Bangladesh Med J. 2022 May; 51(2)
DOI: https://doi.org/10.3329/bmj.v51i2.69240

Case Report

Coronary Artery Perforation following Percutaneous Coronary Intervention in an Elderly Patient: A case report

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Abstract

Percutaneous coronary intervention (PCI) is widely used in the diagnosis and treatment of symptomatic coronary artery disease. However, much like any other procedure, it has its risks; one such rare but lethal complication is coronary artery perforation (CAP) which requires immediate intervention. Prompt recognition and appropriate treatment strategy are of utmost importance in reducing the mortality and morbidity. We herein report a case of Ellis Type III perforation of the left anterior descending coronary artery (LAD) during PCI who underwent emergency coronary artery bypass grafting (CABG) refractory to conventional coronary stent placement and balloon tamponade. The patient recovered well despite excessive initial postoperative bleeding and was discharged from the hospital.

Keywords: *Coronary artery disease, coronary artery perforation, percutaneous coronary intervention, complication*

INTRODUCTION

Coronary artery perforation (CAP) is an infrequent but potentially life-threatening complication of percutaneous coronary intervention (PCI). The incidence of CAP during PCI has been reported as about 0.2–0.6%.[1,2] The risk factors associated are female sex, old age, complex coronary artery lesions, location of lesion, use of oversized balloons or stents, high-pressure balloon dilatation and hydrophilic-coated, polymer jacketed, and stiff-tip guidewires.[3,4] Ellis has classified coronary artery perforation according to its severity into three types.[3-5] Type I CAP is defined by the development of an extra luminal crater, without extravasation. Type II CAP refers to the development of a pericardial or myocardial blush, without contrast jet extravasation. Type III CAP, the most severe form of it is defined as a perforation resulting in extravasation of blood through a frank perforation (>1 mm) or spilling into an anatomic cavity. It is associated with very high mortality rates, ranging from 7 to 44%. The rate of cardiac tamponade is also high[6] (up to 40%) and emergency coronary artery bypass grafting (CABG) is required in 20–40% of cases.[5]

Treatment should be aimed at sealing the perforation with low pressure prolonged conventional or perfusion balloon inflation, prudent reversal of anticoagulation and use of covered stents. Echocardiography should be performed in all cases of coronary perforation and urgent pericardiocentesis if tamponade develops. In cases where sealing of the perforation by conservative measures cannot be achieved, emergency bypass surgery must be performed Treatment should be aimed at sealing the perforation with low pressure prolonged conventional or perfusion balloon inflation, prudent reversal of anticoagulation and use of covered stents. Echocardiography should be performed in all cases of coronary perforation and urgent pericardiocentesis if tamponade develops. In cases where sealing of the perforation by conservative measures cannot be achieved, emergency bypass surgery must be performed

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Current mainstay of treatment for severe perforation (type III Ellis) is immediate hemodynamic stabilization, sealing by prolonged balloon inflation, if available, use of perfusion balloons followed by covered stent implantation.[7, 8] Urgent pericardiocentesis should be performed if tamponade develops. However, when these measures fail, emergent surgical intervention may be required.[8,9,10] We report such a case of successful management of a Type III left anterior descending (LAD) CAP by emergency CABG.

CASE REPORT

A 63-year-old male with a history of hypertension and type II diabetes mellitus was admitted to the Coronary Care Unit for chest pain and dyspnea for one day. Electrocardiogram and chest x-ray were normal. The initial serum troponin I level was 22.041ng/ml and he had a rare blood group (O negative). Electrocardiography showed inferior wall hypokinemia and mild LV systolic dysfunction with an ejection fraction of 50%. He was given medical therapy with low molecular weight heparin, aspirin 75mg and atorvastatin 80mg and was elected to undergo percutaneous coronary intervention (PCI).

Coronary angiography (Figure 1) revealed 70% long lesion at junction of proximal and mid left anterior descending (LAD) coronary artery and 80% lesion in dominant, distal circumflex coronary artery (LCx).

