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Comparison of Culprit Artery Patency Between Diabetic and Non-Diabetic Patients Undergoing Thrombolysis with Streptokinase for ST Elevation Myocardial Infarction

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ABSTRACT

Introduction

Myocardial Infraction is the leading cause of mortality and mortality globally. Thrombolysis with streptokinase is well established therapeutic intervention in Myocardial Infraction. Timely intervention with adequate myocardial reperfusion is associated with better clinical outcome whereas failed reperfusion due to incomplete or non-reopening of culprit artery is associated with complications. This study aims to compare diabetic and non-diabetic patients with acute myocardial infraction in term is culprit artery patency.

Methods

This analytical cross-sectional study was carried out in Cardiology Department, Collage of Medical Sciences, Bharatpur from 1st June 2023 to 30th October 2023. Total 80 patients with acute Myocardial Infarction were enrolled in the study. Blood sugar level and twelve leads ECG of each patients were recorded before giving intravenous 1.5 million units of streptokinase over one hour for acute ST elevation myocardial infarction. Coronary angiogram was done after 24 hours of thrombolysis. Patency of the culprit artery was assessed in each patients and compared between diabetics and non-diabetics.

Results

The study included 57.5 % (n=46) male and 42.5 % (n=34) female patients. Mean random blood sugar level was 160.87 ±40.8 mg/dl. Mean age of the study population was 52.9 ±10.8 years. 40 % (n= 32) of patients were diabetics. The percentage of culprit artery patency was lower in diabetic patients as compared to non-diabetic patients (43.75 % vs 75%).

Conclusions

Among both male and female patients the success of thrombolysis in term of culprit artery patency was higher in non-diabetic patients as compared to diabetic patients.

Keywords: ST elevation myocardial infarction; diabetes; streptokinase; culprit artery patency.

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INTRODUCTION

Acute myocardial infarction represents a medical emergency worldwide.[1] Thrombolysis and Primary PCI being two standard modes of treatment in acute ST elevation myocardial infarction, streptokinase is still being used for around 500,000 patients per year and proven effective when used within six hours of onset of symptoms.[2,3] However it has been proven less effective among diabetic as compared to non-diabetic patients.[4-6] Post streptokinase reperfusion failure on the basis of non-resolution of ST segment elevation in acute myocardial infarction is also seen more commonly seen in diabetics.[7-9] Failure of achieving adequate myocardial reperfusion following therapeutic intervention in ST elevation myocardial infarction patients is associated with increased incidence of congestive cardiac failure, recurrent myocardial ischemia, arrhythmia and sudden cardiac death and even more common in diabetics.[10,11] Diabetes and elevated blood glucose level at admission has been demonstrated as an independent predictor of impaired micro-vascular flow and epicardial flow among patients undergoing primary percutaneous coronary intervention(PCI) and no reflow phenomenon is seen even after thrombolysis in diabetics.[12-14] This study was therefore conducted to see the comparison of thrombolytic success in patients undergoing reperfusion therapy with streptokinase for ST elevation myocardial infarction, in terms of culprit artery patency in diabetics versus the non-diabetics.

METHODS

This analytical cross-sectional study was carried out in Cardiology Department, Collage of Medical Sciences, Bharatpur from 1st June 2023 to 30th October 2023. Total 80 patients with acute ST elevation myocardial infarction were selected on using non-probability purposive sampling technique. Both males and females between the ages of 20-60 years presenting with acute myocardial infraction were selected. Patients with active bleeding status, recent surgeries within past 3 months, previous history of myocardial infarction or documented ischemic heart disease, those presenting later than 6 hours of chest pain and those not willing for coronary angiography were excluded from the study. Blood sugar level was checked at admission. 12 leads ECG was done at emergency. Streptokinase was given intravenous over one hour under hemodynamic monitoring. Coronary angiogram was done after 24 hours to check patency of the culprit artery. Patent culprit artery was defined as the establishment of blood flow in the coronary artery involved in myocardial infraction. Data was entered and analyzed using SPSS version 17.0. Numerical variable i.e. age was described as mean ± SD (standard deviation). Qualitative variables like gender and patency of culprit artery were described in the form of frequency and percentages. The frequency of culprit artery patency was compared between diabetic and non-diabetic patient.

