Effect of early thrombolysis on the clinical outcome of ventricular septal rupture in patients with myocardial infarction

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Abstract---Background: Ventricular septal rupture is one of the most lethal complications of myocardial ischemia with timely treatment preventing the catastrophic results for the patients.[1] Objective: To determine whether early thrombolysis' in patients with VSR increases or decreases mortality and to assess the risk factors for development of VSR in patients with ST elevation MI. Materials and Methods: This cross-sectional study was done at Peshawar Institute of Cardiology after the approval of synopsis from ethical research committee of the institution bearing IRC/23/54 dated 28 September 2023. The sample size was 34 and method was non-probability convenient. The inclusion criteria were all those patients who had acute myocardial infarction and detectable VSR on ECHO. Data collection will be started after IRB approval. All patients admitted via ER to CCUs and diagnosed as cases of VSR through clinical exam and ECHO findings. Descriptive analysis was employed to find out the mean age and Chi Square test and Pearson Correlation was employed to compare the outcomes of the patients after receiving thrombolysis with a p value of

less than 0.05 as significant. Results: The mean age of the patient was 65 years with a minimum of 45 and maximum of 83 years.58.8% were males and 41.2 % being females. 64.7% were hypertensive and 35.3% were normotensives. 41.2 % were diabetic and 58.8% having no diabetes. 16 patients among hypertensive patients who had VSR survived and 6 patients died. 4 patients among non-hypertensive patients who had VSR survived and 8 patients died. 10 patients among diabetic patients survived and 4 patients died. 10 patients each in non-diabetics survived and died respectively. Statistically significant difference was seen in terms of treating the patients with streptokinase with a p value of less than 0.05. There was insignificant results in diabetic patients with higher mortality seen in patients who didn't have any diabetes. Conclusion: VSR is a deadly complication of acute myocardial infarction in which early diagnosis and treatment by expert clinician can reduce mortality

Keywords---ventricular septal rupture, thrombolysis.

Introduction

Ventricular septal rupture (VSR) seldomly occurs in acute myocardial infraction but a very deadly complication of ischemic heart disease which can cause death in most of the patients. [2]Early detection and prompt treatment have produced promising results leading to decreased mortality and morbidity of patients and early discharge from the hospital.[3]

In majority of cases it occurs after 3-5 days after the initial insult but can occur as early as 16 hours post myocardial infarction especially in patients who have uncontrolled diabetes and hypertension and are not compliant with medical treatment.[4] The other risk factors which have been implicated in the causation of VSR are advancing age, female gender, past medical history of cerebrovascular accident chronic renal failure and congestive cardiac failure.[5]

Patients who develop VSR are more like to have ST segment elevation on initial ECG, raised cardiac enzymes and suboptimal parameters on echocardiography. Apical defects are outcome of anterior infarction and inferior or lateral infarctions are more likely to result in basal defects at the point of junction of the septum and the posterior wall.[6]

Ventricular septal rupture is a very dangerous complication of acute myocardial infarction causing mortality in 98% of cases and still there is a room for conducting more studies in Pakistan to understand the gravity of the situation.[7] Therefore this study will help whether early thrombolysis increases or decreases the mortality in such patients and will help in modifying our future clinical practice. [8]The aim of the study is to determine whether early thrombolysis' in patients with VSR increases or decreases mortality and to assess the risk factors for development of VSR in patients with ST elevation MI.

Operational definitions

Ventricular Septal Rupture is one of the mechanical complications of Myocardial infarction. It results from necrosis of tissues in the interventricular septum leading to its thinning and finally rupture thus connecting the two ventricles. This leads to shunting of blood between the two ventricles. It may be simple with a single channel or complex type with multiple channels.[9]

Hypothesis

Early thrombolysis with Streptokinase increases mortality in patients with VSR.