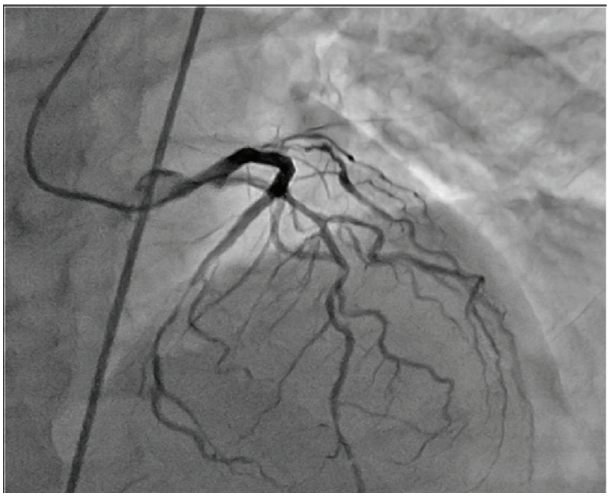


Figure- 1: *Coronary angiography showing 70% long lesion at junction of proximal and mid left anterior descending (LAD) coronary artery and 80% lesion in dominant, distal circumflex coronary artery (LCx).*

Right femoral 6 French (6F) arterial access was taken and the vessel was cannulated with 6 French catheter with 3.5cm curve. The lesion in LCx was wired with 0.014-inch Balance Middleweight (BMW) coronary wire. The lesion was then pre dilated and 2.25×28mm Promus Premier Stent was successfully deployed over the stenosed area (Figure 2). 2.5×10mm Europa was used for post dilatation.

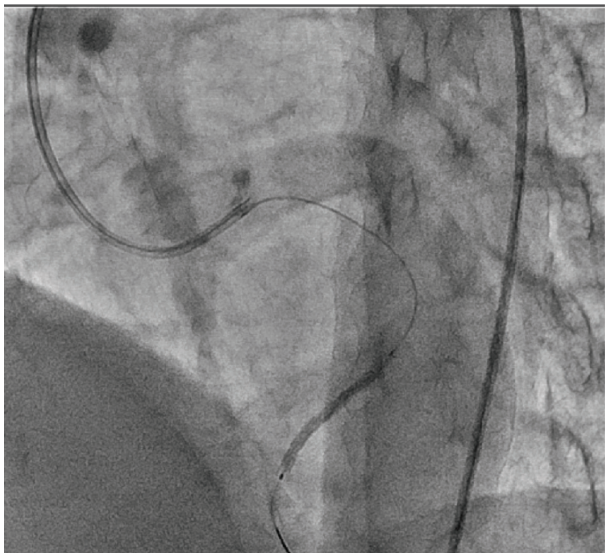


Figure- 1: *Coronary angiography showing 70% long lesion at junction of proximal and mid left anterior descending (LAD) coronary artery and 80% lesion in dominant, distal circumflex coronary artery (LCx).*

In case of LAD a0.014-inch Rinato guidewire was used to pass through the lesion. Pre-dilatation was done with 1.5×15mm Europa balloon. The control angiography after pre-dilatation (Figure 3) showed a type III Ellis severe perforation.

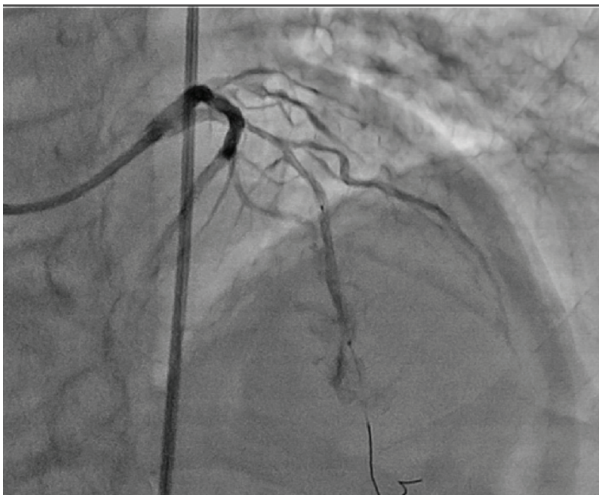


Figure- 3: Ellis Type III perforation after pre-dilatation.

