CATHALOGUE

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CASE REPORT

Out of the Frying Pan into the Fire: A Case Study of NSTEMI Complicated by Complex Bifurcation Lesions

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Abstract

Background: Acute coronary syndrome (ACS) encompasses a spectrum of conditions, including unstable angina and myocardial infarction, necessitating swift diagnosis and intervention to prevent morbidity and mortality. Timely management is especially critical for patients presenting with complex coronary anatomies, which can complicate standard treatment protocols. In cases involving bifurcating lesions, the choice of intervention whether single or dual stenting requires careful consideration of anatomical factors to optimize outcomes.

Case Presentation: A 42-year-old female patient with a history of hypertension and diabetes presented initially with NSTEMI but left the hospital against medical advice. Two weeks later, she returned with ST elevation in anterior leads. Cardiac markers were elevated, and echocardiography indicated impaired left ventricular function with a 36% ejection fraction.

Results: Coronary angiography revealed total occlusion of the left anterior descending (LAD) artery, an 80% stenosis in the major diagonal branch, and diffuse 80% disease in the mid-segment of the right coronary artery (RCA). An upfront two-stent strategy using the culotte stenting technique was employed. Following predilation, a Promus stent was deployed in the major diagonal, and a XIENCE stent was placed in the LAD with kissing balloon inflation performed to ensure optimal stent apposition. Post-intervention, TIMI flow III was achieved, leading to improved hemodynamics. Follow-up echocardiography showed an increased ejection fraction of 60%, with the patient remaining pain-free.

Conclusion: This case highlights the importance of early and comprehensive management of ACS in patients with complex coronary lesions. An upfront two-stent strategy proved effective in restoring cardiac function and improving patient outcomes.

Keywords

STEMI, Bifurcating lesion. Definition criteria, Culotte technique.

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Introduction

Acute coronary syndrome (ACS) encompasses a spectrum of conditions resulting from the disruption of coronary blood flow, leading to myocardial ischemia.1 Among these, non-ST elevation myocardial infarction (NSTEMI) often presents with elevated cardiac markers and varying degrees of left ventricular (LV) dysfunction. Timely intervention is crucial, as delayed treatment can exacerbate myocardial injury and compromise cardiac function. In cases involving complex coronary anatomy, such as bifurcating lesions, the need for a strategic approach becomes paramount.[1]

This case highlights the clinical challenges faced by a patient with NSTEMI who experienced a delayed presentation and subsequent deterioration, necessitating a comprehensive revascularization strategy. The importance of recognizing and effectively managing significant side branches during percutaneous coronary intervention (PCI) is underscored, particularly in the context of bifurcation lesions[2].

Case Presentation

A 42-year-old female with a history of hypertension and diabetes initially presented with NSTEMI. Despite being offered admission (TIMI 4), she left the hospital against medical advice. Two weeks later, she returned with recurrent chest pain, accompanied by ST elevations in the anterior leads.

Diagnostic Assessment

Upon presentation, cardiac markers were elevated. An electrocardiogram (ECG) revealed ST and T wave changes, with an echocardiogram showing impaired LV function and an ejection fraction of 36%, alongside anterior hypokinesia.

Therapeutic Intervention

Coronary angiography was performed via the right radial artery using a 6 Fr catheter. The left main stem (LMS) appeared normal, while the left anterior descending (LAD) artery was totally occluded. The major diagonal branch exhibited subtotal (80%) stenosis, and the right coronary artery (RCA) showed 80% diffuse disease in its mid-segment. Given these findings, angioplasty of the LAD was indicated. Using a BMW guide wire, the LAD was engaged distally, while a second wire crossed into the major diagonal. A complex true bifurcating lesion was identified, meeting the criteria for a Madina 1,1,1 classification. Based on the lesion characteristics, an upfront two-stent strategy was planned using the culotte stenting technique, as the vessels had equal diameters and an angle of less than 70 degrees.

The procedure began with predilation of both the side branch and the main vessel. The first stent (Promus 3x32) was then deployed in the major diagonal. Following this, distal optimization techniques were employed to ensure proper stent apposition and mitigate the risk of suboptimal outcomes. Proximal optimization was also performed to prevent abluminal stenting and wiring.

