

CASE REPORT

Successful Management of NSTEMI in a 66-Year-Old Male Using DK Crush Technique for Complex Bifurcation Lesions

Hafsa Shahid Malik

Rawalpindi Institute of Cardiology, Rawalpindi-Pakistan.

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**Citation:**

Hafsa SM. Successful Management of NSTEMI in a 66-Year-Old Male Using DK Crush Technique for Complex Bifurcation Lesions. *Catalogue*. 2024; 2(2): 56-59.

Corresponding Author Email:

hafsamalik4@hotmail.com

Funding:

The author(s) received no specific funding for this work.

Conflicts of Interests:

The authors have declared that no competing interests exist.

Received 12/02/2024**Accepted** 22/03/2024**First Published** 01/06/2024**Abstract**

Background: The management of non-ST elevation myocardial infarction (NSTEMI) in patients with complex coronary lesions poses significant challenges. The DK crush technique has emerged as a valuable option for addressing bifurcation lesions, ensuring optimal outcomes.

Case Presentation: A 66-year-old male with a history of hypertension presented with typical chest pain. ECG revealed dynamic ST-T changes, and cardiac biomarkers were positive, leading to a diagnosis of NSTEMI. Baseline echocardiography indicated hypokinetic anterior territory with an ejection fraction (EF) of 45% and no significant valvular pathology.

Results: Following the DK crush procedure, optimal stent placement was achieved with successful revascularization. The final angiographic assessment demonstrated improved coronary flow and resolution of the lesion.

Conclusion: The DK crush technique, when performed by experienced operators, provides an effective strategy for managing complex bifurcation lesions in NSTEMI patients. This case underscores the importance of meticulous procedural steps and intracoronary imaging for optimal results.

Keywords

NSTEMI management, DK crush technique, Complex coronary lesions, Bifurcation lesions, Percutaneous coronary intervention (PCI).



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Introduction

Coronary artery disease (CAD) is one of the foremost contributors to morbidity and mortality globally, significantly impacting public health. Among its manifestations, non-ST elevation myocardial infarction (NSTEMI) presents unique challenges in clinical management, particularly due to the complexity of coronary anatomy and the presence of bifurcation lesions¹. NSTEMI is typically characterized by partial occlusion of the coronary arteries, which can lead to varying degrees of ischemia and requires timely intervention to restore blood flow and prevent further myocardial damage².

Bifurcation lesions, where a single coronary artery branches into two vessels, complicate this scenario further. These lesions pose significant challenges during percutaneous coronary interventions (PCI) because successful stenting must ensure adequate flow to both branches without compromising their patency. The DK crush technique has emerged as a valuable strategy for managing such complex lesions, allowing for the effective deployment of stents while minimizing the risk of complications such as stent thrombosis or restenosis³.

The DK crush technique involves a series of meticulous steps that optimize the treatment of bifurcation lesions by ensuring that both the main vessel (MV) and side branch (SB) are adequately addressed. This technique has been shown to improve angiographic outcomes and clinical results in patients with complex bifurcation scenarios, making it a critical option for interventional cardiologists. As the field of interventional cardiology continues to evolve, understanding and implementing advanced techniques like DK crush is essential for enhancing patient care and outcomes in those presenting with NSTEMI and bifurcation lesions.

Case Presentation

A 66-year-old male with a significant medical history of hypertension and hyperlipidemia presented to the emergency department with a complaint of acute, substernal chest pain that had begun approximately two hours prior to admission.

The pain was described as a pressure sensation, radiating to the left arm, associated with shortness of breath and mild nausea. He had no prior history of coronary artery disease or myocardial infarction. On examination, the patient appeared anxious but was in no acute distress. Vital signs revealed a blood pressure of 140/90 mmHg, heart rate of 92 bpm, respiratory rate of 20 breaths per minute, and oxygen saturation of 96% on room air. Auscultation of the heart revealed a regular rhythm without murmurs. Lung examination was unremarkable, and there were no peripheral edema or signs of heart failure.

