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Original Article

Generation of a giant coronary artery aneurysm from an intra-plaque cavity with a ruptured fibrous cap: an observation over time through coronary angiography

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Abstract: A 74-year-old man underwent coronary artery bypass graft surgery. Thirteen years later, he presented with complaints of exertional anterior chest oppression again. Computed tomography coronary angiography revealed the significant stenosis at the mid right coronary artery (RCA). In addition, a giant proximal left anterior descending (LAD) coronary artery aneurysm (CAA) was found. We did not observe this aneurysm on his previous coronary angiogram, performed 12 years previously (i.e., 1 year after his surgery). Diagnostic coronary angiography confirmed the computed tomography findings. We found the significant stenosis at the mid RCA site and a giant proximal LAD coronary artery aneurysm. First, we performed the percutaneous coronary intervention (PCI) at the mid RCA significant stenosis. We implanted the drug eluting stent. After that, we performed PCI to treat the giant proximal LAD coronary artery aneurysm with a covered stent (a 2.8/26-mm polytetrafluoroethylene covered stent), and complete exclusion of the aneurysm was obtained. The etiology of this patient's aneurysm was unclear, but we speculate that the mechanism responsible for the appearance of this aneurysm was the expansion of the intra-plaque cavity with the ruptured fibrous cap. This observation over time through coronary angiography suggests that giant CAAs might be generated asymptomatically under certain conditions. In this case, the possible conditions might have been the chronic total occlusion of the mid-LAD and the significant stenosis just distal to this aneurysm, so increasing flow and pressure against this diseased cavity might have caused this giant CAA to form. In addition, another speculation might have been the local inflammation or macrophage-based degradation after coronary artery bypass graft surgery.

Keywords: Coronary artery aneurysm, covered stent, intravascular ultrasound, computed tomography

Introduction

A coronary artery aneurysm (CAA) is an uncommon disease. The incidence varies from 1.5% to 5% in the literature [1]. A CAA is termed "giant" if its diameter exceeds the diameter of the reference vessel by more than 4-fold or if it is >8 mm in diameter [2]. Maehara et al. classified angiographically diagnosed CAAs into four distinct patterns based on an intravascular ultrasound (IVUS) analysis: true aneurysms, pseudoaneurysms, complex plaques, and normal arterial segments adjacent to the stenosis [3]. Here we report the case of a giant coronary artery aneurysm which was not observed on the previous coronary angiogram, and that was successfully treated with catheter intervention.

Case report

A 74-year-old man underwent coronary artery bypass graft surgery 13 years ago, which included grafting the left internal mammary artery to the left anterior descending artery (LAD), the right internal mammary artery to the first diagonal, the radial artery to the obtuse marginal, and the saphenous vein to the second diagonal. After that, his condition was stable over a long period of time, but recently, he presented with complaints of exertional anterior chest oppression again. Computed tomography coronary angiography (Aquilion, Toshiba, Tokyo, Japan) revealed the significant stenosis at the mid right coronary artery (RCA). In addition, a giant proximal LAD coronary artery aneurysm was found (**Figure 1**). This aneurysm mea-

