# HEMODYNAMIC TREATMENT OF SEVERE LESION OF THE LEFT MAIN CORONARY ARTERY: A CASE REPORT

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**ABSTRACT**

Compared to other cardiac artery stenosis, the left main coronary artery stenosis is associated with a higher risk of mortality and myocardial injury due to the greater amount of subtended myocardium. For treatment, myocardial revascularization surgery and percutaneous coronary intervention are indicated. Therefore, this work has as main objective to present the benefits of the treatment of a lesion of the main coronary artery by hemodynamic approach and to report a case of a severe lesion treatment of the left main coronary artery. This is a case report and an integrative literature review. The search was carried out in the PubMed and Scielo libraries. The works that were included discuss the theme proposed for the study in Portuguese and English, with full texts and available in free versions. In conclusion, for patients with stenosis of the main coronary artery with low and medium complexity of coexisting coronary artery disease, PCI treatment offers a favorable long-term result and, therefore, it constitutes an alternative therapy to MRS. While complex disease is best treated with MRS. For evaluation of the angiographic SYNTAX score, it can be used to indicate the best treatment tool.

**KEYWORDS: CORONARY TRUNK LESION; TREATMENT; HEMODYNAMIC WAY; REVASCULARIZATION; ALTERNATIVE THERAPY.**

## INTRODUCTION

The coronary trunk (CT) originates from the aortic sinus, passing behind the pulmonary trunk. Generally, the path is horizontal or slightly caudocranial, dividing itself into the anterior descending artery (ADA) and the circumflex artery (CXA). Occasionally, the CT ends in a trifurcation, thus initiating the diagonalis branch, which runs laterally to the ADA 1. Compared to other sites, CT stenosis is associated with an increased risk of mortality and myocardial injury due to the greater amount of subtended myocardium2.

For treatment, myocardial revascularization surgery (MRS) was introduced in 1968, becoming the standard for the treatment of symptomatic patients with coronary artery disease. With advances in the area over the years, providing smaller incisions, greater myocardial preservation, use of arterial conduits and better postoperative care, it was possible to reduce morbidity, mortality and graft occlusion rates. Another available technique is percutaneous coronary intervention (PCI), which was introduced in 1977. Through this intervention and with current high technology, it has become possible to treat complex lesions safely and efficiently3.

Thus, efforts are increasingly being made to provide scientific advances in the area so that the patient has access to cutting-edge therapies. Therefore, studies on the subject make this progress possible. Presenting the benefits of the treatment of coronary trunk lesions by hemodynamic way is the objective of this work through the conceptualization of coronary trunk lesions, highlighting the differences between treatments, as well as pointing out the indications for treatment of coronary trunk lesions by hemodynamic way.

## METHODS

A qualitative narrative review study was carried out. The search was carried out in the virtual libraries of the United States National Library of Medicine (PubMed) and Scientific Electronic Library Online (Scielo). The keywords used were: coronary trunk lesion; treatment; hemodynamic way, isolated or associated through the Boolean AND operator.

The articles were selected from a previous reading of the abstracts in order to compare the respective points proposed, used and discussed by each author. In cases where reading the abstracts was not enough to understand the context, the full article was accessed. Subsequently, a selective reading of the articles was carried out to organize the information found, an analytical reading to highlight the most relevant themes and topics from a selection of information that will interest the research in general.

The inclusion criteria were: works that discussed the theme proposed for the study in Portuguese and English, with complete texts and available in free versions.

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The exclusion criteria were: works that did not contemplate the proposed objective of the research; that did not adhere to the research area and that were unavailable at the time of collection and that, therefore, would not be relevant for this study.

## CASE REPORT

Patient N.P.S.A., female, 65 years old, previously suffering from hypertension, insulin-dependent type 2 diabetes, chronic stable angina (functional class 2) and previous history of breast cancer with right mastectomy 27 years ago. Admitted in November 2021 due to an episode of stabbing retrosternal chest pain radiating to the left upper limb, prolonged at rest, intensity 8/10, associated with dysautonomia. Upon admission, a twelve-lead electrocardiogram and myocardial necrosis markers were evaluated, both negative for ischemia. A diagnosis of unstable angina was made and an invasive coronary risk assessment was performed through cardiac catheterization.

Previous use medications: Sustrate 20 mg/day, Clopidogrel 75 mg/day, Atenolol 100 mg/day; Nifedipine Retard 20 mg/day, Pitavastatin 2 mg/day, Gligafe XR 2000 mg/day and NPH Insulin 30 U/day. Despite the previous use of antianginal drugs, the patient reported having recurrent angina.

