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CLINICAL SIGNIFICANCE OF CORONARY ARTERY ANATOMY IN THE DEVELOPMENT OF MYOCARDIAL INFARCTION

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ABSTRACT: Myocardial infarction is one of the most serious manifestations of coronary artery disease and develops when coronary blood flow becomes insufficient to maintain myocardial viability. Although atherosclerotic plaque rupture and acute coronary thrombosis are the principal mechanisms of myocardial infarction, the anatomical characteristics of the coronary arterial system significantly influence the localization, extent, severity, and clinical consequences of myocardial ischemia. The left anterior descending artery, left circumflex artery, and right coronary artery supply different myocardial territories, and occlusion of each vessel produces characteristic patterns of myocardial injury. Coronary dominance, vessel caliber, branching pattern, collateral circulation, and congenital coronary artery variations may further modify the amount of myocardium at risk. Certain anatomical anomalies may also predispose individuals to myocardial ischemia or sudden cardiac events. This article analyzes the clinical significance of coronary artery anatomy in the development of myocardial infarction and emphasizes the importance of anatomical knowledge for diagnosis, risk assessment, coronary angiography, and revascularization planning.

Keywords:coronary arteries, myocardial infarction, coronary anatomy, left anterior descending artery, right coronary artery, coronary dominance, coronary artery anomalies, myocardial ischemia, acute coronary syndrome, coronary circulation.

INTRODUCTION: Myocardial infarction (MI) is an acute form of myocardial injury associated with ischemia and represents one of the most clinically important consequences of coronary artery disease. In the majority of cases, acute myocardial infarction develops after disruption of an atherosclerotic plaque followed by platelet activation and thrombus formation within an epicardial coronary artery. The resulting reduction or complete interruption of coronary blood flow causes ischemic injury and, when sufficiently prolonged, irreversible necrosis of cardiomyocytes. However, the anatomical organization of the coronary circulation plays an important role in determining which myocardial region is affected, the amount of myocardium at risk, and the clinical severity of the event [1].The coronary arterial system normally originates from the ascending aorta immediately above the aortic valve. The two major coronary vessels are the left coronary artery (LCA) and the right coronary artery (RCA). The left coronary artery usually originates from the left coronary sinus and commonly divides into the left anterior descending artery (LAD) and the left circumflex artery (LCx). In some individuals, an additional intermediate branch, commonly referred to as the ramus intermedius, may arise between the LAD and LCx.

The LAD travels within the anterior interventricular groove toward the cardiac apex and supplies a large proportion of the anterior wall of the left ventricle, the anterior portion of the interventricular septum, and frequently the apical myocardium. Septal perforating branches arising from the LAD supply the anterior two-thirds of the interventricular septum, including important parts of the cardiac conduction system. Diagonal branches provide blood supply to the anterolateral wall of the left ventricle.Because the LAD supplies a substantial portion of left ventricular myocardium, proximal LAD occlusion can produce an extensive anterior myocardial infarction. The amount of myocardium at risk is particularly large when the obstruction occurs proximal to major septal and diagonal branches. Such infarctions may result in significant left ventricular systolic dysfunction, cardiogenic shock, ventricular arrhythmias, and mechanical complications. Thus, the anatomical level of coronary occlusion is clinically important in addition to the presence of the occlusion itself.

The LCx travels within the left atrioventricular groove and supplies the lateral and posterolateral regions of the left ventricle through obtuse marginal branches. In individuals with left-dominant coronary circulation, the LCx also gives rise to the posterior descending artery and supplies a larger proportion of the inferior and posterior myocardium. Consequently, proximal LCx obstruction in a left-dominant circulation can place a considerably greater myocardial territory at risk than a similar lesion in a right-dominant coronary system [2].The RCA normally originates from the right coronary sinus and travels in the right atrioventricular groove. Its branches usually supply the right atrium, right ventricle, inferior portion of the left ventricle, and parts of the cardiac conduction system. In most individuals, the RCA gives rise to the posterior descending artery, which travels within the posterior interventricular groove. Acute RCA occlusion may therefore produce inferior-wall myocardial infarction and, depending on the level of obstruction, right ventricular infarction or conduction abnormalities.

