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ORIGINAL ARTICLE

Health-Related Quality of Life After Complete Versus Infarct Artery-only Percutaneous Coronary Revascularization in Multi-Vessel Disease with St Segment Elevation Myocardial Infarction

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ABSTRACT

Objective: The purpose of this study was to compare the HRQoL of patients who had complete revascularization at the time of the first admission to those who underwent revascularization of the infarct artery alone using the EQ-5D (European quality of life-5 dimensions) self-report questionnaire.

Background: The effect of revascularization procedures on health-related quality of life (HRQoL) in patients with multivessel disease who undergo primary percutaneous coronary intervention is the subject of controversy (P-PCI).

Methods and Results: There was a significant difference between individuals with STEMI who received revascularization of the infarct-related artery alone and those who got total revascularization. we divided the group by the extent of complete revascularization (n=147) or the extent of IRA-only revascularization (n = 153) during the index admission Mobility, self-care, routine activity, pain or discomfort, anxiety, and sadness were all evaluated using the EQ-5D scale. The prevalence of heart failure and the gender of patients were different at baseline. Patients who had full revascularizations had lower mean ±SD (EQ-VAS and EQ-5D) utility ratings than those who had infarct artery revascularizations alone after 2 years of follow-up. (70.00 (±19.9) vs. 51.04 (±17.8), P < 0.04, and 0.71 (±0.03) vs0.61 (±0.03), P<0.005, respectively).

Conclusion: Complete revascularization produced clinically significant increases in quality of life when compared to treating just the IRA at 24 months.

Keywords: Complete Revascularization, Infarct-related artery, Primary percutaneous coronary angioplasty, ST-segment elevation.

INTRODUCTION

Primary percutaneous coronary intervention (P-PCI) is a form of revascularization that can be performed on patients who have had an ST-segment elevation myocardial infarction (STEMI).[1] A considerable majority of individuals with multi-vessel disease (MVD) have a minimum ≥70% stenosis in at least one non-infarct-related artery (N-IRA), which indicates a poor prognosis for long-term disease outcomes, such as severe adverse cardiac events (MACE).[2]

The current recommendations state that individuals having a STEMI with MVD should have either percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG).[3] A PCI is performed when the arteries are significantly narrowed due to STEMI or MVD to restore epicardial flow and myocardial perfusion.[3,4] There is an extensive range of severity in the narrowing of arteries among patients. The 'infarct artery' refers to the entire blocked coronary artery responsible for the MI in a patient with acute STEMI and MVD, whereas the 'non-infarct artery' refers to the remaining severely blocked coronary artery that did not cause the MI.[5] Both "complete revascularization" and "infarct artery-only revascularization" PCI revascularization procedures can be used to treat acute STEMI with MVD.[6] Referring to PCI that is only carried out on the infarct that produced the MI at the time of the patient's index hospitalization for the MI, "infarct artery-only revascularization" means that only the infarct artery is treated.[7] Patients who undergo “complete revascularization” include revascularization of the infarct arteries in the infarct as well as the non-infarct arteries at the time of their index MI admission. Primary PCI is performed with medication and only for infarcted arteries by some interventionists. Revascularization is reserved for non-infarcted arteries if the symptoms worsen.[8,9] During primary PCI for patients with MVD following a STEMI with infarct artery-only, the effectiveness and efficacy of revascularizing all significant stenosis arteries have been studied extensively[9–14], Despite the potential importance of health-related quality of life (HRQoL) in determining the best revascularization approach, surprisingly few researchers have focused on this topic.[15] The purpose of this research was to use the EQ-5D (European quality of life-5 dimensions) self-report questionnaire to evaluate the difference between the HRQoL of patients treated with revascularization of the infarct artery alone and revascularization of the whole infarct artery.

MATERIAL AND METHODS

This study utilized an observational, cross-sectional study conducted at NICVD, Karachi. From 1st February 2019 to 31st January 2020. This study's design and inclusion/exclusion criteria have already been defined in detail.[16] Researchers evaluated all patients with multivessel disease who underwent PCI within 24 hours of suffering a STEMI, either using complete or only infarct artery revascularization. The procedure was approved by all patients in writing. The IRB has given its clearance to the study.

Inclusion Criteria: All patients diagnosed with STEMI and MVD who had primary PCI at our cardiac facility during the research period were.[17,18] Patients who had PCI performed at the time of their index hospitalization were included in the PCI-only infarct artery group.[19] In this study, non-culprit coronary arteries with a narrowing > 70% were considered to need revascularizationg.[20]

Exclusion Criteria: Patients who have had CABG surgery or PCI in the past. Medical records missing from patients. Information missing from patients. Studies that were not consented to by patients.

In a catheterization laboratory registry, all STEMI patients had their demographics, pre-procedural risks, peri-procedural complications, devices used, and extent of disease collected prospectively. These records were obtained at the catheterization laboratory both immediately following the procedure and at the time of the patient's discharge. HRQoL data were collected via a structured questionnaire administered by a telephone interviewer. Five dimensions of quality of life are assessed by the EQ-5D: mobility, self-care, usual activities, pain or discomfort, anxiety, and depression, with no issues (level 1), some problems (level 2), and

serious difficulties (level 3) being the range of responses (level 3).[21] Our study converted individual domain scores into utility weights for our population by converting them to a summary index.[22] According to the patient's desired level of optimism, their health is ranked on a scale from 0 to 1, with 0 indicating the "worst" health situation (death) and 1 representing the "perfect" health condition."[23]

Statistical Analysis: The Stata14 software package was used to conduct all statistical analyses. A two-group stratification was applied to the patients. Infarct artery revascularization was shown to be more effective than revascularization of the infarct artery alone. Chi-square test was applied to compare revascularizations with and without infarct artery revascularizations for reported problems. Complete revascularization patients were compared with infarct artery-only revascularization patients using an independent t-test to determine whether or not there was a statistically significant difference in the mean±SD of the standard deviation of EQ-VAS scores and EQ 5D utility values. Models of multivariate stepwise linear regression were utilized to predict EQVAS and utility scores. Several independent variables were examined, including age, hypertension, diabetes, sex, MACE, vessel involvement, and type of PCI revascularization. Patients who had total revascularization, as opposed to revascularization of the infarct artery alone, had a higher risk of reporting issues across all five EQ-5D domains, as determined by binary regression analysis. We defined statistical significance at the P<0.05 level, and we identified highly statistically significant at the P<0.001 level.

RESULTS

There were about 300 patients enrolled in this research, all of whom had STEMI and MVD and had undergone primary PCI. Three hundred patients with multivessel disease who had angioplasty within 12 hours after their AMI were included in the research. Of them, 147 (59% of patients) had total revascularization, and 153 (51% of patients) got PCI with just IRA. Associated with the total revascularization group, the IRA-only PCI group had a higher percentage of female patients (86.3 versus 71.8, P =0.004). Complete revascularization patients had a higher prevalence of co-morbidities, including heart failure and diabetes. Patients who had solely IRA treatment were more likely to have previously suffered from a MI. It was observed that both groups had similar left ventricular ejection fractions and types of surgical stents. Table 1 and Table 2 show baseline characteristics of patients stratified by PCI procedure type.

The five aspects of the EQ-5D questionnaire are summarized in **Table 3**. The anxiety/depression domain revealed a significant difference between the infarct artery-only revascularization group (p<0.02) and the whole revascularization group (p<0.01). For all EQ-5D dimensions except mobility and doing everyday activities, patients with infarct arteries alone experienced more difficulty or problems than those with complete revascularization. Compared with complete revascularization, only 33.3% of patients with infarct artery revascularization reported self-care, and 59.1% reported anxiety or depression (P < 0.005). When compared with infarct artery-only revascularization, patients receiving full revascularization exhibited lower EQ VAS and EQ-5D utility ratings after 2 years (70.00 (±19.9) compared to 51.04 (±17.8), P<0.04, and 0.71 (±0.03) compared to 0.61 (±0.03), P<0.005.

EQ VAS and EQ-5D utility scores were assessed using multivariate stepwise linear regression models, as shown in **Table 4**. The existence of infarct-artery-only revascularizations and the number of diseased vessels were negatively correlated with EQ-VAS scores at 2 years and EQ5D utility scores at 2 years. There was a significant relationship between hypertension and lower EQ-5D utility ratings at 2 years, and complete revascularization affected the EQ VAS score (P <0.05 in both cases). All EQ-5D questionnaire measures, except undertaking regular activities, were linked with infarct artery-only revascularization at baseline, excluding mobility (OR 1.7, 95% confidence interval 1.1-21.0); self-care (OR 1.3, 95% confidence interval 1.1-2.3); pain/discomfort (OR 2.1, 95% confidence interval 1.8-5.4); anxiety/depression (OR 2.4.1, 95% confidence interval 1.3-3.8).

Table 1: Demographic details of the patients (n=300)

Characteristics	Complete revascularization n n=147	Infarct artery-only PCI n=153	P value
Baseline characteristics			
Male	127 (86.3)	110 (71.8)	0.004
Age in years, (mean ±SD)	67.7(6.1)	67.2(6.4)	0.36
Risk factors and comorbidities			
Body Mass Index (kg/m^2), (mean ±SD)	30.0 (6.5)	29.8 (8.7)	0.67
Smoking status at PCI	23 (15.6)	22 (14.3)	0.13
Diabetes	36 (24.4)	34 (22.2)	0.41
Hyperlipidemia	32 (21.7)	33 (21.5)	0.03
Hypertension	107 (72.7)	109 (71.2)	0.3-
Cerebrovascular disease	6 (0.4)	4 (0.3)	0.55
Gastrointestinal disease	18 (12.2)	24 (16.6)	0.57
COPD	4 (0.3)	3 (0.2)	0.36
Cardiac status			
Anterior myocardial infarction	31 (21.0)	33 (21.5)	0.67
Unstable angina	120 (81.6)	119 (77.7)	0.44
History of myocardial infarction	55 (37.4)	56 (36.6)	0.08
Myocardial infarction status by Troponin level			
Probable myocardial infarction	87(59.1)	108 (70.5)	0.06
LVEF by CMR (%), (mean ± SD)	46.8 (4.3)	47.0 (5.0)	0.34

Table 2: Angiographic characteristics of coronary arteries Stenosis ≥70%. (n=300)

Characteristics	Complete revascularization n=147	Culprit artery-only revascularization n=153	P-value
Hemodynamic unstability			
Unstable	4(0.3%)	5(0.3%)	0.35
Killip class II/III on admission	8(0.6%)	12(0.8%)	0.42
TIMI flow grade ≤ 2 in IRA	69(46.9%)	87(56.8%)	0.004
Number of diseased vessels			
Two	127(86.3%)	123 (80.3%)	0.52
Three	27 (18.3%)	33 (21.5%)	
Door to balloon time(min), (mean±SD)	181 (46.6)	174 (31.6)	<0.001
Stent approach			
Radial	125 (85.0%)	128 (83.6%)	0.45
Femoral	22 (14.9%)	25 (16.3%)	
PCI treated culprit arteries			
Proximal Right coronary artery	27 (18.3%)	24 (15.6%)	0.63
Mild RCA	22 (14.9%)	17(11.1%)	0.32
LMS	0 (0)	0 (0)	
Proximal LAD	26(17.6%)	30 (19.6%)	0.50
Mild Left anterior descending	21 (14.9%)	15 (9.8%)	0.24
Proximal circumflex	8 (5.4%)	15 (9.8%)	0.23
Other arteries	19 (12.9%)	27 (17.6%)	0.32
PCI treated non-culprit arteries			
Proximal Right coronary artery	18(12.2%)	31(20.2%)	0.76
Mild RCA	34(23.1%)	21(13.7%)	0.001
LMS	1(0.6%)	4(2.61%)	0.49
Proximal LAD	21 (14.2%)	56(36.6%)	0.006
Mild left anterior descending	37 (25.1%)	38 (24.8%)	0.31
Proximal	33(22.4%)	2(1.3%)	<0.001

circumflex			
Other arteries	8 (5.4%)	15 (9.8%)	0.17
Number of stents placed, (mean±SD)	3.13(0.6)	2.1 (0.5%)	<0.001
Non-Infarct‐related artery lesions			
Chronic Total Occlusion	47(31.9%)	52(33.9%)	<0.001
Distal or secondary branches	32(21.7%)	27(17.6%)	0.003
Discharge medication			
Antiplatelets	133 (90.4%)	151 (98.6%)	0.75
Beta‐blockers	90 (61.2%)	97 (63.3%)	0.75
Angiotensin‐converting enzyme inhibitor/ Angiotensin receptor blockers	90(61.2%)	16 (10.4%)	0.678
Calcium blockers	38 (25.8%)	40 (26.1%)	0.891
Statins	2(1.3%)	0(0)	0.403
Diuretics	27(18.3%)	22 (14.3%)	0.132

Table 3: Proportion of patients reporting problems on each EQ-5D questionnaire dimensions on an average of 2-year follow-up (n=300)

Dimension	Complete revascularization n=147	Infarct artery-only revascularization n=153	P-value
Mobility	99 (67.3%)	101 (66.0%)	0.03
Self-care	49 (33.3%)	59 (38.5%)	0.02
Usual activities	103 (70.0%)	87(56.8%)	0.05
Pain/discomfort	110 (74.8%)	121 (79.0%)	0.14
Anxiety/depression	87 (59.1%)	97 (63.3%)	0.03
Current health status, mean VAS (±SD)	70.00 (±19.9)	51.04 (±17.8)	0.04
Quality of life health utility score, mean (±SD)	0.71 (±0.03)	0.61 (±0.03)	0.005

