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Case Report

Clinical case of stenting of the left main coronary artery under artificial circulation: a case report

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ABSTRACT

This case report documents the intricate management of a 61-year-old patient presenting with acute coronary syndrome, permanent atrial fibrillation (AF), and a history of prior cardiac interventions. Coronary angiography revealed significant left coronary artery pathology, necessitating intervention under artificial circulation. Percutaneous coronary intervention was deemed unsuitable due to high risk, prompting the installation of an intra-aortic balloon counter pulsation system. Subsequent interventional stenting of the left main coronary artery (LCA) was successfully performed. Despite post-operative complications, including pneumonia and renal dysfunction, the patient exhibited steady improvement, highlighting the importance of tailored, multidisciplinary care in complex cardiovascular cases.

Keywords: Coronary artery disease chronic AF, Spontaneous coronary artery dissection, Coronary artery stenting, Artificial external circulation, Coronary artery stenosis, PTCA

INTRODUCTION

The coronary artery disease (CAD) is a medical condition that develops due to the constriction of coronary arteries, responsible for the supply of oxygen and blood to the heart muscle. The constriction is commonly caused by the deposition of plaque comprising of cholesterol, fat, and other substances. This deposition results in atherosclerosis, which obstructs the blood flow to the heart and can lead to symptoms like chest pain, shortness of breath, and more severe outcomes like myocardial infarction.[1]

Spontaneous coronary artery dissection (SCAD) is a rare but serious medical condition that occurs when the layers of arterial wall separate, creating a false passage in the coronary artery. This can happen when a tear occurs in the inner lining of the artery or when the vessels outside the artery rupture, resulting in a hematoma that narrows the artery. Another type of SCAD can occur due to a blockage in the artery that looks similar to atherosclerosis. This condition produce a reduced blood flow, myocardial ischemia, heart attack, sudden death, cardiogenic shock, or pericardial tamponade.[2]

It's a commonly acknowledged fact that AF is a heart condition that causes an irregular and often rapid heartbeat. As one ages, the chances of developing AF increase, and it can coexist with CAD. A significant number of nonvalvular AF patients have been identified with CAD, with over 50% of AF patients diagnosed with CAD through invasive or computed tomography coronary angiography. Moreover, research has indicated that AF is an autonomous risk factor for both CAD and acute coronary syndromes.

When an individual is diagnosed with both AF and CAD, the severity of CAD symptoms is generally more pronounced, and their SYNTAX score tends to be higher than in those without AF. The risks associated with CAD

also increase significantly when it occurs concurrently with paroxysmal or persistent AF. This elevation in risk includes a higher probability of developing heart failure, ventricular arrhythmias, and major adverse cardio-cerebrovascular events, which can ultimately lead to increased morbidity and mortality rates.[5]

In order to diagnose CAD and SCAD, medical professionals typically conduct a thorough evaluation, including an ECG, an echocardiogram, a stress test, and a coronary angiography. Depending on the individual basis, additional tests like cardiac CT or MRI may also be necessary. In contrast, AF can be diagnosed with an ECG, as it can detect the characteristic rapid and irregular heartbeat that is commonly associated with this condition.[2,6,5]

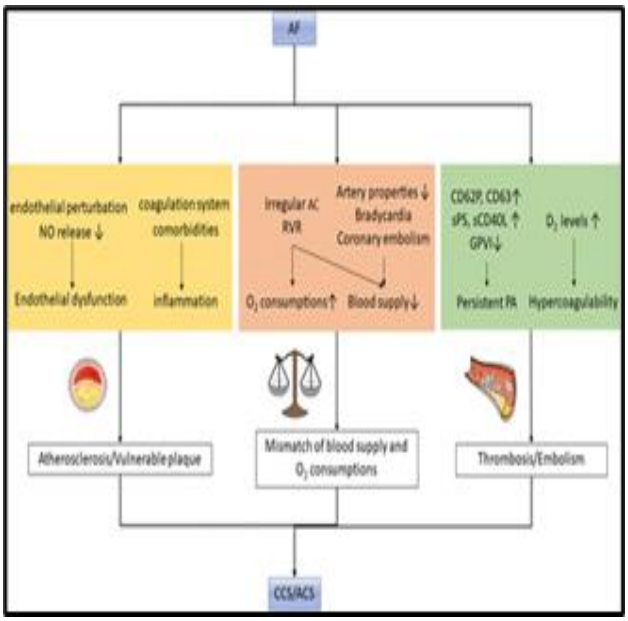

Figure 1: Mechanism of AF causing CAD.[3]

