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A case of coronary perforation with graft-covered stent placement

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Abstract

Coronary artery perforation is a rare but potentially fatal complication during percutaneous coronary intervention. In this case, we report a patient with myocardial infarction who experienced coronary perforation during percutaneous coronary intervention and successful application of the graft stent. In our case, coronary rupture occurred as a result of balloon inflation in a small vessel without making sure that the guidewire was in the lumen. Prolonged balloon inflation at the site of coronary perforation may provide a solution in some cases. In our case, the balloon was inflated proximal to the rupture, the bleeding was stopped by waiting, and the coronary rupture was successfully closed with a graft stent. The balloon or stent balloon should not be inflated without making sure that the coronary lumen is in place. If inflated without being sure, coronary rupture may occur. Steps to manage this complication include rapid closure of the perforated area, administration of protamine sulfate, graft covered stenting and emergency surgery if necessary.

Key Words: Coronary artery perforation, Complication, Graft-covered stent

Greft Kaplı Stent Yerleştirilen Bir Koroner Perforasyon Olgusu

Özet

Koroner arter perforasyonu perkütan koroner girişim sırasında nadir görülen fakat mortal olabilen bir komplikasyondur. Bu olguda, miyokard infaktüsü ile gelen hastada girişim sırasında koroner perforasyon ile karşılaşılması ve greft stentin başarılı bir şekilde uygulanması sunuldu. Olgumuzda küçük çaplı bir damarda kılavuz telin lümende olduğuna emin olunmadan balon şişirilmesi sonucu koroner rüptür olmuştur. Koroner perforasyon gelişen bölgede uzun süreli balon şişirilmesi vakaların bir kısmında çözüm sağlayabilir. Olgumuzda da rüptürün proksimalinde balon şişirilip beklenerek kanamanın durması sağlandı, sonrasında da greft stent ile koroner rüptür başarılı şekilde kapatıldı. Koroner lümende olunduğundan emin olunmadan balon veya stent balonu şişirilmemelidir. Eğer emin olunmadan şişirilirse, koroner rüptüre neden olunabilir. Bu komplikasyonu yönetme adımları; perfore bölgenin hızlı bir şekilde kapatılması, protamin sülfat verilmesi, greft kaplı stent uygulanması ve gerekli durumda acil cerrahidir.

Anahtar kelimeler: Koroner arter perforasyonu, Komplikasyon, Greft kaplı stent

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INTRODUCTION

Coronary artery perforation is a rare but fatal complication during percutaneous coronary intervention. Coronary perforation is observed in 0.3-0.6% of these interventions (1). The

prevalence of this complication has increased with the development of new interventional techniques such as laser coronary angioplasty, rotablator, high-pressure balloon dilation, and interference with chronic total occlusions. However, perforation can sometimes be related to a standard balloon or stent. Coronary perforation may cause pericardial tamponade, myocardial infarction, or death. Surgical intervention is required in a considerable proportion of patients (2,3). This case report presents a patient with non-ST elevation myocardial infarction, who presented with coronary perforation during intervention, and the successful application of a polyurethane-covered graft stent.

CASE REPORT

An 84-year-old male patient with a diagnosis of hypertension and no other cardiac event history was admitted to the emergency department of our hospital after having chest pain. In the emergency department, 300 mg of acetyl salicylic acid was administered. Electrocardiogram performed in the emergency department showed atrial fibrillation, D1-AVL, and V5-V6 ST depression (Figure 1). The patient's blood pressure was 130/80 mmHg, heart rate was 70 bpm, and physical examination findings were normal. The echocardiography of the patient revealed an ejection fraction of 55%, no wall motion abnormality, and mild mitral, aortic, and tricuspid regurgitation. In biochemistry tests, troponin 6125 ng/ml (normal range: 0-19.8 ng/ml) was detected, and the patient was admitted to the catheter laboratory with the diagnosis of non-ST elevation myocardial infarction.

