CATHALOGUE

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CASE REPORT

Percutaneous coronary intervention (PCI) for Chronic Total Occlusion (CTO) of Left Descending Artery (LAD)

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Abstract

Introduction: This case report highlights a novel approach in the management of refractory angina by utilizing advanced interventional techniques for Chronic Total Occlusion (CTO) lesions. While conventional interventional cardiology tends to avoid treating CTO due to potential complications, this case presents an innovative strategy that challenges the status quo and contributes to the scientific literature.

Case Presentation: The patient under study presented with refractory angina, a condition characterized by persistent chest pain despite medical treatment. The focus was on a CTO lesion, which traditionally poses high risks and often necessitates surgical intervention. However, in this instance, the patient's condition and suitable anatomical characteristics made them a candidate for an alternative approach.

Results: The management involved the use of advanced CTO equipment and endovascular methods, deviating from the conventional surgical route. The chosen Percutaneous Coronary Intervention (PCI) approach proved successful, resulting in the complete resolution of the CTO lesion. This intervention led to a notable improvement in the patient's overall cardiac function, both regionally and globally, as evidenced by follow-up assessments.

Conclusion: This case underscores the potential of advanced CTO PCI techniques in managing refractory angina patients with appropriate anatomical features. The positive outcomes challenge the conventional notion of exclusively opting for surgical intervention for CTO cases. The successful application of this innovative strategy not only expands the therapeutic options available but also underscores the importance of expert intervention and specialized equipment.

Keywords

CTO, PCI, Angina NSTEMI, Angiography.

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Introduction

Chronic total occlusion (CTO) refers to the complete cessation of blood flow within a coronary vessel for more than three months, as determined by coronary angiography. CTOs are characterized by histological changes, including fibrous tissue, calcium deposition, neo-channels, and negative remodeling. They are prevalent among patients with coronary artery disease, with a significant proportion presenting with CTO in at least one vessel. The occurrence of CTO is often linked to prior myocardial infarction.

Traditionally, CTOs have been managed conservatively through lifestyle adjustments and medical therapy optimization. However, advancements in techniques and equipment have opened avenues for revascularization via percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG). PCI for CTOs demands specialized expertise and tools, including intravascular ultrasound (IVUS) for precise procedure guidance.

This manuscript underscores the intricacies of CTO management, focusing on the utilization of IVUS for procedural refinement. Moreover, it explores techniques like antegrade and retrograde approaches, along with strategies involving subintimal space dissection for wire insertion and re-entry. The classification of CTO wires and their roles in the procedure are also highlighted.

Case Presentation

A 43-year-old male resident of Faisalabad presented to the emergency room on August 10, 2020, with the chief complaint of chest pain that had been persisting for the past 4 hours. The chest pain had commenced 4 hours prior to his arrival and was characterized by a gradual onset with a progressively intensifying nature. Described as central and ranging from moderate to severe in intensity, the pain was accompanied by a squeezing sensation. Notably, the pain radiated to both arms and was unrelieved by rest. Additionally, the patient reported experiencing cold sweating and palpitations concurrently with the pain.

Throughout the episode, the pain demonstrated no variation in response to different postures, deep inspiration, or coughing. Absent were any concurrent symptoms of nausea, vomiting, fever, sore throat, myalgias, shortness of breath, or recreational drug use.

The patient's history revealed no prolonged periods of bed rest due to any cause. Seeking initial care at a local general hospital, he underwent an electrocardiogram (ECG) as his first diagnostic step. Following the administration of five oral tablets and intravenous injections, his pain exhibited improvement during his approximately 30-minute stay at the hospital. Subsequently, he was referred to FIC Hospital, where he received information about the possibility of a heart-related issue.

Diagnostic Assessment

Systematic Patient History

A comprehensive inquiry was conducted upon the patient's admission to FIC. The systematic history revealed no indications of respiratory issues, gastrointestinal complications, genito-urinary problems, or central nervous system abnormalities. Noteworthy points include the absence of diabetes, hypertension, obesity, or dyslipidemia in the patient's medical history. Personal and social history depicted the patient as a smoker with a 10-pack-year history, residing with his family, while having no history of alcohol or IV drug use. The family history showed no significant CAD.

