Cath Lab Digest

A product, news & clinical update for the cardiac catheterization laboratory specialist

CATH LAB SYSTEMS

Long Island Jewish Medical Center: A New Cath Lab Offers Reduced Radiation Exposure to Better Serve Patients and Team Members

CLD talks with Alexander Lee, MD.

Can you tell us about your hospital and share some details about the updated cath lab?

Long Island Jewish Medical Center (LIJ), part of Northwell Health, is in Queens, New York, and is a tertiary hospital with 600-plus beds. We don't have cardiothoracic surgery on site, so we send our surgical cases to our sister hospital, North Shore University Hospital, just a few miles down the road. LIJ has all the necessary capabilities in performing primary percutaneous coronary intervention (PCI) including cardiogenic shock cases and most complex PCI, but for other high-risk cases like an unprotected left main or when there is a need for more advanced mechanical circulatory support, those patients are typically transferred to North Shore Hospital.

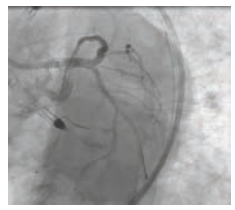
continued on page 12

In This Issue

CLINICAL UPDATE

Data-Driven Decisions for Left Main Revascularization

CLD talks with Brian A. Bergmark, MD



Dr. Bergmark presented during the session "How Do I Treat Left Main Disease in 2024" at the American College of Cardiology Scientific Session.

Can you tell us about left main disease?

Left main disease obviously is clinically important for most people, as the left main coronary artery typically provides at least 80% of the blood supply to the heart. It is important to note that when we are talking about left main percutaneous coronary intervention (PCI), it is usually implied that we are talking about *unprotected* left main PCI, where the patient has not had prior coronary artery bypass graft (CABG) surgery with a graft to the left anterior descending (LAD) or left circumflex artery.

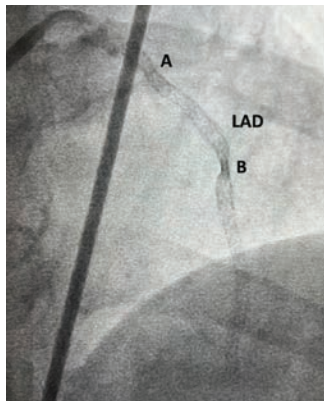
continued on page 8

CASE REPORT

Successful Dilation of a Heavily Calcified LAD With 3 Layers of Under-Expanded Stents With the OPN NC Super High-Pressure Balloon

Vikramjit Purewal, DO; Raehan Ahmed, DO; Chad F. Goerndt, RT(R); Nachiket J. Patel, MD

Severe calcification of an obstructive coronary lesion can adversely impact its successful dilation during stent implantation, increasing the likelihood of stent under-expansion, which is associated with higher rates of restenosis and repeat revascularization.[1,2] Herein, we describe a patient with persistent anginal symptoms after undergoing placement of 4 drug-eluting stents to a heavily calcified left anterior descending (LAD) artery with severe stent under-expansion, treated with the OPN NC super high-pressure balloon (SIS Medical AG).



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Successful Dilation of a Heavily Calcified LAD With 3 Layers of Under-Expanded Stents With the OPN NC Super High-Pressure Balloon

Vikramjit Purewal, DO; Raehan Ahmed, DO; Chad F. Goerndt, RT(R); Nachiket J. Patel, MD