RESULTS

The study included 57.5 % (n=46) male and 42.5 % (n=34) female patients. Mean random blood suger level was 160.87 ±40.8 mg/dl. Mean age of the study population was 52.9 ±10.8 years. 25%(n=20) of patients were under 40 years of age and 75%(n=60) of patients were over 40 years of age (Table 1).

Table 1. Age of the patients. (n=80)

Age	Frequency (%)
< 40 years	20 (25%)
> 40 years	60 (75%)
Mean = 52.9 ±10.8 years	

40 % (n= 32) of patients were diabetics and 60 % (n=48) of patients were non-diabetic. Culprit arteries causing acute myocardial infarction was left anterior descending (LAD) in 49% cases, right coronary artery (RCA) in 27% cases

and left circumflex artery in 24% of cases. The percentage of culprit artery patency was lower in diabetic patients as compared to non-diabetic patients (43.75 % vs 75%) (Table 2).

Table 2. Patency rate of culprit artery in diabetic and non-diabetic. (n=80)

Patency	Diabetes Mellitus	
	Yes	No
Yes	14(43.75)	36(75)
No	18(56.25)	12(25)

The result was further stratified based on age and gender. In less than 40 years age group, the culprit artery patency was 62.5% among diabetics and 83.3% among non-diabetics. In more than 40 years age group, the culprit artery patency was 37.5% among diabetic and 61.1% among non-diabetics. So in the younger patients below 40 years of age the patency rate of culprit artery following thrombolysis was found to be better in both diabetic and non-diabetic patients as compared to older patients. In males, culprit artery patency was found in 47.3% of diabetics and 74 % of non-diabetic subjects. In females, culprit artery patency was recorded in 38.5% of diabetic patients and 71.43% of non-diabetic subjects (Table 3).

DISCUSSION

Management of STEMI requires the rapid reperfusion of the culprit artery such that the myocardium under hypoxic stress is reperfused. Despite advances in revascularization strategies, and to reduce the ischaemic adverse outcomes, medical revascularization with fibrinolytic agents remains a necessary modality. Although most effective reduction of mortality in golden first hour of the event, the thrombolysis shows similar results when done in three hours of event.[15, 16] A major contributor, diabetes is not only a risk to the development of, but also to outcome of coronary artery disease.[17] Studies show significant effects on the efficacy of diabetes in patient administered streptokinase when they present with acute ST elevation myocardial infarction.[18] A statistically indifferent post thrombolysis coronary artery patency of 40.3% vs 37.6% in diabetic vs non diabetic was respectively shown in 1996 by Woodfield et.al.[19] In contrast to this current study showed a significant difference in patency of 47.3% vs 74% in diabetics and non-diabetics respectively. In TIMI trials a similar but early approach of angiography after 90 minutes following the thrombolysis was studied which showed 8.9% of the patients had an infarct-related artery luminal diameter stenosis

Table 3. Stratification with respect to age and gender. (n = 80)

Variables	Patency	Diabetes Mellitus		Chi-square	P-value
		Yes	No		
Age					
<40	Yes	5(62.5)	10(83.3)	1.137	0.286
	No	3(37.5)	2(16.7)		
>40	Yes	9(37.5)	22(61.1)	13.99	<0.001
	No	15(62.5)	14(38.8)		
Gender					
Male	Yes	9(47.30)	20(74)	7.83	0.286
	No	10(52.6)	7(26)		
Female	Yes	5(38.50)	15(71.1)	6.69	0.01
	No	8(61.5)	6(28.57)		

of <50% or a persistent 91% patient showing significant stenosis.[20] They further attributed the early angiographic assessment as a reason for such findings,[20] which might be the reason for the finding of significant reduction in stenosis in our study. In further analysis in our study the demographic determinant of age showed the culprit artery patency was 62.5% among diabetics and 83.3% among non-diabetics in less than 40 years patients. Similarly, the culprit artery patency was 37.5% among diabetic and 61.1% among non-diabetics in more than 40yrs old patients. This result was also seen in the study in TIMI trials where 87% of non-diabetics had >50% patency after thrombolysis who had the mean age of 58.6 ± 11 whereas higher age group 59.1 ± 11 had arterial occlusion even after the thrombolysis.[20] No difference in between gender in the infarct related artery patency was shown in a study by Woodfield et. al. where 69% versus 66.5% of differences were seen in women vs men with p-value of 0.46.[21] In contrast current study showed culprit artery patency of 47.3% of diabetic males and 74 % non-diabetic males. Whereas, in females, culprit artery patency was recorded in 38.5% of diabetic and 71.43% of non-diabetic.

