Case Report

Balloon rupture during coronary angioplasty causing dissection and intramural hematoma of the coronary artery; a case report

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Summary A 73-year-old male with diabetes mellitus was referred for coronary angiography (CAG). He presented with stable effort angina pectoris. CAG showed a significant stenotic lesion in the proximal-segment of the left anterior descending (LAD) coronary artery with heavy calcification. He then underwent angioplasty for the LAD stenosis. On the second balloon dilatation, the balloon was inflated to 22 atm, at which point the balloon waist had not yet yielded and balloon rupture occurred. Immediately after the procedure, CAG showed no-reflow phenomena and chest pain occurred. Intravascular ultrasound (IVUS) imaging revealed a dissection into the media with extension into the medial space without reentry, and demonstrated significant stenosis and obstruction of the distal LAD with a semilunar echo-dense intramural hematoma. To bail out, two bare metal stents were deployed. After the procedure, proper stents expansion and no residual dissection flap were detected either by IVUS or CAG. The final CAG showed a good result with TIMI-3 coronary flow. This case highlights balloon rupture during coronary angioplasty with heavy calcification caused no-reflow phenomena by dissection and intramural hematoma of the coronary artery. We could bail out hematoma by coronary stent implantation with complete cover of the coronary dissection.

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Introduction

Balloon rupture resulting in coronary dissection has previously been reported [1,2]. Pin hole rupture at high inflation pressures would expectedly expel a high velocity contrast jet to a small localized area, increasing the likelihood of vascular trauma [3].

On the other hand, the incidence of intramural hematoma after percutaneous coronary intervention (PCI) is
The baseline coronary angiography showed a significant stenotic lesion in the proximal-segment of the left anterior descending coronary artery with heavy calcification.

6.7% [4], and a possible mechanism of intramural hematoma formation after PCI is a dissection into the media with extension into the medial space where blood has accumulated due to distal dead end [4].

Intramural hematoma is sometimes caused by balloon rupture, however, it rarely causes no-reflow phenomena. In fact, there are no case reports of no-reflow phenomena with intramural hematoma caused by balloon rupture. Because of serious results of this complication, we thought it was important that we should know how to diagnose and manage it promptly.

Case report

A 73-year-old male with hypertension, diabetes mellitus, and current smoking as coronary risk factors was referred for coronary angiography (CAG). He presented with stable effort angina pectoris. The coronary angiography showed a significant stenotic lesion in the proximal-segment of the left anterior descending (LAD) coronary artery with heavy calcification (Fig. 1).

He then underwent angioplasty for the LAD stenosis. The lesion was traversed with a 0.014 in. hyper-flexible guidewire. But an intravascular ultrasound (IVUS) catheter (CVIS-device, Boston Scientific, Watertown, MA, USA) could not be advanced across the lesion because of increasing resistance felt during the advancement of the device.

First, the stenosis was dilated with a 2.25-mm high pressure balloon at 20 atm. On the second dilatation, the balloon was inflated to 22 atm, at which point the balloon waist had not yet yielded and balloon rupture occurred. The rated burst pressure for that balloon was 22 atm.

Immediately after the procedure, CAG showed no-reflow phenomena (Fig. 2) and electrocardiogram (ECG) showed ST segment elevation on the precordial lead, and chest pain occurred. The administration of 2 mg intracoronary nico-randil did not improve the coronary flow.

IVUS was then used to reveal the underlying cause of this complication. The IVUS catheter was advanced distal to the lesion, and imaging was performed retrograde through the proximal reference artery at a pullback speed at 0.5 mm/s automatically.

IVUS imaging revealed the dissection into the media with extension into the medial space without reentry, and demonstrated a significant stenosis and obstruction of the distal left anterior descending artery with a semilunar echo-dense intramural hematoma.

Intravascular ultrasound image revealed the dissection into the media with extension into the medial space, lack of reentry, and demonstrated a significant stenosis and obstruction of the distal
Balloon rupture causing dissection and hematoma

...inflation pressures. In heavily calcified lesions, the inflated balloon waist may not fully yield even with higher inflation pressures.

Calcified lesions are more often complex, and predilatation before coronary stenting of complex lesions is still necessary [2]. In heavily calcified lesions, the inflated balloon waist may not fully yield even with higher inflation pressures.

Dissections are detected by angiography in about 30% of lesions after coronary balloon angioplasty with a smaller fraction of 4–8% being major dissections, which bear a high risk for subsequent vessel closure leading to adverse ischemic events [6–8].

In our case, the narrow jet at high pressure from the pin hole rupture probably resulted in the injury to the vessel wall, and also resulted in the dissection and intramural hematoma. We first implanted a stent into the entry site as ordinary coronary dissection. This strategy might enlarge the false lumen toward distal portion. Finally, we could bail out no-reflow phenomena caused by intramural hematoma by the two stents implanted over the whole length of intramural hematoma, however, we should deploy first stent on the distal dead end, and then deploy second stent at the entry point of intramural hematoma. On the other hand, the incidence of intramural hematoma after PCI is 6.7% [4], and a possible mechanism of intramural hematoma formation after PCI is a dissection into the media with extension into the medial space where blood has accumulated due to distal dead end [4]. IVUS is useful to identify intramural hematoma [5,9,10]. In our case, IVUS imaging also revealed the dissection into the media with extension into the medial space without reentry, and demonstrated a significant stenosis and obstruction of the distal LAD with a semilunar echo-dense intramural hematoma. We could bail out hematoma by the coronary stent implantation over the whole length of coronary dissection.

LAD with a semilunar echo-dense intramural hematoma (Fig. 3). To bail out, a 23-mm bare metal stent premounted on the 3-mm balloon catheter was deployed into the entry of the dissection site using an inflation pressure of 16 atm. Although angiography showed a good result in the proximal LAD lesion, significant stenosis was observed in the mid LAD lesion. Then an 18-mm bare metal stent premounted on the 3-mm balloon catheter was deployed mid LAD lesion using an inflation pressure of 14 atm. After deployment of these two stents, proper stent expansion and no residual dissection flap were detected either by IVUS or CAG.

Immediately after procedure, chest pain and ST elevation of ECG precordial leads subsided. The final CAG showed a good result with TIMI-3 coronary flow (Fig. 4).

Discussion

This case highlights balloon rupture during coronary angioplasty with heavy calcification caused no-reflow phenomena by dissection and intramural hematoma of the coronary artery.

Balloon rupture during PCI is not common. It has been reported to be associated with high balloon inflation pressures, the presence of calcification of the artery being dilated, or significant over-sizing of the balloon [1,5]. Some of these patients are associated with intimal tears, acute coronary occlusions, or coronary artery rupture. And pin hole balloon rupture during PCI can cause dissection to the coronary artery especially at high inflation pressure [3].

The target lesion of this case was heavily calcified. Calcified lesions are more often complex, and predilatation before coronary stenting of complex lesions is still frequently necessary [2]. In heavily calcified lesions, the inflated balloon waist may not fully yield even with higher inflation pressures.

Conclusion

This case highlights balloon rupture during coronary angioplasty causing dissection and occlusion of the coronary artery. We could bail out hematoma by the coronary stent implantation over the whole length of coronary dissection.

References