The relationship between coronary anatomy and myocardial infarction is especially evident when considering the blood supply to the sinoatrial and atrioventricular nodes. The sinoatrial nodal artery most commonly arises from the RCA but can also originate from the LCx. The atrioventricular nodal artery is usually derived from the dominant coronary artery. Consequently, inferior myocardial infarction caused by RCA occlusion may be associated with sinus bradycardia, atrioventricular block, and other conduction disturbances when nodal arterial supply is compromised.An important anatomical characteristic of coronary circulation is coronary dominance. Dominance is generally defined according to which coronary artery gives rise to the posterior descending artery and supplies the posterior interventricular septum. Right-dominant circulation is the most common pattern, while left dominance and codominance are less frequent. Coronary dominance is clinically relevant because it determines the extent of myocardium supplied by each major coronary artery [2].

In a right-dominant system, the posterior descending artery originates from the RCA. In left dominance, the posterior descending artery arises from the LCx, increasing the myocardial territory dependent on the left coronary circulation. In codominant circulation, contributions to the posterior myocardium arise from both coronary systems. Recent evidence indicates that coronary dominance

may influence the clinical consequences of obstructive coronary disease and outcomes following acute coronary syndromes, although the relationship varies according to lesion location, associated coronary disease, and patient characteristics [2].The anatomical location of a coronary obstruction is another major determinant of infarct size. A proximal lesion generally compromises more downstream branches than a distal lesion and therefore places a larger myocardial territory at risk. For example, proximal LAD occlusion occurring before the origin of major diagonal and septal branches can cause extensive anterior and septal myocardial injury. Conversely, distal LAD occlusion usually affects a smaller region of apical myocardium.

Similarly, proximal RCA occlusion may compromise both right ventricular and inferior left ventricular blood supply, whereas a more distal lesion may spare the right ventricular branches. Understanding these anatomical relationships is therefore essential for interpreting electrocardiographic changes, assessing hemodynamic abnormalities, and predicting potential complications.Collateral coronary circulation can modify the consequences of an acute arterial obstruction. Coronary collaterals are vascular connections between branches of different coronary arteries or between different segments of the same vessel. In patients with slowly progressive coronary stenosis, collateral vessels may enlarge and provide alternative blood flow to ischemic myocardium. Well-developed collateral circulation may reduce infarct size in some patients, whereas sudden occlusion of a vessel without adequate collateral supply can result in rapid and extensive myocardial necrosis.

In addition to normal variations in coronary branching and dominance, congenital coronary artery anomalies may have important clinical consequences. Coronary anomalies can involve the origin, course, number, or termination of the coronary arteries. Although major coronary artery origin and course anomalies are relatively uncommon, some variants may impair coronary blood flow and predispose individuals to myocardial ischemia, arrhythmias, or sudden cardiac death [3].A recent systematic review and meta-analysis found that typical coronary anatomy is present in the vast majority of individuals, while major origin and course anomalies occur in a small but clinically important proportion of the population. Certain configurations, particularly anomalous coronary arteries with interarterial or intramural courses, are considered higher-risk anatomical patterns because dynamic compression or restricted coronary flow may occur during physical exertion [3].

It is important to distinguish these congenital coronary abnormalities from the much more common mechanism of myocardial infarction caused by atherosclerotic coronary artery disease. Most myocardial infarctions are not caused directly by congenital coronary anomalies. Nevertheless, identification of such anatomical variants is important because they can alter myocardial perfusion, influence ischemic risk, complicate coronary angiography, and affect interventional or surgical treatment planning [4].Modern cardiovascular imaging has considerably improved evaluation of coronary anatomy. Invasive coronary angiography remains central to the assessment and treatment of acute coronary syndromes because it allows rapid identification of the culprit lesion and enables percutaneous coronary intervention. Coronary computed tomography angiography provides detailed three-dimensional information about coronary origins, vessel course, anatomical variations, and relationships with surrounding cardiac structures. Contemporary acute

coronary syndrome guidelines emphasize rapid anatomical identification of the culprit coronary lesion and appropriate revascularization in patients with acute myocardial infarction [1].

Knowledge of coronary anatomy is also essential for interpreting electrocardiographic findings. ST-segment elevation in particular groups of leads can provide information about the likely infarct territory and affected coronary artery. Anterior ST-segment elevation commonly suggests LAD involvement, inferior changes frequently reflect RCA or LCx occlusion, and lateral abnormalities may indicate LCx or diagonal branch involvement. However, individual anatomical variability means that electrocardiographic localization does not always correspond perfectly to a single coronary vessel.From a clinical perspective, understanding coronary anatomy allows physicians to integrate symptoms, electrocardiographic findings, echocardiographic wall-motion abnormalities, coronary angiography, and other imaging results. It also assists interventional cardiologists in selecting appropriate revascularization strategies and anticipating technical difficulties associated with unusual coronary origins or branching patterns.