On November 19, 2021, cardiac catheterization was performed, which showed: Right Coronary Artery: Dominant, without obstructive lesions (Figure 1); Posterior Ventricular and Posterior Descending: without obstructive lesions. Left main coronary artery: 90% severe ostial lesion followed by aneurysm in the distal third (Figure 2). Anterior Descending Artery: without obstructive lesions; Circumflex artery: ostial occlusion. On ventriculography: Left ventricle with slightly increased volumes, diffuse hypokinesis, no left ventricle-aorta gradient, mitral valve didn't not allow reflux into the left atrium. Moderate left ventricular systolic dysfunction.

**Figure 1. Videography Right Coronary Artery: Dominant, without obstructive lesions. Rocha, T.B., 11/19/2021;**

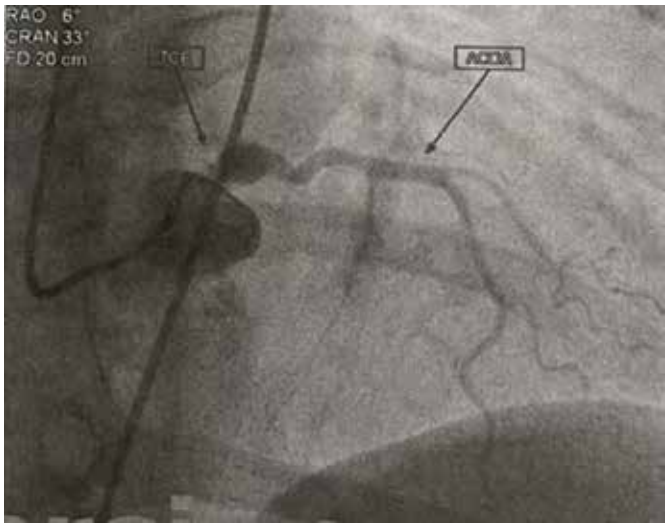


**Figure 2. Cardiac catheterization image showing left main coronary artery: severe ostial lesion of 90% followed by aneurysm in the distal third. Rocha, T.B., 11/19/2021;**

After evaluating the cardiac catheterization, the SYNTAX score was assessed, which presented an intermediate score, and on November 23, the intervention was performed by hemodynamic way, with angioplasty and implantation of a drug-eluting stent in the left main coronary artery, showing TIMI 3 final flow ( Figure 3).

**Figure 3. Imaging catheterization, Patient N.P.S.A., demonstrating final TIMI 3 flow after a procedure by hemodynamic way with angioplasty and implantation of a drug-eluting stent in the left main coronary artery. Rocha, T.B., 11/23/2021;**

## DISCUSSION

A prospective, randomized, open-label, non-inferiority NOBLE study was performed by Holm et al. 4 in 36 hospitals in nine northern European countries. Patients with left coronary artery disease requiring revascularization were randomly assigned to receive either percutaneous coronary intervention (PCI) or myocardial revascularization surgery (MRS). Patients were followed up for an average of 3.1 years, with this, the authors found that, in revascularization of left main coronary artery disease (LMCA), PCI was associated with a lower clinical outcome at 5 years compared to MRS. Mortality was similar after both procedures, but patients treated with PCI had higher rates of nonsurgical myocardial infarction and the need for revascularization. These results were also pointed out by Giacoppo et al. 2 the authors emphasized that PCI and MRS show comparable safety in patients with LMCA stenosis and low-to-intermediate coronary artery disease. However, repeated revascularization is more common after PCI.

In the research by Serruys et al.3, the authors evaluated 1,800 patients with disease of three vessels or of the left main coronary artery to be submitted to MRS or PCI. Most preoperative characteristics were similar in both groups. The 12-month rates of major adverse cardiac or cerebrovascular events were significantly higher in the PCI group (17.8%, vs. 12.4% for MRS), largely because of an increased rate of repeat revascularization (13.5 % vs. 5.9%). As a result, the non inferiority criterion was not met. At 12 months, death and myocardial infarction rates were similar between the two groups; stroke was significantly more likely to occur with MRS (2.2% vs. 0.6% with PCI). It was concluded that MRS remains the standard of care for patients with three-vessel or left main coronary artery disease, as compared with PCI, it resulted in lower rates of major adverse cardiac or cerebrovascular events at 1 year.

For Head et al. [5] the SYNTAX score has emerged as a valuable tool for classifying the complexity of patients with coronary disease. Although there is inter- and intra-observer variability in the calculation of the SYNTAX score, this appears to no longer be a clinically relevant issue after appropriate training. The SYNTAX score is now advocated in clinical guidelines and is increasingly being used worldwide in daily clinical practice. Integrating the SYNTAX score in multivessel coronary patients and decision making seems inevitable as current studies and clinical guidelines continue to expand its use. The method evaluates the difficulty and the chance of success of the percutaneous intervention, through the evaluation of several items related to the coronary plaque - such as its location in the vessel, length, calcification, proximity to the bifurcation, chronic occlusions, etc., and the larger, the more technically difficult to perform PCI.

