombolysis	Failed thrombolysis	
AWMI	42.5%(17)	57.5%(23)	P value <0.025
IWMI	73.7%(14)	26.3%(5)	

	SUCCESSFUL	FAILED	
IWMI	75%(15)	25%(5)	P value <0.013
AWMI	41.0%(16)	59%(23)	

The time taken for lysis of patient on arrival to coronary care unit, was divided in to three sub division, like patient who arrived < 3hr of onset of chest pain , and those between 3-12 hrs , > 12hrs. in the total of 20 patients who arrived to hospital within < 3 hrs of chest pain 85% of patients had a successful thrombolysis while only the remaining 15% of patients had a failed thrombolysis patient who presented after 3 hrs of symptom onset where more commonly seen with failed thrombolysis . in the group of patients who presented >12 hrs after onset of chest pain ;of the 5 patients, nearly 80% of patients had a failed thrombolysis than successful thrombolysis. Those patients who presented between 3-12hrs

after onset of chest pain nearly 61% of the patient had a failed thrombolysis as compared to the patients with 39% of patients with successful thrombolysis. Patient who had time to thrombolysis of less than 3 hrs had a statically significant p value of
< .001.

TIME TO THROMBOLYSIS	SUCCESSFUL	FAILED	
<3hrs	85%(17)	15%(3)	
3-12 hrs	38.2%(13)	61.8%(21)	P value <0.001
>12 hrs	20%(1)	80%(4)	

Relief of chestpain, after 2 hrs of thrombolysis was studied in all patients included in the study. Of the total patients 36 patients had relief of chest pain within 2hrs after the thrombolysis, 77.8% of patients in the successful group had relief of chest pain within 2 hrs of thrombolysis, but only 22.2% of patients in the failed thrombolysis group had resolution of chest pain less than 2 hrs after thrombolysis. This difference in the relief of chest pain was statistically significant in the successful with a p value of (ooo). Of all the patients included in the study 19 patients had a history of diabetes mellitus, of these patients about 73.7% of patients had a failed thrombolysis as compared to the patient in the successful group of 26.3% of the study population in diabetes mellitus. Failure of thrombolysis in diabeteic population as compared to the non diabetic population was statically significant with a p value of (.005). the significance diabetes mellitus as a risk factor for failed thrombolysis is more than that of hypertension.

	Successful	Failed	
Diabetes	26.3%(5)	73.7%(14)	P value <0.005
No diabetes	65%(26)	35%(14)	

Similarly patient who had a hypertension , where analysed in both the groups , patient who had systemic hypertension in all patients was 15 patients of the 15 patients 73.3% of patients had failed thrombolysis and 26.7% had successful thrombolysis , with a pvalue of (<.020).

EJECTION FRACTION	SUCCESSFUL	FAILED	

>55%	91.7%(11)	8.3%(1)	
45-54%	57.7%(15)	42.3%(11)	P value <0.002
35-44%	25%(5)	75%(15)	
<35%	0%(0)	100%(1)	

Patients in the study population where divided in to single vessel , double vessel and triple vessel disesases depending on the number of coronary artery involved. The stenosis was considered significant if the diameter stenosis was greater than 50% in the study population group 20 patients had a single vessel disease, of these 20 patients 70% of them had failed thrombolysis and 30% had a successful thrombolysis patient in the successful group only 19 % percent had a single vessel diseases, while patient in the failed lysis group about 50% had a single vessel diseases. This data was statically significant with a p value of (<.013).

The study had 7 patient with double vessel diseases of which 85.7% had failed thrombolysis and 14.3% had a successful thrombolysis. In the patient group of successful thrombolysis only 3.2% had double vessel diseases, whereas the failed lysis group had 21.4% of double vessel diseases, which was statistically significant. All patient in the data with triple vessel disease belonged to the failed lysis group, none of the patients in the successful group had a triple vessel diseases. 17.9% of patient in the failed thrombolysis group had triple vessel diseases.The statistically data was later interpreted as patient with multivessel diseases, as those with single vessel diseases. Total of 20 patients had single vessel diseases of which 30% where in the successful thrombolysis group and 70% in the failed thrombolysis group. Patient who had multivessel diseases include about 10 patients of which 90% where in the failed thrombolysis group and 10% in the successful thrombolysis group.

