



From Failure to Fixation: Guide Extension Catheter-assisted Percutaneous Coronary Intervention in a Patient with a Huge Ascending Aortic Aneurysm

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Abstract

Background: Severe aortic root dilation makes coronary engagement difficult. We report a case where guide extension catheter (GEC) enabled the engagement of the left coronary artery, and facilitated left main (LM) to left anterior descending artery (LAD) percutaneous coronary intervention (PCI) in the presence of a 6.4-cm aortic aneurysm. After standard JL/AL catheters repeatedly failed to engage the LM ostium, we used the right femoral approach with a 7 Fr long sheath, an EBU 4.5 guiding catheter, and a 6 Fr GEC to achieve stable engagement. IVUS identified an eccentric calcified nodule.

Results: The lesion was treated with plain old balloon angioplasty, intravascular lithotripsy (80 pulses), and drug-eluting stent implantation, resulting in excellent stent expansion. Distal LAD disease was treated with POBA and drug-eluting balloon. Final angiography showed TIMI-3 flow without complications.

Conclusion: GEC-assisted engagement of the left coronary ostium to facilitate PCI is an effective strategy in a patient with markedly dilated aortic root.

Keywords: guide extension, aortic aneurysm, IVUS, intravascular lithotripsy, left main PCI

Introduction

Coronary engagement in patients with markedly dilated ascending aorta is challenging because the enlarged root alters the usual relationship between catheter curves and the coronary ostium. Standard Judkins or Amplatz catheters often fail to reach or maintain stable alignment at the left main coronary artery, resulting in inadequate backup support due to the markedly dilated ascending aorta. Several

escalation techniques—telescoping technique (five-in-six configurations), JR single catheter, and modern guide-extension devices—have been reported to improve reach and stability in such anatomy. These strategies have shown success even in giant aneurysms¹⁻⁶. However, reports describing successful percutaneous coronary intervention (PCI) in the setting of severe aortic dilation remain limited. The reported case demonstrates how a long femoral sheath, EBU catheter, and guide-extension catheter enable

Received: Mar. 3, 2026; Accepted: May 30, 2026

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a safe IVUS-guided left main to left anterior descending (LM–LAD) PCI in a patient with a 6.4-cm diameter aortic aneurysm. In such anatomically complex cases, a strategic approach combining guide-extension support engagement, imaging, and calcium modification is key to procedural success.

Case Report

A 77-year-old man with prior CABG (LIMA–LAD, SVG–OM, sequential to RCA), mechanical aortic valve replacement (AVR), cardiac resynchronization therapy with defibrillator (CRT-D) implantation, and prior stroke, presented with episodic chest tightness. Coronary computed tomography angiography revealed a 6.4-cm ascending aortic aneurysm, Agatston score 3159, LIMA–LAD occlusion, and severe native LM–LAD calcification. Coronary angiogram (CAG) showed unseen LIMA and non-significant stenosis over SVG. Multiple diagnostic catheters (JL 3.5, JL 4.5, JL5, JL 6, AL 1, AL 2 and JR 4), therapeutic guiding catheter (EBU 3.5), and telescoping technique (EBU 3.5/6F + VTK 125cm/5F) failed to engage the LM due to marked aortic dilation (Figures 1A–1D). The strategy was escalated to right femoral access with a 7 Fr long non-kinking sheath, EBU 4.5/6 Fr guide, and Guidezilla TM (Boston Scientific, Marlborough, MA)/6 Fr, which successfully achieved coaxial LM alignment (Figure 1E). The guide-extension support engagement provided stable support to advance devices and perform intervention safely. CAG showed 60% stenosis in the left main ostium with severe calcification, 60–70% stenosis in the proximal LAD, and 90% stenosis in the distal LAD (Figure 1F).

IVUS showed LM ostial eccentric calcified nodule and diffuse fibrocalcific plaque at the proximal LAD. PCI was performed using non-compliant (NC) balloon 3.5×12 mm pre-dilation, intravascular lithotripsy (Shockwave Medical, Santa Clara, CA; 4.0×12 mm, 80 pulses), and Megatron 4.0×24 mm drug-eluting stent

implantation followed by proximal optimization technique with NC balloon 4.5×12 mm. The distal LAD was treated with plain old balloon angioplasty followed by drug-eluting balloon (Selution SLR 2.0×20 mm). Final IVUS confirmed optimal expansion, full apposition, and no edge dissections; final angiography showed TIMI-3 flow. The patient recovered uneventfully and was discharged on dual antiplatelet therapy. Treatment of the proximal-to-mid LAD moderate stenosis (60–70%) was deferred given its sub-critical severity and the patient's high overall procedural risk; it will be reassessed at future follow-up.

