A case of double coronary perforations and tamponade during left main percutaneous coronary intervention and treatment with stenting and autotransfusion

Sol ana koroner artere perkütan girişim sırasında çift perforasyon ve tamponat gelişen olgu: Stent ve ototransfüzyon ile tedavi

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Summary– Coronary perforation is a rare complication of percutaneous coronary intervention. A 60-year-old male patient with a diagnosis of hepatocellular carcinoma was admitted to our hospital with crescendo anginal attacks. Coronary angiogram revealed significant stenosis in distal left main coronary artery (LMCA). After implanting a 4.0×18 mm coronary stent from LMCA to left anterior descending artery (LAD), coronary angiography showed a perforation in the proximal part of the LAD and a plaque shift to the osteum of circumflex artery (Cx), causing 60% stenosis. Rupture was sealed by implantation of a polytetrafluoroethylene (PTFE) coated stent in proximal LAD. Due to ongoing chest pain and electrocardiographic ischemic changes, a 3.5×18 mm coronary stent was implanted in Cx. Unfortunately, another perforation occurred in Cx. The PTFE coated stent was not flexible enough to advance from the former LMCA to LAD stent to the Cx artery, and another 3.5×18 mm coronary stent was deployed in Cx artery successfully. Although control angiography showed complete sealing of the rupture, echocardiography showed a large pericardial effusion compressing the right side of the heart. Autotransfusion was done to stabilize the hemodynamic status. One-week later, coronary angiography did not show any contrast agent extravasation. In this case, we present double coronary perforations of the LAD and Cx arteries, and successful treatment with both covered and conventional stents and autotransfusion.

Özet– Koroner perforasyonu perkütan koroner girişimlerinin nadir görülen bir komplikasyonudur. Hepatosellüler karsinom tanısı konan 60 yaşında erkek hasta giderek şiddeti artan anjina atakları ile hastanemize başvurdu. Koroner anjiyografide sol ana koroner arter (LMCA) distal bölümünde ciddi darlık gözlendi. LMCA'dan sol ön inen artere (LAD) uzanan stent (4.0x18 mm) yerleştirildikten sonra koroner anjiyografide LAD'nin proksimal kesiminde perforasyon ve sirkumfleks arter (Cx) ostiyumunda %60 darlığa neden olan plak kayması görüldü. LAD'nin proksimal kesimine politetrafloroetilen (PTFE) kaplı stent yerleştirilerek yırtık kapatıldı. Devam eden göğüs ağrısı ve iskemik elektrokardiyografik değişiklikler nedeni ile Cx'e de 3.5×18 mm koroner stent yerleştirildi. Ne yazık ki, Cx'te başka bir perforasyon oluştu. PTFE kaplı stent esnek olmadığından dolayı önceki LMCA-LAD stentinin içinden geçirilerek Cx'e ilerletilemedi. Bu nedenle başka bir koroner stent (3.5x18 mm) Cx'e başarı ile yerleştirildi. Koroner anjiyografide yırtılmanın tam olarak kapanmış olduğu görüldü. Ancak ekokardiyografide sağ kalp boşluklarına bası yapan geniş perikardiyal sıvı birikimi saptandı. Hemodinamik durumu stabilize etmek için ototransfüzyon uygulandı. Bir hafta sonraki koroner anjiyografide kontrastın damar dışına sızması gözlenmedi. Bu olgu bildirisinde LAD ve Cx arterlerin ikisinin birden perforasyonu ile ilaç kaplı ve konvansiyonel stentler birlikte kullanılarak ototransfüzyonla başarılı tedavisi sunuldu.

Coronary perforation is a rare but serious complication of percutaneous coronary interventions (PCI), resulting in myocardial infarction in 27% of cases, cardiac tamponade in 17% and death in 9%.[1] Incidence is reported to be between 0.2% and 0.6% of all PCI, and this proportion may further increase with the use of atherectomy or thrombectomy devices.[2-5] The non-surgical management of coronary artery perforation includes reversal of heparin with protamine sulphate, prolonged balloon inflation, perfusion bal-

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loon inflation, conventional or covered stent implantation, and coil or thrombus embolization.[4,6] Here we present a case with both left anterior descending (LAD) and circumflex (Cx) artery rupture and tamponade development during left main stenting. Successful treatment was achieved with stenting (covered and bare metal stents) and autotransfusion.

Abbreviations:

Cx	*Circumflex*
LAD	*Left anterior descending*
LMCA	*Left main coronary artery*
PCI	*Percutaneous coronary intervention*
PTFE	*Polytetrafluorethylene*

CASE REPORT

A 60-year-old male patient, ex-smoker and non-diabetic with a diagnosis of hepatocellular carcinoma was admitted to our hospital with crescendo anginal attacks that were poorly controlled with maximal anti-anginal drugs. His electrocardiography showed precordial inverted T-waves. Echocardiography revealed normal left ventricular contraction. After an initial evaluation, coronary angiography was performed. Coronary angiogram revealed 70% stenosis in the distal left main coronary artery (LMCA) by visual estimation, and calcification in the proximal part of the LAD (Fig. 1a). Due to the lower survival rate of patients with hepatocellular carcinoma, surgery was not proposed for this patient. A combination of aspirin and clopidogrel treatment was initiated before the interventional therapy.