General Physical Exam

The general physical examination unveiled a normal pulse rate of 74 bpm with regular rhythm and normal volume and character. Blood pressure readings were within normal limits (130/80 mmHg for both arms). The respiratory rate was 18 breaths/minute, and the patient was afebrile.

Cardiovascular (CVS) Exam

Inspection of the cardiovascular system confirmed a regular rhythm, normal volume, and character of pulses. There were no delays in radial or femoral pulses. Palpation and auscultation further supported the findings of regular heart rate and

vesicular breathing. The central nervous system was found to be intact.

ECG Results
Both the ECG performed earlier at the local hospital and the one conducted at FIC were examined. The ECG at FIC indicated features consistent with a provisional diagnosis of non-ST elevation myocardial infarction (NSTEMI).

Echo Cardiography
Baseline testing through echocardiography revealed left ventricular ejection fraction (LVEF) of 52%, indicative of a preserved left ventricular systolic function so stress MPI or viability scan was not recomended

Initial Treatment
Upon admission to the emergency department, the patient underwent a series of interventions. These included attachment to a cardiac monitor with a defibrillator, serial ECG monitoring, and administration of medications such as aspirin, lowplat, and heparin. The patient's rhythm and vital signs were closely monitored.

Subsequent Monitoring
Throughout the hospital stay, the patient remained pain-free and exhibited stable hemodynamics. Serial ECGs were conducted, and the patient was kept under observation for 48 hours. On the third day of hospitalization, coronary angiography (CT angiogram) was performed.

Diagnosis and Treatment Plan
Based on the diagnostic findings, the patient was diagnosed with NSTEMI. A percutaneous coronary intervention (PCI) to the left anterior descending artery (LAD) was recommended. The patient was temporarily discharged with a prescribed medication regimen. The decision for PCI to LAD was subsequently reconsidered and abandoned for specific reasons.

Therapeutic Intervention

Treatment Compliance and Lifestyle Changes
The patient demonstrated commendable compliance with his prescribed medications, successfully quitting smoking, and adopting a healthier lifestyle. However, despite these positive changes, he did not undergo the recommended CT angiogram and refused the option of coronary artery bypass grafting (CABG). He chose not to seek surgical consultation for an entire year. Despite optimized medical therapy, he experienced angina of CCS Class II during brisk walking for a duration of 5 minutes.

Subsequent Coronary Angiogram & Intervention
A year later, on January 22, 2022, the patient underwent another coronary angiogram with dual injection. This procedure aimed to reassess his cardiac condition. The results of this angiogram were not provided, but it is suggested that procedural videos related to this angiogram have been included in the paper's supplementary materials.

Successful Chronic Total Occlusion (CTO) PCI
Ultimately, a decision was made to perform a Chronic Total Occlusion (CTO) percutaneous coronary intervention (PCI) to the left anterior descending artery (LAD). Proximal cap of CTO lesion was soft, Hence, The procedure was done using hydrophilic floopy wire using ante-grade wire escalation technique. Procedural videos capturing the steps of this intervention have been included in the supplementary materials. The report indicated a successful outcome of the PCI procedure in the LAD.

Follow-Up and Outcomes

Following the therapeutic intervention, the patient was advised to have regular follow-up appointments scheduled every two weeks. During these follow-up visits, the patient's vital signs remained stable, indicating a positive response to the treatment. Notably, the patient reported no signs of pain, suggesting a successful alleviation of angina symptoms. Moreover, there was a marked improvement in the patient's overall quality of life, further highlighting the effectiveness of the interventions.

The clinician-assessed outcomes included the stability of vital signs and the absence of reported pain. The patient's adherence to the recommended treatment plan was assessed through their regular follow-up visits and reported improvements in their quality of life. There are no indications in the provided information of any adverse or unanticipated events, suggesting a favorable response to the interventions without any significant complications.

