

Unexpected huge post-stenting coronary perforation during complex left main revascularization

Sol ana koroner revaskülarizasyonunda stent sonrası beklenmedik dev koroner perforasyon

ABSTRACT

A 78-year-old man with a tight left main and a long calcified disease of the left anterior descending coronary artery refused surgery. After stenting, the patient went into a shock because of a large coronary artery rupture. Pericardial drainage with blood reinfusion, without heparin reversal, allowed for completion of revascularization.

Keywords: Angioplasty, interventional cardiology, left main

ÖZET

Sol ön inen koroner arterde sıkı sol ana ve uzun kalsifiye hastalığı olan 78 yaşında erkek hasta ameliyatı reddetti. Stent taktıktan sonra hasta büyük bir koroner arter rüptürü nedeniyle şok geçirdi. Heparin reversal olmadan kan reinfüzyonlu perikardiyal drenaj revaskülarizasyonun tamamlanmasına olanak sağladı.

Anahtar Kelimeler: Anjiyoplasti, girişimsel kardioloji, sol ana

Coronary perforations remain a rare event after stent deployment with an estimated incidence ranging between 0.34% and 0.51%.^[1-2] In this report, we present a case of coronary type III perforation during a complex left main (LM) revascularization.

CASE REPORT

A 78-year-old man with hypertension was referred with recurrent episodes of chest pain when mild effort was applied for the past 3 days. Physical examination and cardiac auscultation did not reveal any abnormalities. Biochemical tests showed hypercholesterolemia and a low-density lipoprotein level of 145 mg/dL. Electrocardiogram revealed mild ST segment depression in D1, DII, and V4-V6. Transthoracic echocardiogram revealed an ejection fraction of 60% with hypokinesis of the anterior and inferobasal walls. On coronary angiography, an LM diffuse disease involving the left circumflex (LCx) and the left anterior descending (LAD) coronary artery with a long moderately calcified disease were observed. The right coronary artery (RCA) showed a severe proximal midportion disease. Using the Abbott system (Abbott Medical), a resting full cycle ratio demonstrated ischemic lesions in all territories (Figure 1). SYNTAX score was 29.0, EuroSCORE II was 6.03, Dual Antiplatelet Therapy (DAPT) score was 3.0, and PRECISE-DAPT score was 23. The patient strongly refused surgery. Therefore, after administration of ticagrelor 90 mg twice a day and aspirin 100 mg, a transradial intravascular ultrasound (IVUS)-guided (Boston Scientific Corp) complete percutaneous coronary revascularization was scheduled. After successful stenting of the RCA (Figure 2) with a 2.75 × 40 mm Orsiro Mission stent (Biotronik), IVUS of the left system was attempted after wiring of both LAD and LCx with a Sion Blue (Asahi Intech) on LCx and a Whisper LS (Abbott Medical) on LAD,

CASE REPORT OLGU SUNUMU

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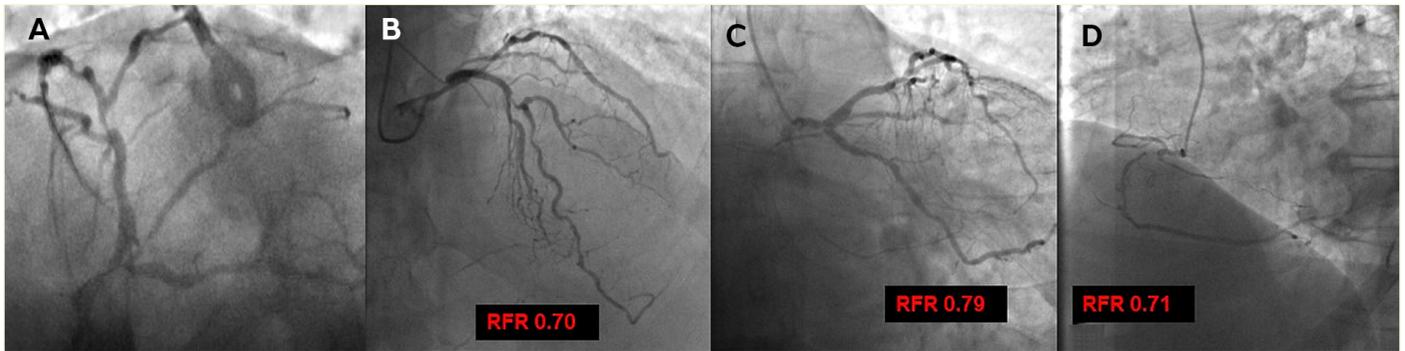


Figure 1. (A) Spider view of the left system revealing severe diffuse disease; (B) Left anterior posterior cranial view of the left system revealing tight stenosis of the mid and distal segments of left anterior descending coronary artery with a significant resting full cycle ratio (RFR) value; (C) Caudal anteroposterior view revealing severe disease of the left circumflex artery with a significant RFR value; (D) Left anterior oblique view revealing severe disease of the right coronary artery with a significant RFR value.