A 2.5×27mm NC Euphora balloon was immediately introduced to the site of perforation and balloon occlusion was done for 20minutes in an attempt to seal the perforation. However, the perforation continued to persist. Hence, two covered stents sized 2.8×19mm and 3.5×26mm Graft master was implanted to cover the rupture area. Despite all these attempts, the angiography (Figure 4) showed continued contrast extravasation. Echocardiography revealed mild pericardial effusion with no evidence of cardiac tamponade. He was tachycardia, anaemic and other parameters were normal. Protamine sulphate to reverse heparin was not considered in view of the risk associated with stent thrombosis and also because the patient had mild derangement in the hemodynamics.

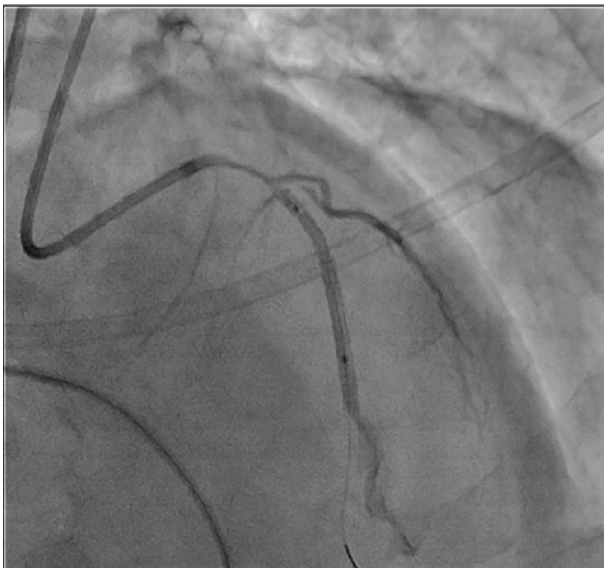


Figure- 4: *Contrast extravasation after implantation of covered stents*

The patient underwent open heart surgery with prolonged balloon inflation proximal to the ruptured area to prevent further blood extravasation and subsequent cardiac tamponade. During surgery 750ml of clotted blood was evacuated from the pericardial cavity. A hematoma was found in the LAD territory (Figure 5) at the site of stent insertion and there was no active bleeding found. Cardiopulmonary bypass (CPB) was established and left internal mammary artery (LIMA) was harvested and grafted to LAD distal to the stent (Figure 6). The patient was weaned from CPB uneventfully and shifted to intensive care unit (ICU). Cross clamp time was 28 minutes and total CPB time was 54 minutes.

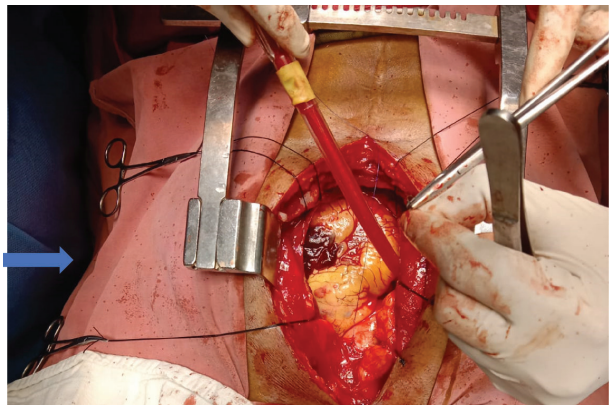
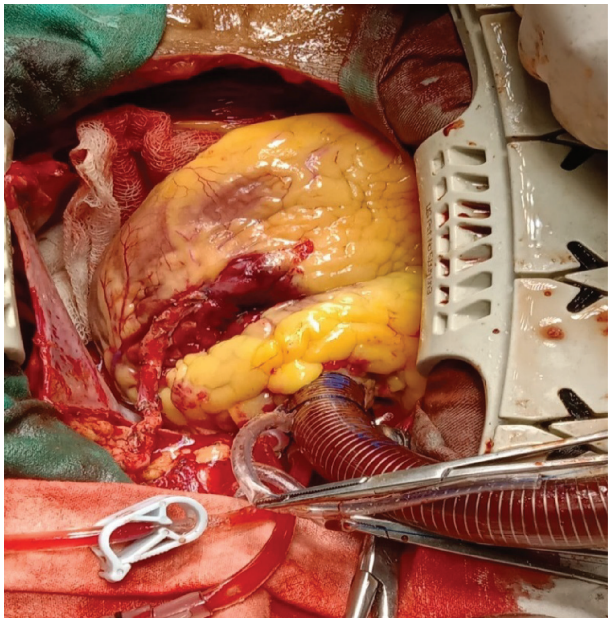


