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RESEARCH ARTICLE

OSTIAL RIGHT CORONARY ARTERY STENT FRACTURE DURING PCI: A CASE REPORT AND REVIEW OF THE LITERATURE

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Abstract

Stent fracture is an uncommon but potentially serious complication following percutaneous coronary intervention (PCI), particularly in heavily calcified and dynamic vessel segments. We report a case of stent fracture occurring at the ostium of the right coronary artery (RCA) during PCI, a challenging anatomical site due to vessel angulation and high mechanical stress. This report highlights the diagnostic clues, procedural strategies, and clinical implications associated with stent fracture, along with a brief review of the current literature.

Introduction:-

Stent fracture is an uncommon event that can lead to serious complications such as in-stent restenosis (ISR), thrombosis, and recurrent symptoms. The phenomenon is most often associated with long stents, overlapping segments, calcified lesions, and locations exposed to high biomechanical forces such as the RCA. Ostial RCA stent fractures are particularly rare but clinically significant due to the strategic location and technical difficulty in diagnosis and management.

Case Report:

A 72-year-old man with a history of type 2 diabetes mellitus, hypertension, and previous PCI to the RCA presented to the cardiology department with worsening exertional chest pain over the preceding two weeks. Physical examination was unremarkable. Electrocardiogram showed nonspecific ST-segment changes in the inferior leads. High-sensitivity troponin assays were negative.

A 72-year-old man with a history of hypertension and previous PCI to the RCA presented with recurrent exertional angina. His ECG was nonspecific, and troponin levels were negative. Coronary angiography revealed significant in-stent restenosis at the ostial RCA, treated two years prior with a drug-eluting stent (FIGURE 1). During PCI, resistance was encountered while advancing the balloon catheter.

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Figure 1: Coronary angiography pre-intervention

During the intervention, significant resistance was encountered when advancing a balloon catheter through the target lesion, even after initial pre-dilatation with a 2.5 mm semi-compliant balloon. High-pressure inflation with a 3.5 mm non-compliant balloon was attempted. Immediately after balloon inflation, angiography revealed focal haziness and deformation at the ostial segment.

StentBoost imaging revealed features consistent with a Type III stent fracture— complete transverse fracture of the stent without displacement of 2 components of the fractured stent by 1 mm —at the ostial segment (FIGURE 2).

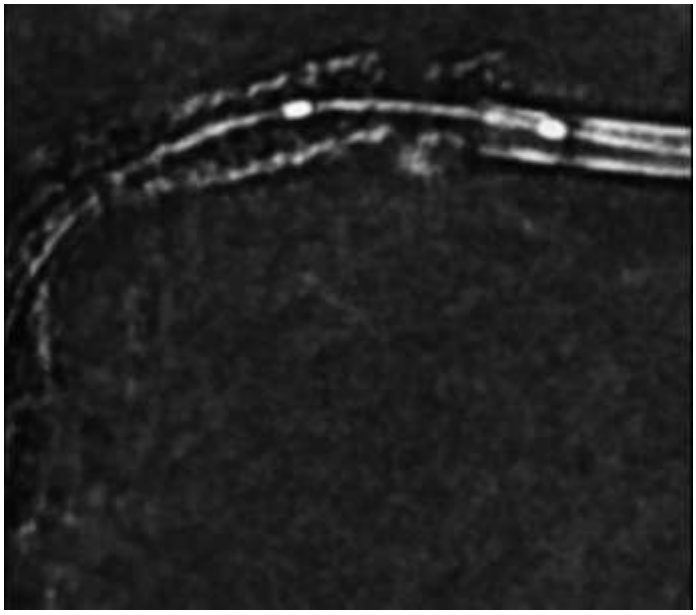

FIGURE 2: StentBoost-enhanced fluoroscopy image showing a Type III stent fracture at the ostial RCA.

Given the mechanical instability and persistent stenosis, the lesion was carefully pre-dilated with a non-compliant balloon, followed by deployment of a new drug-eluting stent (DES) overlapping the fractured segment. Post-dilation was performed to optimize stent expansion. Final angiography demonstrated excellent stent apposition, no residual stenosis, and TIMI grade 3 flow in the RCA (FIGURE 3).

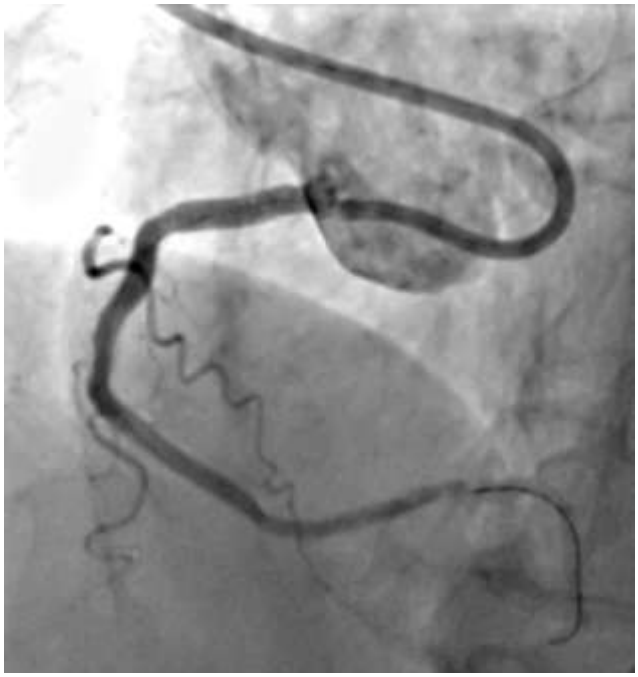

FIGURE 3: Final angiographic result after overlapping drug-eluting stent (DES) implantation and post-dilation.
The patient remained hemodynamically stable throughout the procedure and was discharged in good condition. At 6-month follow-up, he remained asymptomatic with no evidence of ischemia on stress testing.