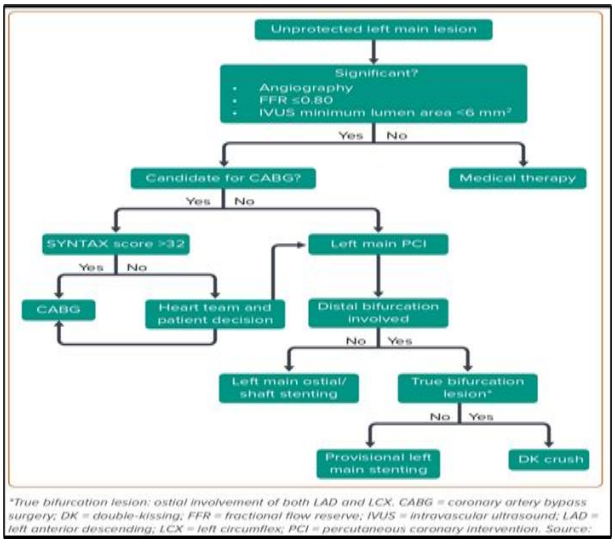

Figure 2: Algorithm for choosing the best method of treatment LCA lesion.[7]

Patients who have a considerable blockage or constriction of the coronary arteries have various treatment options available to them. These treatments can include making lifestyle changes, taking medications, and undergoing medical procedures like PTCA or stenting. PTCA involves using a balloon catheter to expand arteries that have become narrowed or blocked, while stenting involves placing a small metal mesh tube into the artery to keep it open. However, PTCA is not recommended for people who have left main CAD, as it might increase the risk of developing acute obstruction or spasm during the procedure. Additionally, PTCA is not recommended for patients who have insignificant narrowing of their coronary arteries. Instead, stenting the LCA is a safe and cost-effective treatment option for patients with the CAD.[1,8]

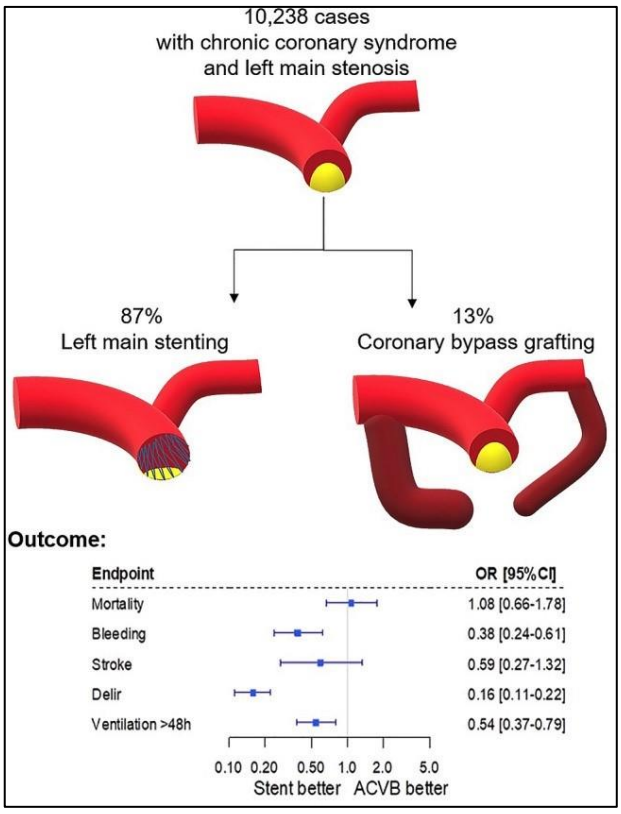

Figure 3: Preference of stenting over CABG.[8]

The treatment approach for SCAD varies depending on the severity and scope of the condition. For individuals with mild to moderate SCAD, a conservative management approach may be recommended, which involves the administration of aspirin and beta-blockers to manage symptoms and avert further complications. However, for patients who require coronary artery stenting or other revascularization procedures, IABP can be an effective treatment option to help stabilize the patient.

