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COMPARING OUTCOMES OF PCI VS CABG IN MULTIVESSEL Coronary arteries disease.

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Abstract

Background

CABG bypass surgery with PCI revascularization procedures to date is getting advanced. These major surgeries and treatments for multivessel disorders with the inclusion of DES which is supposed to have dramatically improvised outcomes. due to insufficient prospective, randomized control trials, that reflect the recent practices, the multivessel disease optimal treatment is still uncertain. We aim to perform a specialized study that represents the evaluation of the real world that efficiently treats different (Multivessel disorders) MVDs

Methods and Results

In our study, we aim to consider 1760 patients who experience some revascularization techniques in the patients diagnosed with some MVD either in one, two, or three vessels. From these included 1760 patients, 1090 patients were suffering from 2 -2-vessel disease and the major population of 2 vessel disease underwent percutaneous coronary intervention (78 % of individuals received PCI treatment and 22% underwent CABG surgery). Out of our sample, 670 individuals were diagnosed with 3-vessel disease, it was observed that this patient group was more likely to receive CABG surgery 23 % of patients were treated with percutaneous coronary

intervention, and 77 % of individuals were treated by CABG surgery. We considered many variables in our study and the major variables were target vessel failure, diseased Q-wave which was a marker for MI, death rate following one year of the procedure, and different cerebrovascular events. Multiple adverse cerebrovascular and cardiovascular events in these patients were compared between these two setups which are PCI and CABG groups. The results of these two groups were adjusted for the baseline characteristics and hazardous ratios were reported. It is proved in our study that in patients suffering from 2-vessel disease, the CABG surgery is supposed to have reduced cerebrovascular, and cardiovascular events. This comparison has a p-value of 0.02 and this reduction in CABG was 9.7% and for PCI procedure it was 21.2%, in the patients suffering from the 3-vessel disease this comparison had a p-value of 0.03 and a percentage ratio of 10.8 % to 28.4 % for CABG and PCI respectively.

Increased major adverse cerebrovascular and cardiovascular were observed from the adjusted outcomes in the 2-vessel disease patients; this had a p-value of 0.02 with a hazard ratio of 2.29 with a CL % of 95 %, and in patients suffering from the 3-vessel disease, the p-value was 0.0006 with a hazard ratio of 3.09 with a CL % of 95 %. These CAD patients were merged with diabetes mellitus. The results were adjusted for non-diabetic patients who showed multiple cardiovascular and cardio-cerebral events after the intervention of PCI revascularization for the patients suffering from the 2-vessel disease. This had a p-value of 0.002 with a hazard ratio of 3.39 with a CL % of 95 %, and for the 3-vessel disease patients, a p-value of 0.12 with a hazard ratio of 1.69 with a CL % of 95 % was observed.

Conclusions

Comparing both of these techniques like CABG and PCI added to DES gives rise to enhanced primary CBE and CVE in patients suffering from multivessel disease, either blockage in two or three vessels, particularly in patients having some underlying diabetic disease. The CABG surgery is a serious open-heart surgery and it might be the preferred choice of the experts for the revascularization of the patients suffering from some coronary artery disorders.

Both of these considered procedures like PCI and CABG are significant representations and help in the establishment of modalities containing some mechanical revascularization of CAD patients. These designated therapies are known as a reliever of symptoms in some cases and they also result in increasing the lifespan of the individual in other cases 1–4.

Both of these techniques and treatment procedures are already compared in many of the past studies, their comparison with medicinal therapy was done and they were finally compared with each other. The extreme results followed by both of these procedures like MI, and mortality were quite similar. The CABG surgery is supposed to give more relief to patients suffering from a failure of the target vessels, CABG is also supposed to treat the angina pectoris 5–14. The most significant aspect that makes CABG superior to PCI is that CABG in some cases is more apparent when it comes to the groups of individuals who are high-risk CAD patients. In some of the individual metanalysis and studies, more benefits were demonstrated by CABG surgery and helped in reducing the death rate, and the risk of MI 15–17.

Anyhow certain irrelevancy is found in the past studies. Some lacking was observed and, in this study, we focused on those lacking by noticing the difference between the demographics, advancement in technology, and medical history of the patients that limits their application to current situations. Previously these study trials were based on very small sample sizes and all the patients included in the study were high-risk patients and had some chronic disorders like the history of some multivessel diseases, Diabetes Mellitus, and LVD. The second limitation of those studies was the advancement in medical procedures that were not considered part of the standard care when these studies were conducted, and this limitation has altered the long-term results significantly in the patients suffering from some multivessel diseases.18–21.