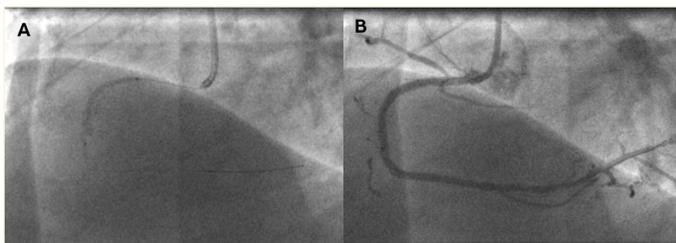


Figure 2. Percutaneous coronary intervention of the right coronary artery: (A) Predilatation and (B) final results after stenting.

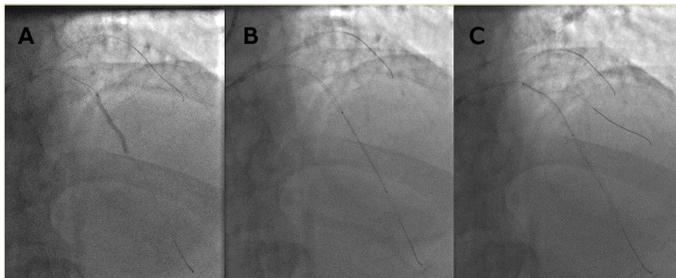


Figure 3. Percutaneous coronary intervention of the left anterior descending coronary artery (LAD): (A) Predilatation and (B) stenting of the distal and (C) mid portion of LAD.

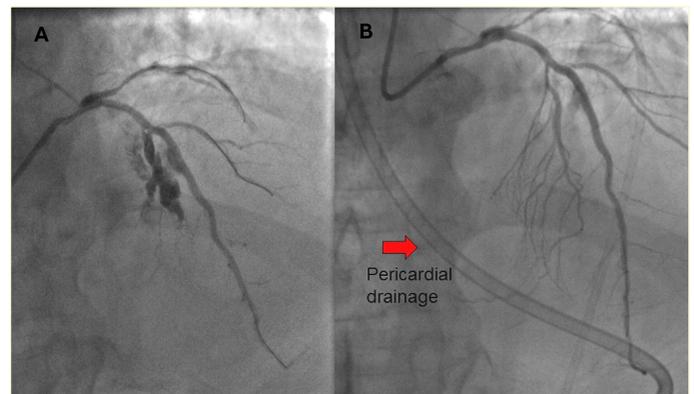


Figure 4. (A) Angiographic control immediately after stenting revealed a huge type III perforation. (B) Patient shocked: after inflating a balloon at the coronary rupture site, a pericardial drainage was immediately placed through a subxifoideal approach. The pericardial pig tail (red arrow) was connected to a sac and with a 5F venous sheath for continuous manual reinfusion.

but this failed owing to excessive tortuosity. It was decided that IVUS should be used for optimization after stenting (Video 1*). After multiple predilatations of LAD with a 2.0 × 30 Euphora balloon (Medtronic Inc.) and a 2.5 × 27 mm Euphora

ABBREVIATIONS

DAPT	Dual Antiplatelet Therapy
IVUS	Intravascular ultrasound
LAD	Left anterior descending
LCx	Left circumflex
LM	Left main
POT	Proximal optimization technique
QCA	Quality coronary angiography
RCA	Right coronary artery