In more severe cases, invasive procedures such as PCI or CABG may be necessary to restore blood flow and prevent further damage.[2,9]

Figure 4: Characteristics of percutaneous mechanical circulatory support devices.[10]

Characteristics	IABP	Impella	Tandem heart	ECMO
Indications	Cardiogenic shock, high-risk PCI	Cardiogenic shock, high-risk PCI	Cardiogenic shock	Cardiogenic shock, severe refractory heart failure, allograft failure following cardiac transplant
Cardiac output (liters/min)	0.5	2.5-5	4-5	5
Mechanism	Diastolic augmentation via balloon inflation	Axial rotary pump (continuous flow)	Continuous flow, centrifugal, extracorporeal membrane device	Venoarterial, extracorporeal membrane oxygenation
Quick implant	Yes	Yes	No	No
Duration of use	Few hours-few days	7 days	14 days	Several weeks
Limitations	Requires native cardiac output and cardiac cycle synchronization (malfunctions in dysrhythmias)	Large 12-14 “french” catheters, catheter displacement (left ventricle to aorta)	Requires transseptal access, long implant time, large 21-French cannula	Requires cardiac contractility (may require IABP or pressors); can increase left ventricular afterload and wall stress
Contraindications	>mild aortic regurgitation, severe peripheral or aortic disease	Aortic regurgitation, aortic dissection, prosthetic aortic valve, severe aortic stenosis, peripheral arterial disease, left atrial/ ventricular thrombus, bleeding diathesis, sepsis	Severe peripheral arterial disease, bleeding diathesis, right/ left atrial thrombus, ventricular septal defect, right ventricular failure	Severe peripheral arterial disease, aortic regurgitation
Complications Limb ischemia, thrombocytopenia, bleeding, infection, vascular complications	Yes	Yes	Yes	Yes

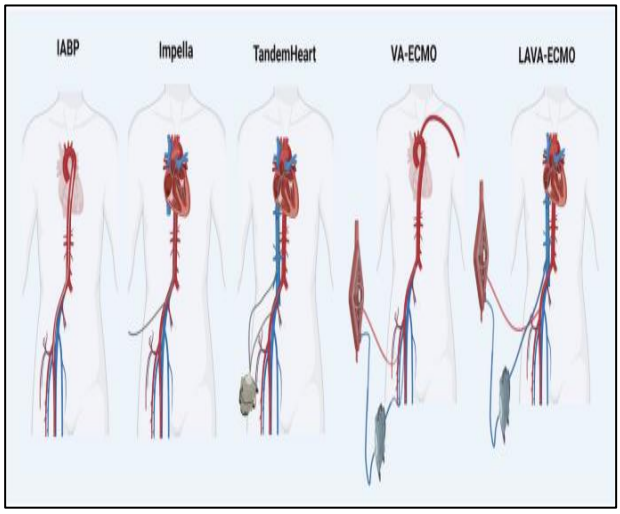

Figure 5: Types of percutaneous mechanical circulatory support devices.[11]

CASE REPORT

Upon presenting at the outpatient department, an individual aged 61 experienced sudden and severe chest pain, which did not subside despite the self-administration of Molsidomine. An ECG revealed negative dynamics when compared to previous tests, with ST-segment elevation noted in leads II, aVL, V4-V6. As a result, the patient was promptly admitted to the ICU of a regional cardiologic center, where they were diagnosed with acute coronary syndrome. Following admission, the patient's high sensitivity troponin I level was elevated at 3121 ng/mL.

To address the patient's intricate medical history, a significant cardiac procedure was performed in 2010 to replace the ascending aorta and aortic valve with prosthetics. The patient was also diagnosed with permanent AF, which is being managed with a daily

warfarin regimen. During a subsequent coronary angiography in the operating room, the cardiac team identified a significant pathology in the LCA. Specifically, the vessel wall was discovered to be dislocated, extending into the middle and distal segments with a 70-75% reduction of the lumen due to stenosis. Additionally, the proximal segment of the first segment of the posterior descending artery was found to be occluded. No significant hemodynamic changes were observed in the other coronary arteries.

During the surgical procedure, a thorough echocardiogram was conducted, and the results indicated a range of cardiovascular irregularities. Specifically, there were indications of weakened movement in certain segments of the septal area and apex of the left ventricle, accompanied by an enlarged left ventricular myocardium. The patient's LVEF was found to be 42%, which signifies poor heart function. Furthermore, the echocardiogram revealed second-degree mitral and tricuspid regurgitation, indicating a complex cardiovascular condition with multiple facets.

According to the available information, performing a medical procedure known as PCI on the LCA was considered unsuitable due to the high risk of severe complications. Consequently, a specialist cardiac surgeon was called in to the operating room, who recommended the installation of an intra-aortic balloon counter pulsation system. A final decision on surgical intervention was not made until after further examination. Later on, an IABP balloon was inserted into the descending aorta, and the operation was initiated in a 1:2 mode, without any negative incidents.

