CASE REPORT

Fracture, inflation and floatation embolisation of PTCA balloon

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SUMMARY

This case outlines an unusual complication of coronary intervention, the likely mechanisms leading to this and possible retrieval options. It is the first case to the best of our knowledge reporting this complication. A 78-year-old Caucasian man underwent coronary stenting. During the procedure kinking and subsequent fracture of a non-compliant percutaneous transluminal coronary angioplasty (PTCA) balloon occurred. Injection of contrast down the guide to opacify the coronary arteries resulted in 'inflation' of the balloon with air, and embolisation of the inflated balloon into the proximal left anterior descending artery. The embolised balloon was retrieved by removal of the guide catheter and wire as a unit. The patient had a good angiographic outcome. This case highlights risks associated with usage of kinked balloons catheters, and describes for the first time to our knowledge, the inflation of a PTCA balloon with air from its shaft within the catheter, causing 'floatation' embolisation into the coronary artery.

BACKGROUND

Complications due to equipment malfunction during coronary angiography and intervention are well described. The fracture of angioplasty catheters, balloons and stents often results in serious consequences for the patient and may warrant urgent surgical intervention. Appreciation of possible complications and knowledge of percutaneous methods for dealing with these in a timely manner can improve patient outcomes. We describe an unusual situation of balloon fracture and 'floatation' embolisation and outline possible causative factors and methods for retrieval.

CASE PRESENTATION

A 78-year-old man with no cardiac history was admitted with an 8-day history of recurrent presyncope associated with palpitations. Echo showed normal left ventricular function without valvular disease. Subsequent telemetry monitoring revealed runs of broad complex tachycardia up to 220 bpm consistent with non-sustained ventricular tachycardia.

We proceeded to coronary angiography which was performed via the right radial artery. This demonstrated a left coronary dominant system. The circumflex artery was patent. Within the left anterior descending artery (LAD) there was a severe, calcified, proximal stenosis. The ongoing vessel demonstrated a long segment of severe disease in the mid-distal vessel. The decision was made to proceed to percutaneous coronary intervention of

the LAD. The left main stem was intubated with a Mach 6 Fr CLS guide catheter (Boston Scientific) and the LAD lesions were crossed with a Synapse Medical BMW wire. The long segment of disease was treated with a 2.5×30 mm Resolute Integrity drug eluting stent distally and an overlapping 3.0×18 mm resolute integrity drug eluting stent proximal to this. The critical stenosis in the proximal vessel was stented using a 4.0×15 mm resolute integrity drug eluting stent. The distal stented length was postdilated with a 2.5 Trek non-compliant balloon to 20 atmospheres. We then planned to postdilate the proximal stented lesion.

A 4.0 Trek non-compliant balloon (Synapse Medical) was then passed into the guide catheter. This was not air purged prior to insertion. As the balloon was fed through the catheter it was noted that it was slightly kinked at its mid-portion; this was felt to be mild only and unlikely to pose a problem for delivery or use. As the balloon was advanced, it was noted that the radio-opaque balloon markers failed to appear in the coronary artery. On closer inspection the balloon markers were visualised in the guide catheter a few centimetres proximal to the distal end of the catheter. Manipulation of the proximal end of the balloon catheter failed to cause any movement of the balloon within the catheter. It was suspected that the shaft of the balloon had fractured at the point of kinking. At this point the decision was made to withdraw the guide catheter (with fractured balloon retained therein) and coronary guide wire as a unit, and to then reintubate the left main stem (LMS) and rewire the vessel once the percutaneous transluminal coronary angioplasty catheter was removed. Prior to removal of the guide catheter it was decided to perform a check angiogram to ensure stability of the coronary tree. On injection of contrast through the guide catheter, the balloon was seen to inflate with air, 'float' forward and travel out of the catheter and embolise into the proximal LAD ([figure 1](#), [video 1](#)); this resulted in obstruction to coronary flow distally. The decision was made to withdraw the catheter, wire and balloon as a unit without further delay. With the wire and guide catheter fixed, gentle traction was applied and under screening the balloon was also seen to move back out of the coronary. Further traction resulted in successful removal of the fractured inflated balloon from the guide catheter and the patient.