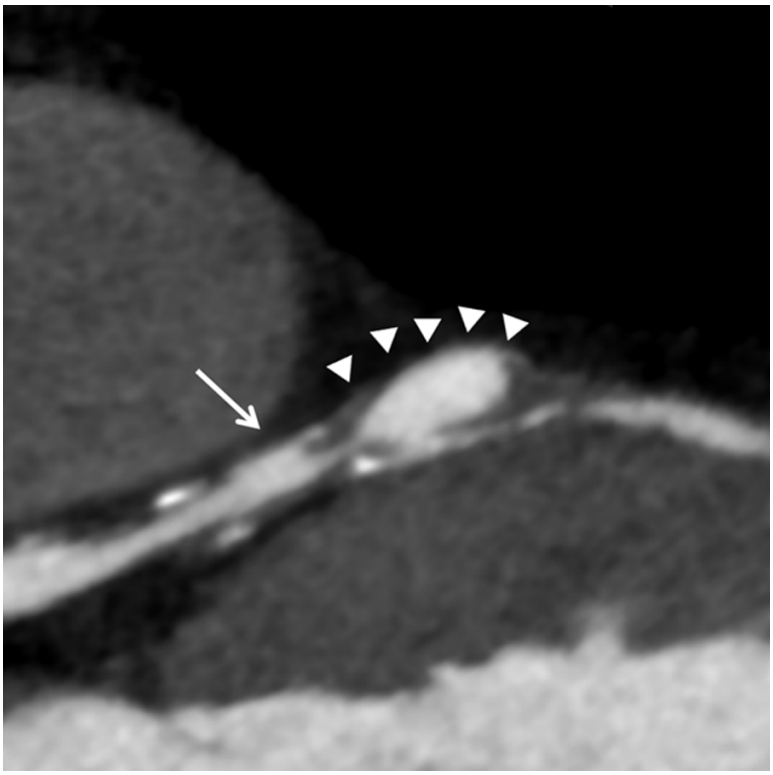

Figure 1. Computed tomography coronary angiography (curved multiplanar reconstruction) revealed a giant proximal left anterior descending coronary artery aneurysm (arrow-heads). The aneurysm measured 13 × 6 mm, and we observed an intra-plaque cavity with a ruptured fibrous cap (arrow) adjacent to it.

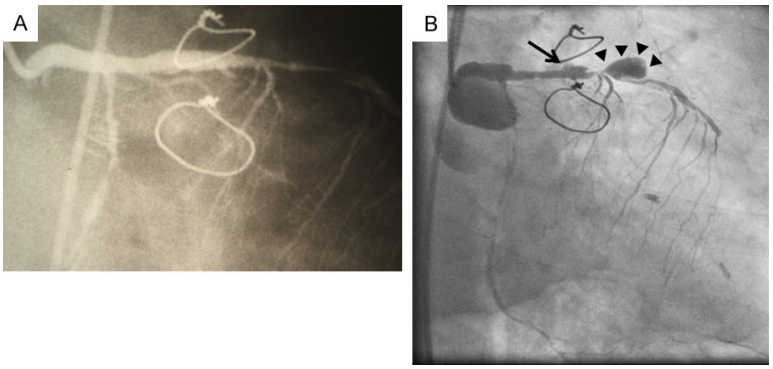

Figure 2. A. The aneurysm and the intra-plaque cavity are not observed on the previous coronary angiography performed 12 years previously. B. The current coronary angiography revealed the giant coronary artery aneurysm (arrow-heads) adjacent to the intra-plaque cavity with a ruptured fibrous cap (arrow) in the proximal left anterior descending artery.

sured 13 × 6 mm. There was no evidence of Kawasaki disease, and we did not observe this aneurysm on his previous coronary angiogram, performed 12 years previously (i.e., 1 year after his surgery) (**Figure 2A**). Diagnostic coronary angiography confirmed the computed tomography findings. We found the significant stenosis at the mid RCA site and a giant proximal LAD coronary artery aneurysm (**Figure 2B**). First, we performed the percutaneous coronary intervention (PCI) at the mid RCA significant stenosis. We implanted the drug eluting stent (Xience Alpine 3.0 × 33 mm, Abbott Vascular, Santa Clara, CA). After that, we performed PCI to treat the giant proximal LAD coronary artery aneurysm. A 6-Fr VL3.5 guiding catheter (Mach1, Boston Scientific, Fremont, CA) was engaged into the LAD. We were able to pass a guide wire (Sion Blue, ASAHI INTECC, Aichi, Japan) into the LAD. An IVUS catheter (Opticross 40 MHz, Boston Scientific, Fremont, CA) was advanced distal to the aneurysm, and the IVUS procedure was performed in a standard fashion using an automated motorized 1.0-mm/s pullback with a commercially available imaging system (iLab, Boston Scientific, Fremont, CA). IVUS findings revealed a large aneurysm (**Figure 3A**) and an intra-plaque cavity with a ruptured fibrous cap (**Figure 3B**) in tandem. In the first place, the LAD stenotic lesion was inflated with a 2.0/15-mm balloon (TENKU, St. Jude Medical Japan Corp, Japan). Thereafter, we successfully implanted a 2.8/26-mm polytetrafluoroethylene (PTFE)-covered stent (Graft Master, Abbott Vascular, Santa Clara, CA) (**Figure 4A**). Stent placement was optimized by high-pressure postdilatation with a 3.0/15-mm noncompliant balloon (NC TREK, Abbott Vascular, Santa Clara, CA). Finally, complete exclusion of the aneurysm was obtained (**Figure 4B**).