The next day, a team of medical experts comprising cardiologists, cardiac surgeons, and interventional radiologists conducted an in-depth evaluation of the patient's clinical case. After assessing the severity and extent of the CAD, they collectively agreed to opt for interventional stenting of the LCA trunk while the patient was under artificial circulation. This method was deemed suitable to address the patient's critical cardiac condition while minimizing the potential complications associated with traditional surgical intervention.

During the examination that followed the initial procedure, it was discovered that the patient had an intimal dissection in the middle and distal thirds of the LCA, spreading at the orifice of the LADA. Additionally, there was a 70-75% stenosis of the lumen and occlusion in the proximal third of the first segment of the LADA. However, no significant stenosis was observed in the other branches of the LADA and circumflex artery during angiography.

In order to treat a blockage in the LADA, the medical team performed a procedure called conductor recanalization. The doctors inserted coronary conductors into the distal sections of the additional branch of the LADA and common femoral vein, but no blood clots were obtained during the manual thrombectomy. To address the residual blockage, a balloon was centered in the stenosis zone of the LADA and predilection was performed, but the plastic zone still presented with stenosis. The doctors then performed cylinder dilatation of the LCA-circumflex artery and the LCA-additional branch of the LADA without significant atherosclerosis. Stents were implanted in the stenosis zone of the LADA using a 2.5×24 mm stent more proximally, overlapping the previous stent, followed by a stent of 3.5-4.5×27mm from the LADA to the LCA. The doctors also found dissection of the intima outside the stenting zone in the area of the orifice of the trunk, which was addressed by implanting a 4.5×8 mm stent overlapping with the previous stent followed by post-dilation with a 4.5×15 mm balloon. Control angiography confirmed that the operation had produced an optimal result in the area of plastic and stenting, and the patient was treated with an aseptic bandage after the artificial circulatory apparatus was disconnected, and the patient was decannulated.

In an effort to alleviate the patient's breathing difficulties and weakness following post-operative intensive care, the medical team administered an intravenous infusion of aminophylline (2.4%-5 ml) and 100 ml of saline solution, along with two salbutamol inhalations. While there was a slight improvement in the patient's condition, they continued to experience symptoms such as weakened vesicular breathing and moist fine crackles throughout the lungs, which eventually progressed to wheezing.

To ensure a continuous monitoring and regulation of the patient's blood pressure, the medical team recommended inserting a thin, flexible tube called a catheter into the radial artery, which would allow for an invasive blood pressure monitoring system to be installed. However, despite this intervention, the patient's condition did not show any improvement and a bruise had formed around the puncture site. An ultrasound specialist was consulted to monitor the subcutaneous hematoma, and they suggested the insertion of a CVC to monitor the patient's hemodynamic parameters. The patient's blood pressure continued to decrease, leading medical team to administer a Dobutamine infusion at rate of 5 mcg/kg/min, which successfully stabilized blood pressure.

After expressing feelings of fatigue and discomfort in the chest region, the individual underwent a chest X-ray that revealed the existence of pneumonia affecting multiple segments on the right side of the chest. Subsequently, an ultrasound scan was conducted that showed the buildup of fluid in the pleural cavities, measuring 55 mm and 40 mm on the right and left sides, respectively.

Despite the patient's laboratory test results indicating some kidney dysfunction and inflammation due to elevated levels of urea, creatinine, and C-reactive protein, the patient's overall condition remained stable with normal physiological functions and the absence of

angina. As days passed after the stent procedure, the patient's health condition improved, decompensation decreased, and blood supply through the coronary arteries remained stable without any angina. Following the procedure, the patient continued to receive treatment as an outpatient, which is a positive sign towards their overall recovery and well-being.

DISCUSSION

This report provides a comprehensive analysis of a complex clinical case involving a patient with a history of ischemic heart disease, AF, and multiple past cardiac interventions. The patient presented with severe chest pain, which was concerning given their prior history of heart attack and fibrillation. The report offers a detailed examination of patient's medical background, symptoms, and test results, and also discussion of potential treatment options and recommendations.

In patients with complex cardiovascular conditions and multiple comorbidities, managing their health can be a challenging task. Such patients often have a history of ischemic heart disease and myocardial infarction, which are common manifestations of CAD. However, diagnosis of SCAD in LCA, which involves separation of arterial wall layers, can complicate case and add to complexity. SCAD can cause significant ischemia and infarction, contributing to patient's acute clinical presentation. Furthermore, if patient has permanent AF, it can further complicate case. AF is known to be connected with CAD, and more than half of patients with AF also have CAD. Irregular and often rapid heartbeat associated with AF can exacerbate CAD progression, potentially increasing risk of complications such as SCAD. Therefore, it is essential to have a comprehensive management plan for patients with current pathology of their CVS.

