Case report - Coronary

Serious acute coronary thrombosis associated with heparin-induced thrombocytopenia in off-pump coronary artery bypass grafting

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Abstract

A 72-year-old female underwent off-pump coronary bypass grafting one month after heparin exposure. Immediately after protamine administration, she developed hypotension due to acute graft failure. Grafting to left anterior descending branch was revised under intra-aortic balloon pump insertion and she was transferred to intensive care unit under stable hemodynamic condition. However, she gradually developed low cardiac output syndrome and echocardiography showed new onset of myocardial infarction. Coronary angiography on the first postoperative day revealed diffuse serious coronary thrombosis involving all grafts and grafted native coronary arteries. Emergent percutaneous coronary intervention (PCI) was performed for native vessels. Laboratory examination revealed severe progressive thrombocytopenia and she was clinically diagnosed as heparin-induced thrombocytopenia (HIT). After cessation of all heparins and alternative anticoagulation with argatroban, thrombocytopenia was improved and some of occluded grafts were recanalized. She was discharged on the 51st postoperative day. Acute graft thrombosis, especially caused by HIT, is a serious complication, which sometimes results in mortality. This is a successful case treated by PCI followed by an alternative anticoagulation.

Keywords: Off-pump coronary artery bypass grafting; Acute graft failure; Heparin-induced thrombocytopenia; Percutaneous coronary intervention

1. Introduction

We report the successful treatment of serious acute coronary thrombosis associated with heparin-induced thrombocytopenia (HIT) in a patient undergoing off-pump coronary artery bypass grafting (OPCAB).

2. Clinical summary

A 72-year-old female with triple vessel coronary artery disease was referred for coronary artery bypass surgery. She had a history of heparin exposure in coronary angiography (CAG) one month before. She underwent OPCAB with left internal thoracic artery (LITA) grafted to left anterior descending branch (LAD) and the radial artery (RA), anastomosed to right internal thoracic artery (RITA), grafted to obtuse marginal (OM), posterolateral (PL) and posterior descending (PD) branches sequentially. Grafting procedures were performed uneventfully and sufficient graft flow was confirmed by the ultrasonic flowmeter. Immediately after protamine administration, she showed hypotension and the transesophageal echocardiography (TEE) revealed reduced wall motion of the global left ventricle (LV). The flowmeter showed decreased graft flow in bilateral internal thoracic arteries (ITAs). Although protamine-induced hypotension was suspected, graft flow was refractory to further inotropic support and intra-aortic balloon pump (IABP) insertion even after hypotension was improved. As acute graft failure was suspected, anastomosis of LITA was revised under readministration of heparin. Blood flow from proximal LAD was not detected when the anastomosis was opened. It was recanalized by inserting the coronary probe. Sufficient flow was reconfirmed after reanastomosis to LAD. TEE showed no asynergy wall motion in LV. She was transferred to the intensive care unit with stable hemodynamics. On the operative day, she gradually developed low output syndrome, which was refractory to medical treatment. Laboratory examination revealed increased creatine kinase isozyme with muscle and brain subunits (CK-MB) level up to 251 IU/l 24 h after the operation. On the first postoperative day, echocardiography showed new onset of asynergy motion in anteroseptal and apical wall in LV and the ejection fraction was reduced to 45%, from 68% preoperatively. Emergent CAG, examined 18 h postoperatively, demonstrated occlusion of all grafts and native coronary arteries distal to anastomotic sites (Fig. 1). Diffuse coronary thrombosis was shown. Percutaneous coronary intervention (PCI) was performed for native vessels under heparin administration and thrombolysis in myocardial infarction flow grade 3 (TIMI-3) flow was established. LAD and OM were recanalized with bare-metal stents, and proximal RCA with the rotational atherectomy system and sirolimus-eluting stents. Only balloon angioplast-
Fig. 1. (a, b) LAD, OM, PL and PD branches were occluded at anastomosis sites. (c) Bilateral internal thoracic arteries were occluded. (d) Thrombus in LAD was revealed during PCI. LAD, left anterior descending branch; OM, obtuse marginal branch; PL, posterolateral branch; PD, posterior descending branch; LITA, left internal thoracic artery; RITA, right internal thoracic artery; PCI, percutaneous coronary intervention.

Fig. 2. (a) LITA to LAD was recanalized. (b) RA, anastomosed to RITA, to OM was recanalized. (c, d) Angiography of left coronary artery revealed patent LITA and RA to OM, though RA to PL and PD was still occluded. LITA, left internal thoracic artery; RITA, right internal thoracic artery; LAD, left anterior descending branch; RA, radial artery; OM, obtuse marginal branch; PL, posterolateral branch; PD, posterior descending branch.