Therefore, coronary artery anatomy is not merely an anatomical concept but an important determinant of the pathophysiology and clinical presentation of myocardial infarction. Vessel distribution, coronary dominance, lesion location, branching patterns, collateral circulation, and anatomical anomalies can influence myocardial territory at risk and subsequent complications. A detailed understanding of these anatomical characteristics is essential for accurate diagnosis, appropriate risk stratification, and effective treatment of patients with acute myocardial infarction.The aim of this study is to analyze the clinical significance of coronary artery anatomy in the development of myocardial infarction, with particular emphasis on coronary arterial distribution, dominance patterns, anatomical variations, localization of arterial occlusion, myocardial territories at risk, and their implications for diagnosis and clinical management.

MATERIALS AND METHODS:This study was conducted as a literature-based review aimed at evaluating the clinical significance of coronary artery anatomy in the development and course of myocardial infarction. Scientific publications, clinical guidelines, anatomical studies, imaging-based investigations, systematic reviews, and meta-analyses related to coronary artery anatomy, myocardial ischemia, and acute coronary syndromes were analyzed. The literature search included publications available through PubMed, Google Scholar, Scopus-indexed journals, and major cardiovascular society guidelines. Priority was given to peer-reviewed studies published between 2019 and 2026, while earlier fundamental anatomical and clinical studies were also considered when necessary to explain established coronary circulation patterns. The main search terms included “coronary artery anatomy,” “myocardial infarction,” “coronary dominance,” “left anterior descending artery,” “right coronary artery,” “left circumflex artery,” “coronary artery anomalies,” “coronary collateral circulation,” “acute coronary syndrome,” “myocardial ischemia,” and “coronary artery occlusion.” Studies were included if they provided information on the anatomical distribution of coronary arteries, coronary dominance patterns, anatomical variants, vessel branching, collateral circulation, localization of coronary occlusion, myocardial territories supplied by individual vessels, or the relationship between these anatomical characteristics and myocardial infarction. Studies focusing exclusively on non-coronary cardiac disorders, isolated

case reports without broader anatomical relevance, duplicate publications, and **articles without sufficient methodological information were excluded. The selected literature was analyzed** according to several major anatomical and clinical categories, including the origin and course of the left and right coronary arteries, distribution of the LAD, LCx, and RCA, coronary dominance, proximal and distal lesion localization, coronary collateral circulation, and congenital coronary artery anomalies. Particular attention was paid to the relationship between anatomical lesion location and the extent of myocardial tissue at risk. Occlusion of the proximal LAD, RCA, and LCx was evaluated in relation to anterior, inferior, lateral, posterior, septal, and right ventricular myocardial infarction patterns. The clinical significance of coronary dominance was assessed according to whether the posterior descending artery originated from the RCA, LCx, or both coronary systems. Anatomical variants were evaluated according to their potential effect on myocardial perfusion, ischemic risk, electrocardiographic presentation, coronary angiography, and revascularization procedures. Data obtained from invasive coronary angiography, coronary computed tomography angiography, and anatomical studies were compared in order to identify the most clinically relevant coronary patterns. The relationship between coronary anatomy and clinical manifestations was analyzed by considering infarct localization, electrocardiographic changes, ventricular dysfunction, conduction abnormalities, hemodynamic instability, and potential complications. Particular attention was also given to current evidence-based recommendations concerning the diagnosis and management of acute myocardial infarction. Since the present study was based entirely on previously published scientific literature and did not involve direct participation of patients, collection of personal medical information, or experimental procedures, ethical approval and informed consent were not required.

RESULTS:The analysis of the selected literature demonstrated that coronary artery anatomy has a substantial influence on the localization, extent, clinical presentation, and potential complications of myocardial infarction. The most clinically significant anatomical determinants were the affected coronary artery, the proximal or distal location of the occlusion, coronary dominance, branching pattern, and the presence or absence of effective collateral circulation. Variations in these anatomical characteristics were associated with differences in the amount of myocardium at risk and the severity of left ventricular dysfunction following acute coronary occlusion.The left anterior descending artery was identified as one of the most clinically important vessels because it supplies a large proportion of the anterior left ventricular wall, the anterior interventricular septum, and the cardiac apex. Proximal LAD occlusion was associated with a larger ischemic territory compared with distal LAD occlusion because proximal lesions can compromise major septal perforators and diagonal branches. Consequently, proximal LAD infarction may produce extensive anterior and anteroseptal myocardial necrosis, significant reduction in left ventricular systolic function, ventricular arrhythmias, acute heart failure, and cardiogenic shock. The clinical impact is especially pronounced when the lesion is located before the origin of the first major septal or diagonal branch [5].

