CASE REPORT

Catheter induced aortocoronary dissection during percutaneous coronary intervention: successful aortoostial stenting

Perkütan koroner girişim sırasında kateter kaynaklı gelişen aortokoroner diseksiyon: Başarılı aortoostiyal stent uygulaması

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Summary– Iatrogenic acute dissection of the ascending aorta is a serious but rare complication of cardiac catheterization and percutaneous coronary intervention (PCI). Although treatment of ascending aortic dissection may require surgical repair, stenting at the origin of the dissection area may be sufficient in aortocoronary dissection (AD) following PCI. Described is the case of a 64-year-old female patient who was treated with PCI for a critical lesion of the right coronary artery (RCA). Immediate stenting at the source of the dissection was sufficient to repair the RCA lesions and successfully seal the site of retrograde propagation of the dissection. The ascending aortic dissection was monitored with computed tomography and the dissection was spontaneously repaired within 72 hours.

Özet– Çıkan aortanın iyatrojenik akut diseksiyonu, kalp kateterizasyonu ve perkütan koroner girişimin (PKG) ciddi ancak nadir bir komplikasyondur. Çıkan aort diseksiyonu tedavisinde cerrahi onarım gerekebilir, ancak perkütan koroner girişim sırasında gelişen aortokoroner diseksiyonda diseksiyon başlangıcının stent ile kapatılması yeterli olabilir. Bu yazıda, sağ koroner arterdeki kritik darlık PKG ile tedavi edilirken işlem sırasında aortokoroner diseksiyon gelişen 64 yaşında kadın hastayı sunduk. Diseksiyon başlangıç noktasına hızlıca stent yerleştirilmesi, diseksiyonun geriye doğru ilerlemesini durdurdu. Çıkan aort diseksiyonu bilgisayarlı tomografi ile takip edildi ve 72 saat içinde kendiliğinden iyileştiği görüldü.

Iatrogenic coronary artery dissection is a rare and serious complication of diagnostic coronary angiography and percutaneous coronary intervention (PCI). The etiology of this condition is most likely multifactorial. Various possible mechanisms include retrograde propagation of a coronary dissection resulting from mechanical trauma due to a wire, catheter, inflated balloon, or other device and aortic trauma resulting directly from a guide catheter.[1] Management of retrograde coronary dissection extending toward the aorta is challenging.[2] Several factors that impact management decisions include the hemodynamic stability of the patient; mechanism of aortic injury; size, severity, and propagation of the dissection; presence of an intimal flap; and pre-existing atherosclerotic disease.[3] Herein, the case of a patient with iatrogenic retrograde dissection of the right coronary artery (RCA) to the aorta that was successfully treated with osteal stenting is described.

Abbreviations:

AD	*Aortocoronary dissection*
CT	*Computed tomography*
PCI	*Percutaneous coronary intervention*
RCA	*Right coronary artery*

CASE REPORT

A 64-year-old female patient was admitted to the outpatient clinic with the complaints of exertional dyspnea and chest paint ongoing for 3 months. Her physical examination was unremarkable. Electrocardiography indicated normal sinus rhythm without any abnormality. A treadmill exercise test yielded an abnormal result with ischemic ST changes. Coronary angiography showed no significant lesion in the left coronary arteries, but a 70% lesion was detected in the proximal RCA (Video 1*). The decision was made to perform a PCI to the RCA lesion. The RCA was engaged with a JR4-6F guide catheter (Launcher; Medtronic, Inc., Minneapolis, MN, USA). After the first contrast injection, an

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RCA osteal dissection extending to the ascending aorta was apparent. The patient experienced a sudden onset of chest pain with hemodynamic instability. The patient developed ventricular fibrillation and was converted to sinus rhythm with defibrillation. A surgical team was informed. The dissection was passed with a Hi Torque balance middleweight universal guidewire (Abbot Vascular, Inc., Santa Clara, CA, USA) and a bare-metal stent (3.5x12 mm, Integrity BMS, Medtronic, Inc., Minneapolis, MN, USA) was implanted from the proximal segment to the ostium of the RCA. The patient stabilized hemodynamically. A follow-up angiogram revealed no contrast leakage to the false lumen of the RCA. A second bare-metal stent (3.0x15 mm, Integrity BMS; Medtronic, Inc., Minneapolis, MN, USA) was also implanted at the mid segment of the RCA, overlapping with the proximal stent in order to cover whole dissection line (Video 2[*]) (Fig. 1). Anticoagulation therapy was not reversed due to achieving hemodynamic stability and a complete seal of the origin of the dissection with the stent. Emergent computed tomography (CT) aortography performed just after the procedure revealed an intramural hematoma formation with contrast retention in the proximal segment of the ascending aorta. Antiplatelet medications were continued in the intensive care unit. The patient developed no further adverse event during the remainder of her hospital stay and follow-up CT scans 24 hours and 72 hours after the procedure demonstrated a complete resolution of the false lumen (Fig. 2). The patient was discharged uneventfully after a week.