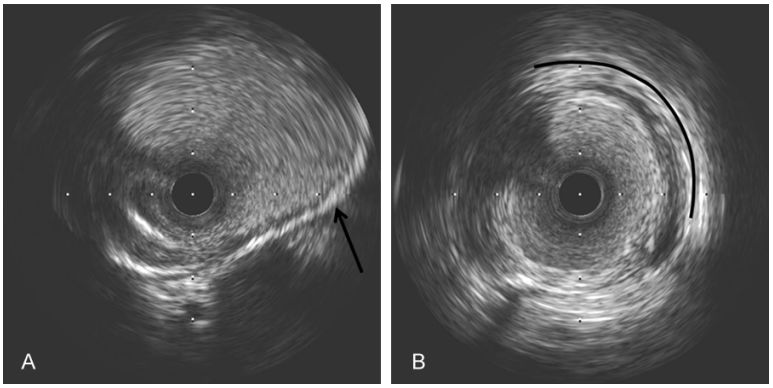

Figure 3. Intravascular ultrasound findings. A. The aneurysm had a three-layer atherosclerotic appearance (arrow) and was classified as a complex plaque. B. We recognized the intra-plaque cavity with the ruptured fibrous cap (solid line) adjacent to the aneurysm.

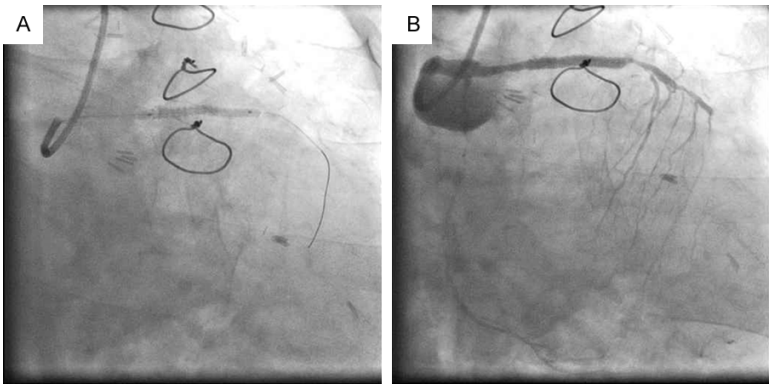

Figure 4. A. We successfully implanted a 2.8/26-mm polytetrafluoroethylene (PTFE)-covered stent (Graft Master, Abbott Vascular, Santa Clara, California). B. Complete exclusion of the aneurysm was obtained.

Discussion

These days, a giant coronary artery aneurysm may be treated with PCI, particularly with covered stents [4], or with surgical treatment. In this case, the risk of bypass graft injury from surgical re-entry was thought to be high, so we decided to perform PCI with a covered stent.

Using the classification system described above, this aneurysm was classified as a complex plaque, which is defined for lesions with ruptured plaques or a spontaneous or unhealed dissection. Based on a review of the literature, multiple atherosclerotic plaque ruptures typically present simultaneously with the culprit lesion in acute coronary syndrome [5]. The etiology of this patient's aneurysm was unclear, but we speculate that the mechanism responsible for the appearance of this aneurysm was the expansion of the intra-plaque cavity with the ruptured fibrous cap. This observation over time through coronary angiography suggests that giant CAAs might be generated asymptomatically under certain conditions. In this case, the possible conditions might have been the chronic total occlusion of the mid-LAD and the significant stenosis just distal to this aneurysm, so increasing flow and pressure against this diseased cavity might have caused this giant CAA to form. In addition, another speculation might have been the local inflammation or macrophage-based degradation after coronary artery bypass graft surgery.

Conclusion

We treated a giant coronary artery aneurysm with a covered stent safely and we obtained complete exclusion of it, and we could observe the proximal LAD changes over time, especially the generation of a coronary artery aneurysm through coronary angiography. So this case includes the meaningful observational findings, and we determine this case is worthy to report.

Disclosure of conflict of interest

None.

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