CytoSorb® usage in a dual antiplatelet agent treated patient during CABG and broken guidewire retrieval from right coronary artery ostium

N. Kumar, V. K. Keshri, R. R. Bhuyan

Fortis Escorts Heart Institute, New Delhi, India

ABSTRACT — OBJECTIVE: *We report a case of a patient undergoing Open Coronary Artery Bypass Graft Surgery (CABG) with CytoSorb® under dual antiplatelet therapy (DAPT) with a broken guidewire in RCA ostium.*

CASE PRESENTATION: *A 66-year-old male patient on doublet antiplatelet therapy of ticagrelor and ecospirin underwent percutaneous transluminal coronary angioplasty (PTCA) in lieu of Triple Vessel Disease (TVD). During withdrawal, guide wire was stuck in the right coronary artery ostium. Patient's LVEF reduced to 40% with akinitic walls and early pulmonary edema. On-pump coronary artery bypass graft (CABG) surgery was performed using intraoperative CytoSorb®.*

RESULTS: *No post-operative bleeding was recorded. The patient demonstrated good pump function and sinus rhythm. The patient was discharged within 7 days of hospitalization including 3 days of ICU stay.*

CONCLUSIONS: *Intra-operative usage of CytoSorb® during emergency cardiac surgery in-patient treated with anti-platelet agents is an effective option which reduces risk of bleeding complications, thereby improving outcomes, reducing cost and minimizing morbidity and mortality.*

KEYWORDS
CytoSorb, Triple Vessel Disease, Edema, Ticagrelor, Ecospirin, Coronary artery bypass graft.

INTRODUCTION

Percutaneous transluminal coronary angioplasty (PTCA) is standard procedure for the treatment of coronary artery syndrome. A rare complication of percutaneous coronary interventions (PCIs) is the entrapment or fracture of guidewire, with an incidence of 0.2-0.8%[1,2]. Guidewire fracture could be due to entrapment in stent struts, wire cutting by rotational atherectomy devices, stuck wire in distal tortuous vessel, and structural failure of the wire[3,4]. Entrapped guidewire fragments in the coronary tree may cause thrombosis, embolic phenomena, dissection, perforation, and vessel occlusion[3-5]. While there is no defined evidence-based optimal management of entrapped guidewire, physicians use different approaches of surgical removal, percutaneous extraction of the guidewire fragment, or conservative management, depending upon the clinical situation and the position of the entrapped guidewire[6].

CytoSorb®, a European CE-approved extracorporeal blood purification therapy, adsorbs hy-

Corresponding Author
Ritwick Raj Bhuyan, MD; e-mail: drritwick72@gmail.com

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drophobic molecules with the size of up to 60kD, including cytokines, damage-associated and pathogen-associated molecular patterns, or metabolic products, such as bilirubin and myoglobin, but also some drugs[7,8]. In order to help in reducing bleeding complications, CytoSorb® is used in emergency cardiac surgery to remove platelet aggregation inhibitor ticagrelor and direct oral anticoagulant (DOAC) rivaroxaban.

Here we report a case of a patient under dual antiplatelet therapy (DAPT) with a broken guidewire in RCA ostium who underwent open Coronary Artery Bypass Graft Surgery (CABG) with CytoSorb®.

CASE DESCRIPTION

A male patient, 66 years of age presented with complaints of left sided chest pain radiating to left arm for 1 week and acute/severe pain in the last 2 days on May 27th, 2020. Patient had a history of type 2 diabetes mellitus and acute coronary syndrome (ACS) with a recent inferior wall myocardial infarction (IWMI). Patient was under DAPT: ticagrelor 90 mg twice daily and aspirin (Ecosprin®) 150 mg once daily, and on statin Rosuvas® 20 mg once daily, angiotensin II receptor blocker Telma® 40 mg once daily, diuretic Lasilactone® 50 mg once daily, and anti-diabetic medicine Glycomet SR® 500 mg once daily. Coronary angiography revealed multiple lesions in left anterior descending (LAD) artery (30% ostial, 90% proximal, 90% mid-LAD and 90% distal), left circumflex (LCX) artery (30-40% mid-LCX) and first obtuse marginal (OM1) branch (90% proximal, 30-40% mid-OM1), right coronary artery (RCA) (90-95% proximal, 50-60% mid-RCA), and posterior left ventricular (PLV) artery (90% distal). Overall, the patient had coronary artery disease (CAD), IWMI and critical triple vessel disease (TVD). In view of the acute myocardial infarction, primary percutaneous transluminal coronary angioplasty (PTCA) of the right coronary artery (RCA) was performed immediately using a JR3.5-6 FR guide catheter, BMW (Balanced Middle Weight), ALL STAR guidewire, and Xience Xpedition stent (3.5 x 38 mm) at 12 atm. Thrombolysis in Myocardial Infarction (TIMI) III flow was achieved. During wire withdrawal, guidewire got entangled in one of the stent struts and floppy part was separated from wire shaft in the RCA ostium.