Those studies made a comparative trial of balloon angioplasty with this major surgery CABG, and then a comparison was made with the BMS revascularization technique. In modern medicine, BMS is supposed to have a very low perception and is supposed to minimize TV failure and reduce restenosis 22,23. The combined end-points are theoretically reduced by this combination, including TVF, death rate, and MI. This additionally is sometimes also composed of the pivotal trial's complementary end-points. The investigators effectively used the Drug drug-eluting stenting technique, the ARTS-II, and reported some favorable and early results 24. Some RCTs and prospective were analyzed to compare CABG and PCI assisted with DES techniques in patients suffering from MVD and diabetes mellitus, and these are currently under observation 25. The results extracted from linked with DES-assisted PCI and CABG were evaluated in some real-world situations and circumstances with a greater sample size.

Methods

In our study, we examined 1680 patients who suffer from multivessel CAD with either obstruction in one, two, or three vessels, and these patients require some revascularization procedures like DES-assisted PCI or CABG surgery. An 18-month period was given to them, and, a one-year follow-up was available for every patient. The two vessel CAD patients who were treated through PCI, which was assisted with DES, were included only when the revascularization was done in both the damaged vessels within the same hospitalization stay. The same was the inclusion criteria for the tree vessel disease patients; these patients were only included in the study if all three diseased arteries were vascularized during the same hospital within 45 days of the procedure. The selected revascularization process was based on the dissertation attending physician, and this physician forms a loop with the cardiologist and the open-heart surgeon. Our study does not include the patients coming with complaints of cardiogenic shocks. Also, patients complaining about significant left main CAD who had already undergone some revascularization procedures were excluded from the study.

Telephonic follow-ups were advised and given to the patients, and the patients were treated by professional experts. Verification and adjustment of all the clinical events were done by the physicians who were uninformed about the aim of our study. A standard anticoagulation regimen was given to all the patients treated via PCI assisted with DES. This was also entertained by the dual antiplatelet therapy given with an additional blood thinner; this blood thinner was indefinitely continued. An additional medicine was also given with the name of clopidogrel for more than 6 months once the patient was treated with PCI assisted with DES. Contrary to this, the patients who underwent CABG surgery were also encouraged to take some blood thinner indefinitely and continuously, plus the second medicine (Clopidogrel) was prescribed for a 3-month duration.

The primary end-points of our study were diseases Q-wav resulting from MI, combined mortality rate, and specified cardiovascular and cardiocerebral events with some chances of TVF. Simultaneously, some adverse conditions may also arise, including a rate of MACCE, abbreviated as major adverse cerebrovascular and cardiovascular events, followed one year after the surgery. Angiography was yet another diagnosis procedure in which a stent is used to locate or diagnose any thrombosis that may occur in the clinical setting, followed by Coronary

Syndrome. A detailed explanation was given that if, after 30 days of PCI, a subacute thrombosis occurs, it is known as a subacute coronary syndrome. We defined persistent cardiovascular events as the transient ischemic heart attack that occurs due to a deficient supply of oxygen, or it may be a stroke. For this condition, the patient has to consult a neurologist. TV failure for CABG patients is defined as the symptomatic failure of the implanted graft, or it may also target the territory revascularization.

The local institutional review board approved our study. We were given full access to take full responsibility of the database, a manuscript was signed, and the consent was taken for all the data collection.

Statistical Analysis

The mean values of the continuous variables were expressed as (±SD). This was compared and analyzed by the effective use of categorical variables and t-test, which is expressed as percentages, and the confirmed value was then compared by the use of Fisher's extract test and x3 statistics. For both the different groups with the 2-vessel and 3-vessel CAD, two separate analyses were done. It is the fact that our study is of a non-randomized nature. The proportional hazard Cox regression model was also used for the adjustment of baseline characteristics. The baseline characteristics were identified by the univariate regression analysis. Their hazard ratio was found to be CL 95%. The outcomes for the patients with 2-vessel disorder were adjusted for the differences in the baseline characteristics in the CRI prevalence, along with the history of CABG, increased lipid concentration, and PVD, along with a history of PCI. This presentation was unstable with LADA, and LVEF.