Materials and Methods

This cross-sectional study was done at Peshawar Institute of Cardiology after the approval of synopsis from ethical research committee of the institution bearing IRC/23/54 dated 28 September 2023. The sample size was 34 and method was non-probability convenient. The inclusion criteria were all those patients who had acute myocardial infarction and detectable VSR. Data collection was started after IRB approval. All patients admitted via ER to CCUs and diagnosed as cases of VSR through clinical exam and ECHO findings were observed until their discharge after being given thrombolytic therapy. Proper informed consents taken from all patients recruited into the study. The discharge patients were followed for their outcome or any surgical intervention. Data was analysed using SPSS latest version and expressed as frequencies and percentages. Mean and SD will be applied to quantitative data. Frequency % will be applied for categorical data. Descriptive analysis was employed to find out the mean age and Chi Square test and Pearson Correlation was employed to compare the outcomes of the patients after receiving thrombolysis with a p value of less than 0.05 as significant.

Results

The mean age of the patient was 65 years with a minimum of 45 and maximum of 83 years.58.8% were males and 41.2 % being females. 64.7% were hypertensive and 35.3% were normotensives .41.2 % were diabetic and 58.8% having no diabetes.16 patients among hypertensive patients who had VSR survived and 6 patients died. 4 patients among non-hypertensive patients who had VSR survived and 8 patients died. 10 patients among diabetic patients survived and 4 patients died. 10 patients each in non-diabetics survived and died respectively .Statistically significant difference was seen in terms of treating the patients with streptokinase with a p value of less than 0.05 as demonstrated by results below for ejection fractions and conditions of the patient upon discharge which wasn't the case in the patients who had intervention with a p value of 0.242 (insignificant).Similarly statistical difference was observed in terms of effectiveness of treatment in hypertensive patients with p value 0.02 with reduced mortality seen in the patients with no significant impact on size of VSR observed on investigations . There was insignificant results in diabetic patients with higher mortality seen in patients who didn't have any diabetes

Statistics

Age

N	Valid	34
	Missing	0
Mean		65.50
Minimum		45
Maximum		83

Hypertensive

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	22	64.7	64.7	64.7
	No	12	35.3	35.3	100.0
	Total	34	100.0	100.0	

Diabetic

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	14	41.2	41.2	41.2
	No	20	58.8	58.8	100.0
	Total	34	100.0	100.0	

Correlations

		Ejection Fraction	Condition of patient upon discharge	Streptokinase given or not	any intervention done	Any other pathology on Echo
Ejection Fraction	Pearson Correlation	1	-.134	-.715*	.134	.b
	Sig. (2-tailed)		.732	.030	.732	.
	N	9	9	9	9	0
Condition of patient upon discharge	Pearson Correlation	-.134	1	-.007	.206	.b
	Sig. (2-tailed)	.732		.967	.242	.
	N	9	34	34	34	0
Streptokinase given or not	Pearson Correlation	-.715*	-.007	1	.256	.b
	Sig. (2-tailed)	.030	.967		.144	.
	N	9	34	34	34	0
any intervention done	Pearson Correlation	.134	.206	.256	1	.b
	Sig. (2-tailed)	.732	.242	.144		.
	N	9	34	34	34	0

. Correlation is significant at the 0.05 level (2-tailed).

Bar Chart
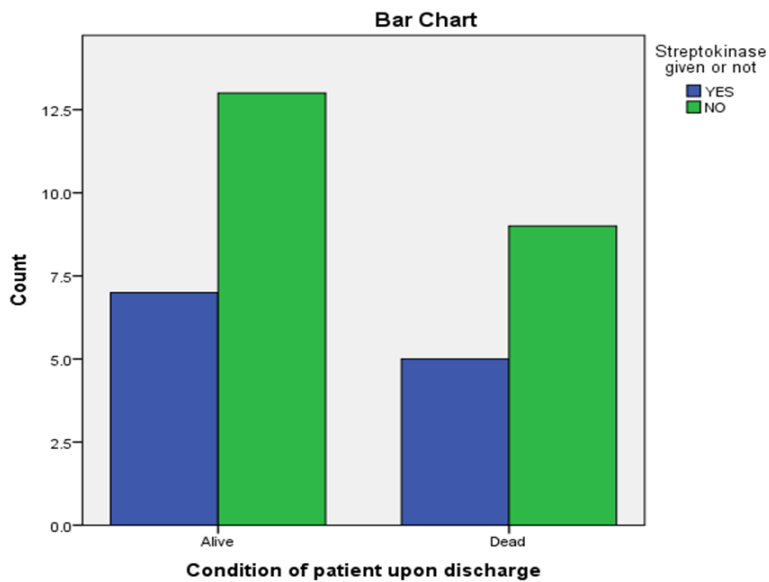
Crosstab				
Count				
		Condition of patient upon discharge		Total
		Alive	Dead	
Hypertensiv e	Yes	16	6	22
	No	4	8	12
Total		20	14	34