On 28th May, 2D ECHO revealed moderate left ventricular dysfunction (LVEF of 40%) with akinetic posterior wall, basal inferior wall, and mid basal lateral wall, elevated heart rate (HR) of 105/min, and mild mitral regurgitation (MR). CT scan on 29th May revealed ground glass opacities with both central and peripheral distribution with impression of early pulmonary edema. Patient underwent on-pump coronary artery bypass graft surgery (CABG) x 4, along with antibiotics and IV fluids on 30th May. Midline sternotomy showed mild cardiomegaly, dilated aorta, and PTCA guidewire stuck in RCA ostium. Patient was heparinized using standard dosage of heparin and cardiopulmonary bypass was performed with the right axillary artery (RAA) cannulation. CytoSorb® was connected to the heart lung machine circuit with aortic cross clamp. Heart was arrested using cold blood cardioplegia. Small transverse autotomy was performed. The floppy part of the PTCA wire was pulled out gently with forceps (Figure 1). Removed wire is shown in Figure 2. One left internal mammary artery (LIMA) and three reversed saphenous vein grafts (RSVG)

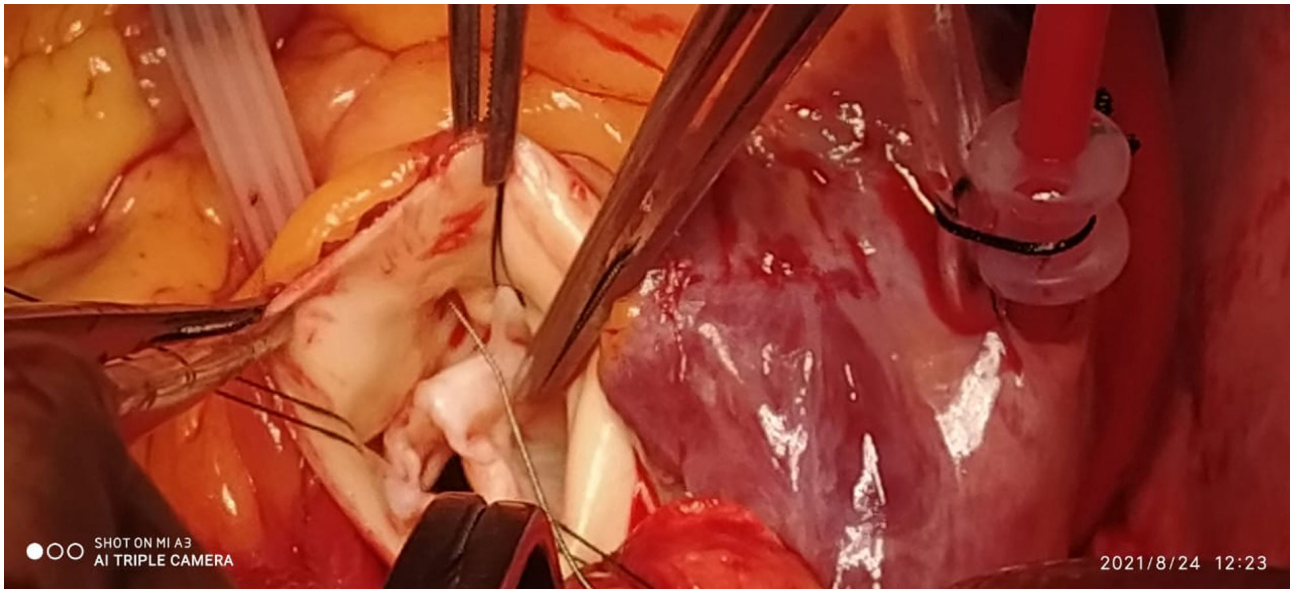

Figure 1. Floppy part of guide wire stuck in right coronary artery ostium pulled out using forceps.