DISCUSSION

Dissection of a coronary artery is a well-known complication of coronary angiography and PCI. In our

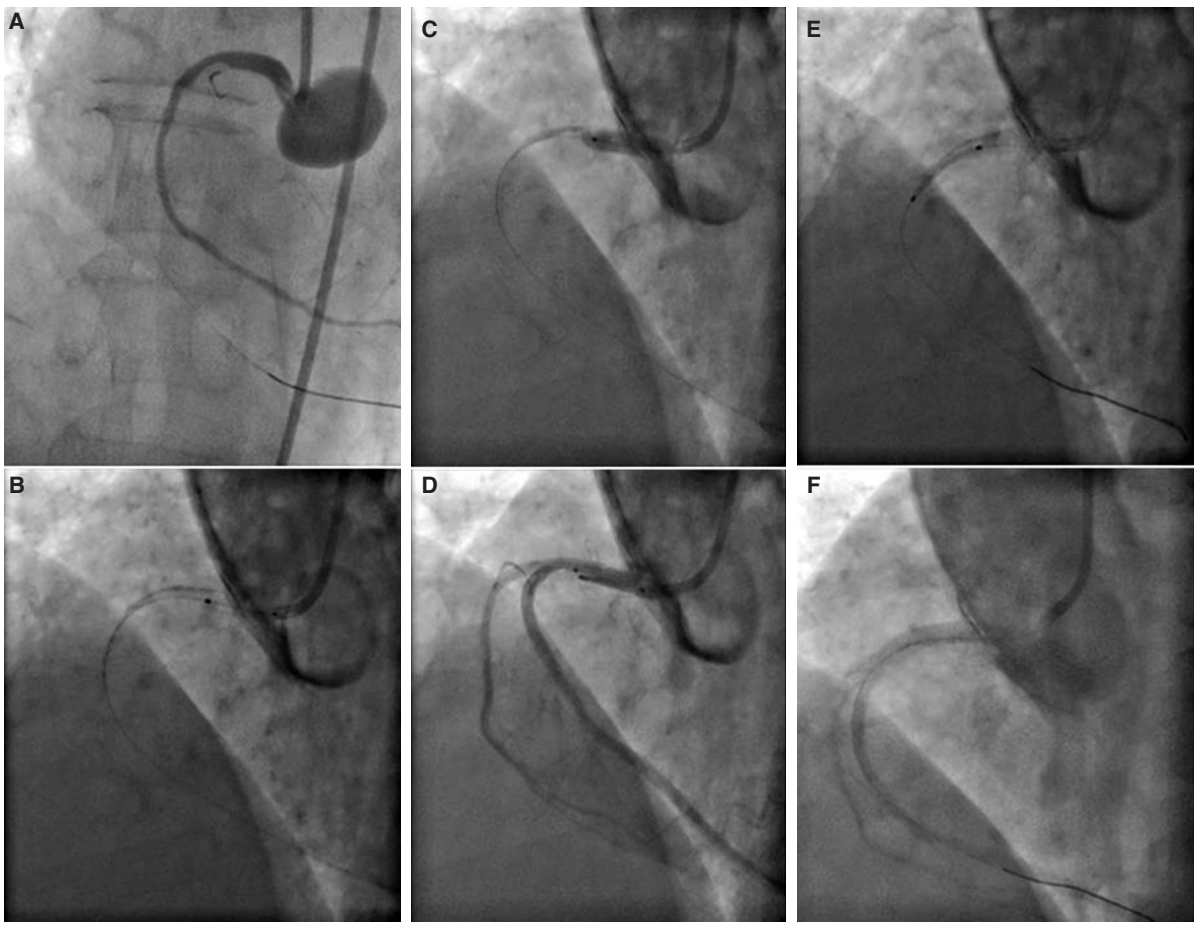

Figure 1. (A) After the contrast imaging of the right coronary artery (RCA), aortocoronary dissection was apparent and had spread to the ascending aorta. **(B, C, D)** Stenting the ostium of the RCA and sealing the source of the dissection. **(E)** Stenting of the mid segment of the RCA, overlapping with the proximal stent in order to cover whole dissection line. **(F)** Control angiogram revealing that there was no contrast leakage to the false lumen.