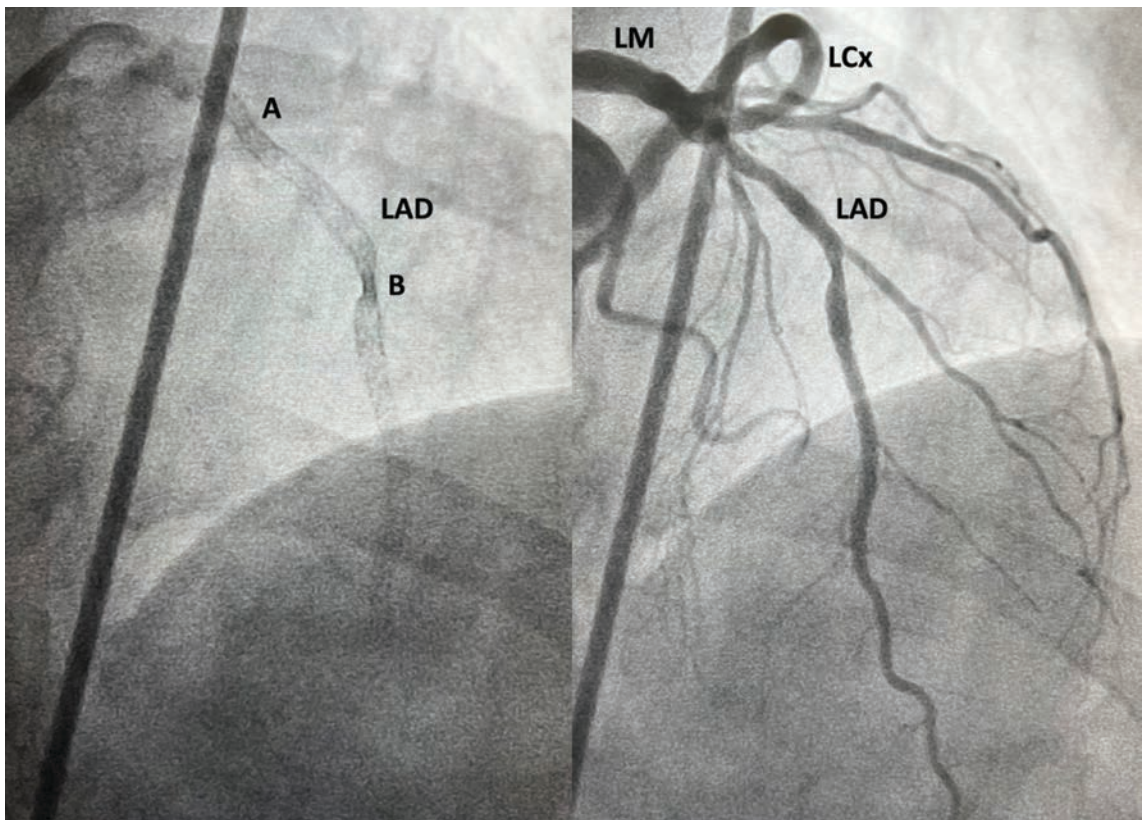

Figure 1. Anteroposterior (AP) cranial no contrast (left) and contrast (right) cinematography of the left system demonstrating undersized and under-expanded stents in the left anterior descending (LAD) coronary artery with 2 areas of severe under-expansion with 2 layers (A) and 3 layers (B) of stents.