	successful	failed	
SINGLE VESSEL DISEASES	30%(6)	70%(14)	P value 0<.000
MULTIVESSEL DISEASES	10%(1)	90%(9)	

Hypercholestroemia is a risk factor for coronary artery diseases, mean total cholesterol in patients with successful thromboysis was 144.58 and that of patients with failed thrombolysis was 177.68 which was statically significant.TIMI flow grading in the each coronary artery was compared in both successful and failed thrombolysis group with variables as TIMI 3 flow and those with TIMI <3 flow . in the study population of assessment of TIMI flow in the LAD territory, total of 27 patients had a TIMI 3 flow in the coronary artery with 85.2% in the successful thrombolysis

group as compared to the failure of thrombolysis which had about 14.3% patients. Patient who had less than 3 TIMI flow where a total of 32 patients and it was more common in patients with failed thrombolysis in about 75% of patient, and in the successful thrombolysis group it was seen in 25 of patient. In the successful group only 25.8% had TIMI flow < 3 as compared to the patient with failed thrombolysis who had 85.7% which was statically significant with a p value of >.000. Similarly the TIMI flow in the right coronary artery was assessed and patient who had a TIMI flow of 3 in the right coronary artery was 43 patients ,with 62.8% in the patients with successful lysis and 37.2% in the failed lysis group. Among the patient in the successful thrombolysis group 62.8%had TIMI 3 flow while only 37.2% in the failed lysis had a TIMI 3 flow with a p value of <.010. similarly patient with successful lysis had 58% TIMI 3 flow, as compared to the patient group of failed lysis which had 42% TIMI 3 flow, which was statistically significant with a p value of <.048. TIMI 3 Flow after
successful thrombolysis was stastically more significant in left anterior descending artery than in the right coronary artery.
Percentage stenosis

The study population was divided in to patients with significant coronary artery diseases and patients without significant coronary artery diseases (>50%) of the total no of patients about 26 patients had normal coronary artery. The remaining 33 patients about 14 patients had a stenosis of < 50 percentage stenosis and 19 patients had a percentage stenosis of > 50% stenosis. In the patients with less than 50% stenosis about 48.4% of patients belonged to the successful thrombolysis group , as compared to 42.3% patients in the failed thrombolysis group.

In the group with > 50% stenosis nearly 89.5% of patients had failed thrombolysis as compared to 10.5% had successful thrombolysis
.which was stastically significant with a p value of 0.000.

Type A lesion	successful	failed	
Yes	30%(3)	70%(7)	P value,0.117
no	57.1%(28)	42.9%(21)	

Patient who had type B lesion where 25 patients out of the 59 patients , 76% of type B lesion where found in the failed lysis group and 24% of type B lesion where found in the successful lysis group. In the successful thrombolysis patients type Bleion are seen in 19.4% and in 67.9% in the failed thrombolysis group which was statistically significant. With a p value of <.000.

TYPE C	SUCCESSFUL	FAILED	
YES	0%(0)	100%(6)	P value of <0.007

NO	58.5%(31)	41.5%(22)	

Among the total patient in the successful lysis group the comparison was made whether successful thrombolysis is more common in LAD , RCA, LCX. 26 patients in the LAD group patients only 15.4% had successful thrombolysis. In failed thrombolysis of the left coronary artery was more common and seen in 78.6% of patients .

DISCUSSION:

In this study population of 59 patients, based on electrocardiography patients where divided in to successful group and the failure of thrombolysis group .52.5% of patients had successful thrombolysis group and only 47.5% had failure to thrombolysis.the percentage of patients who had failed thrombolysis where more common in anterior wall myocardial infarction than in inferior wall myocardial infarction which was stastically significant. Patients who had inferior wall myocardial infarction were more like to have successful thrombolysis based on electrocardiography than patients with failed thrombolysis.