The right coronary artery was most commonly associated with inferior myocardial infarction. The extent of myocardial injury depended strongly on the level of occlusion. Proximal RCA

obstruction may compromise the right ventricular branches in addition to the inferior wall of the left ventricle, leading to right ventricular infarction, systemic hypotension, and increased dependence on adequate preload. More distal RCA lesions generally affect a smaller myocardial territory. Because the RCA commonly supplies the sinoatrial and atrioventricular nodes, inferior myocardial infarction due to RCA occlusion may also be accompanied by sinus bradycardia, atrioventricular block, or other conduction disturbances.The left circumflex artery was associated primarily with lateral and posterolateral myocardial infarction. However, its clinical significance increased substantially in individuals with left-dominant coronary circulation. In these patients, the LCx supplies the posterior descending artery and therefore perfuses a larger proportion of the inferior and posterior myocardium. As a result, proximal LCx occlusion in a left-dominant system may produce extensive myocardial ischemia and severe hemodynamic consequences [6].

Coronary dominance emerged as an important anatomical factor modifying the consequences of coronary occlusion. Right dominance was the most common pattern, whereas left dominance and codominance were less frequent. In a right-dominant circulation, the posterior descending artery originates from the RCA, while in a left-dominant circulation it arises from the LCx. Left dominance therefore increases the myocardial territory dependent on the left coronary circulation. The reviewed evidence indicated that left coronary dominance may be associated with worse outcomes in selected patients with acute coronary syndromes, particularly when significant left coronary obstruction is present [6].

The anatomical relationship between coronary occlusion and electrocardiographic changes was also evident. LAD occlusion was most commonly associated with anterior or anteroseptal ST-segment elevation, depending on lesion location. RCA occlusion frequently produced inferior ST-segment elevation, whereas LCx lesions were associated with lateral or posterior infarction patterns. However, anatomical variability limited the ability of electrocardiography alone to identify the culprit artery with complete accuracy.Collateral coronary circulation was found to modify the extent of myocardial necrosis. Patients with slowly progressive coronary stenosis may develop collateral vessels that provide alternative blood flow to ischemic myocardial territories. In the presence of well-developed collaterals, complete occlusion of a major coronary artery may produce a smaller infarct than would be expected from the anatomical level of obstruction. Conversely, acute occlusion in a patient with poorly developed collateral circulation may cause rapid and extensive myocardial necrosis [7].

The reviewed literature also demonstrated that congenital coronary artery anomalies can have important clinical consequences despite their relatively low prevalence. Abnormal origin or course of a coronary artery may interfere with normal myocardial perfusion. Particular concern is associated with anomalous vessels that travel between the aorta and pulmonary artery or have an intramural course within the aortic wall. Such anatomical configurations may be associated with dynamic compression, ischemia during exertion, arrhythmias, syncope, and, in rare cases, sudden cardiac death [3, 4].Coronary computed tomography angiography was particularly useful for defining anomalous coronary origins, proximal vessel course, branching patterns, and relationships with adjacent anatomical structures. Invasive coronary angiography remained essential in acute

myocardial infarction because it allowed both anatomical diagnosis and immediate revascularization of the culprit vessel. The combination of anatomical imaging and clinical assessment therefore provided the most complete information for treatment planning.

Table 1. Clinical Significance of Major Coronary Arteries in Myocardial Infarction

Coronary artery / anatomical factor	Main myocardial territory supplied	Typical infarction pattern	Major clinical consequences
Proximal LAD	Anterior LV wall, anterior septum, apex	Extensive anterior/anteroseptal MI	Severe LV dysfunction, arrhythmia, heart failure, cardiogenic shock
Distal LAD	Apical and distal anterior myocardium	Apical/anterior MI	Usually smaller infarct territory
Proximal RCA	Inferior LV wall, RV, conduction system	Inferior ± right ventricular MI	Hypotension, RV failure, bradycardia, AV block
Distal RCA	Inferior LV myocardium	Inferior MI	Smaller area of injury, fewer RV complications
LCx	Lateral and posterolateral LV	Lateral/posterior MI	LV dysfunction, posterior ischemia
LCx in left dominance	Inferior, posterior and lateral LV	Extensive inferoposterolateral MI	Larger ischemic territory and potentially worse prognosis
Left-dominant circulation	Larger territory dependent on left coronary system	Depends on culprit vessel	Greater consequences of left coronary occlusion
Well-developed collaterals	Alternative perfusion to ischemic myocardium	May limit infarct size	Reduced ischemic injury in some patients
Poor collateral circulation	Limited alternative perfusion	Larger infarction after acute occlusion	Greater necrosis and ventricular dysfunction
High-risk coronary anomaly	Variable	Ischemia or infarction depending on anatomy	Exertional ischemia, arrhythmia, sudden cardiac events