In the study by Jahangiri et al. 6 the authors reviewed the methodology, results, caveats and statements about the EXCEL and SYNTAX study. It was concluded that for patients with less complex lesions, SYNTAX found PCI to be an acceptable alternative, although it was not designed to assess the overall effectiveness of PCI versus MRS. It was in this context that the EXCEL trial was designed to investigate new-generation PCI versus MRS in low-risk or intermediate-risk patients. The EXCEL authors' initial conclusion that there was no significant difference between PCI and MRS with regard to the composite endpoints of death, stroke, or myocardial infarction at 5 years, these results have subsequently been questioned. This is related to controversies over study methodology, disagreements over which definition of periprocedural myocardial infarction was used, and alleged investigator conflicts of interest. The EXCEL disaster has, to some extent, undermined public confidence in medical research in general and clinical trials in particular.

The 2021 guidelines of the Brazilian Society of Cardiology on unstable angina and acute myocardial infarction without ST-segment elevation indicate that to choose the treatment, the SYNTAX score tool should be used, and patients with SYNTAX > 22 points (intermediate or high) have greater long-term benefit from surgical revascularization. In case of urgency or emergency, the use of venous to arterial grafts should be recommended. Cardiopulmonary bypass aid may or may not be used, taking into account the conditions of each individual. For patients with cardiogenic shock, complete revascularization through angioplasty should be the initial option; however, due to its limitation, surgery may be indicated according to a multidisciplinary evaluation[7].

European guidelines highlight that predicted surgical mortality, anatomical complexity of coronary artery disease and early completion of revascularization are important criteria for decision making regarding the type of treatment. Whether conservative therapy, PCI, or MRS is preferred should depend on the risk-benefit ratio of these treatment strategies, assessing the risks of periprocedural complications (e.g., cerebrovascular events, blood transfusions, renal failure, new-onset arrhythmias or surgical wound infections) against improvements in health-related quality of life, as well as prevention of death, myocardial infarction or repeated revascularization in the long term8.

Buszman et al.[9] reported the 10-year clinical follow-up of 105 patients with stenosis of the unprotected left main coronary artery with low and medium complexity of coexisting coronary artery disease according to the SYNTAX score. Patients were treated with PCI with stent (n = 52) or MRS (n = 53). Drug-eluting stents were implanted in 35%, while arterial grafts for the anterior descending artery were used in 81%. At 10 years, there was a trend towards higher ejection fraction on stents compared to surgery. There was no statistical difference in mortality between the groups, however, numerically the difference was in favor of the

stent. Likewise, there was no difference in the occurrence of myocardial infarction, stroke and rates of repeated revascularizations.

Ruel et al. 10 pointed out that when the stenosis is in the initial part of the coronary tree and is relatively large in caliber and short in length, the stenosis seems to be an anatomically attractive target for PCI. However, as the tissue is more elastic than coronary vessels, balloon angioplasty has been associated with immediate procedural unpredictability as well as unacceptable rates of restenosis and early mortality. The adoption of bare metal stents has rejuvenated interest in PCI for coronary disease, with a reduction in acute procedural complications (eg, recoil, abrupt closure, or dissection). Along with the non-negligible risks of operative mortality and morbidity associated with MRS, as well as the high rate of saphenous vein graft attrition, many interventional cardiologists have sought to explore less invasive procedures. Among elective, low-risk patients, procedural and short-term results are acceptable. However, the stent repetition rate still remains excessive.

In this sense, for Lee et al.11 patients with stable ischemic heart disease, anatomical conditions associated with a low risk of complications from the PCI procedure and a high probability of good long-term results (for example, a low SYNTAX score, ostial stenosis or of the main coronary artery), in addition to clinical characteristics that predict a significantly increased risk of adverse surgical results, conservative treatment with PCI should be performed.

## CONCLUSION

In patients with stenosis of the main coronary artery with low and medium complexity of coexisting coronary artery disease, PCI treatment offers a favorable long-term outcome, therefore, it constitutes an alternative therapy to MRS, as it is a less invasive and effective treatment.

Percutaneous coronary intervention and coronary artery bypass graft surgery are treatment options for coronary artery bypass grafting in selected patients with stable coronary artery disease and ischemia. Current revascularization guidelines indicate that treatment selection depends on patient preferences, comorbidity, and the complexity of the coronary artery disease. Less complex one- or two-vessel coronary artery disease is preferentially treated with PCI, where the level of acceptance is higher for PCI, while complex three-vessel disease is better treated with MRS.

## DATA AVAILABILITY

Data used to support the findings of this study are available from the corresponding author upon request.

## CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest in the publication of this manuscript.

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