In the catheterization laboratory, LMCA was engaged with a 7F guiding catheter (Cordis, a Johnson & Johnson company; Miami Lakes, Fla). Soft-tip guidewires (Neo's Soft, Asahi Intecc Co.; Nagoya, Japan) were chosen and carefully advanced into the LAD and Cx arteries. The width of the LMCA and LAD were measured as 4.9 mm and 3.6 mm by quantitative coronary angiography. Then, a 4.0x18 mm Ephesos II stent (Nemed Ltd.; Istanbul, Turkey) was implanted from the LMCA to the LAD at 12 atmospheres (atm). Unfortunately, coronary angiography showed a class III-perforation ≥1 mm in diameter with contrast streaming or cavity spilling as evidence of rupture of the proximal LAD, and a plaque shift to the osteum of Cx, causing 60% stenosis (Fig. 1b). The patient had defined chest pain immediately after implantation. A polytetrafluorethylene (PTFE) coated Jostent of 3.5x16 mm in size was implanted to rescue the rupture of the proximal LAD. Further injection did not show any extravasation of the contrast agent. Activated clotting time was measured as 196 seconds, so additional protamine sulphate was not applied. After that, a 3.5×18 mm Ephesos II stent (Nemed Ltd.; Istanbul, Turkey) was implanted by covering the osteum of the Cx. Control injection showed another class III- perforation from the Cx (Fig. 2a). As the PTFE coated stent was not

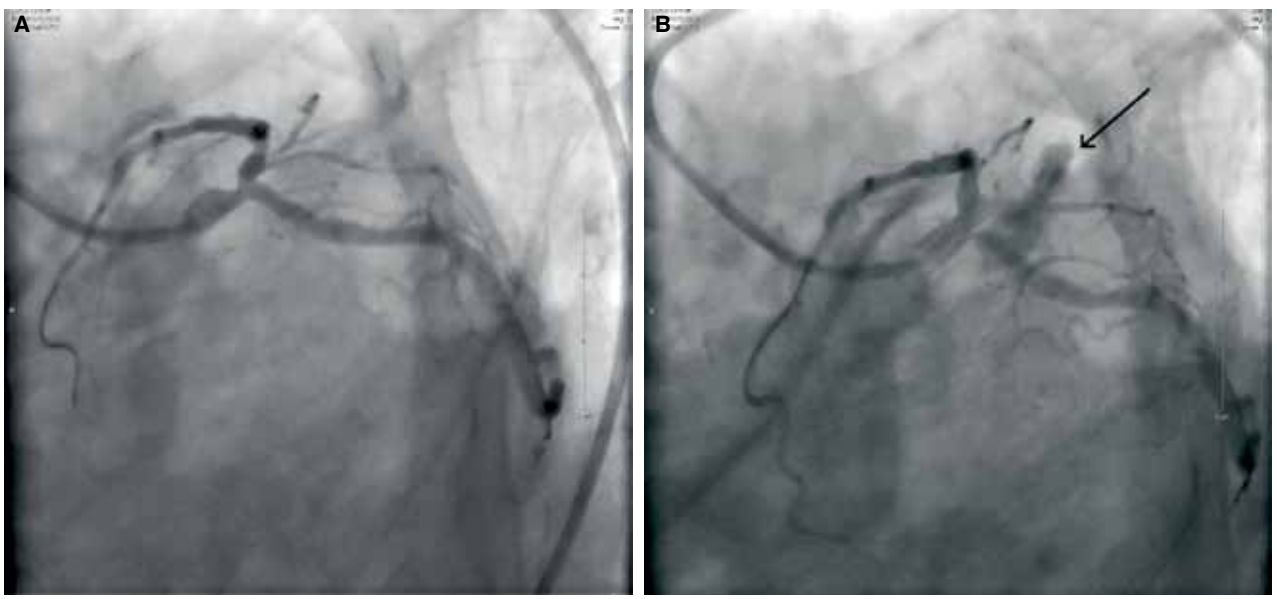

Figure 1. **(A)** Coronary angiogram revealed 70% stenosis in distal LMCA. **(B)** Class III-perforation proximal part of the LAD and plaque shift to the osteum of Cx arteries causing 60% stenosis. LMCA: Left main coronary artery; LAD: Left anterior descending; Cx: Circumflex.