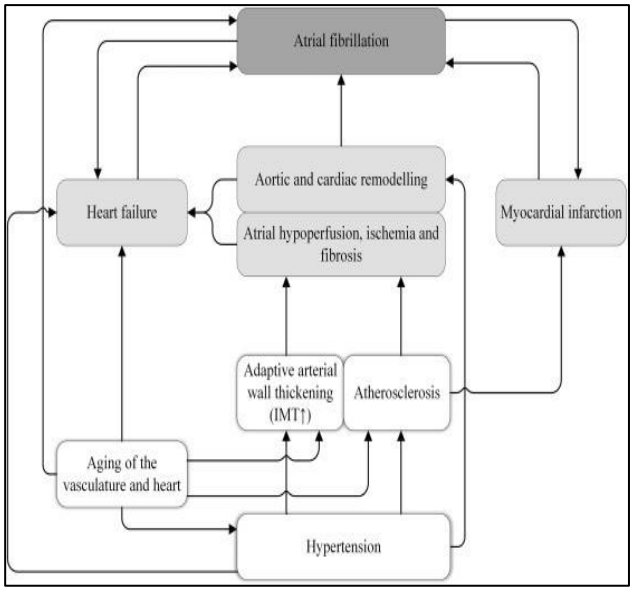

Figure 6: Vicious cycle of fibrillation, atherosclerosis and myocardial infarction.[12]

The report emphasizes the need for medical professionals to work together through a collaborative and interdisciplinary approach when treating patients with complex cardiac pathologies. Shared decision-making among experts in cardiology, cardiac surgery, and interventional radiology is vital to ensure optimal patient outcomes. In the case discussed, the decision to choose interventional stenting for the LCA trunk highlights the importance of tailoring treatment strategies to individual patient needs, taking into account factors like surgical risk and lesion characteristics. This approach underscores the significance of integrating diverse medical knowledge and expertise to improve patient care.

Despite following a meticulous and comprehensive approach during the medical procedure, the patient encountered complications after the operation. These complications included difficulty in breathing and pneumonia that affected various sections on the right side of the body. This situation highlights the potential challenges that can arise when managing patients with a high burden of cardiovascular disease. Additionally, the patient's elevated levels of urea, creatinine, and C-reactive protein indicate that there is inflammation in the body, and the kidneys are also being impacted. This further complicates the patient's clinical course.

Despite the issues in the initial stages, the patient exhibited encouraging improvement in the days following the stent procedure, as evidenced by a decrease in the frequency of decompensation episodes and the absence of angina pectoris.

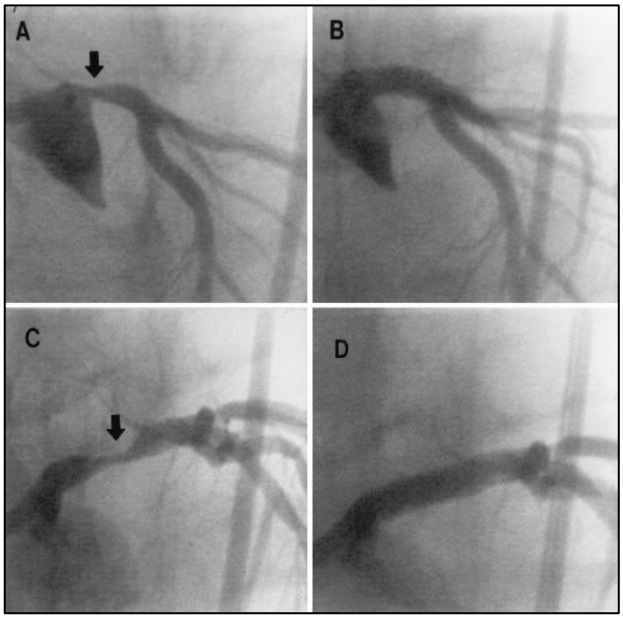

Figure 7 (A-D): Examples of lesion and after successful stenting of the LMCA.[13]

Left coronary angiogram showing a tight stenosis of ostium of LMCA (arrow). No residual stenosis after stenting. Left coronary angiogram of a tight stenosis of shaft of LMCA (arrow). No residual stenosis after stenting.