Discussion:

Stent fracture (SF) is a recognized but underdiagnosed complication of percutaneous coronary intervention (PCI), particularly in ostial lesions where mechanical stress is substantial. Although the incidence of SF is reported to range between 1% and 8% depending on imaging modality and lesion location, it is notably more prevalent in specific anatomical sites such as the right coronary artery (RCA), especially its ostial and proximal segments [1,2]. This case illustrates an ostial RCA stent fracture that occurred during PCI—a rare but clinically significant event.

Several factors have been implicated in stent fracture, including mechanical stress from vessel angulation and torsion, heavy calcification, excessive post-dilation, long or overlapping stents, and use of rigid stent platforms [3–5]. Ostial RCA lesions are particularly susceptible due to constant movement from cardiac contraction, high shear stress at the aortic root, and frequent angulation at the ostium. In this case, the fracture likely resulted from high-pressure balloon inflation during lesion preparation, highlighting the mechanical vulnerability of the ostial RCA.

Stent fractures are classified from Type I (minor strut break) to Type V (complete transection with separation) [6]. In this case, a Type III stent fracture—defined as a complete transverse fracture of the stent without displacement of 2 components of the fractured stent by 1 mm—was identified intra-procedurally at the ostial RCA using StentBoost. The fracture was likely precipitated by balloon-induced mechanical stress during lesion preparation in a heavily calcified plaque. Procedural factors such as stent underexpansion, use of oversized balloons, and stenting across angulated or calcified segments may all contribute to structural compromise. While StentBoost aided in detecting the fracture, intravascular imaging modalities such as IVUS or OCT, which can provide more detailed real-time assessment [7,8], were not utilized in this instance.

Management depends on the severity of the fracture and clinical presentation. While minor fractures may not require intervention, cases with restenosis, thrombosis, or mechanical deformation typically benefit from re-stenting and high-pressure balloon optimization [9]. In our case, overlapping DES implantation effectively treated the fractured segment without further complications.

Despite advances in stent technology, fractures remain a concern in high-stress areas. New-generation DES with thinner struts and improved flexibility have lowered the incidence but not eliminated the risk [5,10]. Preventive strategies include careful lesion preparation, appropriate stent sizing, avoidance of excessive mechanical trauma and intravascular imaging guidance during PCI.

In summary, ostial RCA stent fracture is a rare but important complication. Awareness of predisposing factors, early recognition via imaging, and prompt, appropriate management are key to preventing adverse outcomes.

Conclusion:

Ostial RCA stent fracture is a rare but important complication that requires a high index of suspicion, especially in calcified and angulated lesions. Intracoronary imaging is essential for diagnosis, and prompt intervention can restore vessel patency and prevent adverse outcomes.

References:

1. Aoki J, Nakazawa G, Tanabe K, et al. Stent fracture: the clinical implications and its impact on patient outcomes. Catheter Cardiovasc Interv. 2007;70(4):510-517.
2. Lee SH, Park JS, Shin DG, et al. Incidence and predictors of stent fracture after drug-eluting stent implantation. Int J Cardiol. 2013;167(6):2615-2619.
3. Sianos G, Hofma SH, Ligthart JM, et al. Stent fracture and restenosis in the drug-eluting stent era. Catheter Cardiovasc Interv. 2004;61(1):111-116.
4. Nakazawa G, Otsuka F, Nakano M, et al. The pathology of neoatherosclerosis in human coronary implants: bare-metal and drug-eluting stents. J Am Coll Cardiol. 2011;57(11):1314-1322.
5. Rhee TM, Kim JY, Hahn JY, et al. Impact of stent design on stent fracture: insights from the Korean Coronary Stent Fracture Registry. Circ J. 2017;81(8):1099-1108.
6. Park JS, Choi JH, Park JJ, et al. Clinical and angiographic outcomes of stent fracture in drug-eluting stents. Circ J. 2012;76(5):1242-1249.
7. Okabe T, Mintz GS, Buch AN, et al. Intravascular ultrasound analysis of sirolimus-eluting stent fracture. Am J Cardiol. 2007;100(8):1322-1325.
8. Cook S, Wenaweser P, Togni M, et al. Incomplete stent apposition and very late stent thrombosis after drug-eluting stent implantation. Circulation. 2007;115(18):2426-2434.
9. Kim U, Kim DI, Han KR, et al. Clinical implications of stent fracture in the era of drug-eluting stents. Catheter Cardiovasc Interv. 2008;72(6):787-793.
10. Waksman R, Pakala R. Drug-eluting stent fracture: implications and management. JACC Cardiovasc Interv. 2009;2(6):555-557.