On inspection of the balloon post removal, it was confirmed that it was inflated with air to approximately three quarters of its nominal diameter. The LAD was reaccessed with the guide at this

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Figure 1 Still angiographic image demonstrating partially inflated balloon in the proximal left anterior descending coronary artery.

point, a further guide wire passed down the coronary artery, and the procedure completed without further incident. The end angiographic result was excellent with thrombolysis in myocardial infarction (TIMI) III flow distally in the LAD and no dissection. The patient had an uneventful recovery.

OUTCOME AND FOLLOW-UP

The patient had a good angiographic and clinical outcome. He was followed up in the general cardiology clinic and remained symptom free.

DISCUSSION

There are several case reports in the literature describing fracture and retention of coronary angioplasty stents and balloons^{1–4} with

Video 1 Video clip showing embolisation of fractured and partially inflated balloon into the left main stem and proximal left anterior descending coronary artery.

an incidence previously estimated at 0.1–0.8%.⁵ Often emergency surgery is required to retrieve retained angioplasty fragments in the unstable patient.^{6–8}

Most reports describe fracture after the balloon or stent has been passed into the coronary and usually after unsuccessful attempts at inflation or deflation.^{1–4} Our case is unusual in that the balloon shaft fractured within the catheter, and under the pressure of contrast injection down the guide catheter subsequently inflated with air retained in the balloon shaft. This air buoyancy facilitated the embolisation of the balloon distally into the coronary artery (video 1). Our hypothesis is that the force created by the injection of contrast into the catheter caused contrast to enter the distal end of the fractured shaft so that the balloon filled with the air from within the shaft. This is the only description in this literature of this phenomenon to the best of our knowledge. The fracture occurred at the point where the balloon was kinked slightly on passage through the guide catheter hub Y-connector.

As we still had a wire in the distal LAD and we knew that the major part of the fractured shaft was still within the guide catheter we felt there was a reasonable chance that gentle traction would result in the removal of the assembly as a whole. This also presented the quickest solution to the problem. Fortunately, in this case, once gentle traction was applied to the guide catheter, with wire and proximal balloon shaft fixed, we could see the balloon beginning to withdraw. Had this not been the case this approach would have been abandoned immediately so as to maintain guide catheter and wire position. Further, sustained traction resulted in withdrawal of the whole assembly as a unit from the coronary tree.

Several percutaneous options exist for removal of retained angioplasty fragments. These include the use of a snare, to capture and remove equipment from the intravascular compartment.^{9–10} The well-described technique of inflating another balloon within the guide catheter to trap the proximal fractured segment against the wall of the guide catheter³ also could have been useful in our case as it would have allowed us to pull back the guide catheter while ensuring that the fractured balloon travelled with it. Another percutaneous option available was the Fogarty technique involving passing another balloon distal to the entrapped balloon and then inflating this at a low pressure, then withdrawing slowly so as to retract the entrapped balloon.^{1–11} The fact, however, that our balloon was inflated to approximately three quarters its nominal volume would have made negotiating another balloon distal to it difficult. Use of intertwined guidewires to retrieve broken angioplasty fragments is also described and could have been attempted had our approach failed.¹²

In conclusion this case outlines a rare situation of balloon inflation with air and 'floatation' embolisation postfracture from within the guide catheter, and emphasises the importance of adequate balloon preparation and caution with regard to the use of kinked catheter equipment. Our method of retrieval provided the fastest solution to the problem at hand but may not always be successful. As it was the injection of contrast through the catheter that caused the balloon to inflate and embolise, it may be advisable in this situation to remove the catheter with fractured contents immediately and avoid performing a check angiogram until the situation has been remedied.

Learning points

- ▶ This case highlights the risks associated with usage of even very mildly kinked balloons or catheters.
- ▶ Timely intervention in the case of complications arising due to damaged equipment is essential.
- ▶ In the case of suspected fracture of balloon or stent shaft within the catheter, it may be advisable to avoid performing a check angiogram to avoid the rare complication of potential embolisation of distal fragments as described above.
- ▶ The traction between wire and balloon fragments may prove sufficient to allow the assembly be withdrawn as a whole, however, if this fails other methods should be undertaken urgently to retrieve fractured fragments.

Competing interests None.

Patient consent Obtained.

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