Retrieval Of A Fractured And Retained Percutaneous Coronary Angioplasty Catheter On Beating Perfused Heart
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Citation

Abstract
A fractured and retained percutaneous transluminal coronary angioplasty catheter was successfully removed on a perfused beating heart with concomitant bypass grafting. We believe this is the first report in English literature of such an operation on a beating heart. Broken and retained percutaneous transluminal coronary angioplasty balloon catheter is a rare but serious complication of interventional cardiology. The presence of a calcified proximal lesion hinders withdrawal of the broken catheter. It requires retrieval and emergency coronary bypass grafting to prevent further complications.

REPORT
A 60 year old male, known case of coronary artery disease with hypertension and type 2 diabetes mellitus with chronic stable angina grade 3 was admitted in the cardiology department of a tertiary care hospital in New Delhi. Coronary angiography was done which revealed proximal left anterior descending (LAD) block of 90% and distally another 100% lesion. The mid right coronary artery (RCA) was 100% blocked. The patient was taken up for percutaneous trans-luminal coronary angioplasty (PTCA) and stenting. PTCA with stenting to the LAD was attempted first. After wiring the lesion and pre dilatation using 1.5x10 Sprinter (Medtronic, Inc Minneapolis, MN, 55432-5604 USA) the distal lesion was stented first using 2.5x32 Supralimus core stent (Sahajanand Medical Devices India). Then the proximal lesion was stented using 2.75x24 Supralimus core stent(Sahajanand Medical Devices India). But while withdrawing the balloon catheter, it broke down from the neck. Check angiogram showed that it was stuck in the middle of the stent with the proximal part hanging into the aortic lumen.

The cardiologist tried several attempts to snare it out, but was unsuccessful. The case was referred to the cardiology department of our hospital. In our hospital too, attempts to snare the catheter out were unsuccessful. Thrombus formation was seen in the proximal stent which was propagating towards the left main artery. The patient was then referred to the cardio-thoracic department for emergency coronary artery bypass grafting (CABG). The patient was quickly shifted to the intensive care unit (ICU). On admission he was hypotensive, tachycardic and acidotic. He was immediately put on inotropic support and an intra-aortic balloon pump (IABP) was inserted and he was taken up for emergency CABG.

Surgical details The patient was electively put on cardio-pulmonary bypass (CPB), but the heart was not cooled nor arrested. Reverse saphenous vein grafting to LAD and distal RCA was done. Subsequently, retrograde warm blood perfusion via coronary sinus was started at the rate of 40 ml/kg maintaining a coronary sinus perfusion pressure not higher than 40 mmHg and a mean arterial pressure of at least 60 mmHg. Aortic cross clamp was applied. A transverse aortotomy was done. The broken end of the PTCA balloon was seen dangling into aorta. It was extracted from the left coronary ostium. The aortotomy was closed. The patient was weaned off from cardio-pulmonary bypass and shifted to the ICU on inotropic and IABP support. Post-operatively, he was weaned off IABP support after 2 days and off inotropic support over the next 2 days. He was discharged home on post-operative day 11.
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Figure 1
Figure 1: The broken end of PTCA balloon visualized in the ascending aorta, protruding out of left coronary ostia.

Figure 2
Figure 2: The retained segment of PTCA balloon being extracted out of the ascending aorta.

Figure 3
Figure 3: The fully removed retained segment of PTCA balloon.

DISCUSSION

Presence of a fractured segment of angioplasty balloon catheter or guidewire in a coronary artery carries the risk of grave complications such as acute embolisation leading to acute coronary thrombosis and myocardial infarction. There have been reports where guidewires or components of PTCA equipment lodged in coronary arteries have been managed conservatively.\[6\][7] But it becomes imperative to remove the retained segment if the patient becomes haemodynamically unstable or if there is acute coronary syndrome.

Non-surgical removal of these retained catheters has been reported by snaring and retrieval.\[1][9][10]\ A technique, using a second dilation system, to free the entrapped catheter during percutaneous transluminal coronary angioplasty has been described.\[5]\ Watson described two cases of percutaneous removal of trapped, broken steerable PTCA guidewires.\[10]\ The presence of a calcified, proximal lesion is believed to prevent withdrawal of the broken catheter. In such cases surgical removal is usually required.\[1]\ Also if there is coronary artery perforation, to prevent further laceration of the coronary artery and pericardial tamponade, the perforating wires or balloon should not be withdrawn and patient should be referred for emergency CABG.

Typically surgical removal of these catheters has been done on a cardioplegic arrested heart.\[3][4][5]\ In our case however we employed a beating heart technique, where even though the aorta was cross-clamped, the heart was kept beating by retro-grade coronary sinus perfusion. Maintaining
myocardial perfusion, we believe, prevented reperfusion injury after aortic unclamping and bypass grafting and helped in early restoration of stable hemodynamics in the early post-operative period.

Surgical removal of these catheters is also not always straightforward as it may uncoil and transform into a razor sharp wire. [4] Passing a Teflon catheter over the wire to protect the coronary artery to free the entrapped distal end of the guidewire at operation has been recommended.

Angioplasty guidewires and catheter are extremely reliable but device failure can occur, when any device is subject to extreme operating stress such as when a guidewire is rotated repeatedly in a single direction while the tip is held fixed in a total occlusion, or when a balloon catheter is inflated past its operating pressure range in an attempt to dilate a resistant stenosis. In our case, snapping of the balloon catheter occurred at the time of withdrawal, possibly from the traction force resulting from the pull of the catheter while the cathether was impacted in the incompletely dilated lesion, because of calcification or incompletely deflated balloon. A similar mechanism has been reported when the balloon got stuck in an incompletely open stent. [4]

In the stent era detachment of a part of wire or dilatation catheter; dislodgement of a bare, mounted stent from its delivery balloon or failure of a stent delivery balloon to inflate or deflate properly are going to increase. As a result, intervention cardiologists and cardiac surgeons around the world are going to encounter more of these complications. The angioplasty operator and cardiac surgeon should be familiar with various techniques of basket, bioptomes, intertwined guidewires for catheter removal and optimal surgical management in cases of unsuccessful non-surgical retrieval

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