The platelet count immediately after surgery was $89 \times 10^9/l$ and decreased to 28 and $12 \times 10^9/l$, respectively, on the first and second postoperative day, whereas it was $160 \times 10^9/l$ preoperatively. As HIT was strongly suspected, the use of heparin was stopped and argatroban was started as an alternative anticoagulation on the second postoperative day. Heparin-coated Swan–Ganz catheter and the central venous catheter were also removed. IABP was weaned off on the third postoperative day. The platelet count increased gradually, to 82 and $183 \times 10^9/l$ on the
third and fifth postoperative day, respectively. CAG on the 25th postoperative day showed recanalized grafts to LAD and OM, though grafts to PL and PD were still occluded (Fig. 2). Argatroban was transited to oral warfarin on the 13th postoperative day and she was discharged on the 51st postoperative day. Coronary computed tomography examined six months after surgery revealed no restenosis in PCI target lesions and grafts to LAD and OM were still patent. The patient has survived with no cardiac events for eight months since the operation and aspirin and clopidogrel have been continued.

3. Discussion

Perioperative graft failure in coronary artery bypass grafting (CABG) is a serious complication occasionally resulting in poor mortality and morbidity [1, 2]. Coronary thrombosis is one of causes of graft failure; especially HIT could sometimes cause a fatal clinical manifestation because of its rapid and serious progression. In adult cardiac surgery, the frequency of HIT is known as 1.0–2.4% [3]. The occlusion rate for saphenous vein grafts, but not arterial conduits, was significantly increased after CABG in HIT patients [4].

The diagnosis of HIT is based on its typical clinical picture. The ‘4Ts’ of HIT, i.e. the degree of Thrombocytopenia, the Timing of the platelet fall after heparin exposure, the presence of Thrombosis, and oTher causes for thrombocytopenia excluded, may be useful for assessing patients with suspected HIT [5]. In our case, the total points by the ‘4Ts’ assessment point system were six out of eight and HIT was highly suspected, though IABP and cardiac surgery were possible causes of thrombocytopenia and points did not counted in the category of oTher causes for thrombocytopenia. Heparin exposure in PCI might progress thrombocytopenia. Immediate therapy, i.e. cessation of all heparins including heparin-coated catheter and alternative anticoagulation with argatroban, was effective. Thielmann et al. reported that PCI was superior to redo-CABG for graft failure in limiting the extent of myocardial damage [1].

HIT-antibody, i.e. heparin-platelet factor 4 (PF4) antibody testing is recommended for confirming the clinical diagnosis of HIT; however, initiation of proper treatment must never be delayed pending laboratory results, which may not be obtained for hours to days. In our case, heparin-PF4 antibody measured on the second postoperative day was reported negative two weeks later. The assay in our institute was the ELISA and the sensitivity and specificity were limited to 73% and 77%, respectively.

HIT was considered most compatible for rapid and serious thrombocytopenia. Localized vascular injury and the direct contact to the foreign body, that is the intracoronary shunt tube used during anastomosis procedure, might play an important role for thrombi formation in surgical site.

When HIT is diagnosed preoperatively, cardiac surgery should be delayed until heparin-PF4 antibodies turn into undetectable. Heparin is recommended over alternative anticoagulants because of the limited experience with the latter agents in cardiovascular surgery and their lack of specific antidotes and monitoring. If delay is impossible, cardiac surgery should be performed under alternative anticoagulants, though the safety and efficacy are not established. Antiplatelet therapy, such as glycoprotein IIb/IIIa blockade, combined with heparin or alternative anticoagulants has been reported and may be effective [3]. The experience is also limited and the risk of bleeding is a great concern. It should be applied with prudent consideration.

This is a clinically worthy case who was successfully treated by PCI and argatroban for intraoperative acute coronary thrombosis in OPCAB.

References


eComment: Heparin-induced thrombocytopenia in cardiac surgery

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We appreciate your decision to transfer the patient to intensive care unit at the end of the intervention; a longer stay in the operating room carries major complications [1]. We agree also with your decision to perform percutaneous coronary intervention (PCI) and not redo coronary artery bypass grafting (CABG). Heparin-induced thrombocytopenia (HIT) can be developed in 1–2.4% of patients treated with heparin [2]; HIT is an antibody-mediated reaction caused by exposure to heparin and while it usually occurs 5–10 days from the heparin therapy it can happen more rapidly in patients who are re-exposed to heparin within 100 days [3].

We recently treated surgically a 78-year-old man with a history of coronary disease. During his hospitalization in the intensive care unit a severe thrombocytopenia was observed and HIT was diagnosed. Heparin-platelet factor 4 (PF4) antibody test confirmed HIT resulting positive (68%). We postponed CABG for 120 days but antibodies were still high (56%) at his re-admission. The experience is also limited and the risk of bleeding is a great concern. It should be applied with prudent consideration.

Consequently, we suggest fondaparinux sodium as alternative anticoagulant treatment in cases where coronary disease and HIT co-exist, while more studies are needed for the stabilization of this suggestion.
References


