

The Use of Imaging to Guide Treatment Decisions with Coronary Orbital Atherectomy

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Coronary calcification is an increasing problem in patients undergoing Percutaneous Coronary Intervention (PCI) procedures. Imaging during these procedures is an important tool used to distinguish calcium severity, lesion morphology, and procedural strategy in complex coronary cases. The Diamondback 360[®] Coronary Orbital Atherectomy System has a unique dual-action mechanism of action (MOA) that sands superficial and fractures deep calcium, which has been demonstrated through imaging. I conducted a patient series of 25 consecutive cases that demonstrated sanding and fracture with OAS; this article describes two real-world cases and the importance of using imaging to determine strategy and treatment in these complex scenarios with Diamondback 360. In addition, the use of imaging allows one to visualize the ablation and fracture that occurs with Diamondback 360.

CASE 1

Patient is a 77-year-old male who presented with chest pain and associated radiation to the left arm with exertion concerning for unstable angina. He had a stress test concerning for inferior ischemia and underwent cardiac catheterization. He underwent PCI of the RCA as the culprit vessel for his unstable angina; however, he was found to have significant calcified stenosis of the LAD/Diagonal. Physiologic assessment in the form of RFR was hemodynamically significant in the LAD distribution at 0.87. RFR of the diagonal was not hemodynamically significant. He was scheduled for staged intervention of the LAD with intravascular imaging and potential atherectomy.

Intravascular imaging of the LAD showed a heavily calcified stenosis; the arc of calcium was greater than 180°, thickness greater than 0.5 mm and a length of calcium greater than 5 mm. Based on the OCT-based calcium scoring system, this patient would score 4 out of 4 points. Without appropriate calcium modification, there is significant concern for stent under expansion and ultimately poor long-term outcomes.

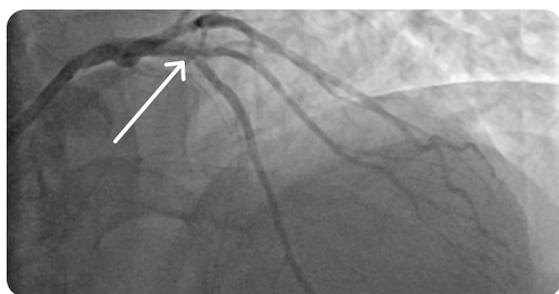
Orbital atherectomy was performed of the LAD with appropriate lesion modification. There was evidence of calcium modification/fracturing on the post-atherectomy images. Post-OCT guided PCI showed greater than 90% stent expansion without evidence of proximal or distal edge dissection.

Due to plaque shifting into the diagonal, PCI was performed with a stent into the diagonal as well with final kissing balloon inflations.

Based on the OCT-based calcium scoring system, without atherectomy, this patient would be at very high risk for stent under expansion, which ultimately leads to poor long-term outcomes and increased risk for target vessel revascularization.

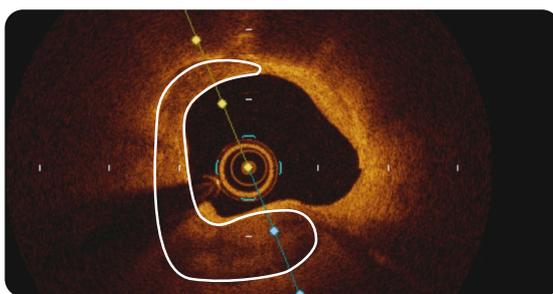
By utilizing coronary orbital atherectomy, there is appropriate evidence of calcium modification and appropriate stent expansion, which will lead to better long-term results.

Treated Region



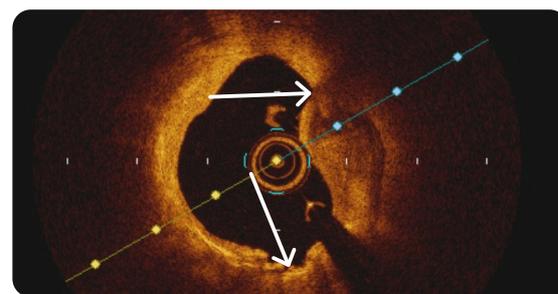
Pre-PCI angiography showing evidence of LAD/Diagonal stenosis.