The incidence of failed thrombolysis varies between different studies, but roughly it ranges from 25-45 percentage.Katyal et al in his analysis showed the patients who showed failed, thrombolysis where about 34 percentage. (3) Our study showed a incidence of 47% for failed thrombolysis. Subindraetal in his statically data on patients with failed lysis showed that 40% had failed thrombolysis. (9)

The study conducted by Richardson SGetal showed about 44% incidence of failed thrombolysis.(10) The variation in the incidence between the studies was probably due to baseline rule involved in the diagnosis of failed thrombolysis, the thrombolytic drug used.

Sutton etal analysed the patient with failed thrombolysis was present in 40 percentage of patients in his study.

Diabetes patients in this study had more number of failed thrombolysis, than patients with successful thorombolysis. In our study,
73.7 percentage of the diabetic population had failed thrombolysis while only 26 percentage in the successful thrombolysis where diabetic which was statsically significant. In the study done by sudhindrarao
20 percentage of diabetic population had failed thrombolysis as compared to the patients with successful thrombolysis only 13 percentage had diabetes mellitus. Though this was not statically significant in his study.(10)

Samir M. Rafla, et al., in his studied of patients in comparison of diabetic vsnondiabetic, patient with in the diabetic group was seen in 18% of patients and patients in the non diabetic group about 62.5% showed significant resolution of the ST segment, which was stastically significant.(11).

In the GISSI -2 trial , death rate within the hospital in patients with diabetes mellitus was modest and ther e was no difference between the type 1 and type 2 diabetic patientsdiabetes (8.7 percentage and 10.1 percentage respectively, vs. 5.8 percentage in nondiabetic patients) . In female deadth rate is more in females with type 1 diabetes mellitus and slight modest in patients with type 2 diabetes mellitus (24.0 percentage and 15. percentage, respectively, vs. 13.9 percentage for nondiabetic patients).

The increase in in-hospital mortality of diabetic patients was moderate and similar for men with insulin- and noninsulin-dependent; in women, mortality was markedly higher for insulin-dependent and only slightly higher for noninsulin-dependent diabetic patients.

Hypertension another common association in heart disesases, subindrawdetal in his study showed that 20 percentage of patients in the failed thrombolysis group had hypertension , but only 16 percentage in the successful group which was not stastically significant (8). In this study about eleven patients in the failed lysis group had hypertension which constitutes to about 39.3% in the failed lysis group as compared with the successful group which has only 12.9% of patients .

Lee et al in his study showed, in his study population about 37 percentage of patients had hypertension, in which nearly 66 percentage of patients in had failure of thrombolysis. The hypothesis for decrease success rate in these patients is due to the endothelial abnormality associated in these patients.(8)

Time to thrombolysis , also contribute to thrombolysis failure.Lee Y Y et al patients who were thrombolysed after 6 hrs after onset of chest pain, 70% percentage patients had failure to thrombolytics. also stated that for each 60 sec delay in the thrombolysis time form symptom onset, the failure to thrombolysis was more by 10 percentage.(36)

The GISSI -2 trial showed that patient who presented to the hospital less than 6 hrs of onset of chest pain had a better prognosis than patient who presented late to the emergency . subindraetal in his study showed time for door to needle time was more(5.85±2.47 hrs) in failed thrombolysis patients while it was only (4.55±2.4 hrs).in the successful group.

In our study 85% of patients who presented to the coronary care unit less than 3 hrs after onset of symptoms had successful thrombolysis, but only 20 percentage of patients who presented to ccu after 12hrs of chest pain had a successful thrombolysis which was stastically significant.

Angiographic data of GUSTO 1 showed a higher TIMI flow in the patients who were smokers as compared to that of the non smokers(41% vs. 33%, p 5 0.02).in the TEAM -, study population patients who were smokers had a better possibility of TIMI 3 flow, which not related to infarcted artery. The pausible mechanism is due to increased thrombus in smokers, while the non smokers have more possibility of atherosclerotic diseases. In our study more number of patients where smokers in the

successful thormobolysis group as compared to the failed lysis group however it was not stastically significant in our study.

Studies comparing the significance of thrombolysis have compared in various studies. The gusto study had decrease in the deadth rate in patient with anterior myocardial infraction.

Lee et al, in his study showed that anterior wall myocardial infarction was associated with less successful thrombolysis.(36) In our study also patient with inferior wall myocardial infarction had better resolution of the ST segment than patient with anterior wall myocardial infarction.