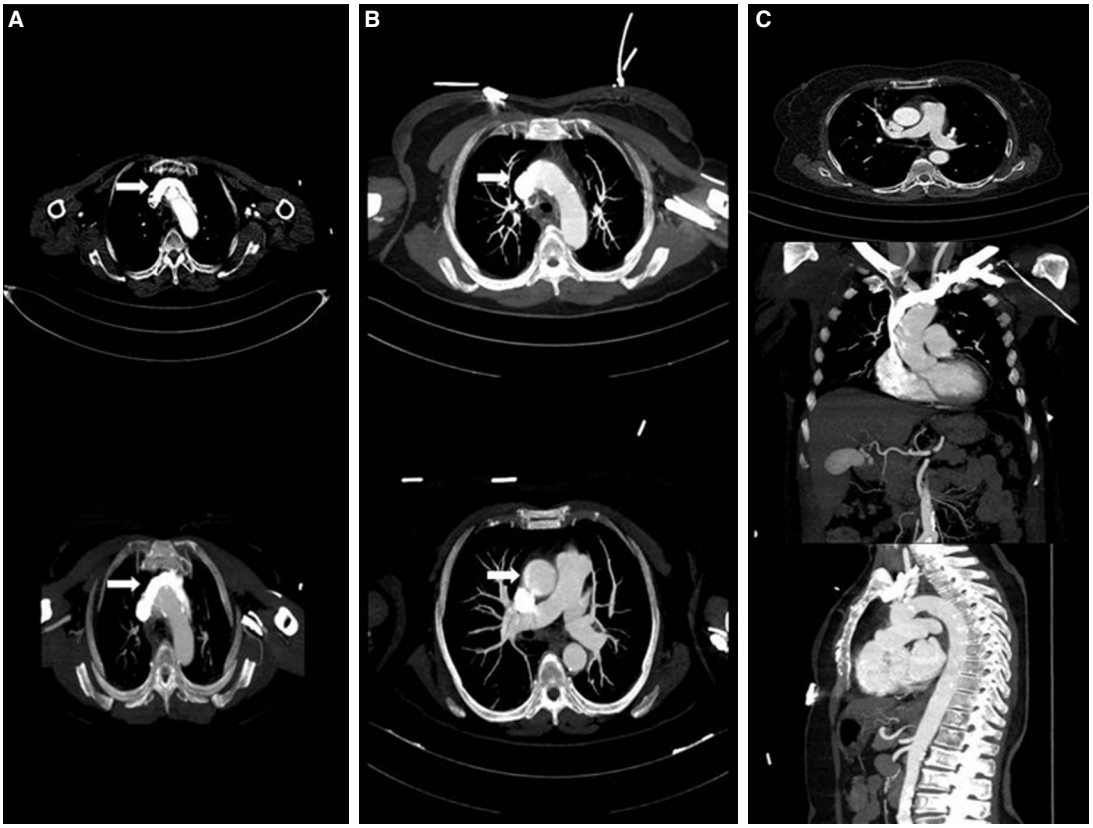

Figure 2. **(A)** Computed tomography (CT) angiography performed just after the procedure showing an intramural hematoma with contrast retention in the ascending aorta near the coronary orifice with involvement of the descending aorta. **(B)** CT 24 hours after percutaneous intervention (PCI) demonstrated an intramural hematoma in the ascending aorta. **(C)** Complete resolution of the false lumen 72 hours after the PCI.

case, the coronary artery dissection and aortic dissection might have been associated with mechanical trauma from the tip of the guide catheter. Retrograde extension of the dissection to the ascending aorta is an infrequent but serious complication. The reported frequency of AD has been 0.008% to 0.20% of diagnostic catheterizations and PCIs.[4] However, the true incidence of this entity is unknown and/or probably underestimated, given an increasing number of complex coronary procedures performed by interventional cardiologists in recent years.

The predisposing factors for AD are hypertension, advanced age, diabetes mellitus, history of cardiac surgery and cystic medial necrosis.[5–6] Goldstein et al. reported that 89% of AD is on the right side and 11% on the left side.[7] López-Mínguez et al.[8] reported that most cases of AD are in the RCA because the RCA has fewer smooth muscle cells and matrix type-1 collagen fibrils than the left coronary artery at the level of the coronary ostium and the sinotubular junction. Previous studies have defined risk factors for iatrogenic aortic dissections; however, these are limited to case reports due to the rarity of the event. Heavy calcification in vessel walls that often requires aggressive catheter manipulation, the vigorous injection of contrast dye into the subintimal space, and the use of stiff wires and catheters that are wedged or in a noncoaxial position relative to the vessel wall have also been described as related.[9] In addition, the use of Amplatz catheters has been frequently associated with ostial coronary artery dissection.[5]

The treatment for type A AD is surgical repair. However, catheter-induced AD can be treated conservatively, with stenting, or with surgery.[10] In such cases, a stent may be used if the origin of the dissection is well defined, and the stent is sufficient to cover the dissection flap.[11] Emergent stenting to treat AD may limit the extent of the dissection and eliminate the need for further interventions.[12] Tanasie et al.[13] successfully performed immediate coronary stenting in 5

of 8 patients in whom AD developed during cardiac catheterization. Resolution of the AD occurs between 48 hours and 3 months later. Tanasie et al. suggested that the follow-up strategy for iatrogenic retrograde aortocoronary dissection should include CT imaging immediately, on the second day, and after 1 week.