Discussion

Ascending aortic dilation creates excessive catheter redundancy and poor torque transmission, leading to repeated engagement failure. When the aortic root is enlarged, the standard JL or AL curves become inadequate to reach the coronary ostium, often resulting in unstable or non-coaxial alignment.

Three major techniques have been reported to overcome the difficulty of coronary engagement in patients with markedly dilated ascending aorta: telescoping technique, JR4 single-catheter approach, and guide extension–assisted engagement. Each method offers distinct mechanical advantages and limitations.

The telescoping technique, typically using a 5 Fr catheter inserted into a 6 Fr guiding catheter, extends the effective reach and improves coaxial alignment. However, the configuration increases internal friction and may predispose to thrombus formation, making it less suitable for prolonged PCI procedures^{2,3,5}.

The JR4 catheter technique provides a simpler, single-catheter solution that allows rapid access, particularly when targeting the left main artery from the femoral route. Nevertheless, the limited support and unstable engagement often make it inadequate for complex PCI requiring heavy device manipulation^{1,6}.

By contrast, the guide extension technique—



employing a standard guide catheter combined with an extension system like Guidezilla—offers a balance of reach, stability, manipulability and safety. Its rapid-exchange design allows simultaneous diagnostic engagement and interventional delivery. The soft-tip extension minimizes trauma to the coronary ostium while providing sufficient backup for device passage⁴.

In our case, the guide extension-assisted engagement enabled safe and effective LM–LAD PCI in the setting of a 6.4-cm dilated aorta with heavy calcification. This technique maintained stable coaxial alignment despite the enlarged root and allowed full procedural completion under IVUS and IVL guidance. Compared with the

previously described methods, it provided the most practical and reproducible balance between support, flexibility and safety for such a complex anatomy.

This case also highlights the importance of procedural planning in post-surgical anatomy. The patient's prior CABG and prosthetic valve increased the difficulty of catheter manipulation. Switching from radial to femoral access provided improved backup support and coaxial alignment, especially with the use of a long, non-kinking sheath. Such adjustments exemplify the tailored approach necessary for complex anatomies where off-the-shelf strategies fail.

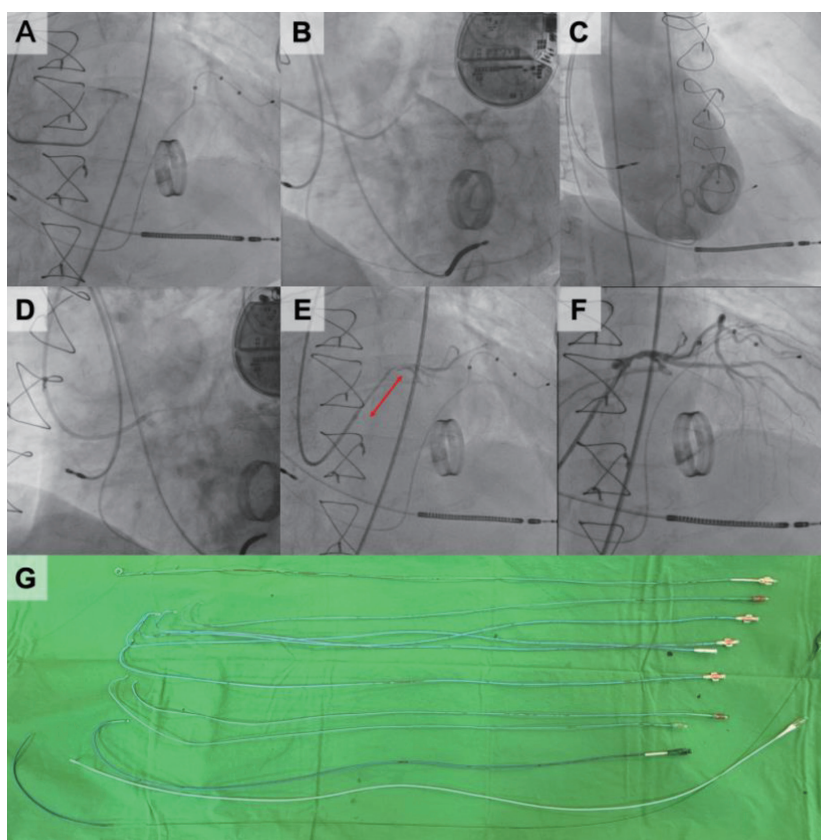


Figure 1. Serial images of engagement attempts and devices used.

