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CURRENT CHALLENGES IN THE DIAGNOSIS AND TREATMENT OF LEFT MAIN CORONARY ARTERY (LMCA) STENOSIS

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Abstract
Stenosis of the left main coronary artery (LMCA) remains one of the most critical and high-risk conditions in cardiology due to its direct impact on myocardial perfusion and its association with sudden cardiac death. The diagnosis and treatment of LMCA stenosis involve complex decision-making and pose significant challenges in clinical practice. To study the world experience in the diagnosis and treatment of left coronary artery trunk (LTCT) stenosis.

Introduction:

Material and methods:
A search of literature on the epidemiology, diagnosis and treatment of LMCA, published for the period 1988-2020, was conducted in the electronic databases PubMed, COCHRANE and Scholar Google.

Results:
Stenosis of the left main coronary artery (LMCA) is a risk factor for sudden cardiac death, diagnosed in 4–8% of patients with coronary artery disease (CAD). Patients with LMCA stenosis vary in etiology, clinical presentation (asymptomatic course, myocardial infarction (MI), or cardiogenic shock), and treatment strategy.
Independent risk factors for mortality in patients with LMCA stenosis include left ventricular ejection fraction (LVEF) <30%, grade 3–4 mitral regurgitation, MI or shock, and serum creatinine levels >200 mg/L.
The “gold standard” for diagnosing LMCA stenosis is coronary angiography (CAG). However, this method has limitations in determining the hemodynamic significance of stenosis, as well as significant variability in the interpretation of coronary angiograms by different specialists. Hemodynamically significant stenosis of an “unprotected left main” is defined as >50% stenosis. There is a high likelihood of cardiovascular events occurring during CAG and within the first hour after the procedure.
In assessing the degree of LMCA involvement, fractional flow reserve (FFR) and intravascular ultrasound (IVUS) are of particular importance. IVUS provides information on the true length of the lesion, vessel diameter, and plaque morphology.
The decision regarding myocardial revascularization (MR) is made on a personalized basis by a cardiology team, including an interventional cardiologist, a non-invasive cardiologist, and a cardiac surgeon.
With the introduction of drug-eluting stents (DES), the proportion of patients undergoing percutaneous coronary interventions (PCI) has surpassed those undergoing

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coronary artery bypass grafting (CABG). However, the proportion of patients on medical therapy has remained relatively stable. After PCI, close follow-up is required due to the risk of repeat MR.

There is no consensus on the optimal waiting time between diagnostic CAG and open revascularization. Patients with low SYNTAX scores (≤22) are recommended for CABG or PCI, while those with SYNTAX scores >32 are advised to undergo CABG only.

Early surgical revascularization (within 10 days after CAG) should be performed in patients with LMCA stenosis ≥70%, chronic heart failure (NYHA Class IV), or recent MI. Emergency CABG is indicated for acute MI or life-threatening ventricular arrhythmias, although emergency CABG is associated with poor prognosis.

Given these considerations, it is necessary to identify patient groups at higher risk of cardiovascular events while awaiting surgery. Risk factors for mortality after CABG (in addition to female sex, advanced age, and left ventricular dysfunction) include the duration of anginal symptoms, left-dominant coronary artery anatomy, the length of cardiopulmonary bypass, the number of grafts, significant stenosis of the right coronary artery, and lack of collateral circulation.

Five years after CABG, mortality in LMCA stenosis patients is 15.8%, compared to 10.7% in patients with triple-vessel disease.

Discussion:

Diagnostic Challenges:

1. Limitations of Coronary Angiography (CAG):

• Although CAG is considered the "gold standard" for LMCA stenosis diagnosis, it has limitations in accurately determining the hemodynamic significance of stenosis.

• Variability in the interpretation of angiographic images among specialists can lead to inconsistent assessments.

2. Hemodynamic Assessment:

• Hemodynamically significant stenosis is defined as narrowing of >50% in the unprotected LMCA. However, further evaluation using advanced techniques, such as fractional flow reserve (FFR) and intravascular ultrasound (IVUS), is often necessary.

• IVUS provides detailed information on the length of the lesion, vessel diameter, and plaque morphology, aiding in treatment planning.

3. Risk of Complications:

• Cardiovascular events frequently occur during or shortly after CAG, particularly in patients with severe LMCA stenosis.

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Treatment Challenges:

1. Choosing the Optimal Revascularization Strategy:

• Decisions regarding myocardial revascularization (MR) must be individualized, involving a multidisciplinary team of interventional cardiologists, non-invasive cardiologists, and cardiac surgeons.

• The SYNTAX score is a key tool for guiding treatment:

• SYNTAX ≤22: PCI or CABG may be recommended.

• SYNTAX >32: CABG is preferred.

2. Timing of Revascularization:

• There is no consensus on the optimal waiting period between diagnostic CAG and surgical revascularization.

• Early revascularization (within 10 days post-CAG) is advised for patients with severe LMCA stenosis (≥70%), chronic heart failure (NYHA Class IV), or recent MI.

3. Risks of Emergency CABG:

• Emergency CABG for acute MI or life-threatening arrhythmias is often associated with poor outcomes, highlighting the importance of careful patient selection and preparation.

4. Post-Intervention Monitoring:

• After PCI, there is a significant risk of restenosis and the need for repeat MR, necessitating close follow-up.

• Long-term outcomes vary based on the initial revascularization method, with CABG generally providing better survival in high-risk patients.

Long-Term Prognosis:

• Five-year mortality after CABG in LMCA stenosis patients is approximately 15.8%, compared to 10.7% in patients with triple-vessel disease.

• Key factors influencing post-CABG mortality include the duration of anginal symptoms, the anatomy of the coronary circulation, the number of grafts, and the presence or absence of collateral circulation.

Conclusion:

The management of LMCA stenosis remains a dynamic and evolving field, with significant advancements in diagnostic and therapeutic strategies. Despite these advancements, challenges persist in accurately diagnosing hemodynamically significant stenosis, determining the optimal revascularization strategy, and minimizing perioperative risks. Effective risk factor control, timely diagnosis of LMCA stenosis, and appropriate treatment strategies significantly reduce the risk of cardiovascular events and mortality. The introduction of drug-eluting stents (DES) has narrowed the gap between PCI and CABG in terms of outcomes, although the proportion of patients

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receiving medical therapy has remained relatively unchanged. Continued research and multidisciplinary collaboration are essential to improve outcomes for this high-risk patient population.

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