In our case, we immediately performed a stent implantation to the RCA ostium to seal the site of the dissection and stop further progression of the aortic dissection. Complete sealing of the origin of the dissection was confirmed by follow-up coronary angiogram with no contrast leakage and anticoagulation was not reversed. Here, the injection of contrast may have contributed to the propagation of the dissection with retrograde extension to the aortic root and ascending aorta. In patients with arterial dissection it may be wise to avoid repeated and forceful contrast injections. A follow-up CT scan 72 hours after the procedure revealed no residual opacification of the dissected aortic lumen, which documented the resolution of the aortic dissection.

In conclusion, immediate coronary artery stenting at the source of the AD can be an important and emergent life-saving strategy in catheter-induced retrograde AD. Further evaluation for residual aortic extension of the dissection and follow-up can be safely performed using CT angiography.

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

REFERENCES

1. Shah P, Dzavik V. Percutaneous treatment of dissection of the ascending aorta occurring as a complication during coronary angioplasty of a saphenous vein bypass graft. J Interv Cardiol 2005;18:45–8. [CrossRef]
2. Carstensen S, Ward MR. Iatrogenic aortocoronary dissection: the case for immediate aortoostial stenting. Heart Lung Circ 2008;17:325–9. [CrossRef]
3. Adlam D, Cuculi F, Lim C, Banning A. Management of spontaneous coronary artery dissection in the primary percutaneous coronary intervention era. J Invasive Cardiol 2010;22:549–53.
4. Pérez-Castellano N, García-Fernández MA, García EJ, Delcán JL. Dissection of the aortic sinus of Valsalva complicating coronary catheterization: cause, mechanism, evolution, and management. Cathet Cardiovasc Diagn 1998;43:273–9.
5. Dunning DW, Kahn JK, Hawkins ET, O'Neill WW. Iatrogenic coronary artery dissections extending into and involving the aortic root. Catheter Cardiovasc Interv 2000;51:387–93.
6. Pande AK, Gosselin G, Leclerc Y, Leung TK. Aortic dissection complicating coronary angioplasty in cystic medial necrosis. Am Heart J 1996;131:1221–3. [CrossRef]
7. Goldstein JA, Casserly IP, Katsiyiannis WT, Lasala JM, Taniuchi M. Aortocoronary dissection complicating a percutaneous coronary intervention. J Invasive Cardiol 2003;15:89–92.
8. López-Mínguez JR, Climent V, Yen-Ho S, González-Fernández R, Nogales-Asensio JM, Sánchez-Quintana D. Structural features of the sinus of valsalva and the proximal portion of the coronary arteries: their relevance to retrograde aortocoronary dissection. Rev Esp Cardiol 2006;59:696–702. [CrossRef]
9. Doyle B, Juergens CP. Conservative management of ascending aortic dissection caused by percutaneous coronary intervention. J Invasive Cardiol 2004;16:92–4.
10. Alfonso F, Almería C, Fernández-Ortíz A, Segovia J, Ferreirós J, Goicolea J, et al. Aortic dissection occurring during coronary angioplasty: angiographic and transesophageal echocardiographic findings. Cathet Cardiovasc Diagn 1997;42:412–5.
11. Kim JY, Yoon J, Jung HS, Yoo BS, Lee SH. Percutaneous coronary stenting in guide-induced aortocoronary dissection: angiographic and CT findings. Int J Cardiovasc Imaging 2005;21:375–8. [CrossRef]
12. Yip HK, Wu CJ, Yeh KH, Hang CL, Fang CY, Hsieh KY, et al. Unusual complication of retrograde dissection to the coronary sinus of valsalva during percutaneous revascularization: a single-center experience and literature review. Chest 2001;119:493–501. [CrossRef]
13. Tanasie C, Chandonnet M, Chin A, Kokis A, Ly H, Perrault LP, et al. Catheter-induced aortic dissection after invasive coronary angiography: evaluation with MDCT. AJR Am J Roentgenol 2011;197:1335–40. [CrossRef]

Keywords: Aortic dissection; computed tomography; percutaneous coronary intervention.

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