The findings further demonstrated that proximal coronary lesions were generally more clinically significant than distal lesions because they compromised a greater number of downstream

branches. This relationship was particularly evident in LAD disease but was also important in RCA and LCx occlusion. Thus, anatomical lesion location should be considered when estimating myocardial territory at risk and predicting complications.

The results also confirmed that coronary anatomy has direct implications for revascularization strategy. Knowledge of vessel origin, lesion location, vessel diameter, bifurcation anatomy, collateral circulation, and anatomical variants assists interventional cardiologists in selecting the most appropriate approach for percutaneous coronary intervention. Complex bifurcation disease and unusual coronary origins may increase procedural difficulty and influence the selection of catheters, guidewires, stents, or surgical revascularization.Overall, the reviewed evidence showed that the clinical consequences of myocardial infarction cannot be explained solely by the presence of coronary thrombosis. The anatomical characteristics of the coronary circulation determine how much myocardium becomes ischemic and which cardiac structures are affected. Proximal LAD occlusion, left-dominant coronary circulation, proximal RCA obstruction involving right ventricular branches, limited collateral flow, and selected congenital coronary anomalies were among the anatomical factors associated with potentially more severe clinical consequences.

DISCUSSION: The findings of this review confirm that coronary artery anatomy has a major influence on the clinical expression and severity of myocardial infarction. Although acute coronary thrombosis is the principal mechanism responsible for most myocardial infarctions, the consequences of an occlusion depend strongly on which coronary artery is involved, the level of obstruction, the dominance pattern of the coronary circulation, and the availability of collateral blood flow.One of the most important anatomical observations is the clinical significance of the left anterior descending artery. Because the LAD supplies a large proportion of the anterior left ventricular wall, the interventricular septum, and the apex, proximal LAD occlusion may compromise a particularly large myocardial territory. This explains why anterior myocardial infarctions are often associated with severe left ventricular dysfunction, malignant ventricular arrhythmias, cardiogenic shock, and increased mortality. The clinical impact is greatest when the occlusion occurs before the origin of major septal perforators and diagonal branches.

The right coronary artery has a different but equally important clinical role. In right-dominant circulation, which is the most common anatomical pattern, the RCA frequently supplies the posterior descending artery, the inferior myocardium, and parts of the cardiac conduction system. Therefore, RCA occlusion may lead not only to inferior myocardial infarction but also to right ventricular dysfunction and conduction abnormalities. Proximal RCA lesions are especially important because they may compromise the right ventricular branches and produce hypotension, elevated right-sided filling pressures, and significant hemodynamic instability.The clinical consequences of left circumflex artery occlusion depend strongly on coronary dominance. In patients with left-dominant circulation, the LCx supplies the posterior descending artery and therefore perfuses a larger myocardial territory than in right-dominant circulation. This anatomical arrangement may increase the amount of myocardium at risk during proximal LCx occlusion. Consequently, knowledge of coronary dominance is essential when interpreting angiographic findings and estimating the expected severity of ischemic injury [6].

Another important issue is the location of the coronary lesion. Proximal lesions generally have greater clinical significance than distal lesions because they affect a larger number of downstream branches. This principle applies to all major coronary arteries but is especially evident in LAD disease. Thus, the anatomical position of a lesion should always be considered together with the degree of stenosis or occlusion when assessing myocardial risk.Collateral circulation can significantly modify the relationship between coronary anatomy and infarct size. In patients with chronic progressive atherosclerotic disease, collateral vessels may enlarge over time and provide alternative blood flow to ischemic regions. This may reduce the extent of myocardial necrosis after acute occlusion. In contrast, sudden coronary obstruction in a patient with poorly developed collateral circulation may cause extensive myocardial injury. Therefore, the functional anatomy of the coronary circulation is determined not only by the major epicardial vessels but also by the presence and effectiveness of collateral networks.

