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Multivessel disease treated with a double-kiss culotte and chronic total occlusion with support of quantative flow ratio, intravascular ultrasound and shockwave intravascular lithotripsy

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A 72-year-old man with a history of hypertension, hypercholesterolemia, and type 2 diabetes was admitted to the cardiology unit for unstable coronary angina. Coronary angiography revealed advanced multivessel coronary disease with stenoses in the left anterior descending (LAD) artery, proximal circumflex (Cx) artery, obtuse marginal (OM) branches, and a total chronic occlusion (CTO) in the right coronary artery (RCA) (Fig. 1A) (SYNTAX Score: 39 points). Left ventricular ejection fraction was 55%.

The patient was scheduled for evaluation by the Heart Team. However, the patient refused surgical treatment. Percutaneous coronary intervention (PCI) planning involved quantitative flow ratio (QFR) assessment from an independent core laboratory (LAD QFR-0.78; Cx/OM1 QFR-0.79, OM2 QFR--0.90; OM3 QFR-0.74; distal Cx QFR-0.79) (Fig. 1B).

During the procedure, a no-flow phenomenon occurred after wiring the Cx and OM1 branch (Fig. 1C). Treatment decisions relied on the QFR and intravascular ultrasound (IVUS) assessment. The distal Cx was stented with two overlapping drug-eluting stents (DES): 2.25 × 16 mm and 2.5 × 20 mm. The Cx/OM1 bifurcation was managed using the double-kiss culotte technique with two DES: 2.5 × 20 mm and 3.0 × 12 mm. IVUS revealed severe stent under-expansion distally to the bifurcation (Fig. 1D, E). Additional interventions, including a non-compliant balloon and shockwave intravascular lithotripsy with a 3.0 × 12 mm catheter (80 impulses), were performed to achieve full stent expansion (Fig. 1F).

The LAD was treated with three overlapping DES: 2.25 × 8 mm, 2.5 × 38 mm, and 2.75 × 38 mm under IVUS guidance. Staged CTO-RCA-PCI, performed after ischemia was demonstrated in a stress ECHO, involved an antegrade wire escalation technique and the implantation of two DES: 2.5 × 32 mm (Fig. 1G).

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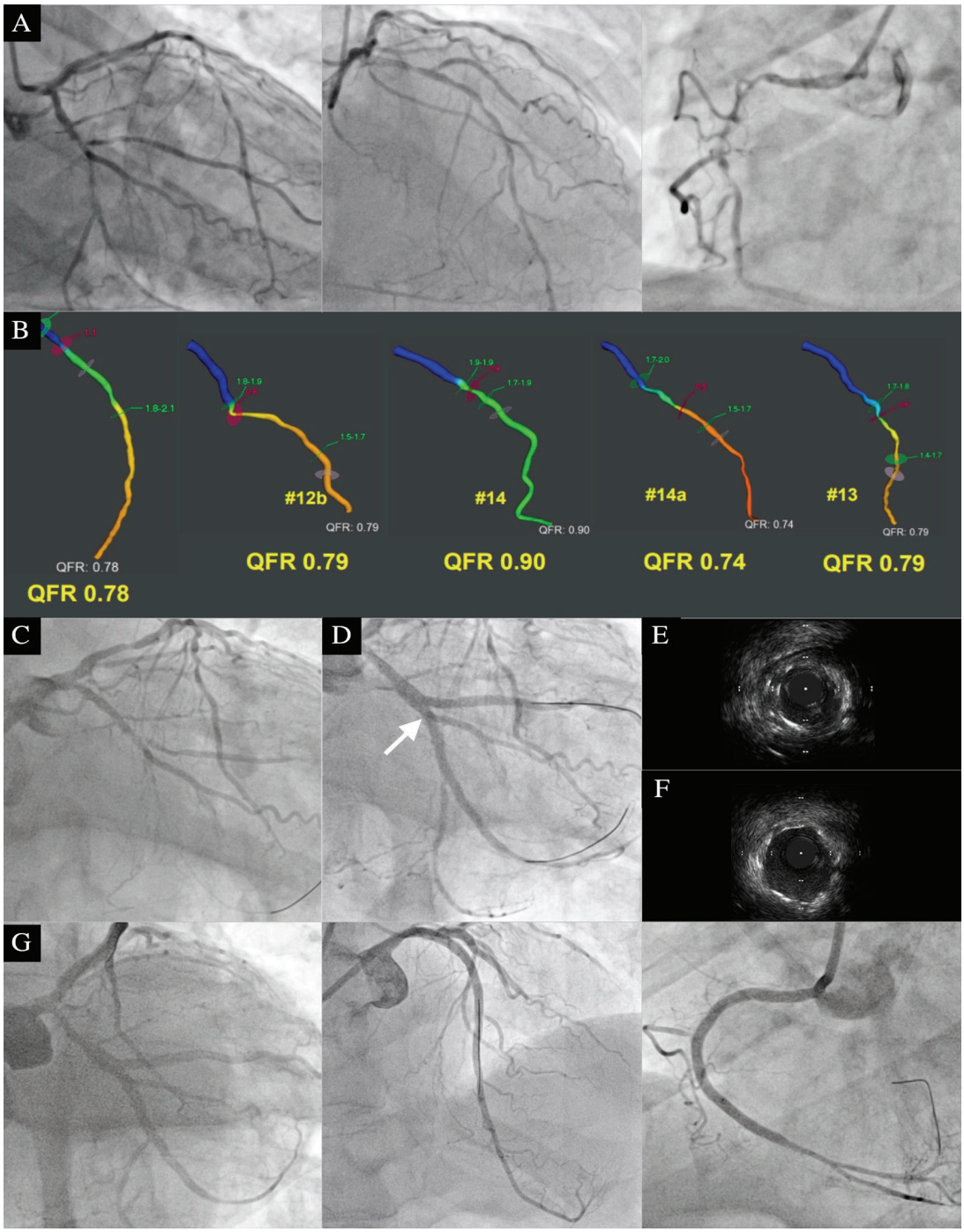

Figure 1. A. Initial coronary angiography of the left and right coronary arteries showing multivessel coronary disease; **B.** External core lab quantitative flow ratio assessment; **C.** No-flow phenomenon observed after wiring the Cx and OM1 branch; **D.** Although good angiographic results were achieved with the double-kiss culotte technique for Cx/OM1 bifurcation stenting, subsequent control IVUS revealed severe stent under-expansion (white arrow) with a minimum stent area (MSA) of 3.34 mm ^ 2 (**E**); Following treatment with Shockwave Intravascular Lithotripsy (S-IVL) (80 pulses), control IVUS showed a MSA of 5.67 mm ^ 2 (**F**); **G.** Final coronary angiograms after LAD and Cx/OM1 PCI and staged CTO-RCA PCI