Condition of the Patient (Hypertension)

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.975[a]	1	.026		
Continuity Correction[b]	3.481	1	.062		
Likelihood Ratio	5.011	1	.025		
Fisher's Exact Test				.036	.031
Linear-by-Linear Association	4.829	1	.028		
N of Valid Cases	34				
a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.94.					
b. Computed only for a 2x2 table					

Symmetric Measures					
		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.383	.162	2.342	.026[c]
Ordinal by Ordinal	Spearman Correlation	.383	.162	2.342	.026[c]
N of Valid Cases		34			
a. Not assuming the null hypothesis.					
b. Using the asymptotic standard error assuming the null hypothesis.					
c. Based on normal approximation.					

Size of VSR (Hypertension)

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.149[a]	11	.284
Likelihood Ratio	16.401	11	.127
Linear-by-Linear Association	.163	1	.686
N of Valid Cases	34		
a. 24 cells (100.0%) have expected count less than 5. The minimum expected count is .35.			

Diabetic Group

Crosstab				
Count				
		Condition of patient upon discharge		
		Alive	Dead	Total
Diabetic	Yes	10	4	14
	No	10	10	20
Total		20	14	34

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.561[a]	1	.211		
Continuity Correction[b]	.802	1	.371		
Likelihood Ratio	1.592	1	.207		
Fisher's Exact Test				.296	.186
Linear-by-Linear Association	1.515	1	.218		
N of Valid Cases	34				
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.76.					
b. Computed only for a 2x2 table					

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.863[a]	11	.374
Likelihood Ratio	14.502	11	.206
Linear-by-Linear Association	1.204	1	.273
N of Valid Cases	34		
a. 24 cells (100.0%) have expected count less than 5. The minimum expected count is .41.			

Discussions

This study is one of its kind highlighting the immense significance of ventricular septal rupture as a complication presenting as an acute emergency in patients with myocardial infarctions .Many patients are not good surgical candidates due to advancing age, multiple organ damage and the fact they are hemodynamically unstable .[10] This study showed that patients with normal blood sugar levels had a higher mortality rate as reflected by the results so comorbid are not the only things we have to look for while doing further studies .[11]

Schlotter et al performed a systemic review for assessing the efficacy of percutaneous closure for VSD and it was reported that cardiogenic shock was evident in about 48% of patients in whom interventions were done within 14 days and overall 32% died during hospital admissions raising question mark that although many studies have shown that interventional closure is an effective treatment there is still no unanimous agreement on this which need to be achieved.[12]

According our findings ,statistically significant difference was seen in terms of treating the patients with streptokinase with a p value of less than 0.05 as demonstrated by results below for ejection fractions and conditions of the patient upon discharge which wasn't the case in patients who had intervention with a p value of 0.242 (insignificant). Similarly statistical difference was observed in terms of effectiveness of treatment in hypertensive patients with p value 0.02 with reduced mortality seen in the patients with no significant impact on size of VSR observed on investigations.

Keyan Zhao did analyse 45 consecutive patients with VSR after AMI whose procedures were done in the Department of Cardiovascular Surgery at the General Hospital of Northern Theatre Command between January 2012 and December 2021. [13] Surgical repair did result in great outcomes for patients with VSR after acute myocardial ischemia Patients with VSR to surgical time >14 days had a lower rate of all-cause mortality. According to this study delaying VSR repair beyond 14 days after rupture was optimal for decreased mortality rates and residual shunts. [14]

Our Study had few limitations. Firstly it was done in a single hospital setting which will raise question over generalizability of results. Secondly we need to take

comorbid factors such as smoking and stress, both recognized risk factors for ischemic heart disease. Further research should be done on multiple centers and with large sample size increasing credibility of the study.

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