Calcium



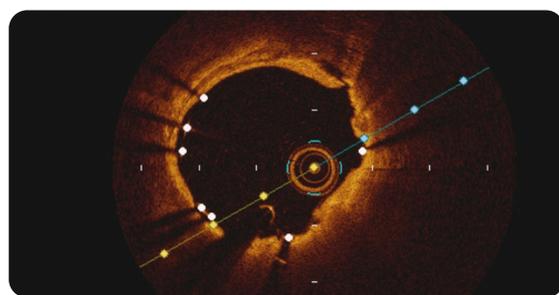
Pre-OCT PCI reveals greater than 180° of calcified stenosis of the proximal LAD. This is greater than 0.5 mm in thickness.

Plaque Modification

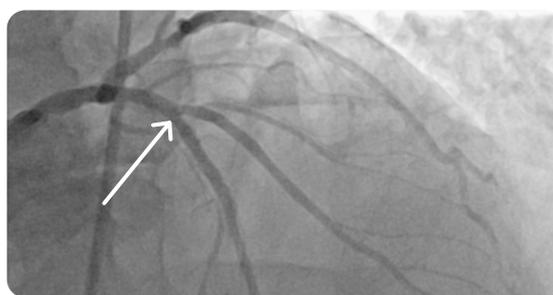


Post-CSI OCT was able to show appropriate plaque modification and calcium fracture.

Treated Stenosis



Post-OCT PCI. Due to appropriate vessel preparation and plaque modification, stent delivery and expansion were significantly improved.



Final Post-PCI angiography with PCI of the LAD/Diagonal.

CASE 2

Patient is a 78-year-old female who presented with increasing dyspnea on exertion. She was found to have severe mitral stenosis and acute kidney injury which delayed her cardiac catheterization. Unfortunately, prior to diagnostic cardiac catheterization, she had an acute neurological event and was diagnosed with a posterior circulation ischemic stroke. She ultimately underwent diagnostic catheterization and was found to have calcified stenosis of the LAD. Due to the recent stroke, she was deemed non-operable for her CAD and mitral valve disease. She presented for staged intervention of the LAD.

Initial intravascular imaging was attempted with an OCT catheter; however, it would not pass through the calcified mid LAD lesion. Due to presence of calcium noted on angiography and the inability to pass an imaging catheter, orbital atherectomy was performed of the LAD.

Post-orbital atherectomy, intravascular imaging was performed with OCT. This revealed calcified nodular disruption in the mid LAD.

The eccentric calcified nodule was appropriately modified in this case by the unique orbital action of the crown.

Post-stent deployment, due to appropriate plaque modification, stent delivery was not an issue and excellent stent expansion was observed.

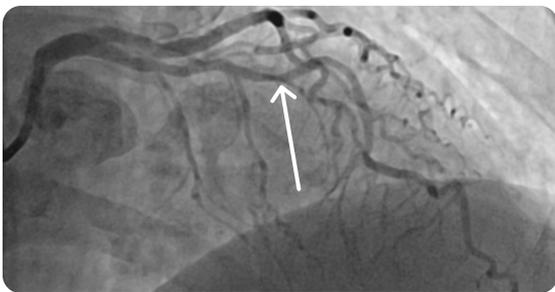
In a case such as this, plaque modification is necessary in order to deliver a stent and/or devices across a calcified lesion. Calcified nodular disruption is of specific concern due to eccentric nature of the lesion. Due to the dual-action MOA of the Diamondback 360®

device, appropriate plaque modification can be performed. This leads to ease of stent/device delivery and better stent expansion, which ultimately has been shown to improve long-term results.