TIMI flow of grade 3 there is important for successful thrombolysis sutttonetal in his showed that patient had mortality benefit only if they achieved a TIMI 3 flow , there was no significant decrease in the deadth rate in patients who had TIMI 2 OR 1 flow in the coronary artery.

Gusto trial, suggested that the successful lysis of the patients is based on the TIMI flow after thrombolysis.(4)

CONCLUSION:

In the study population the prevalance of successful thrombolysis was 53% and the prevalence of failed thrombolysis was 47%.Failed thrombolysis was more common in patients who had diabetes and hypertension as risk factor

Though smokers and alcoholic where more common in the successful group, it was not statistically significant for contributing to failed thrombolysis type B coronary lesion angiographically was more common in failed lysis group.

The prevalence of no reflow phenomenon in the failed thrombolysis patient in this study was 5% .29% of patients with persistant STelevation where symptom free after thrombolysis.

BIBLIOGRAPHY

1. Elliot MA, Eugene Braunwald: ST-Elevation MI in Libby P, Bonow RO, Zipes DP, Mann DL. BRAUNWALD`S Heart Disease. 8thed. Philadelphia: Elsevier; 2008:1207-1300.
2. Mark A de Belder. Acute myocardial infarction: failed thrombolysis. Heart.2001; 85; 104 - 112.
3. Katyal VK, Siwach SB, Jagadish, Sharma P, Batra M. Failed thrombolysis and its impact after acute MI,Assocphysisciansindia. 2002;51:1149-50.
4. The GUSTO Angiographic Investigators. The effects of tissue plasminogen activator, streptokinase, or both on coronary artery patency, ventricular function, and survival after acute myocardial infarction. N Engl J Med 1993;329:1615-22. [Erratum, N Engl J Med 1994;330:516.]
5. Puma JA, Sketch MH Jr, Thompson TD, et al. Support for the open-artery hypothesis in survivors of acute myocardial infarction: analysis of 11,228 patients treated with thrombolytic therapy. Am J Cardiol 1999;83:482-7.

6. Fath-Ordoubadi F, Huehns TY, Al-Mohammad A, Beatt KJ. Significance of the Thrombolysis in Myocardial Infarction scoring system in assessing infarct related artery reperfusion and mortality rates after acute myocardial infarction. Am Heart J 1997;134:62-8.
7. French JK, Hyde TA, Patel H, et al. Survival 12 years after randomization to streptokinase: the influence of thrombolysis in myocardial infarction flow at three to four weeks. J Am CollCardiol 1999 34:62-9.
8. Cannon CP, Gibson CM, McCabe CH, et al. TNK-tissue plasminogen activator compared with front-loaded alteplase in acute myocardial infarction: results of the TIMI 10B trial. Circulation 1998;98:2805-14.
9. Thrombolytic failure with streptokinase in acute myocardial infarction using electrocardiogram criteria,Lee Y Y, Tee M H, Zurkurnai Y, Than W, Sapawi M, Suhairi I.
10. TIMI perfusion grade 3 but not grade 2 results in improved outcome after thrombolysis for myocardial infarction. Ventriculographic, enzymatic, and electrocardiographic evidence from the TEAM-3 Study.J L Anderson, L A Karagounis, L C Becker, S G Sorensen, R L Menlove.
11. Predictors of failed thrombolysis in acute myocardial infarction sudhindrarao m*1, patilbs.
12. Richardson SG, MortanP, Murtagh JG, Scott ME, Barry BO. Relation of coronary artery patency and LV function to ECG changes after streptokinase treatment during acute MI. Am J Cardiol.1988; 61:961-5.
13. Journal of the Medical Research Institute JMRI, 2007; Vol. 28 No.3: (226- 34)Samir M. Rafla, Said M. Kandil, Fatma A. Abou- Elenen, Abd El-Aziz A. El-kak and Amany M. Sedik.
14. GISSI- 2 : In hospital mortality and clinical course of 20891 patients with suspected Acute MI randomized between alteplase and streptokinase with or without heparin. Lancet.1990; 336: 71-75.