The outcomes for the patients suffering from 3-vessel disorder were adjusted for the differences in the onset of UA presentation, CRI history of CABG, increased lipid concentration, and PVD, along with a history of PCI. This presentation was unstable with the LVEF, and LADA. For this group, the statistical analysis was performed through (the SAS Institute) Statistical Analysis Program Version 9.1. We have a p-value of less than 0.05, which was statistically insignificant and did not support the hypothesis. For the illustration of major adverse cerebrovascular and cardiovascular events were illustrated through the Kaplan-Meier curve, and it helps in the free

survival of patients suffering from 2-vessel and 3-vessel coronary artery disorder. This includes both diabetic and non-diabetic individuals.

Results

For both the groups as 2-vessel and 3-vessel coronary artery disorder, the baseline clinical characteristics are summarized in the following table and in our study. In our study, we aim to consider 1760 patients who experience some revascularization techniques in the patients diagnosed with some MVD either in one, two, or three vessels. From these included 1760 patients, 1090 patients were suffering from 2 -2-vessel disease and the major population of 2 vessel disease underwent percutaneous coronary intervention (78 % of individuals received PCI treatment and 22% underwent CABG surgery). Out of our sample, 670 individuals were diagnosed with 3-vessel disease, it was observed that this patient group was more likely to receive CABG surgery 23 % of patients were treated with percutaneous coronary intervention, and 77 % of individuals were treated by CABG surgery.

Baseline Characteristics

	2-vessel CAD			**3-vessel CAD**		
	CABG patients (n=199)	**PCI patients (n=890)**	***P-value***	**CABG patients (n=231)**	**PCI patients (n=447)**	***P-value***
The baseline characteristics designated as CRI represent PVD, CRI, LVEF, and LADA.						
Age of patient ± Standard Deviation)	65.3±10.7	66.0±11.6	0.45	64.9±10.7	65.3±11.4	0.73
Male patients	128 (65.3)	573 (65.0)	0.93	364 (71.7)	60 (63.2)	0.10
Diabetic patients	70 (35.7)	305 (34.7)	0.80	187 (36.8)	39 (41.5)	0.39
Dyslipidemia patients	146 (76.0)	754 (86.3)	<0.001	381 (76.4)	76 (83.5)	0.13
CRI	10 (5.1)	112 (12.8)	0.002	25 (4.9)	12 (12.9)	0.003
Peripheral vascular disorder	23 (11.7)	136 (15.6)	0.03	68 (13.4)	15 (16.0)	0.51

	2-vessel CAD			**3-vessel CAD**		
	CABG patients (n=199)	**PCI patients (n=890)**	***P-value***	**CABG patients (n=231)**	**PCI patients (n=447)**	***P-value***
History of CAD	118 (60.2)	454 (51.6)	0.03	285 (56.1)	43 (45.7)	0.06
History of PCI	64 (32.7)	273 (31.9)	0.84	155 (30.5)	15 (16.9)	0.008
History of CABG	11 (5.6)	136 (15.6)	<0.001	23 (4.5)	10 (10.6)	0.02
Percentage of current smokers	37 (19.1)	160 (18.1)	0.75	78 (15.7)	19 (20.0)	0.30
Percentage of unstable angina pectoris	26 (13.3)	404 (45.9)	<0.001	97 (19.1)	33 (35.1)	<0.001
LVEF± Standard Deviation	50±10	47±14	0.003	47±11	50±12	0.04
Involvement of left artery disease	189 (96.4)	593 (67.1)	<0.001			

The baseline characteristics in the CRI prevalence, along with the history of CABG, increased lipid concentration, and PVD, along with a history of PCI. This presentation was unstable with the LVEF, LADA, and left ventricular ejection fraction.

The patient who has already undergone this bypass surgery for the 2-vessel disease had a lower chance of developing dyslipidemia with a ratio of 77 % vs 87.5 % with an insignificant p-value lesser than 0.05. the chance to develop CRI was also reduced to 6.1 % vs 13.5 %, also with an insignificant p-value lesser than 0.05. For PVD, this chance was reduced to 11.5 % vs 16.7 % with a p-value of 0.035. additionally, these patients have greater chances of developing certain other types of coronary artery disorders, with a percentage of 61.2 % vs 51.7 % of the non-diseased persons. These patients are less likely to have a prior history of CABG 5.7 % vs. 15.8 %.. the patients who have a history of a CABG are less likely to develop a condition of

urinalysis with h14.3 % vs. 42.6 % having a p-value of 0.002. they are further subjected to an increased LVEF (0.43±0.25 versus 0.98±0.33; with ha p-value of 0.023).

A total of 670 patients came with a complaint of 3-vessel coronary artery disorder, and out of those six hundred 70 patients, 23% were treated by PCI, and 77 % of the individuals were treated via CABG surgery. This group of patients has a lower chance of developing CRI at 4.7 % vs 16.8 %; for CABG history, this ratio was 5.6 % vs 13.4 % with a p-value of 0.03. this group also has a reduced occurrence of urinalysis having a percentage ratio of 20.1 vs 43.0 with a p-value of 0.002. the patients receiving the CABG surgery for the 3-vessel disorder are suspected of having a diminished ratio of left lower ejection fraction (0.57±0.21 versus 0.55±0.17; P=0.024), and these groups have a higher chance for a previous history of PCI (32 % vs. 16 %, the p-value was calculated as 0.07).

The clinical outcomes of the 2-vessel CAD and 3-vessel CAD are summarized in Figure 01 and Figure 02. The time-lapse taken for this analysis was 12 months. In the population suffering from 2-vessel CAD, the PCI mortality rate was higher at 2.6 % for CABG; for PCI, this ratio was 8.2 %, with a p-value < 0.05, which is insignificant. The Q-wave MI rate in the CABG patients was also similar, with a ratio of 2.6 % vs 8.9 % for CABG vs PCI. Simultaneously, this patient group had a higher chance of experiencing different cardiovascular and cardiocerebral events 2.3% vs 0.1%; the p-value was 0.005.

The lower TVF rate was observed in the patients who underwent CABG bypass surgery, which was 6.5 % vs. 23.3 %, and p-value = 0.002 simultaneously major adverse cardiovascular and cerebrovascular events ratio was also less at 9.1 % vs 12.3 % with an insignificant p-value less than 0.05. Nine cases of subacute thrombosis were reported in 2-vessel CAD patients who underwent PCI revascularization, and one late thrombosis case was also reported. Yet the results for diabetic and nondiabetic patients were surprisingly similar.