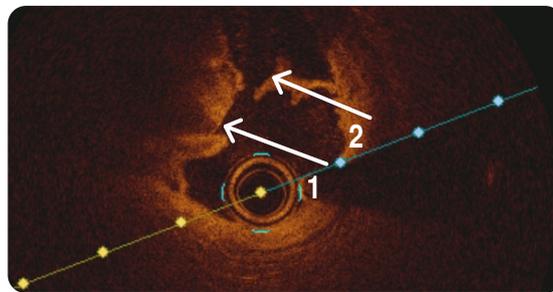
DIAMONDBACK 360®
CORONARY ORBITAL ATHERECTOMY SYSTEM

Mid LAD Stenosis



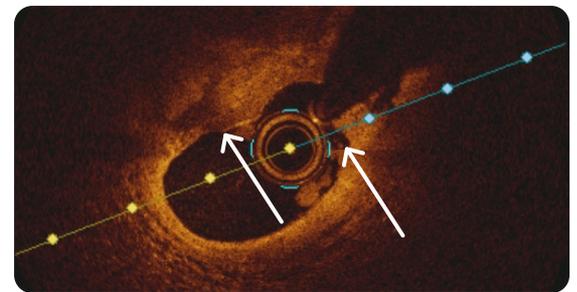
Initial angiography with concern for eccentric calcium throughout the proximal and mid LAD.

(1) Calcified Nodule (2) Plaque Modification



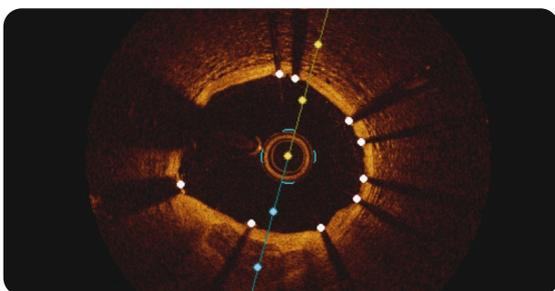
Calcified post-OCT PCI of the LAD showed evidence of calcified nodular dysplasia with modification from orbital atherectomy.

Plaque Modification



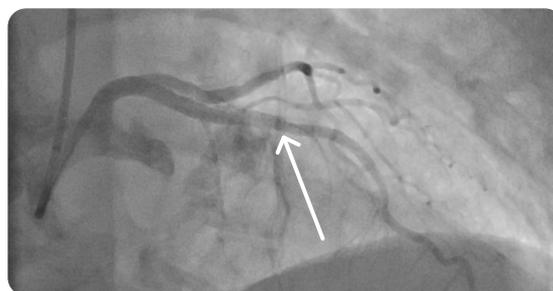
Post-CSI plaque modification.

Maximal



Post-percutaneous coronary intervention with appropriate stent expansion after atherectomy.

Treated Region



Post-PCI angiography.

Dr. Cookman is a consultant of Cardiovascular Systems, Inc. (CSI). CSI sponsored the placement of this article.

Indication: The Diamondback 360® Coronary Orbital Atherectomy System (OAS) is a percutaneous orbital atherectomy system indicated to facilitate stent delivery in patients with coronary artery disease (CAD) who are acceptable candidates for PTCA or stenting due to *de novo*, severely calcified coronary artery lesions. **Contraindications:** The OAS is contraindicated when the ViperWire Advance® Coronary guide wire cannot pass across the coronary lesion or the target lesion is within a bypass graft or stent. The OAS is contraindicated when the patient is not an appropriate candidate for bypass surgery, angioplasty, or atherectomy therapy, or has angiographic evidence of thrombus, or has only one open vessel, or has angiographic evidence of significant dissection at the treatment site and for women who are pregnant or children. **Warnings/Precautions:** Performing treatment in excessively tortuous vessels or bifurcations may result in vessel damage; The OAS was only evaluated in severely calcified lesions, a temporary pacing lead may be necessary when treating lesions in the right coronary and circumflex arteries; On-site surgical back-up should be included as a clinical consideration; Use in patients with an ejection fraction (EF) of less than 25% has not been evaluated. See the instructions for use before performing Diamondback 360 coronary orbital atherectomy procedures for detailed information regarding the procedure, indications, contraindications, warnings, precautions, and potential adverse events. **Caution:** Federal law (USA) restricts this device to sale by, or on the order of, a physician.

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