Surgical retrieval of broken, inflated angioplasty balloon catheter within intracoronary stent: A real emergency

Hemant Digambar Waikar, Rajitha Desilva¹, Wasanthi Rathnayake², Chandrika Ponnamperuma², Anthonpillai Ravikiran¹

Department of Cardiac Anaesthesia, ¹CTVS, ²Cardiology, Navaloka Hospitals PLC, No.23, Deshamanya H K Dharmdasa Mawatha Colombo 00200, Sri Lanka

ABSTRACT
A 54-year old, hypertensive female patient underwent percutaneous coronary angioplasty (PTCA) followed by stenting of calcified chronic totally occluded right coronary artery. The post dilation balloon catheter got stuck and snapped during manipulations in inflated position within the stent, which could not be retrieved by nonsurgical interventions. Emergency surgery was performed to retrieve the stent along with an inflated balloon, followed by vein patch closure of arteriotomy and reversed saphenous vein graft anastomosis to right coronary artery and left anterior descending artery on cardiopulmonary bypass.

Keywords: Cardiopulmonary bypass, Coronary artery bypass graft, intracoronary stent, percutaneous coronary intervention

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balkon by guide wires with the support of microcatheters. However, all these attempts failed and surgical team was summoned for emergency extraction of entrapped, inflated balloon within the stent followed by emergency coronary bypass graft procedure (CABG). The patient had already received loading dose of Aspirin 300 mg and Clopidogrel 300 mg orally and intravenous 5000 units of unfractionated Heparin for angioplasty procedure. In operating suite, all invasive lines, left radial artery for arterial blood pressure monitoring, right internal jugular vein for central venous pressure (CVP), and left femoral artery for sampling of blood and insertion of Intra-Aortic Balloon Pump (IABP), if required, were secured under local anesthesia. The patient was induced with Midazolam 5 mg, Fentanyl 300 μg, and Etomidate 8 mg; trachea was intubated after achieving relaxation with suxamethonium chloride 100 mg. The anesthesia was maintained with N₂O, Oxygen 70%: 30%Fentanyl (total 900 μg), Sevoflurane and combination of Pancuronium bromide, and Vecuronium bromide for muscle relaxation. Cardiopulmonary bypass (CPB) was established after systemic heparinization with two-stage venous cannula for venous return and arterial return cannula in ascending aorta. Aorta was cross clamped and hyperkalemic cold blood cardioplegia was used for myocardial protection. RCA was palpatated and arteriotomy was made distal to the palpable stent. The stent along with inflated balloon and shaft was extracted [Video 1]. The extracted stent and inflated balloon were inspected closely [Figure 1]. The arteriotomy was closed with venous patch and RCA was bypassed with reversed saphenous vein graft distal to arteriotomy. LAD lesion was also bypassed with reversed saphenous vein graft. The left internal thoracic artery (LITA) was not harvested because of emergent nature of the procedure. The low dose tranexamic acid (1 mg/kg/h) was administered till completion of surgery. The patient came off CPB easily and was extubated within 6 h postoperatively. Total chest drainage was 375 ml. Further course was uneventful and she was discharged on 7th postoperative day.

DISCUSSION

With the introduction of dilating low pressure and high pressure balloons for calcific coronary arteries, the percutaneous trans-luminal coronary angioplasty (PTCA) is increasingly performed with great success. This trend has also led to increasing complications such as acute stent thrombosis, coronary dissections, and perforations with abrupt closure, and hardware malfunctions.[1] This includes snapping of angioplasty balloon catheter, dislodgement of guidewire, failure of stent balloon to inflate or deflate properly or stuck balloon used for post dilation in one of the struts of the deployed stent. This may occur with any device which is subjected to various manipulations specifically in calcified arteries where operator attempts to dilate non yielding calcific stenosis.[2] In our case although patient had calcific vessel, stent could be fully deployed but was stuck in mid portion of stent; however, while attempting post dilation, high-pressure ETO sterilized balloon could not be deflated. Balloon was inflated to 16 ATM (Atmospheric Pressure). Various attempts to deflate the balloon like using dual indeflators, coronary snare, failed. The constant manipulations by operator led to snapping of the delivery system, resulting the balloon to stuck in inflated position within the stent, leading to complete occlusion of distal vessel. The attempt of crushing, puncturing the balloon was made by introducing guide wire via microcatheter through another guiding catheter inserted from right femoral artery; however, all these maneuvers did not succeed. The management of such catastrophic event depends on hemodynamic status of the patient. Although patient did complain of heaviness in chest and slight pain, electrographic changes and hypotension were not apparent. This is due to the fact that patient had chronic total occlusion (CTO) before intervention. There are reports of nonsurgical methods of retrieving dislodged hardware using second dilation system to free the entrapped catheter.[3-4] In our case, the calcific lesion prevented withdrawal of the broken PTCA balloon catheter and we also did not have any backup plan for rotablation. Keltai et al.[3] reported emergency bypass surgery when distal 20 cm of snapped wire caused immediate acute thrombotic occlusion of both left anterior descending and circumflex arteries. In another case, as patient was stable hemodynamically, elective surgical retrieval was performed after 2 weeks but broken end of the wire could not be located. On follow-up after 18 months,
patient was doing well while guidewire remained in the same position.[6]

In our case, the surgeon could palpate the stent from outside and via arteriotomy, the entire stent with balloon in inflated state with the snapped delivery system could be retrieved gently [Video 1]. The 26 cm of snapped delivery system with stent and balloon was extracted [Figure 1].

Emergency surgery for retained hardware inside the heart presents unique problems of deranged hemodynamics and excessive bleeding because of loading doses of dual antiplatelet therapy along with heparinization during the procedure. In our case, the nature of lesion preoperatively (CTO) and use of low-dose tranexamic acid salvaged the situation. The patient did not exhibit severe hemodynamic instability and need for any transfusion of blood or blood products.

The anesthesiologist, cardiologist, and surgeons should be aware of these complications and ready to accept these unique challenging situations. The operator should be familiar with alternative methods of retrieval of these hardware or emergency surgical intervention depending on the circumstances.

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Conflicts of interest
There are no conflicts of interest.

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