

Coronary Artery Disease (CAD) and its Interventional Treatments

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Abstract

Coronary Artery Disease (CAD) is a global menace, demanding effective treatment. Medication, lifestyle changes, and dietary adjustments are initial measures. When CAD progresses, interventional coronary artery revascularization, specifically Coronary Artery Bypass Grafting (CABG), stands out as the superior choice. Genetic and lifestyle factors contribute to CAD, often rendering medication and lifestyle changes ineffective. CABG consistently outperforms Percutaneous Coronary Intervention (PCI) for CAD patients, ensuring better long-term outcomes, even in multivessel and diabetic cases. In the left main CAD scenarios, CABG offers more tremendous success in complete revascularization, emphasizing its superiority. While PCI is less invasive, CABG's long-term benefits make it the preferred method, aligning with guidelines and patient preferences.

Background

One of the most common cardiovascular disorders impacting individuals worldwide is coronary artery disease, which has been identified as the major cause of mortality in both developed and developing nations [1]. According to Kamal, et al [2], medication is routinely used to treat CAD, along with dietary and lifestyle changes. If a condition worsens, then it may be suggested that the patient should undergo coronary artery or myocardial revascularization intervention, which is designed to reestablish blood flow to the coronary artery [2]. Coronary Arterial Bypass Grafting is one of the popular artery revascularization procedures used to treat CAD [1]. Coronary artery bypass grafting (CABG) is a procedure that reroutes blood flow around a blockage by using an artery or vein from another section of the body. Internal mammary arteries from the chest wall and sections of the patient's veins are used by surgeons to create new passageways for blood and oxygen to reach the heart [1]. An alternative method of coronary artery revascularization is known as percutaneous coronary intervention (PCI), a non-surgical process that involves placing a tiny tube called a stent within the heart's obstructed blood arteries to maintain blood flow [2]. Coronary Artery Bypass Grafting (CABG) appears to be more effective at coronary artery revascularization than

Percutaneous Coronary Intervention (PCI) for patients with coronary artery disease (CAD) whose condition has continued to deteriorate, and which cannot be managed by medication, therefore, interventional coronary artery revascularization therapy will be required.

Results

Complex hereditary and risk factors play a role in the development of CAD, and myocardial revascularization is often necessary for interventional therapy of CAD. According to Malakar, et al. [3], familial clustering of CAD was observed in the 1950s and 1960s, and mendelian disorders have been connected to CAD. The risk of developing CAD is heritable and has been demonstrated to grow with the number of affected relatives and start at a young age. The risk factors for smoking, diabetes and high blood pressure have all been linked to the development of CAD, according to several epidemiological studies [3]. Since CAD is often unresponsive to medication or dietary modifications, the two treatment options are percutaneous coronary intervention (PCI) and coronary artery bypass grafting (CABG) surgery [4]. This research suggests that the likelihood of having CAD rises when inherited genes are directly to blame for the disease's emergence. As a result of the risk factors' effects, which have been linked to cardiovascular diseases, certain risk factors, such as smoking, diabetes, and



high blood pressure, will also raise the likelihood that CAD will develop in a person. The majority of people with CAD are diagnosed at a point when they cannot be treated with medicine or lifestyle modifications and must have myocardial revascularization. Since percutaneous coronary intervention (PCI) is less invasive and requires a quicker recovery than CABG, Lee, et al. [5] believe that PCI is the best revascularization approach in their study where they found PCI to be more successful [5]. However, despite recent developments in the field of PCI, CABG remains superior in terms of patient benefits. As a result, CABG is the recommended coronary revascularization treatment for CAD patients, including those with multivessel CAD.

In cases of multivessel CAD, CABG is favored over PCI. According to Akhrass, et al. [6], diabetic patients have a higher risk of developing multivessel CAD, they have early morbidity and mortality, with multivessel CAD being the leading cause of death, and the majority of studies consistently show that CABG is more effective than PCI for treating diabetic patients with CAD [6]. Additionally, research using CABG and PCI as treatment options revealed reduced mortality with CABG in comparison to PCI in diabetic patients which accounts for up to 75% of fatalities in multivessel CAD [6]. Regardless of the presence of diabetes, the results obtained suggest that CABG is the best therapeutic option for patients with multivessel CAD due to the evident decrease in long-term mortality and recurrent revascularizations with CABG compared to PCI [4]. It could be argued that CABG has statistically shown to be superior to PCI, even in diabetic patients whose primary cause of death has been identified as multivessel CAD. Furthermore, there is a possibility that the patient would have interventional therapy again with PCI while undergoing CABG once is sufficient as an interventional treatment for multivessel CAD regardless of the patient's diabetes. Therefore, CABG provides significant advantages over PCI in multivessel CAD, and it is the case in left main CAD patients as well.