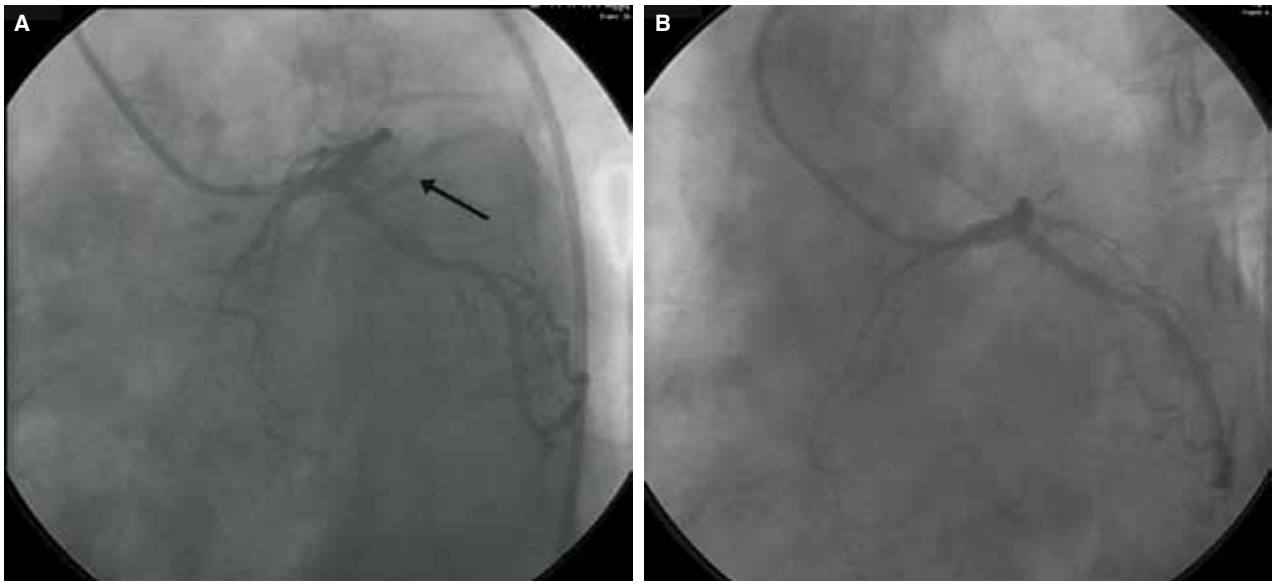

Figure 2. **(A)** Another class III-perforation from Cx. **(B)** At control angiography, rupture was closed completely. Cx: Circumflex.

flexible enough to advance from the former LMCA to the LAD stent to the Cx artery, another 3.5x18 mm Ephesos II stent (Nemed Ltd.; Istanbul, Turkey) was deployed in the Cx artery successfully. At control angiography, the rupture was sealed completely (Fig. 2b). Meanwhile, echocardiography showed a large pericardial effusion compressing the right side of the heart. Approximately 500 cc of blood taken from the pericardial space was given back to the femoral artery system to stabilize the hemodynamic status. The patient's consciousness, blood pressure and heart rate returned to normal in a short period and after hemodynamic stabilization he was followed in the coronary care unit. Clopidogrel and aspirin were continued on the second day.

Later control echocardiographic examinations did not show any progression in pericardial effusion. One-week later, coronary angiography did not show any contrast agent extravasation. And at the beginning of the second week, the patient was discharged from the hospital with medication.

DISCUSSION

Advanced age, oversized or ruptured balloon/stent, female gender, renal failure, heavy calcification, chronic total occlusion, tortuous and bending vessels, complex and type C lesions, target lesions in the Cx and right coronary arteries, long target lesions (>10 mm) and eccentric lesions are the predisposing risk factors for coronary perforation.[7,8] Although in small vessels, prolonged balloon inflation, pericardiocentesis, embolisation of the perforated vessel, haemodynamic support and reversal of heparin anticoagulation might be sufficient for treatment, in larger vessels implantation of covered stents or surgery are preferred.[9,10] It is reported that perforation after stenting is mainly caused by excessive overdilatation or implantation of an oversized stent.[11]

In this case, the coronary perforation risk factors were oversized stent implantation and calcification. Although a PTFE coated stent was successfully implanted following LAD perforation, due to the lack of flexibility of these stents, the stent could not be advanced to the Cx through the former LMCA-LAD stent. Additionally, a conventional stent was successfully implanted in the Cx perforation. On the other hand, autotransfusion, taking blood from the pericardial space and re-circulating through the femoral artery, which carries a risk of contamination, may have an emerging role in hemodynamic status stabilization.

Last but not least, stenting, with both covered and conventional stents, and autotransfusion was successfully applied in place of surgery, which has a high periprocedural mortality and morbidity.

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Key words: Angioplasty, balloon, coronary/adverse effects; coated materials, biocompatible; coronary vessels/injuries; heart injuries/etiology; polytetrafluoroethylene; rupture; stents.

Anahtar sözcükler: Anjiyoplasti, balon, koroner/yan etki; kaplamalı malzemeler, biyouyumlu; koroner damarlar/yaralanma; kalp yaralanmaları/etyoloji; politetrafloroetilen; yırtılma; stent.