Figure- 5: *Hematoma found in the LAD territory at the site of stent insertion*



i**Figure 6.** *LIMA harvested and grafted to LAD distal to the stent*

The patient was extubated after 16 hours. He received 7 units of whole blood, 3 units of fresh frozen plasma in the perioperative period. Tranexamic acid was given to reduce postoperative bleeding. Chest drain collection was 800 ml in the first 24 hours but resolved gradually and completely by post-operative day 6. Troponin levels were not tracked in the post-procedural period. An echocardiogram performed on 6th postoperative day showed normal chamber dimensions, hypokinetic anterior and septal wall of LV, moderate LV systolic dysfunction (Ejection fraction- 40 to 45%), no pericardial effusion and good RV systolic function (TAPSE 17mm). The patient was discharged on the 8th postoperative day in a stable state and continues to be on a regular follow up.

DISCUSSION

The prevalence of emergency CABG has declined significantly in the recent times.[9, 10] This decline is due to increased operator skill and experience, better percutaneous techniques and advances in stent technology which has helped interventional cardiologists to bail out most of the complications caused by failed PCI. However, when surgical intervention is required after failed angioplasty it is associated with high morbidity and mortality.[13-15]

Current recommendation for management of CAP consists of prolonged balloon inflation (proximal to or at the site of perforation to prevent tamponade) and reversal of anticoagulation with protamine[10]. It has been reported that in patients with coronary artery perforation administration of protamine seems to be safe, without an increase in the risk of vessel or stent thrombosis.[11]

Surgical management includes either ligation or suturing of the vessel and bypass grafting to the distal portion of the vessel. Furthermore, pericardial patch/Teflon felt wrapping repair of the CAP with or without coronary bypass grafting is an alternative technique especially when multiple stents with CAP and sub-epicardial hematoma are present.[16]

The Type III perforation in our case had occurred due to high-pressure balloon dilatation or probably due to the fragile vessel wall. As the perforation had been automatically sealed and hematoma was non-expanding, ligation of LAD was not done. In addition, proximal ligation of LAD could result in a long-occluded segment thereby limiting blood flow to the septal branches and could result in a serious myocardial infarction. Hence, LIMA was harvested and grafted to LAD distal to the sealed hematoma to ensure flow in the LAD territory.

Unlike elective CABG, emergency CABG has increased risk of postoperative complications and higher mortality. This is mainly due to the limited preoperative patient evaluation and optimization prior to surgery. As heparin reversal was not performed during PCI in our patient, massive blood loss was anticipated. In addition to the arrangement of large units of rare O negative blood to maintain the patient hemodynamics, arrangement of OT personnel during the fasting period of Holy month of Ramadan especially during the iftar period was a challenging task. Patient counseling regarding operative complications and patient outcome was also important. Despite all these challenges, surgery was successfully performed on this patient.

CONCLUSIONS

In cases of CAP, timely management plays a crucial part in the patient outcome. Caution must be taken during advancement of guide wires and during dilatation of the coronary lesion either before stent, during, or after stent implantation to avoid this serious and potentially lethal complication. Immediate sealing of the ruptured coronary vessel by employing stent-grafts in addition to reversal of anticoagulation can defer a potentially lethal complication. However, if balloon occlusion or stents fail to seal the perforation or patient becomes hemodynamically unstable, emergency CABG must be done.

Conflicts of interest

The authors declare no conflicts of interest regarding the publication of this paper.

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