After rewiring the LAD through the distal stent struts of the diagonal stent, balloon dilation of the stent struts in the main vessel was conducted using various sizes of non-compliant balloons (NC sapphire 3.25x10, 12/10, 14/10, 16/10). Once optimal dilation was achieved, the jailed wire was removed, and a second stent (XIENCE 2.75x18) was deployed in the LAD. Kissing balloon inflation (KBI) was performed, where the balloons within the stents were simultaneously inflated, followed by a second proximal optimization technique. The procedure successfully achieved TIMI flow III, restoring adequate blood flow and improving hemodynamics.

Follow-Up and Outcomes

The patient showed marked improvement, with hemodynamic stabilization and a follow-up echocardiogram revealing an ejection fraction of 60%. She remained pain-free in subsequent visits.

Discussion

Timely intervention in acute coronary syndrome (ACS) is critical,[2] as demonstrated in this case of delayed presentation of non-ST elevation myocardial infarction (NSTEMI) resulting in

deteriorating left ventricular (LV) function and hemodynamics, ultimately leading to acute total occlusion. The patient presented with total occlusion of the left anterior descending (LAD) artery, alongside a significant bifurcating lesion, necessitating urgent intervention.

Following percutaneous coronary intervention (PCI) of the LAD and major diagonal branch, there was immediate improvement in hemodynamic status, warranting further action on the occluded right coronary artery (RCA). The strategy employed involved a comprehensive approach, adhering to the culotte stenting technique, which is particularly beneficial for complex true bifurcation lesions.

This case underscores the importance of complete revascularization, as evidenced by the marked improvement in hemodynamic parameters and LV function observed during the procedure[3]. Notably, the patient's ejection fraction improved to 60% upon follow-up, reflecting the effectiveness of the interventions performed. This highlights the necessity of not only addressing the immediate occlusions but also ensuring optimal anatomical and functional outcomes through meticulous procedural strategies. The successful management in this case reinforces the significance of prompt diagnosis and intervention in patients presenting with ACS, particularly in the context of complex coronary anatomies[4].

Conclusion

This case highlights the critical importance of timely intervention in managing acute coronary syndrome, particularly in patients with complex coronary anatomy. The successful application of an upfront two-stent strategy using the culotte stenting technique effectively addressed the total occlusion of the left anterior descending artery and significant bifurcation lesions, leading to improved hemodynamics and cardiac function. The notable recovery of the patient's ejection fraction from 36% to 60% following comprehensive revascularization underscores the potential for favorable outcomes when complex lesions are treated promptly and effectively. Clinicians must remain vigilant in recognizing the multifactorial nature of coronary artery disease, ensuring that significant side branches and bifurcations are not overlooked during intervention.

Learning points

- Timely intervention is crucial in patients with acute coronary syndrome (ACS) and complex coronary lesions. Swift diagnosis and treatment can significantly improve outcomes.
- It's essential to maintain the integrity of the coronary anatomy and flow dynamics during intervention. This approach helps optimize hemodynamics and enhances long-term results.
- Employ established nomenclature and strategies when addressing bifurcating lesions. A well-thought-out plan, such as using a two-stent strategy, can effectively manage complex anatomies.
- Strive for optimal outcomes even in primary percutaneous coronary interventions (PCI). Utilizing techniques like kissing balloon inflation can enhance stent apposition and improve blood flow, reducing the risk of complications.

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Figure/Video

Figure 1: Right Coronary Artery (RCA) with 80% Stenosis.

Figure 2: Total Occlusion of the Left Anterior Descending (LAD) Artery.

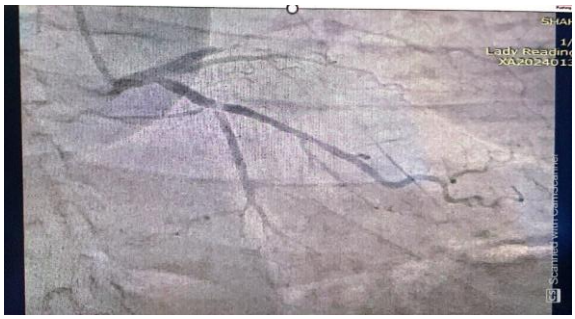

Figure 3: Anteroposterior Caudal View: Normal Left Main Stem (LMS), Total LAD Occlusion, and Subtotal Stenosis in Major Diagonal Branch.

Figure 4: Complex True Bifurcation Lesion Identification.

Figure 5: Restoration of TIMI Flow III Post-Angioplasty.