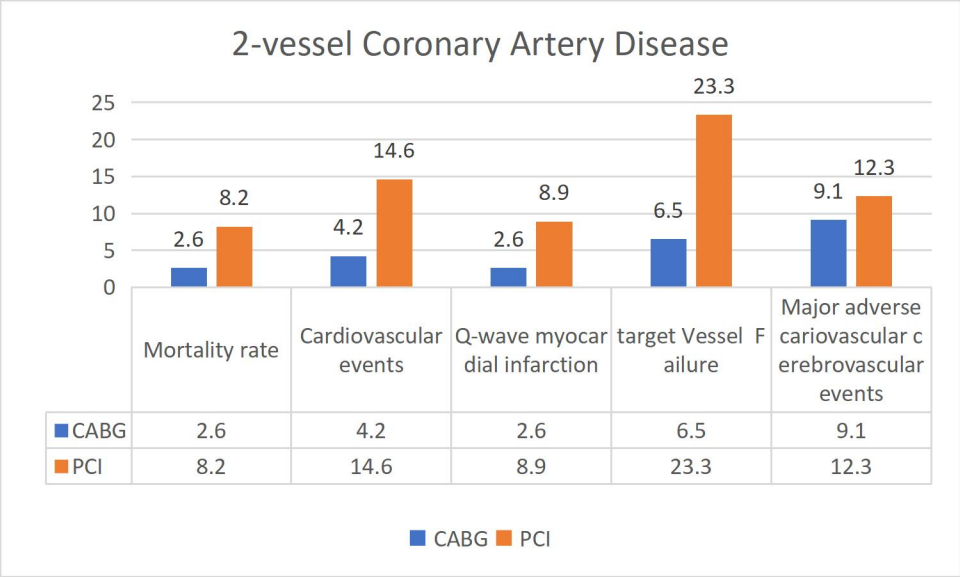

Figure 01. 12 months clinical outcomes of 2-vessel CAD patients

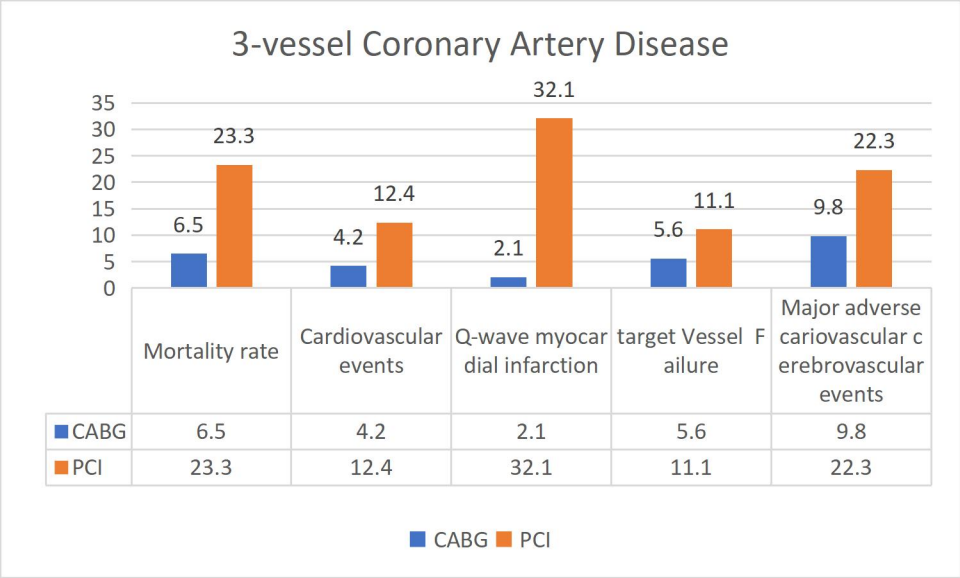

Figure 02. 12 months clinical outcomes of 3-vessel CAD patients

In the population suffering from 3-vessel CAD, the PCI mortality rate was higher at 6.5% for CABG; for PCI, this ratio was 23.3 %, with a p-value=0.05, which is significant. The Q-wave MI rate in the CABG patients was also similar, with a ratio of 2.1 % vs 32.1 % for CABG vs PCI. Simultaneously, this patient group had a higher chance of experiencing different cardiovascular and cardiocerebral events 9.8 % vs 22.3 %; the p-value was 0.005. The lower TVF rate was observed in the patients who underwent CABG bypass surgery, which was 5.6 % vs. 11.1 %, and

p-value = 0.02 simultaneously major adverse cardiovascular and cerebrovascular events ratio was also less at 9.8 % vs 22.3 % with an insignificant p-value less than 0.05. Nine cases of subacute thrombosis were reported in 2-vessel CAD patients who underwent PCI revascularization, and one late thrombosis case was also reported. Yet the results for diabetic and nondiabetic patients were surprisingly similar.

We have maintained a connection with diabetes mellitus, so Figure 03 shows the results of the 2-vessel CAD with DM. The appearance of Q-wave MI was the same in the two distinguished categories of patients (0% CABG and 4.5% PCI with a p-value- 0.23). in the CABG group, the frequency of CVEs was higher at 4.5% for CABG, and for PCI, it was 2.2%; these patients experienced significantly reduced rates of TVF (15.7% versus 28.5%; $P<0.001$) and mortality (13.1% versus 20.9%; $P=0.006$).