Figure 1A: Failure of engagement by JL5/6F. **Figure 1B:** Failure of engagement by JL6/6F. **Figure 1C:** Aortogram revealing severely dilated aorta. **Figure 1D:** Failure of engagement by telescoping technique (EBU 3.5/6F + VTK/5F 125cm). **Figure 1E:** Successful engagement achieved with guide-extension support (EBU 4.5/6Fr + Guidezilla/6Fr), enabling coaxial left main alignment. **Figure 1F:** CAG showed 60% stenosis in LM-ostium with severe calcification, 60-70% stenosis in the proximal LAD and 90% stenosis in the distal LAD.

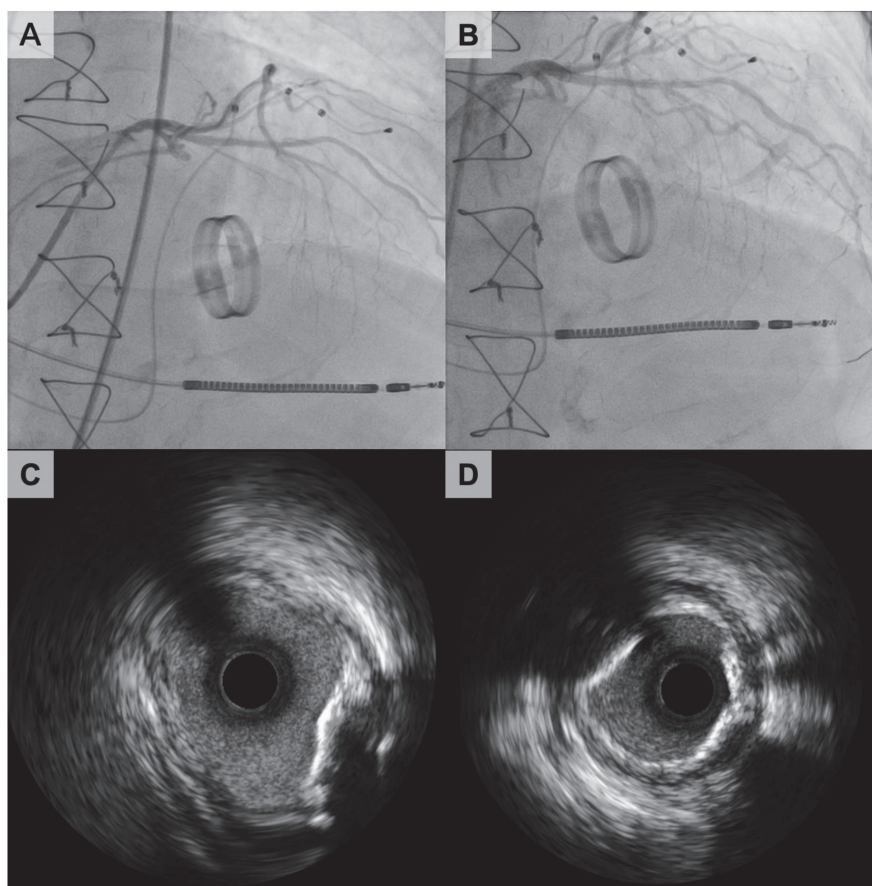


Figure 2. Images of pre-PCI LCA CAG, post-PCI LCA CAG and IVUS

Figure 2A: Pre-PCI LCA CAG showed left main ostium severe calcification with 60% stenosis, 60-70% stenosis in the proximal LAD and, 90% stenosis in the distal LAD. **Figure 2B:** Post-PCI LCA CAG showed TIMI-3 flow with an acceptable result. **Figure 2C:** Pre-PCI IVUS showed an eccentric calcified nodule over the proximal left main. **Figure 2D:** Pre-PCI IVUS showed near 360-degree calcification over the proximal LAD.

Conclusion

Guide extension-assisted engagement, combined with IVUS guidance and IVL therapy, offers a safe and effective method for LM-LAD PCI in patients with markedly dilated ascending aorta. This case highlights the key role of individualized escalation of access, guiding system, and calcium modification tools in achieving success in complex interventions.

Take-home message

1. Coronary engagement in a severely dilated

ascending aorta remains technically challenging because conventional Judkins or Amplatz catheters often fail to achieve coaxial alignment and backup support.

2. Guide extension-assisted engagement provides a practical solution — its rapid exchange design and soft-tip structure enable safe coaxial engagement and stable support even in large aortas.
3. The combination of guide extension-assisted engagement, IVUS imaging, and IVL therapy enables successful and reproducible PCI outcomes in patients with markedly dilated aortas and complex calcified disease.



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