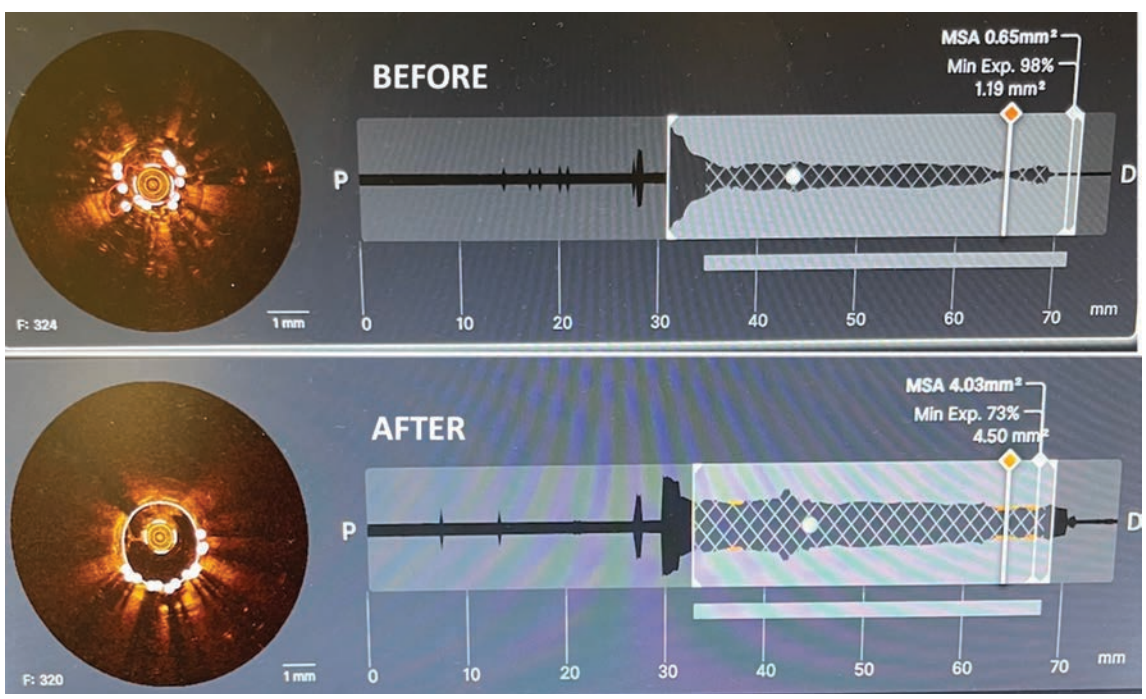

Figure 2. Optimal coherence tomography of the left anterior descending artery.

Case Report

A 76-year-old female with a history of hypertension had a non-ST-elevation myocardial infarction and underwent percutaneous coronary intervention to a heavily calcified and severe diffusely diseased lesion from the proximal to mid LAD. No intravascular imaging was performed to guide the intervention. The proximal to mid LAD was predilated with a 2.25 mm semi-compliant balloon. The mid LAD was stented with a 2.25 mm x 38 mm drug-eluting stent (DES). The proximal portion of the stent did not fully expand due to calcification, but this was not recognized. Next, a 2.5 mm x 30 mm DES was deployed from the proximal to mid LAD, overlapping with the first stent by approximately 10 mm, such that there were 2 layers of stent that were under-expanded due to calcium in the mid LAD. Unfortunately, the interventionalist mistook the under-expanded segment for a lesion in the LAD that was missed and deployed a 2.5 mm x 12 mm DES in that segment. Finally, a 2.75 mm x 12 mm DES was deployed in the proximal LAD (Figure 1). The patient was discharged home the next day.

Three months later, the patient was referred to us with complaints of persistent Canadian Cardiovascular Society 3 angina despite optimal medical therapy and a nuclear stress test showing anterior wall ischemia. She was taken to the cardiac catheterization lab where angiography showed undersized and under-expanded stents in the proximal to mid LAD, including an area of severe stent under-expansion in the mid LAD with 3 layers of stents (Figure 1).

We planned on using the OPN NC super high-pressure balloon (SIS Medical AG) to expand the under-expanded stents. We attempted to perform optical coherence tomography (OCT) (Abbott Cardiovascular) of the LAD, but were unable to cross the more proximal area of stent under-expansion in the mid LAD (Figure 1, Letter A) with the OCT catheter. Next, we attempted pre-dilating, but despite a 7-French (F) extra backup 3.5 guide catheter, 7F guide extension catheter, and extra support guidewire, no balloon could be delivered across that lesion. We therefore performed laser atherectomy with an 0.9 mm laser (Philips) at 80 fluence and 80 pulses per second for a total treatment time of 180 seconds, facilitated by concomitant administration of 70% contrast to cross the proximal and mid lesions (Figure 1, Letters A and B). After laser atherectomy, we pre-dilated the LAD with a 2.5 mm x 20 mm semi-compliant balloon up to 20 atmospheres (atm). OCT of the LAD was performed, which despite pre-dilation, showed a minimal stent area (MSA) of 1.19 mm^2 (Figure 2). We attempted to expand the lesion with a 2.5 mm x 12 mm noncompliant (NC) balloon at 22 atm, but this showed a significant waist (Figure 3). Dilation with a 3.0 mm x 10 mm OPN NC super high-pressure balloon at 35 atm, however, resulted in complete expansion of the under-expanded segment of stents (Figure 3). The remainder of the LAD was post-dilated with 4.0 mm and 3.5 mm NC balloons