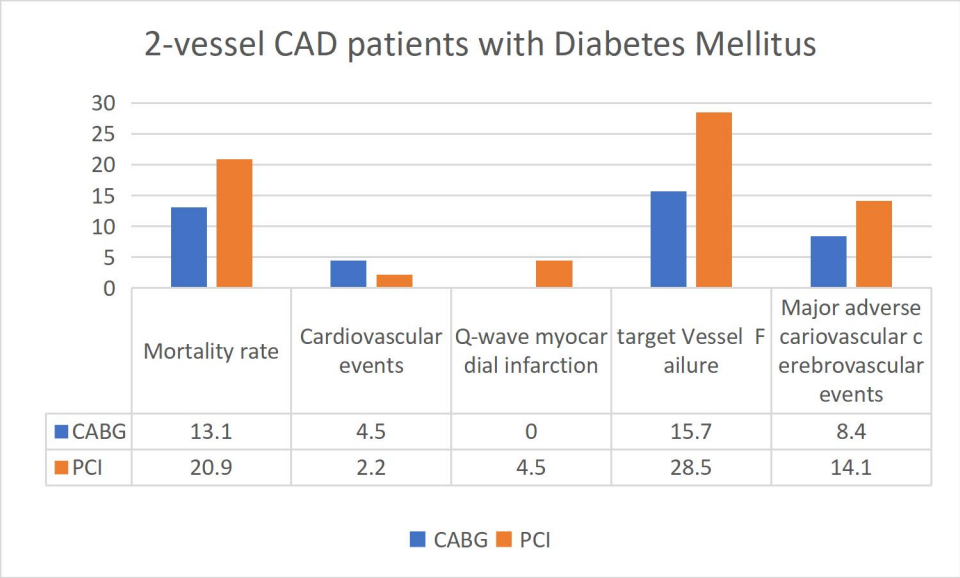

Figure 03. 12 months clinical outcomes of 2-vessel CAD patients with Diabetes Mellitus

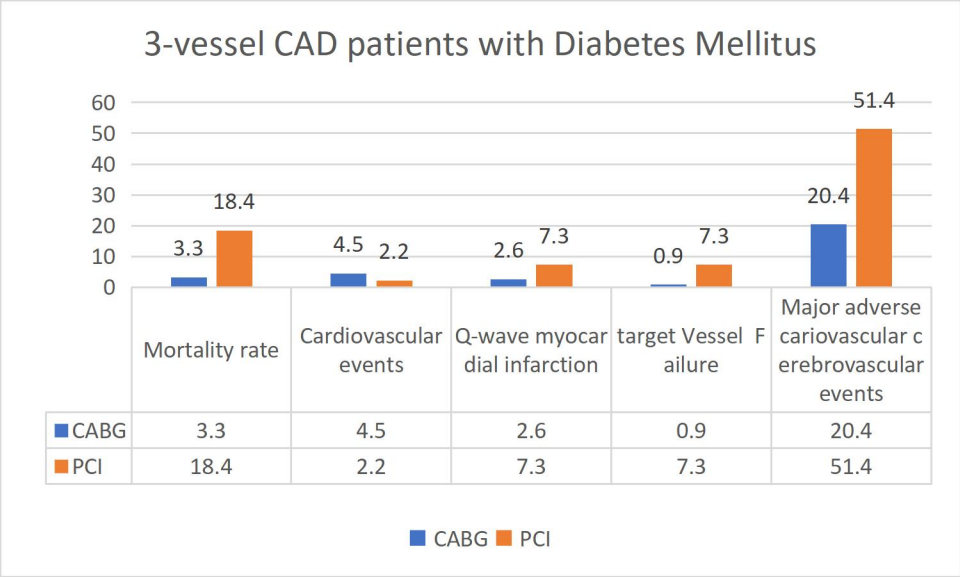

Figure 04. 12 months clinical outcomes of 3-vessel CAD patients with Diabetes Mellitus

Figure 04 depicts the outcomes of 3-vessel CAD patients with Diabetes Mellitus; in this case, the mortality rate in the patients treated by CABG surgery was 3.3% vs. 19.4%, p-value=0.23, target vessel failure for CABG was 0.9 vs. 7.3 for PCI, the p-value was 0.03, the MI q-wave rate was 2.6 vs 7.3 for CABG vs PCI respectively with ha p-value equals 1.00. the cumulative MAACE rate was 20.4 vs 51.4 for CABG vs PCI; they were significantly lower in the CABG group.