On the basis of the results showing that the diabetic patient bearing lower patency 24 hours following the thrombolysis as shown by angiographic reports emphasize the importance of both gluco-centric and multi-risk approach for the management of diabetes including endothelial dysfunction and dyslipidemia associated with diabetes.

CONCLUSIONS

This study shows that thrombolysis with streptokinase was efficacious in maintaining the patency in the culprit artery in patients presenting with acute ST elevation myocardial infarction and was significantly more efficacious in non-diabetics as compare to diabetic patients. Furthermore, the lower age group and non-diabetic patient of both gender showed the better culprit artery patency as compared with diabetics.

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Conflict of Interest: None

REFERENCES

1. Members WG, Lloyd-Jones D, Adams R, Carnethon M, De Simone G, Ferguson TB, et al. Heart disease and stroke statistics—2009 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Circulation. 2009;119(3):e21-e181.https://doi.org/10.1161/CIRCULATIONAHA.108.191261
2. Couto L, Donato J, Nucci Gd. Analysis of five streptokinase formulations using the euglobulin lysis test and the plasminogen activation assay. Brazilian Journal of Medical and Biological Research. 2004;37:1889-94.https://doi.org/10.1590/S0100-879X2004001200015
3. Madsen J, Pedersen F, Amtoft A, Deding A, Grande P, Hansen J, et al. Reduction of mortality in acute myocardial infarction with streptokinase and aspirin therapy. Results of ISIS-2. Ugeskrift for laeger. 1989;151(40):2565-9.https://pubmed.ncbi.nlm.nih.gov/2683281/
4. Ul Ahad Gill B, Ramzan M, Ahmed N, Abbas T, Qureshi BA, Saleemi MS, et al. EFFICACY OF STREPTOKINASE IN DIABETIC AND NON-DIABETIC PATIENTS PRESENTING WITH ACUTE ST ELEVATION MYOCARDIAL

INFARCTION. Pakistan Heart Journal. 2014;47(2). https://doi.org/10.47144/phj.v47i2.763