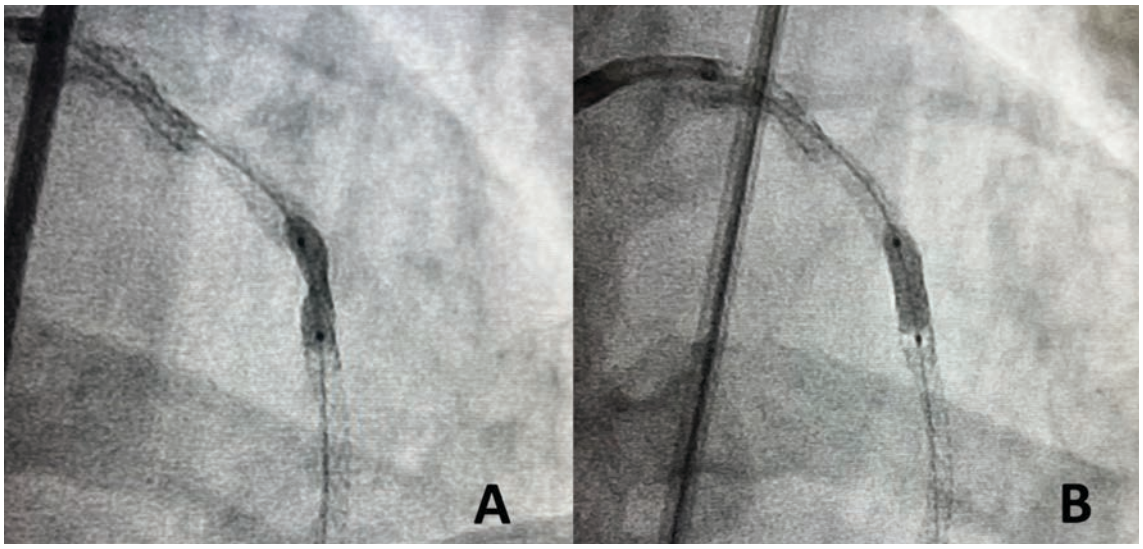

Figure 3. Dilation with a standard 2.5 mm x 12 mm noncompliant (NC) balloon at high atmospheres (atm) showing a significant waist (left). Dilation with the OPN NC super high-pressure balloon at 35 atm showing complete expansion of the under-expanded segment (right).