The diabetic patients treated for 2-vessel CAD had unadjusted outcomes, as they showed reduced target vessel failure and the MAACE rate receiving CABG surgery with 6.6% vs 22.4% and 12.1% vs 21.3%, respectively. No significant difference was observed in the death rate among the two groups, the ratio was calculated as 3.3% vs 4,5% for CABG and PCI, respectively. Contrary to this, the diabetic patients treated for 3-vessel CAD demonstrated a reduced TVF in CABG of 6.5% vs 14.3%, a trend towards MACCE reduction was also observed for 9.1 % vs 21 %

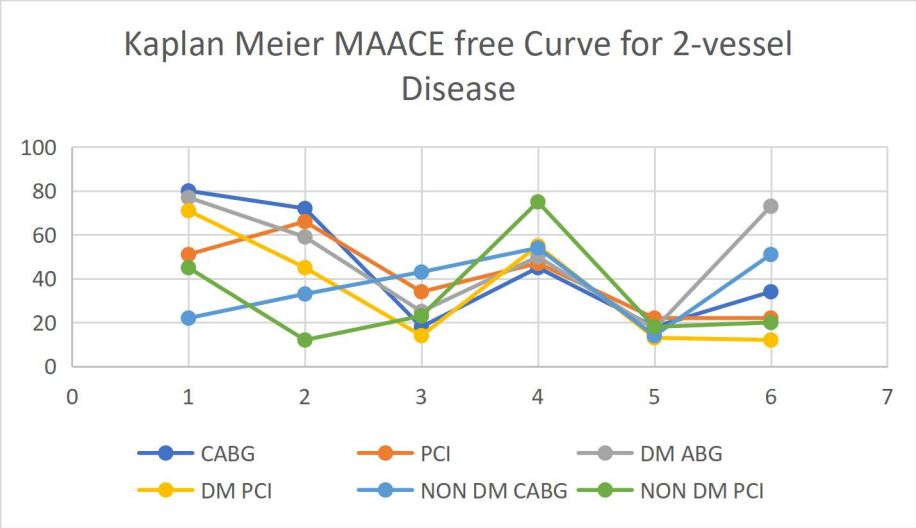

Figure 5. MACE survival curve for 2-vessel CAD

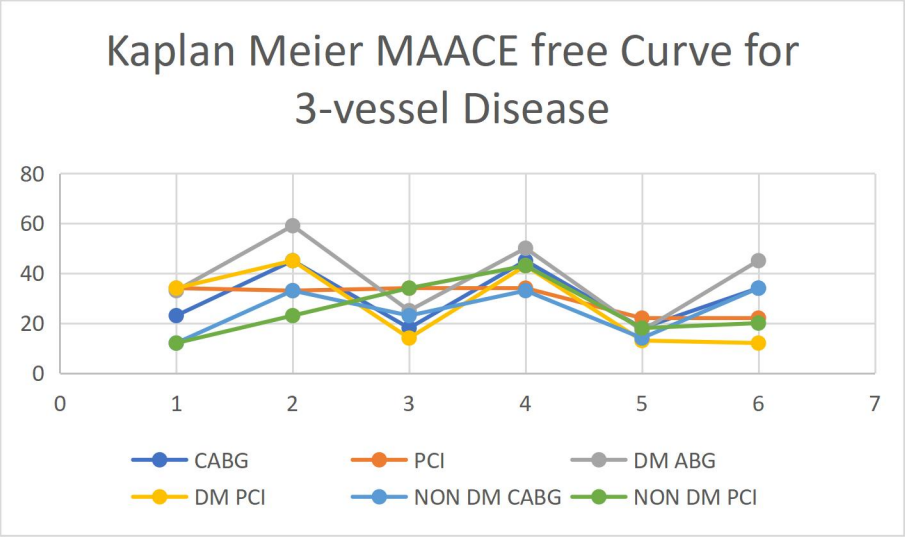

Figure 6. MACE survival curve for 2-vessel CAD

The adjusted Kaplan-Meier Graphs are shown in Figure 5 and Figure 6; these graphs are made to show the mortality-free survival of patients for the patients with complaints of 2-vessel and 3-vessel CAD in both diabetic and non-diabetic individuals either treated through CABG surgery of PCI revascularization process.

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Discussion

The findings of this study lend credence to the hypothesis that diabetic patients who suffer from multivessel disease have a significantly higher risk of death and MACCE when compared to their counterparts who do not have diabetes. Within this population, 35.7% of the 1680 individuals had diabetes that was present from the beginning. The presence of diabetes is almost exclusively responsible for the benefit of CABG (CABG) over percutaneous coronary intervention (PCI), despite the fact that the total populations of patients undergoing CABG with two and three vessels had reduced unadjusted MACCE and death rates.

The preliminary findings of the ARTS-II registry, which have not yet been published, cannot be substantiated in their entirety, as demonstrated by our findings. The differences in patient characteristics at the beginning of the study are the most plausible explanation for the contradictory findings.