CABG is preferable in the left major CAD versus PCI. Usually, CAD occurs in multiple coronary arteries with the left main coronary artery as the most prevalent [7]. The left major coronary artery supplies blood to at least 75% of the left ventricle [8]. Researchers have focused on studying therapeutic approaches to treat left main coronary artery disease since patients are at significant risk of experiencing catastrophic repercussions if this artery is acutely occluded [8]. Spadaccio, et al. [4] believe CABG has produced better outcomes than PCI in this study and hence, CABG has been found to be the best cardiac revascularization treatment for elderly patients in relation to the guidelines [4]. Based on a substantial preliminary study comprising 35 studies and 89,883 patients with CAD, complete revascularization is more commonly achieved with CABG than PCI [4]. The most recent data on the success rate and patient quality of life after the corresponding CABG and PCI procedures are presented in this research. The reduced incidence of repeat revascularizations and lower death rates seem to be the main variables supporting the benefit of CABG over PCI. This research demonstrates the most convincing evidence in favor of CABG is the fact that the most prevalent form of CAD in patients, left main CAD, is handled by CABG in accordance with guidelines, implying that it is a superior revascularization treatment than PCI. It is clear from the data above that CABG has been shown to be the best method for coronary artery revascularization.

Discussion

Hereditary and Risk Factors in CAD Development

The study highlights the complex interplay of hereditary and risk factors in the development of CAD [3]. Familial clustering of CAD has been observed, and mendelian disorders have been linked to CAD. The heritability of CAD risk is well-established, and the risk increases with the number of affected relatives and can manifest at a young age. Additionally, common risk factors such as smoking, diabetes, and

hypertension have been consistently associated with CAD development [3]. These risk factors underscore the importance of identifying effective treatment strategies for CAD patients who may not respond adequately to medication or lifestyle modifications.

Comparative Efficacy of PCI and CABG

The study presents a comprehensive analysis of the comparative efficacy of PCI and CABG in CAD treatment. While both methods have their merits, the evidence suggests that CABG appears to be more effective for patients with advanced CAD [6]. PCI is a less invasive procedure with a quicker recovery time, making it an attractive option. However, several key findings support the superiority of CABG

Multivessel CAD

Patients with multivessel CAD, particularly those with diabetes, are at a higher risk of complications and mortality [6]. The study findings consistently favor CABG over PCI for this patient subgroup. The reduced mortality and recurrent revascularization rates associated with CABG make it the preferred treatment option.

Left Main CAD

Left main CAD is a high-risk condition due to its critical role in supplying blood to a significant portion of the left ventricle [8]. CABG has demonstrated superior outcomes compared to PCI for patients with left main CAD [4]. The study findings emphasize that complete revascularization is more frequently achieved with CABG. The lower incidence of repeat revascularizations and lower mortality rates provide strong support for CABG as the preferred choice.

Implications for Clinical Practice

The results of this study have important implications for clinical practice. For CAD patients, especially those with multivessel CAD or left main CAD, CABG should be considered the primary revascularization therapy. While PCI offers some advantages in terms of invasiveness and recovery time, the long-term outcomes and lower mortality rates associated with CABG make it the superior option. It is crucial for healthcare providers to consider the specific patient profile, including comorbidities such as diabetes, when determining the most appropriate revascularization strategy.

Limitations and Future Research

It is important to acknowledge that this study has certain limitations. The data presented are based on existing research studies, and there may be variations in outcomes across different patient populations and healthcare settings. Additionally, the decision between PCI and CABG should be individualized and take into account patient preferences and the expertise of the treating physicians. Further research is needed to explore specific patient characteristics that may influence the choice of revascularization method and to refine the guidelines for CAD treatment.

Conclusion

For patients with Coronary Artery Disease (CAD) whose condition has worsened and cannot be controlled by medication, interventional coronary artery revascularization therapy will be necessary, Coronary Artery Bypass Grafting (CABG) appears to be the best myocardial revascularization method for CAD as opposed to Percutaneous Coronary Intervention (PCI). The quality of life for the patient is higher with CABG than with PCI since patients have proved to have longer life expectancies. Despite the fact that PCI is less intrusive and takes less time to recover from, there are larger death rates for PCI than for CABG. Although doctors are aware of the most effective strategy for treating CAD, patients should be made aware of the advantages, drawbacks, and uncertainties of both approaches until definitive trial results are available, as the method of coronary revascularization must first satisfy the patient's preferences.



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