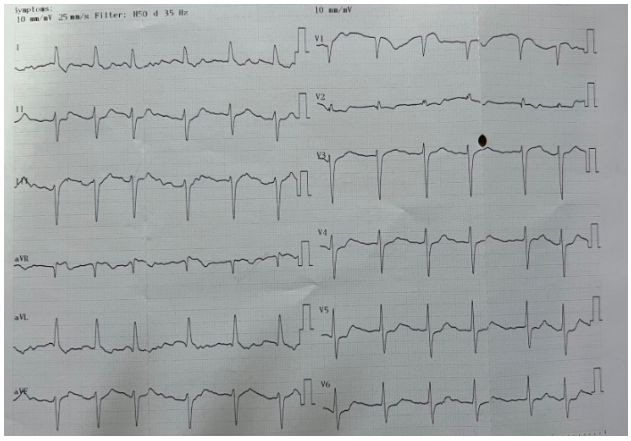

Figure 1. Electrocardiogram at admission showing atrial fibrillation and ST-segment depression in D1-AVL, V5-V6 leads.

A 7 French (Fr) sheath was inserted through the right femoral artery of the patient. The left main coronary artery was cannulated with a left Judkins 4 diagnostic catheter, and no significant stenosis was observed in the circumflex artery on imaging. In the left anterior descending artery, 60-70% stenosis was observed in the mid region, which later led to the decision to test the patient for ischemia. The right coronary artery (RCA) was cannulated with a right Judkins 4 catheter, and the obtained image showed critical stenosis with thrombus in the proximal region (Figure 2).

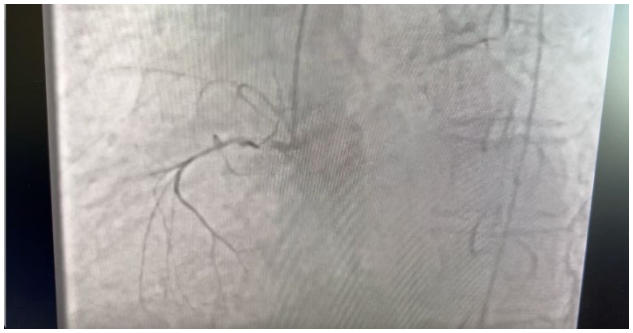

Figure 2. RCA, critical lesion.

An intervention for RCA was planned as the source of the lesion responsible for the myocardial infarction. The patient was administered 600 mg of clopidogrel and 7500 units of unfractionated heparin, adjusted according to his weight. The right Judkins guiding catheter was cannulated into RCA. The guide wire (0.014 Asahi) was sent to the distal of RCA. Pre-dilation was applied to the lesion with a 2.0x15 mm balloon. After pre-dilation, the flow was lost, and no-reflow developed. The balloon could not be advanced again over the guide wire to the area where the flow was lost. It was observed that the right Judkins 4 catheter did not provide sufficient support, and the catheter was removed. For support, RCA was cannulated with an Amplatz Left 1 catheter. The guide wire was again advanced from the lesion, but this time, it could not be sent distally as before. As far as it progressed, a 2.0x15 mm balloon was brought over the guide wire, and dilation was applied to the lesion again. Then, imaging showed a coronary rupture to the distal of the lesion. Contrast staining was observed in myocardial and epicardial adipose tissue (Figure 3). The balloon was inflated in the proximal region of the rupture, and blood flow to the rupture area was stopped as expected. The on-call cardiovascular surgery physician was informed that an emergency operation could be required. After waiting for the balloon to inflate for about 10 minutes, it was observed that the bleeding stopped in the rupture when we deflated and checked the balloon. During this period, the patient was hemodynamically stable. The guide wire was then sent to the distal again. An over-the-wire (OTW) balloon was sent so that it would be positioned in the lumen. The OTW made sure that the contrast agent given using the balloon was in the lumen. Pre-dilation was performed with the OTW balloon, and TIMI-1 flow was achieved.

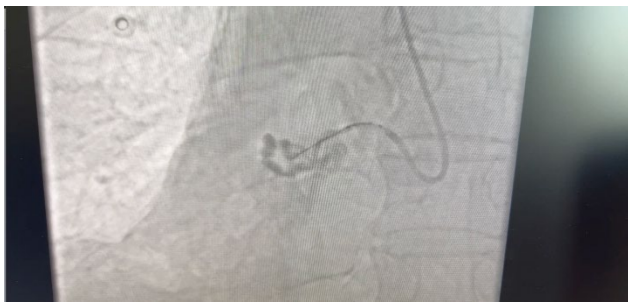

Figure 3. Coronary artery perforation.