There are a number of advantages to this study. The first of these factors is the nature of the institution that is reporting the information, as well as the number of procedures that are involved in both CABG and PCI. The fact that our patient base is so diverse is yet another strong point of our organization. The fact that more than thirty-five percent of patients in each cohort present with diabetes indicates that there is a sufficiently significant subset from which to draw relevant judgments. In addition, the socioeconomic and cultural diversity of patients who present themselves to a tertiary referral center that is situated in an urban region makes it possible to investigate and follow up with a population that is representative of the "real world."

It is possible that the treating physician's ability to exercise judgment led to the selection of a higher-risk population for percutaneous coronary intervention (PCI), for which surgery might not have been deemed appropriate or safe. In addition, it is essential to acknowledge that the current research is of a retrospective character, which means that it is susceptible to inherent biases and have inherent limitations. The outcomes of ongoing randomized studies that will assist in elucidating the most effective therapy plan for patients who have multivessel CAD are something that we are eagerly awaiting.

Limitations

Patients with diabetes who underwent PCI had a greater risk of MI and mortality compared to those being treated via CABG bypass surgery. However, the pathophysiology that underlies this higher risk was not identified. Several hypotheses have been proposed in order to provide an explanation for this phenomenon. We hypothesized that this distinction was due to the fact that CABG (CABG) is associated with more comprehensive revascularization, which allows it to circumvent many atherosclerotic or susceptible plaques with the purpose of providing coronary protection against growing proximal coronary stenosis. Individuals who are diabetic and have coronary disease that is more progressive and diffuse may be particularly susceptible to this influence. a 19 The relationship between cardiopulmonary bypass and an increased risk of air embolism and atheroembolism, particularly in individuals with a large aortic plaque burden, can be used to explain the increased risk of stroke that is associated with CABG (CABG). In light of this, a procedure that reduces the amount of aortic manipulation and/or avoids the use of cardiopulmonary bypass as an off-bump bypass may result in a lower risk of stroke following surgery. 29%

Our meta-analysis has a number of shortcomings that need to be addressed. We made an effort to reduce the impact of the last disadvantage by analyzing the results of three different outcome periods for three different cohorts that were described individually. This percentage was determined to be 3.55 percent. In the fourth place, we relied on published incident rates for each trial rather than data related to individual patients. Access to the data of individual patients would have made it possible to do additional subgroup analysis and propensity studies, which would have taken into account differences in pre-procedural risk in order to reduce the possibility of bias. In the fifth place, the DES that were utilized in these tests were of the first and second generation. There have been no experiments conducted up to this point on the third generation of DES, which is the one that is utilized more frequently in the modern period.

Anyhow certain irrelevancy is found in the past studies. Some lacking was observed and, in this study, we focused on those lacking by noticing the difference between the demographics, advancement in technology, and medical history of the patients that limits their application to

current situations. Previously these study trials were based on very small sample sizes and all the patients included in the study were high-risk patients and had some chronic disorders like the history of some multivessel diseases, Diabetes Mellitus, and LVD. The second limitation of those studies was the advancement in medical procedures that were not considered part of the standard care when these studies were conducted, and this limitation has altered the long-term results significantly in the patients suffering from some multivessel diseases

Conclusion

In conclusion, revascularization with an open heart bypass surgery might be the preference over the other type of revascularization process which is DES-assisted PCI for DM patients suffering from MVCAD. Possibly even more significant is the fact that the results obtained with both methods have a significant amount of space for improvement in these subsets. There is no substitute for solid clinical judgment when it comes to selecting the optimal revascularization method for patients who have multivessel coronary disease.

Both of these techniques and treatment procedures are already compared in many of the past studies, their comparison with medicinal therapy was done and they were finally compared with each other. The extreme results followed by both of these procedures like MI, and mortality were quite similar. The CABG surgery is supposed to give more relief to patients suffering from a failure of the target vessels, CABG is also supposed to treat the angina pectoris 5–14. The most significant aspect that makes CABG superior to PCI is that CABG in some cases is more apparent when it comes to the groups of individuals who are high-risk CAD patients. In some of the individual metanalysis and studies, more benefits were demonstrated by CABG surgery and helped in reducing the mortality rate, and the risk of MI

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