Further research and practical implementation are required to enhance therapeutic approaches and reduce complications in similar clinical scenarios. This particular case study highlights the complex interplay between CAD, SCAD, and AF, which significantly influences medical presentations and treatment strategies for patients with intricate cardiovascular disorders. The multidisciplinary approach to medical care adopted in this case, and the difficulties encountered signify the significance of individualized treatment and continual monitoring to optimize patient outcomes in such cases.

CONCLUSION

This clinical report emphasizes the complexities that arise during the management of patients with simultaneous occurrence of CAD, SCAD, and AF, which pose significant challenges for healthcare professionals. The patient's clinical condition necessitated a comprehensive approach, with experts from various medical domains working together to devise an individualized treatment strategy that could enhance the patient's prognosis.

The team of medical professionals utilized individualized intervention methods to manage the patient's intricate cardiovascular ailments. They opted for PCI to address CAD, while adhering to current guidelines and treating SCAD conservatively. Pharmacological therapy was employed to manage AF, and anticoagulation therapy was administered to mitigate likelihood of a stroke.

In managing intricate cardiovascular conditions, the significance of customized care was prioritized. This entailed adopting a tailored approach to the patient's therapy that considered their unique requirements and preferences. The medical team worked closely with the patient to ensure that they had a comprehensive understanding of their diagnosis and treatment regimen, and that their apprehensions were adequately addressed.

To summarize, the effective treatment of the patient with both CAD, SCAD, and AF emphasizes the significance of a team-based approach for intricate cardiovascular ailments. The tailored interventional techniques employed by the healthcare team highlight the demand for customized care to enhance patient results.

Even though the patient has encountered some difficulties in their recovery process, their steady progress is a promising indication of an optimistic prognosis. This case underscores the significance of carrying out additional research studies and attaining clinical exposure to refine therapeutic strategies that can aid in managing complications in comparable cardiovascular situations. By accomplishing these objectives, medical professionals can enhance their comprehension of how to efficiently treat patients with intricate cardiovascular conditions, ultimately resulting in better patient outcomes and elevated quality of healthcare.

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REFERENCES

1. Malik TF, Tivakaran VS. Percutaneous Transluminal Coronary Angioplasty. Treasure Island (FL): StatPearls Publishing. 2024.
2. Sharma S, Raut N, Potdar A. SCAD: Case series and review of literature. Indian Heart J. 2016;68(4):480-5.
3. Liang F, Wang Y. Coronary heart disease and AF: a vicious cycle. Am J Physiol Heart Circulatory Physiol. 2021;320(1):H1-12.
4. Oktay V. Validation of SYNTAX and clinical SYNTAX scores in predicting AF following on-pump CABG. Turk J Thoracic Cardiovascular Surg. 2017;25(3):333-9.
5. Batta A, Hatwal J, Batta A, Verma S, Sharma YP. AF and CAD: An integrative review focusing on therapeutic implications of this relationship. World J Cardiol. 2023;15(5):229-43.
6. Valappil SP, Iype M, Viswanathan S, Koshy AG, Gupta PN, Velayudhan RV. Coronary angioplasty in SCAD-Strategy and outcomes. Indian Heart J. 2018;70(6):843-7.
7. Showkathali R, Yalamanchi RP. Contemporary Left Main PCI: A State-of-the-art Review. Interventional Cardiol. 2023;18:e20.
8. Stachon P, Klaus K, Philip H, Alexander P, Dennis W, Vera O, et al. CABG versus stent implantation in patients with chronic coronary syndrome and left main disease: insights from a register throughout Germany. Clin Res Cardiol. 2022;111(7):742-9.
9. Trost JC, Hillis LD. Intra-Aortic Balloon Counterpulsation. Am J Cardiol. 2006;97(9):1391-8.
10. Kar S. Percutaneous Mechanical Circulatory Support Devices for High-Risk PCI. Curr Cardiol Rep. 2018;20(1):2.
11. Moscardelli S, Reza M, Pedro V, Ahmad J, Ankitkumar KP, Francesco M, et al. Mechanical Circulatory Support for High-Risk PCI. Curr Cardiol Rep. 2024;26(4):233-44.
12. Willeit K, Kiechl S. Atherosclerosis and AF-Two closely intertwined diseases. Atherosclerosis. 2014;233(2):679-81.
13. Park SJ. Stenting of Unprotected LCA Stenoses: Immediate and Late Outcomes. J Am Coll Cardiol. 1998;31(1):37-42.

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