Table 4: Predictors of EQ VAS and EQ-5D questionnaire utility scores at 2-year follow-up (n=300)

Variables	Partial regression coefficient	SE	P
Dependent variable: EQ VAS score			
Complete vs. infarct-only artery revascularization	-2.183	2.088	0.004
Three vessel disease (reference: Two vessel disease)	-3.351	3.363	0.001
Hypertension	-2.671	2.453	0.003
Dependent variable: EQ-5D questionnaire utility score			
Complete vs. infarct-only artery revascularization	-.091	.138	0.03
Three vessel disease (reference: Two vessel disease)	-.065	-.067	0.001
Hypercholesterolemia	-.346	.146	0.005

DISCUSSION

Intervention strategies to expand the quality of life and length of life for MVD patients with STEMI have the ultimate goal of increasing life expectancy. Intensive studies have been conducted on clinical outcomes, but few have been conducted on the quality of life.[25] Associated with patients preserved with infarct-related artery-only revascularization, those treated with complete revascularization PCI had a longer survival time[19].

In recent years, the quality of life has become a more important factor in evaluating the clinical efficacy and long-term prognosis.[26] Eastern Europe and Central Asia-based patients with STEMI and MVCAD, this is the first study evaluating patients' quality of life after complete or only infarct artery revascularization. It was found that MVD was more likely to occur in males, was less likely to have diabetes, or was treated with complete revascularization in patients with proximal left anterior descending artery lesions. According to this strategy, patients with lower procedural risk tend to be treated more frequently than those with higher risks. These results highlight the significance of evaluating the revascularization strategy's impact on quality of life in further trials contrasting these two revascularization procedures.[27] In the absence of hemodynamic compromise or residual ischemia, it is not recommended to revascularize non-infarct arteries.[28] According to our study, complete revascularization is associated with a higher disease-specific quality of life.[19] To demonstrate this, it may be required to perform randomized studies that systematically assess patients' health. A limitation of the study was the fact that it consisted of nonrandomized patients, which was prone to selection bias, so it was not possible to provide any information on missing data. This study included only patients who had PCI at a single hospital, thus excluding patients who underwent PCI at other hospitals. This means that the results of the study are more appropriate to the center where they were conducted. We were able to gain insight into patient behavior because the interviewers did not know which group the patient belonged to. As a result, the outcomes were blindly assessed. The models evaluating interpreters for the EQ-VAS and EQ-5D utility scores considered most of the known risk factors, but because of the small adjusted R2 values, it is necessary to explore other factors that may be involved. The final step is to conduct baseline analyses so that a clear conclusion can be drawn.[25] PCI with complete revascularization has been shown to extend survival time more than revascularization with infarct-related arteries alone.[19] In recent years, clinical efficacy and long-term prognoses are increasingly evaluated based on the quality of life.[26] We believe that this is the first study evaluating the patient quality of life after revascularization of the whole artery versus infarct artery-only in Eastern European and Central Asian patients with STEMI and MVCAD. The pattern of MVD during a STEMI revealed interesting findings in our study. They were more likely to be males, have less diabetes, and be treated aggressively with revascularization of the proximal left anterior descending artery. This approach may be justified by the notion that ill patients have lower procedural risk than healthy ones. The findings emphasize how crucial it is to compare these 2 revascularization approaches and assess how each affects the quality of life in further studies.[27]

Revascularization of the non-infarct artery is discouraged by guidelines unless there is chronic ischemia or hemodynamic compromise.[28] As in other studies, our study shows that complete revascularization is associated with improved disease-specific quality of life.[19] It would be helpful to perform randomized studies in which patients' health status is systematically measured to prove this. Patients were not randomly assigned, therefore the study may have been affected by selection bias, and there was no information supplied on missing data. Only patients who had PCI at one hospital were included in this research, indicating that patients at other institutions were excluded. Thus, the results are more appropriate for the study center. One of the strengths of our study was the blinding of the interviewers regarding the patient's group. This resulted in a blinded outcome assessment. However, given the low adjusted R2 values, it is clear that more research into additional potential risk variables, extending beyond the factors taken into account in the models analyzing the factors that influence EQ VAS and EQ-5D utility ratings, is warranted. Baseline analyses must be performed before any meaningful inferences can be made.

CONCLUSION

Health-related quality of life was assessed 2 years following PCI for patients with MVD and STEMI who received either full revascularization or IRA-only (PCI). When comparing the whole revascularization group to the IRA-only PCI group, there was a statistically and clinically significant difference in the quality of life at 2 years. Pre-post designs should be used in studies to provide precise results, and further research is needed to demonstrate the advantages and disadvantages of each kind of PCI.

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