5. Hossain AM, Chowdhury MAR, Dey SR, Akhtaruzzaman A. A comparative study on the effect of streptokinase between diabetic and non-diabetic myocardial infarction patients. Bangladesh Journal of Pharmacology. 2008;3(1):1-7.https://doi.org/10.3329/bjp.v3i1.822
6. Mak K-H, Moliterno DJ, Granger CB, Miller DP, White HD, Wilcox RG, et al. Influence of diabetes mellitus on clinical outcome in the thrombolytic era of acute myocardial infarction. Journal of the American College of Cardiology. 1997;30(1):171-9.https://doi.org/10.1016/s0735-1097(97)00118-6
7. Alam MA, Hayat Y, Jadoon SA, Munazza B, Nazir A, Ali W. Efficacy of streptokinase in diabetic patients with acute st elevation myocardial infarction. Pakistan Journal of Physiology. 2019;15(1):10-2.https://inis.iaea.org/search/50050832
8. Masoomi M, Samadi S, Sheikhvatan M. Thrombolytic effect of streptokinase infusion assessed by ST-segment resolution between diabetic and non-diabetic myocardial infarction patients. Cardiology journal. 2012;19(2):168-73. https://doi.org/10.5603/cj.2012.0029
9. Shah I, Hafizullah M, Shah ST, Gul AM, Iqbal A. Comparison of the efficacy and safety of thrombolytic therapy for st-elevation myocardial infarction in patients with and without diabetes mellitus. Pakistan Heart Journal. 2012;45(1).https://inis.iaea.org/search/44002779
10. Hathi V, Anadkat M. A Comparative Study of In-Hospital Outcome of Patients with ST-Segment Elevation Myocardial Infarction with and Without Diabetes Mellitus, after Thrombolytic Therapy; In Government Hospital of Rajkot, Gujarat, India. The Journal of the Association of Physicians of India. 2017;65(11):22-5.https://pubmed.ncbi.nlm.nih.gov/29322705/
11. Lincoff AM, Topol EJ, Califf RM, Sigmon KN, Lee KL, Ohman EM, et al. Significance of a coronary artery with thrombolysis in myocardial infarction grade 2 flow "patency" (outcome in the thrombolysis and angioplasty in myocardial infarction trials). Thrombolysis and Angioplasty in Myocardial Infarction Study Group. The American journal of cardiology. 1995;75(14):871-6.https://doi.org/10.1016/s0002-9149(99)80678-x
12. Iwakura K, Ito H, Ikushima M, Kawano S, Okamura A, Asano K, et al. Association between hyperglycemia and the no-reflow phenomenon inpatients with acute myocardial infarction. Journal of the American College of Cardiology. 2003;41(1):1-7.https://doi.org/10.1016/S0735-1097(02)02626-8.https://www.jacc.org/doi/abs/10.1016/S0735-1097%2802%2902626-8
13. Kibel A, Selthofer-Relatic K, Drenjancevic I, Bacun T, Bosnjak I, Kibel D, et al. Coronary microvascular dysfunction in diabetes mellitus. Journal of International Medical Research. 2017;45(6):1901-29. https://doi.org/10.1177/0300060516675504
14. Muris DM, Houben AJ, Schram MT, Stehouwer CD. Microvascular dysfunction is associated with a higher incidence of type 2 diabetes mellitus: a systematic review and meta-analysis. Arteriosclerosis, thrombosis, and vascular biology. 2012;32(12):3082-94.https://doi.org/10.1161/ATVBAHA.112.300291

15. GershBJ,StoneGW,WhiteHD,HolmesDR. Pharmacological facilitation of primary percutaneous coronary intervention for acute myocardial infarction: is the slope of the curve the shape of the future? Jama. 2005;293(8):979-86.https://doi.org/10.1016/s0145-4145(07)70137-5

16. Weaver WD, Cerqueira M, Hallstrom AP, Litwin PE, Martin JS, Kudenchuk PJ, et al. Prehospital-initiated vs hospital-initiated thrombolytic therapy: the Myocardial Infarction Triage and Intervention Trial. Jama. 1993;270(10):1211-6.https://doi.org/10.1001/jama.1993.03510100061033

17. Norhammar A, Malmberg K, Diderholm E, Lagerqvist B, Lindahl B, Rydén L, et al. Diabetes mellitus: the major risk factor in unstable coronary artery disease even after consideration of the extent of coronary artery disease and benefits of revascularization. Journal of the American College of Cardiology. 2004;43(4):585-91. https://doi.org/10.1016/j.jacc.2003.08.050

18. Zia S, Hasan ZU. Survival after myocardial infarction in patients with type 2 diabetes. JPMA The Journal of the Pakistan Medical Association. 2004;54(2):73-80.https://pubmed.ncbi.nlm.nih.gov/15134207/

19. Woodfield SL, Lundergan CF, Reiner JS, Greenhouse SW, Thompson MA, Rohrbeck SC, et al. Angiographic findings and outcome in diabetic patients treated with thrombolytic therapy for acute myocardial infarction: the GUSTO-I experience. J Am Coll Cardiol. 1996;28(7):1661-9.https://doi.org/10.1016/s0735-1097(96)00397-x

20. Llevadot J, Giugliano RP, McCabe CH, Cannon CP, Antman EM, Murphy S, et al. Degree of residual stenosis in the culprit coronary artery after thrombolytic administration (Thrombolysis In Myocardial Infarction [TIMI] trials). The American journal of cardiology. 2000;85(12):1409-13.https://doi.org/10.1016/S0002-9149(00)00786-4

21. Woodfield SL, Lundergan CF, Reiner JS, Thompson MA, Rohrbeck SC, Deychak Y, et al. Gender and acute myocardial infarction: is there a different response to thrombolysis? Journal of the American College of Cardiology. 1997;29(1):35-42.https://doi.org/10.1016/s0735-1097(96)00449-4

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