The findings also demonstrate the importance of coronary artery anomalies. Most congenital coronary variants are asymptomatic and are discovered incidentally, but selected anomalies may increase the risk of myocardial ischemia, arrhythmia, or sudden cardiac death. In particular, an anomalous coronary artery passing between the aorta and pulmonary artery may be exposed to dynamic compression during exercise. Intramural segments within the aortic wall may also limit coronary blood flow. Although these anomalies account for only a small proportion of ischemic events, their recognition is clinically important because treatment strategies differ from those used for conventional atherosclerotic coronary disease [3, 4].Modern imaging has greatly improved understanding of these anatomical relationships. Invasive coronary angiography remains the standard method for identifying culprit lesions in acute myocardial infarction and allows immediate percutaneous coronary intervention. Coronary computed tomography angiography is particularly useful for defining coronary origins, vessel course, congenital anomalies, and complex proximal anatomy. The complementary use of these imaging modalities enhances diagnostic accuracy and treatment planning.

Electrocardiography also reflects the anatomical distribution of coronary blood supply. Anterior ST-segment elevation commonly indicates LAD-related ischemia, inferior changes suggest RCA or LCx involvement, and lateral changes may reflect LCx or diagonal branch disease. However, individual variability in coronary anatomy means that electrocardiographic localization is not always exact. This reinforces the need to integrate ECG findings with echocardiography and coronary imaging.From a clinical perspective, detailed anatomical knowledge is essential for revascularization. Bifurcation lesions, anomalous coronary origins, left main disease, tortuous vessels, and unusual dominance patterns may influence the choice of interventional technique, catheter selection, stent strategy, or referral for coronary artery bypass surgery. Therefore, coronary anatomy affects not only the development of myocardial infarction but also the technical approach to its treatment.

The reviewed evidence suggests that coronary anatomy should be considered an important determinant of prognosis. Patients with extensive proximal lesions, especially involving the LAD or a dominant left coronary system, may have a larger ischemic burden and a greater risk of heart

failure or shock. In contrast, distal lesions or well-developed collateral circulation may limit infarct size. However, prognosis is also influenced by patient age, comorbidities, time to reperfusion, infarct duration, and ventricular function.This review has several limitations. The included studies differ in methodology, imaging technique, population characteristics, and definitions of anatomical variants. Some evidence is based on observational studies, which may be affected by selection bias and confounding factors. In addition, the clinical significance of certain coronary variants remains controversial because not all anatomical abnormalities produce ischemia.

Despite these limitations, the available evidence consistently supports the importance of coronary arterial anatomy in myocardial infarction. The vessel involved, lesion location, coronary dominance, collateral circulation, and presence of congenital anomalies can significantly influence the distribution and severity of myocardial injury.Future research should focus on integrating coronary anatomy with functional imaging, artificial intelligence-based angiographic analysis, and individualized risk prediction. Better understanding of anatomical and hemodynamic relationships may improve early diagnosis, procedural planning, and prognosis in patients with acute myocardial infarction.

CONCLUSION: Coronary artery anatomy plays an important role in determining the localization, extent, clinical presentation, and severity of myocardial infarction. The consequences of acute coronary occlusion depend not only on the presence of thrombosis but also on the affected vessel, the proximal or distal location of the lesion, the pattern of coronary dominance, the presence of collateral circulation, and individual anatomical variations.Proximal LAD occlusion is particularly dangerous because it can compromise a large portion of the left ventricular myocardium and lead to extensive anterior infarction, severe ventricular dysfunction, arrhythmias, and cardiogenic shock. RCA occlusion may cause inferior and right ventricular infarction and can also produce conduction disturbances, while LCx occlusion may result in lateral or posterior myocardial injury. In left-dominant circulation, LCx lesions may have especially serious consequences because a larger myocardial territory depends on the left coronary system**.**

Collateral coronary circulation can reduce ischemic injury in some patients by providing alternative blood flow to threatened myocardium, whereas poorly developed collaterals may contribute to larger infarct size. Congenital coronary anomalies, although uncommon, may also have important clinical consequences and should be considered in patients with unexplained ischemia, exertional symptoms, or sudden cardiac events.A detailed understanding of coronary anatomy is therefore essential for accurate interpretation of electrocardiographic and imaging findings, identification of the culprit vessel, assessment of myocardial territory at risk, and selection of the most appropriate revascularization strategy. Integration of anatomical knowledge with modern coronary imaging and clinical assessment can improve diagnosis, treatment planning, and prognosis in patients with acute myocardial infarction.

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