A 2.5x20 mm polyurethane-covered graft stent (PK Papyrus; Biotronik) was placed with a pressure of 10 atm starting from the lesion to cover the rupture site as well. There was also a

lesion to the distal of the stent, and a 2.25x16 mm drug-eluting stent (Evermine50; Meril) was implanted distally from the graft stent by overlapping. Post-dilation was applied to the overlap area with a stent balloon. TIMI-2 flow was achieved, and the process was completed (Figure 4). After the intervention, serial echocardiography follow-ups were performed on the patient, and no pericardial effusion was detected. The patient was hemodynamically stable, and there were no complaints. The patient was prescribed medical treatment and discharged. There were no complaints in his follow-ups, and no pericardial effusion was detected.

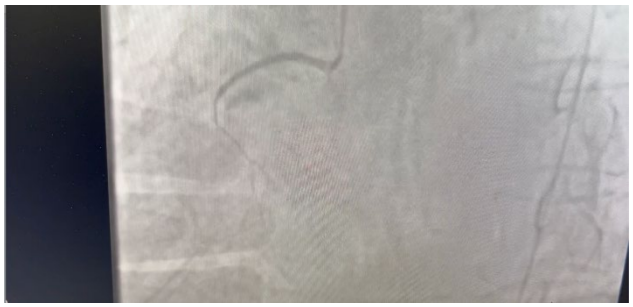

Figure 4. RCA, latest state.

DISCUSSION

The main causes of coronary perforation in the presence of a calcific, small-diameter, chronic total lesion of the intervening coronary artery, the use of rigid hydrophilic wires, and a large-diameter balloon (4). In our case, there was a coronary rupture in a small-diameter artery as a result of the inflation of a balloon without making sure that the guide wire was in the lumen. The size of the coronary perforation is very important in the prognosis of the patient. The most accepted classification related to coronary perforation was made by Ellis et al. in a multicenter review study conducted with 12900 patients. Ellis type 1 refers to the presence of crater extending out of the lumen without contrast extravasation, Ellis type 2 refers to the absence of contrast extravasation and the presence of contrast staining observed in epicardial adipose tissue or myocardium, and Ellis type 3 refers to noticeable contrast extravasation with pronounced perforation (1). In our case, contrast extravasation was not seen as a jet, but it corresponded to the Ellis type 2 class due to contrast staining in myocardial and epicardial adipose tissue. An Ellis type 3 perforation has a worse prognosis, while types 1 and 2 have a relatively better prognosis than type 3 (5). Long-term balloon inflation in the area of coronary perforation may provide a solution in some cases. In our case, the balloon was inflated proximally to the rupture, and the bleeding was stopped by waiting. Close echocardiography follow-up should be performed in patients with type 2 and 3 perforations, and pericardiocentesis should be performed if pericardial tamponade is detected. In our case, pericardial effusion was not detected during echocardiography follow-ups.

Additionally, in case of perforation, the effect of heparin could be neutralized with protamine sulfate.

Graft-covered stents are much more rigid than other standard stents and are difficult to place without adequate guiding catheter support (2). The risk of stent thrombosis is higher in graft-covered stents than in non-covered stents. The rate of restenosis in the stent placement area is 32%, which is high (6). The reason for this situation may be the fact that endothelization occurs later when these stents are used. There is no agreed-upon view about the duration of antiaggregant drug use for graft-covered stents (7). In our case, the coronary rupture was successfully closed with a graft stent. If perforation cannot be controlled with a graft stent, emergency surgery should be considered.

CONCLUSION

Coronary perforation is a fatal complication. The balloon or stent balloon used in interventions should not be inflated without making sure that it is positioned in the coronary lumen. If it is inflated without being sure of this positioning, a coronary rupture may develop as a result. The steps to manage this complication are the rapid closure of the perforated area, the administration of protamine sulfate, graft-coated stent placement, and if necessary, emergency surgery. It should be kept in mind that coronary rupture is a potential complication in balloon and stent interventions, treatments needed for coronary perforation should be known well, and the necessary equipment should be available in the catheter laboratory during the entire procedure.

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

Author Contributions: Conception – Emrah Kaya, Taner Sen; Design - Emrah Kaya, Taner Sen; Supervision - Emrah Kaya, Taner Sen; Data Collection and/or Processing - Emrah Kaya, Taner Sen; Literature Search - Emrah Kaya, Taner Sen; Writing - Emrah Kaya; Critical Review - Emrah Kaya, Taner Sen

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