Discussion

This case report highlights the successful management of a patient presenting with refractory angina due to Chronic Total Occlusion (CTO) through innovative Percutaneous Coronary Intervention (PCI). The strengths of this case lie in its comprehensive approach, combining meticulous diagnostic assessment, optimized medical therapy, patient compliance, and a tailored therapeutic intervention strategy. However, certain limitations are worth considering, such as the patient's reluctance to undergo recommended diagnostic procedures and surgical consultations.

The relevant medical literature supports the notion that CTOs pose challenges in clinical management[1-3]. This case underscores the importance of individualized patient assessment and the potential benefits of specialized interventions like CTO PCI. Prior studies have explored the outcomes of CTO PCI procedures, emphasizing the significance of appropriate patient selection, procedural expertise, and suitable anatomical characteristics.

In this case, the decision to proceed with CTO PCI was well-founded, given the patient's persistent symptoms and the potential improvement in their quality of life. The successful outcome underscores the importance of a multidisciplinary approach involving interventional cardiologists, cardiac surgeons, and patient education.

Conclusion

The primary lesson from this case report is that for clinically indicated, selected symptomatic patients with CTO vessels of suitable anatomy and with the availability of expertise, CTO PCI should be considered as a viable therapeutic option. This approach can lead to substantial improvements in patient symptoms and overall well-being, as exemplified by the patient's successful management and enhanced quality of life. While challenges such as patient compliance and reluctance to pursue recommended interventions were encountered, they underscore the necessity of effective patient education and communication throughout the treatment journey. The case also emphasizes the importance of continuous follow-up and collaboration among healthcare professionals to ensure optimal patient outcomes.

Learning Points

- Individualized Assessment: Clinicians should meticulously evaluate symptomatic patients with Chronic Total Occlusion (CTO) for suitability of anatomy and expertise to determine the potential benefits of CTO Percutaneous Coronary Intervention (PCI).
- Innovative Interventions: Advanced CTO PCI techniques offer a promising alternative to traditional surgical intervention for refractory angina, yielding improved outcomes and enhanced ventricular function.
- Patient Compliance and Education: Successful outcomes hinge on patient compliance, lifestyle modifications, and thorough education about recommended diagnostic and therapeutic interventions.
- Collaborative Approach: Effective management of complex cases like CTO requires collaboration among interventional cardiologists, cardiac surgeons, and other healthcare professionals to ensure optimal patient care.
- Regular Follow-Up: Consistent follow-up appointments are essential to monitor patient progress, assess treatment efficacy, and make necessary adjustments to improve patients' quality of life.

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Figure/Video

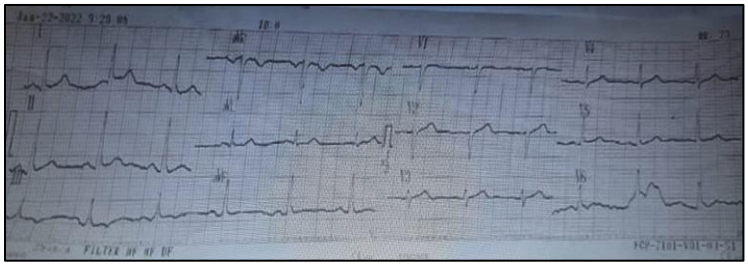

Figure 1: ECG

Figure 2: Balloon dilatation

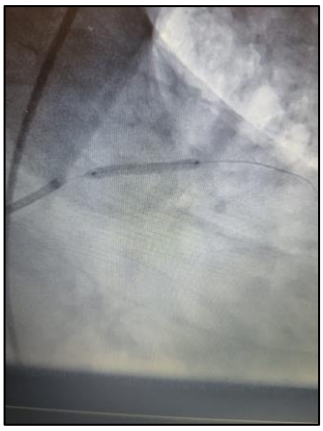

Figure 3: Stent deployment

Figure 4: Final image

Supplementary Materials

Supplementary Videos: