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CASE REPORT

Delayed Distal LAD Perforation After Elective PCI: Successful Treatment with Coil Embolization

Elektif PCI Sonrası Gecikmiş Distal LAD Perforasyonu: Koil Embolizasyonu ile Başarılı Tedavi

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ABSTRACT
Although uncommon, coronary artery perforation (CAP) during percutaneous coronary intervention (PCI) can lead to serious, potentially fatal outcomes.The risk of CAP is notably higher during complex coronary interventions, particularly in cases involving chronic total occlusions (CTO) and heavily calcified lesions. Early recognition and prompt management of life-threatening consequences such as cardiac tamponade are critical for improving patient outcomes and reducing mortality. Management strategies vary depending on the severity and location of the perforation and may include prolonged balloon inflation, the implantation of covered stents, pericardiocentesis, or coil embolization for distal vessel perforations. In this report, we present a case of distal left anterior descending artery (LAD) perforation leading to cardiac tamponade, successfully managed with emergency pericardiocentesis and coil embolization.

Keywords: Coronary artery perforation, coil embolization, cardiac tamponade, pericardiocentesis, autotransfusion

ÖZET
Nadir görülse de, perkütan koroner girişim (PKG) sırasında koroner arter perforasyonu (KAP) ciddi ve potansiyel olarak ölümcül sonuçlara yol açabilir. KAP riski, özellikle kronik total oklüzyonlar (KTO) ve ağır kalsifiye lezyonlar içeren karmaşık koroner girişimler sırasında belirgin şekilde daha yüksektir. Kardiyak tamponad gibi yaşamı tehdit eden sonuçların erken teşhisi ve hızlı tedavisi, hasta sonuçlarını iyileştirmek ve mortaliteyi azaltmak için kritik öneme sahiptir. Tedavi stratejileri, perforasyonun şiddetine ve yerine bağlı olarak değişir ve uzun süreli balon şişirme, greft stent implantasyonu, perikardiyosentez veya distal damar perforasyonları için koil embolizasyonu içerebilir. Bu raporda, kardiyak tamponada yol açan distal sol ön inen arter (LAD) perforasyonu olgusunun acil perikardiyosentez ve koil embolizasyonu ile başarılı tedavisini sunduk.

Anahtar Kelimeler: Koroner arter perforasyonu, koil embolizasyonu, kardiyak tamponad, perikardiyosentez, ototransfüzyon

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INTRODUCTION

Coronary artery perforation (CAP) is an infrequent yet potentially fatal complication of percutaneous transluminal coronary angioplasty, with reported incidence rates ranging from 0.1% to 0.7% (1). The choice of management varies according to factors such as the perforation's anatomical site, its severity, and the resulting hemodynamic impact (2). While graft stent implantation is generally preferred for large vessel perforations, coil embolization and similar techniques are typically employed for perforations involving small-caliber distal branches or collateral vessels.

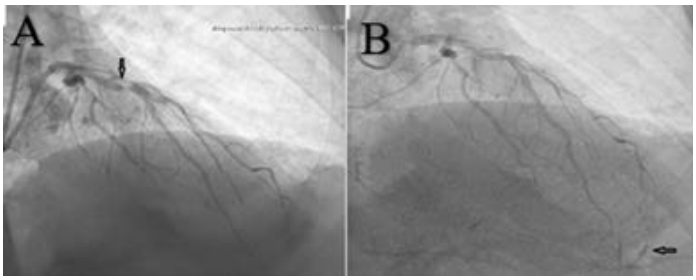

Figure 1A. Pre-procedural coronary angiography showing a significant stenotic lesion (~80%) in the mid-segment of the left anterior descending (LAD) artery near the origin of the second diagonal branch.

Figure 1B. Post-procedural coronary angiography demonstrating contrast extravasation (faint contrast clouding) in the distal LAD, consistent with vessel perforation.

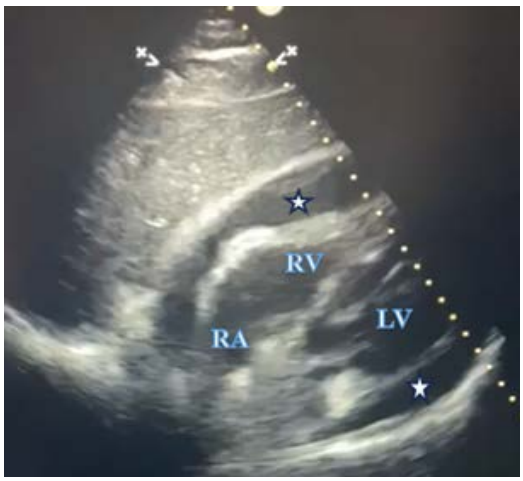

Figure 2. Subcostal transthoracic echocardiographic image showing a large pericardial effusion (*) surrounding the heart, causing compression of the right atrium, consistent with cardiac tamponade. (RA: Right atrium RV: Right ventricle LV: Left ventricle)

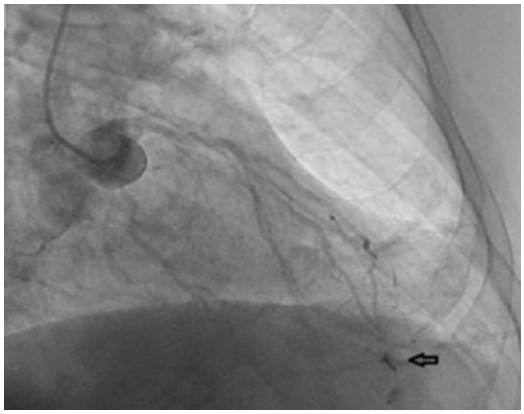

Figure 3. Two 2 mm * 6 cm concerto helix ev 3 coils were placed in the distal LAD.

In this case report, we discuss the management and clinical course of a patient who developed a distal left anterior descending artery (LAD) perforation following percutaneous coronary intervention, successfully treated with coil embolization.

CASE REPORT

A 56-year-old male patient with a history of hypertension and obesity presented to our clinic with unstable angina. Coronary angiography revealed chronic total occlusion (CTO) of the right coronary artery (RCA) and a significant stenosis (~80%) in the mid-segment of the LAD near the origin of the second diagonal branch (Figure 1A). It was decided to perform staged revascularization, prioritizing the LAD lesion first, with elective intervention planned for the RCA CTO at a later date. The LAD was cannulated using a 7F 3.5 Extra Backup (EBU) guiding catheter. A 0.014-inch floppy guidewire was successfully advanced through the lesions in both the LAD and the diagonal branch. A provisional stenting strategy was planned. A 3.0 × 18 mm drug-eluting stent (DES) was implanted into the LAD, followed by post-dilatation with a 3.0 × 15 mm non-compliant (NC) balloon at high pressure. Post-procedural angiography demonstrated preserved flow in the diagonal branch with satisfactory stent expansion and no residual stenosis.

However, during follow-up after the procedure, the patient developed dyspnea and hypotension. Bedside transthoracic echocardiography revealed a massive pericardial effusion consistent with cardiac tamponade (Figure 2). Emergency pericardiocentesis was performed, and 500 mL of pericardial fluid was reinfused via a femoral venous catheter (autotransfusion). Suspecting coronary perforation, the patient was immediately taken back to the catheterization laboratory. Control angiography revealed contrast extravasation from a small distal branch of the LAD (Figure 1B). A microcatheter was advanced to the perforation site, and two 2 mm × 6 cm Concerto Helix EV3 coils were successfully deployed through the microcatheter into the distal LAD (Figure 3). Subsequent

control angiography confirmed cessation of extravasation. The patient's hemodynamic stability was restored, and his subsequent clinical course was uneventful.

DISCUSSION

Coronary artery perforation, while rare, remains a critical complication of PCI with the potential for severe clinical consequences. With the increasing prevalence of interventions for complex lesions, there has been a partial rise in the incidence of perforations. This complication can lead to serious clinical consequences such as cardiac tamponade, hemodynamic deterioration, and elevated in-hospital mortality rates (3). Nevertheless, early recognition and timely intervention are crucial in reducing the risk of adverse outcomes. Coronary artery perforations are generally categorized according to their anatomical location into major vessel, distal vessel, and septal-epicardial collateral perforations. Among these, distal perforations—particularly those linked to the use of polymer-coated guidewires—are frequently attributed to distal wire migration. It has been reported that approximately 90% of coronary perforations caused by guidewires are associated with polymer-coated wires (4). Although floppy guidewires are generally considered safer than stiff guidewires frequently used in CTO procedures, distal wire migration and perforation can still occur, especially in tortuous or angulated vessels. This case underlines the importance of not only the guidewire's stiffness, but also its tip shape, flexibility, and maneuverability in preventing distal perforations. Coronary artery perforations are assessed according to their severity using the Ellis classification. Ellis Type 3 perforation represents the most severe form, characterized by a tear in the vessel wall >1 mm in size and significant contrast leakage into the pericardial cavity, often resulting in cardiac tamponade, which requires immediate intervention. Following pericardiocentesis, autotransfusion is effective in reducing the need for blood transfusion, while facilitating hemodynamic stabilization and preventing adverse outcomes until further interventional treatment can be performed.

Graft stent implantation is the primary therapeutic approach for major vessel perforations. However, for smaller distal vessel perforations, embolization techniques using various embolic materials are commonly employed. In procedures involving microcatheter-guided embolization, various materials such as autologous thrombus, subcutaneous fat or autologous skin, microcoils, gelatin sponge, and polyvinyl alcohol particles have been successfully utilized (5). Since 2017, the umbrella technique has been introduced, wherein a part of the angioplasty balloon is inflated to create an umbrella-like structure at the distal perforation site, blocking blood flow. This structure is then pushed distally with an uninflated balloon, and the balloon and guidewire are retracted to leave the umbrella in place at the perforation site (6). Although the umbrella technique allows for rapid deployment in distal vessel perforations, it requires careful consideration due to potential risks such as distal embolization.

In addition, based on personal experience, the use of balloon fragments, cut tips of guidewires, or absorbable suture materials as embolic agents has also been reported in the literature (7-9). In cases of small vessel perforations, these treatment approaches can play a vital role in preventing fatal outcomes. In the management of guidewire-induced coronary artery perforations, intracoronary thrombin injection via a microcatheter is another alternative treatment option. In this technique, thrombin is directly applied to the perforation site to achieve rapid hemostasis (10).

This case demonstrates that coil embolization is an effective and safe treatment option for distal coronary artery perforation. Early diagnosis and appropriate intervention in these rare yet life-threatening complications of percutaneous coronary interventions significantly reduce mortality and morbidity.

CONCLUSION

In this case, the successful management of tamponade following distal LAD perforation through coil embolization and pericardiocentesis demonstrates that such complications can be effectively treated. This case highlights the important role of coil embolization in the management of distal coronary artery perforations and underscores the critical importance of experience and preparedness in dealing with complications that may arise during percutaneous coronary interventions.

DECLARATIONS

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