NC-balloon at increasing pressure (maximum 18 atm), a 2.5 × 40 and a 3.0 × 40 mm Orsiro Mission stents at 12 atm were implanted on the basis of quality coronary angiography (QCA) diameter (Figure 3, Video 2*). The patient went into a shock owing to a large type III coronary artery perforation Figure 4A, Video 3*). Long-lasting balloon inflation with a 3.0 × 20 mm balloon at nominal pressure was performed (Video 4*), while an attempt to pass a 3.0 × 19 mm covered stent (Graftmaster, Abbott) failed because of the calcification and LAD angle. Pericardial drainage (Figure 4B) with continuous blood reinfusion through a femoral 5F vein access without heparin reversal helped to obtain hemodynamic stability despite a global slow flow with ongoing ischemia. As referral to cardiac surgery was difficult, the procedure was finalized with the nano-inverted-T technique (Figure 5). The LCx was predilated with a 2.5 × 27 NC balloon at 14 atm, and two Orsiro 3.0 × 30 and 3.5 × 40 mm were implanted with one ring protrusion in the LM, while a 3.5 × 20 NC balloon was parked in the mid LAD. The

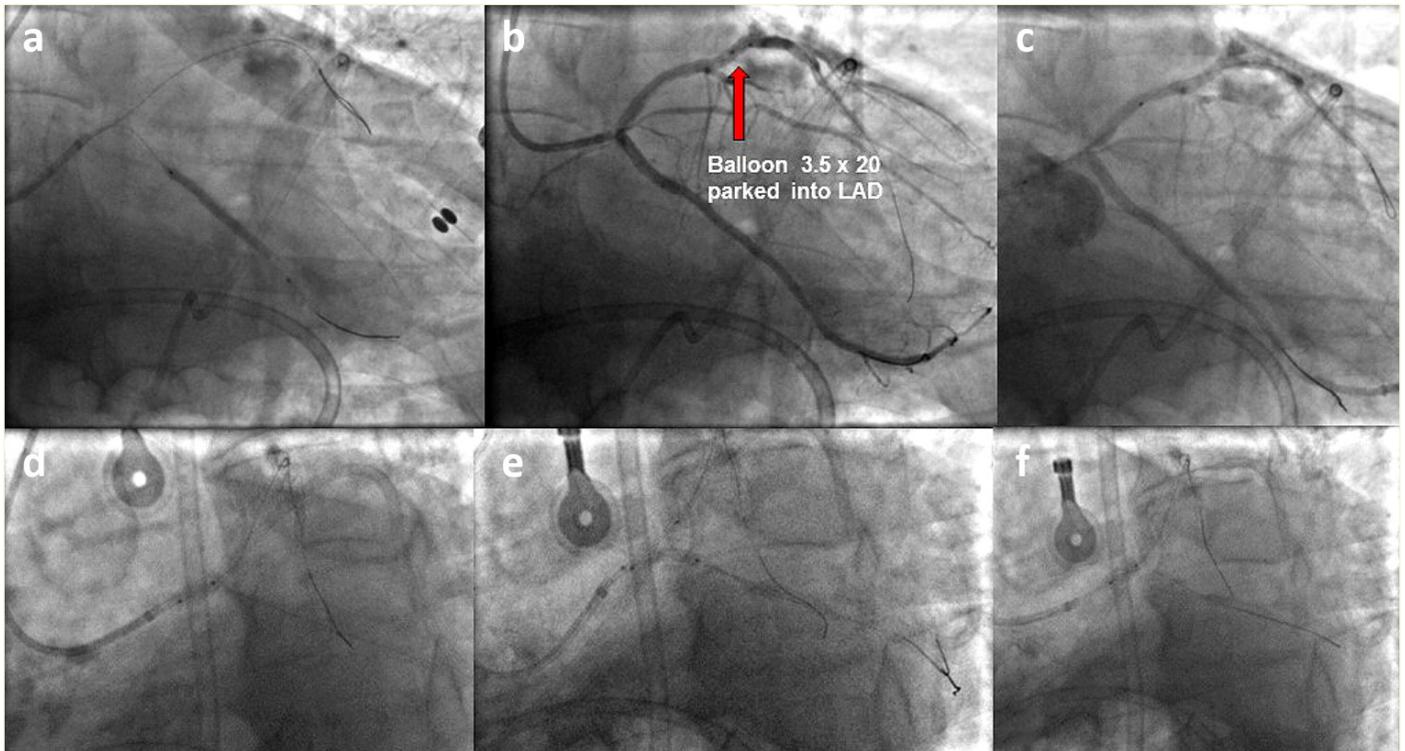


Figure 5. Completion of the left system percutaneous coronary intervention: (A) predilatation and stenting of mid-distal left circumflex artery (LCx); (B) stenting of proximal LCx with one rig protruding into the left main (LM); (C) after crushing the ring with a balloon previously parked into the mid left anterior descending coronary artery (LAD), the LM-proximal LAD were stented; (D) first proximal optimization technique (POT); (E) Kissing technique; (F) Final POT.

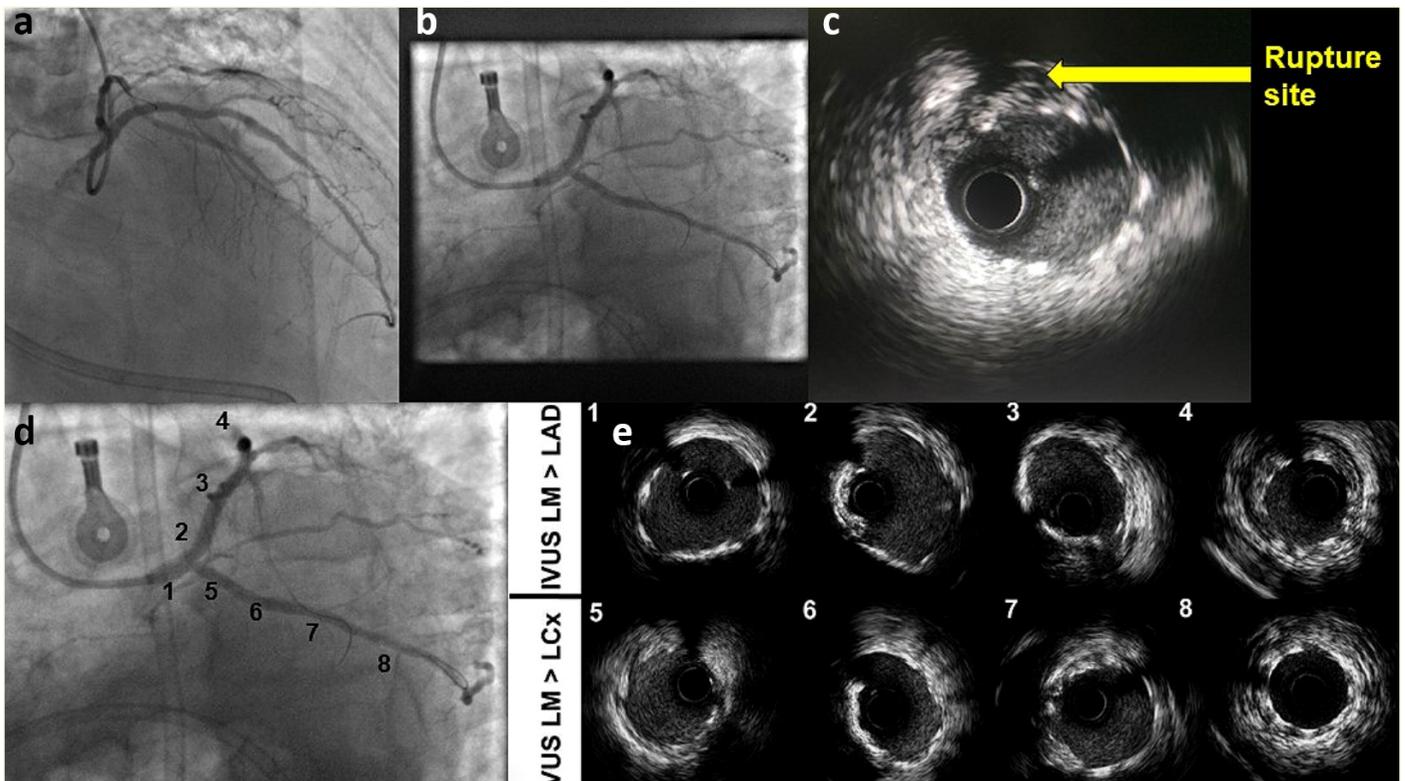


Figure 6. Angiographic and intravascular ultrasound (IVUS) control: (A) Final angiographic results in right anterior cranial and (B) spider views; (C, D) Left system complete IVUS control revealing a good apposition of the stent in all the segments and nicely sized stents in the left anterior descending coronary artery, left circumflex, and left main; (E) the IVUS appearance of the rupture site.

ring was crushed with the 3.5 × 20 balloon in the LM at 20 atm, and a 3.5 × 40 mm Orsiro stent was then implanted in the LM-proximal LAD at 20 atm; the size was selected on the basis of the Finet-law of coronary bifurcation. A proximal optimization technique (POT) with a 4.5 × 12 NC balloon was accomplished allowing an easy rewiring of LCx. Kissing balloon with a 3.5 × 20 NC balloons at 20 atm, and a final POT at 20 atm were finally performed with a good result (Video 5*). IVUS demonstrated an eccentric calcification after the first diagonal with a mean diameter of 3.2 mm at the proximal-mid portion and a mean LM diameter at the body of 4.6 mm with good apposition of the stents, suggesting that the chosen stents diameter was correct (Figure 6). Total contrast medium volume administered was 280 mL.

DISCUSSION

In this case report, we describe a case of unexpected coronary type III perforation during a complex LM revascularization. The reported risk factors include older age, peripheral arterial disease, lower body mass index, treatment of complex lesions (type C), and treatment of chronic total occlusions.^[2] Treatment usually includes conservative measures in the catheterization laboratory and/or emergent referral for cardiac surgery, if possible.

This case has several relevant observations. First, when IVUS cannot be used from the beginning of the procedure, a careful predilatation with increasing balloon sizes and pressures can offer a valid alternative. Second, once a coronary rupture has occurred, perseveration of the implantation of a covered stent might be detrimental. Similarly, the use of ping-pong technique could be time-consuming and of uncertain benefit. Third, if IVUS is not available to determine the LM diameter, the Finet-law based on QCA diameter allows the choice of an adequate LM stent size.^[3] Finally, eccentric calcium laminae should be carefully evaluated for any potential risk of rupture before any interventions. In this patient, the passage of a covered stent was not possible, and this suggests that even the passage of a lithotripsy balloon would fail owing to the profile of such a device.^[4] An undersized stent would probably be reasonable but would expose the patient to eventual problems at the stent site in the future. Finally, in an emergent situation, when to complete the revascularization, especially in LM, remains mandatory, the nano-inverted-T stenting has the advantages of being quick and of avoiding multiple re-wiring and kissing steps, with shorter procedural time and lower metal amount at the carina compared with the culotte

or the DK-crush techniques.^[5] At 6-month, he underwent negative ergometric test at 150 W. Dual antiplatelet regimens were continued for 12 months and switched to aspirin long-life and ticagrelor 60 mg twice a day for other 6 months.

Coronary perforations remain rare occurrences but can still occur after stent deployment with prompt recognition and conservative management being the key factors for procedural and clinical success.

*Supplementary video files associated with this article can be found in the online version of the journal.

Informed Consent: Informed consent was obtained from the patient for the publication of the case report and the accompanying images.

Author contributions: Concept – G.R., M.Z.; Supervision – G.R., L.R.; Data Collection and/or Processing – G.R.; Literature Search – M.Z.; Writing – G.R. M.Z.; Critical Revision – G.R., L.R.

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REFERENCES

1. Shaukat A, Tajti P, Sandoval Y, Stanberry L, Garberich R, Nicholas Burke M, et al. Incidence, predictors, management and outcomes of coronary perforations. *Catheter Cardiovasc Interv* 2019;93:48-56. [\[Crossref\]](#)
2. Simsek EC, Kiris T. The prevalence, management and outcomes of coronary artery perforations during percutaneous coronary intervention in patients with or without acute coronary syndromes. *Coron Artery Dis* 2021;32:610-7. [\[Crossref\]](#)
3. Rigatelli G, Zuin M, Ronco F, Caprioglio F, Cavazzini D, Giatti S, et al. Usefulness of the Finet law to guide stent size selection in ostial left main stenting: comparison with standard angiographic estimation. *Cardiovasc Revasc Med* 2018;19:751-4. [\[Crossref\]](#)
4. Aziz A, Bhatia G, Pitt M, Choudhury A, Hailan A, Upadhyaya S, et al. Intravascular lithotripsy in calcified-coronary lesions: a real-world observational, European multicenter study. *Catheter Cardiovasc Interv* 2021;98:225-35. [\[Crossref\]](#)
5. Rigatelli G, Zuin M, Vassilev D, Dinh H, Dell'Avvocata F, Van Tan N, et al. Feasibility, safety and long-term outcomes of complex left main bifurcation treatment using the nano-inverted-t stenting: a multicentre prospective registry. *Int J Cardiovasc Imaging* 2020;37:1107-9. [\[Crossref\]](#)