Figure 2. Removed guide wire from right coronary artery *ostium*.

were used (LIMA to LAD, RSVGs to OM2, RCA, and Diagonal 2). All grafts showed good lengths and lie. Normal sinus rhythm (NSR) and optimal hemostasis were achieved. Heparin was reversed using 50 units of protamine and chest was closed. Two pacing wires (right atrium and right ventricular) and two chest drains (anterior mediastinal and left pleural) were placed. CytoSorb® was used with a total surgery time of 6 hours (Table 1). The patient was transferred to CTVS ICU for observation in a stable state. The patient was on mechanical ventilation for one day and was exacerbated on zero post operation day. Three units of packed cell volume and fresh frozen plasma were administered. He had an ICU stay of 3 days and was then shifted to normal ward. With a hospitalization time of 7 days, the patient was discharged on 4th June in a stable condition.

DISCUSSION

While entrapment of hardware during coronary angioplasty is a rare phenomenon, there has been an increase in the frequency of such complications due to increased number of difficult cases. In this case, during withdrawal, guidewire got entangled in one of the stent struts and floppy part was separated from wire shaft in the RCA ostium. While there is no standard protocol, there are several options, among which percutaneous procedure is the first choice. Snare loop wire or its modification is the most common technique used followed using hook-tip catheters or basket retrievers[9-11]. These techniques are complex and often unsuccessful. In this case, after failed attempts of percutaneous retrieval procedures and LVEF reducing to 40%, decision for surgical removal was taken.

Table I.

Parameters	On 29/05/2020 (Before CABG X 4 with CytoSorb®)	On 31/05/2020 (After CABG x4 with CytoSorb®)
Hemoglobin (g/dl)	15.6	9.6
Hematocrit (%)	38	27
Serum Creatinine (mg/dl)	1.3	1.1
Serum Lactate (mg/dl)	3.1	2.1
Bilirubin (mg/dl)	1.2	1
SGOT (U/L)	94	42
SGPT (U/L)	84	34
PCT (ng/dl)	1.0	0.8
Urine Output (ml/day)	1750	3470
Mean Arterial Pressure (MAP) (mmHg)	62	61
Nor-epinephrine dose (mcg/kg/min)	0.1	0.05
Dobutamine (mcg/kg/min)	0.5	0.5
Blood urea nitrogen (BUN) (mg/dl)	29	20

Pre-Cytosorb® and Post-CytoSorb® markers which show reduction in inflammation & improvement in hemodynamics.

ACS patients receiving antiplatelets (APT) other than aspirin are at considerable risk of bleeding complications during emergent or urgent CABG. ACCF/AHA Guideline suggest that ticagrelor to be discontinued at least 5 days before surgery[12]. Administration of platelet transfusion has shown to be ineffective in reversing the antiplatelet effects of ticagrelor[13]. Recent literature has shown use of CytoSorb® to remove ticagrelor from blood during CABG[14-17]. CytoSorb® installed in emergency cardiac operations for patients on ticagrelor or rivaroxaban showed significantly shorter operation time, lower drainage volume, fewer transfusions, lower re-thoracotomy rates and shorter ICU stay[16]. A UK based cost utility analysis further added that using intraoperative CytoSorb® in patient receiving ticagrelor saves cost with a probability of 99% and 53-77% compared to alternative options in emergent and urgent cardiac surgery, respectively[14]. In this case as well, use of intraoperative CytoSorb® prevented expected substantial postoperative bleeding. This led to short ICU stay and total hospitalization time. Importantly, as the guidewire was being removed surgically, it was crucial to prevent bleeding to enable successful retrieval of the broken guidewire. Twenty-four-hour drainage volume was found to be, and three Packed cell volume and frozen plasma were transfused.

Patients receiving APT experience bleeding complications during and after cardiac surgery. In emergency situations, delaying surgery to wait for physiological clearance might result in serious adverse events. Immediate surgery without or limited discontinuation of antiplatelet therapy (other than aspirin) is accompanied with considerable risk of bleeding complications with increased risk of mortality, morbidity, and inflated cost. Clinical use of CytoSorb® in such circumstances has been shown to significantly improve patient outcomes by eliminating APT ticagrelor and DOAC rivaroxaban.

To our knowledge this is a first case to be reported in India utilizing CytoSorb® for APT removal during a CABG with guidewire retrieval.

CONCLUSIONS

Intra-operative usage of CytoSorb® during emergency cardiac surgery in patient treated with ticagrelor is an effective option, which reduces risk of bleeding complication, thereby improving outcomes, reducing costs, and minimizing morbidity and mortality rates.

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Conflict of Interest:
The authors declare that there are no conflicts of interest.

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