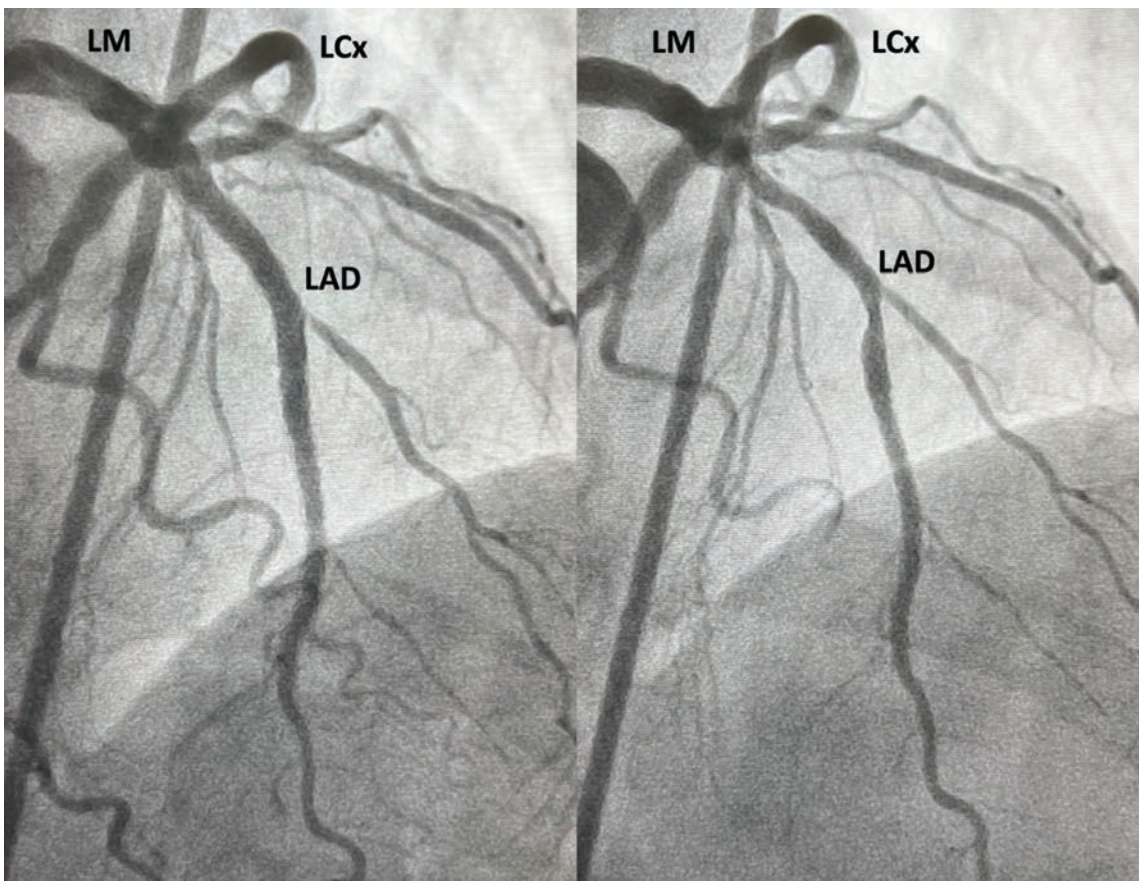

Figure 4. Final angiography showing a significant improvement in expansion of the LAD stents.

up to 20 atm. OCT was performed again, showing good stent expansion and an improvement in the stent area at the more distal lesion from 1.19 mm^2 to 4.50 mm^2 (Figure 2). Final angiography also showed a significant improvement in expansion of the LAD stents (Figure 4).

The patient was discharged home the same day. Her angina resolved and she remains free of angina on 3-month follow-up.

Discussion

Lesion preparation is paramount for successful stent expansion in patients with obstructive, calcified coronary lesions. Several tools are currently available including debulking, ablation, and balloon-based techniques. In the latter, the OPN NC super high-pressure balloons (SIS Medical AG) are double-layer, highly noncompliant coronary balloons that have a rated burst pressure of 35 atm. Studies show this balloon is safe and effective,[3,4] and should be a consideration for the treatment of in-stent restenosis due to an under-expanded stent.

In this case, we felt use of the OPN NC was the best option. We did not want to ablate the stent struts with orbital or rotational atherectomy; while either is an effective strategy, it would have necessitated placing another layer of stent in the vessel. The ARTIST trial,[5] for example, showed that in the treatment of in-stent restenosis, balloon angioplasty alone was better than rotational atherectomy plus balloon angioplasty. We considered coronary lithotripsy as well, which creates micro/macro fractures in the calcified plaque and allows for improved stent expansion. However, in my [NJP] experience, lithotripsy does not work as well when there are 2 layers of stents, and so felt it would be ineffective with 3 layers.

Ultimately, this case underscores the importance of intravascular imaging in guiding percutaneous coronary interventions (PCI). The initial intervention was done at a hospital that did not have intravascular imaging available. Perhaps, if that operator had access to and knew how to use intravascular imaging, the mistakes he/she made in the case could have been avoided. Intravascular imaging-guided stent implantation as compared to angiography alone has been shown to reduce the risk of death, myocardial infarction, repeat revascularization, and stent thrombosis.[6] It is now a class 2a recommendation for all PCI.[7] Despite this, intravascular imaging is only used in approximately 15%-20% of PCIs in the United States. We believe imaging with intravascular ultrasound or OCT in PCI should become standard of care. Just like radial first, "imaging before intervention" should be a mantra in interventional cardiology procedures. ■

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References can be viewed online by scanning the QR code:

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