Diagnostic Assessment

The diagnostic evaluation of the patient revealed significant findings indicative of NSTEMI. An electrocardiogram (ECG) showed dynamic ST-T changes consistent with this diagnosis. Positive cardiac biomarkers further confirmed myocardial injury. An echocardiogram demonstrated a reduced ejection fraction (EF) of 45% and hypokinetic movement in the anterior territory, while no significant valvular pathology was noted. Additionally, a baseline angiogram revealed a bifurcation lesion that necessitated intervention, highlighting the complexity of the patient's condition and the need for a strategic therapeutic approach.

Therapeutic Intervention

The therapeutic intervention began with wire navigation to the main vessel (MV) and side branch (SB), followed by pre-dilatation of both vessels using appropriately sized balloons to ensure optimal access. Subsequently, a stent was deployed in the SB, accompanied by post-dilatation to secure the stent in place. To effectively manage the bifurcation, the DK crush technique was employed: the SB stent was crushed using a balloon sized to the distal MV segment. Re-crossing from the proximal SB strut allowed for the first kissing balloon inflation (KBI), facilitating optimal stent positioning. Following this, the MV stent was deployed, and a proximal optimization technique (POT) was performed to enhance the final results. A second KBI was then conducted, along with a final POT, leading to an angiographic

assessment that confirmed successful revascularization and restoration of blood flow to both branches.

Follow-Up and Outcomes

Following the procedure, the patient was closely monitored for any potential complications, including signs of myocardial ischemia or stent thrombosis. He was stable throughout the observation period, with no adverse events reported. A final angiographic assessment revealed excellent flow in both the main vessel (MV) and side branch (SB), with no residual stenosis noted. This successful outcome underscored the effectiveness of the DK crush technique in managing complex bifurcation lesions in the context of NSTEMI, ensuring optimal revascularization and improved myocardial perfusion. The patient was subsequently discharged with appropriate follow-up instructions and medications to support his recovery and prevent future cardiac events.

Discussion

The DK crush technique has gained recognition as a highly effective strategy for managing bifurcation lesions, particularly in patients presenting with NSTEMI. This approach is particularly beneficial due to its ability to optimize both the main vessel (MV) and side branch (SB) during percutaneous coronary intervention (PCI). Key procedural steps, including careful side branch optimization and the sequential crush technique, are essential in achieving favorable outcomes. These steps ensure that both branches receive adequate stenting while minimizing the risk of complications such as stent thrombosis or restenosis⁴.

The success of the DK crush technique is largely attributed to its systematic methodology, which involves multiple kissing balloon inflations (KBIs) and meticulous stent positioning. This not only enhances the mechanical support of the stents but also improves flow dynamics within the bifurcation area. Additionally, re-crossing through the crushed stent facilitates further optimization and ensures that the SB remains patent, thereby reducing the likelihood of adverse events⁵.

Furthermore, the integration of intracoronary imaging techniques, such as optical coherence tomography (OCT) or intravascular ultrasound (IVUS), can significantly enhance procedural accuracy. These imaging modalities allow for real-time assessment of stent placement, vessel dimensions, and lesion characteristics, enabling operators to make informed decisions during the intervention. Such precision is especially critical in complex cases where anatomical variations may pose challenges to traditional stenting techniques.

Conclusion

This case underscores the efficacy of the DK crush technique in effectively managing complex bifurcation lesions in patients with NSTEMI. By demonstrating successful revascularization and restoration of blood flow, this intervention highlights the technique's potential to improve clinical outcomes in challenging coronary scenarios. It is essential for operators to adhere meticulously to the key procedural steps involved in the DK crush method to ensure optimal results. Additionally, incorporating advanced imaging modalities can further enhance procedural accuracy and patient safety. Overall, the DK crush technique stands out as a valuable option in the interventional cardiology toolkit for addressing intricate bifurcation lesions, ultimately contributing to better patient care and outcomes.

Learning points

- A systematic and organized methodology is crucial when addressing complex bifurcation lesions, as it helps ensure thorough assessment and optimal stenting of both branches.
- Utilizing advanced intracoronary imaging techniques, such as optical coherence tomography (OCT) or intravascular ultrasound (IVUS), significantly enhances procedural success by providing real-time insights into vessel anatomy and stent positioning.
- The successful execution of advanced techniques like the DK crush requires a high level of skill and experience. Operators must be well-trained and familiar with the intricacies of

these procedures to achieve the best outcomes for patients with complex coronary anatomy.

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Supplementary Material

Supplementary Videos:

