Case Report

Perioperative intra-aortic balloon counterpulsation in a patient with myocardium at risk undergoing urgent noncardiac surgery

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ABSTRACT

We are presenting the case of a 76-year-old female scheduled for major abdominal surgery. Her past medical history was remarkable for a three-vessel coronary artery disease, with a severely impaired left ventricular function. She had already undergone complex coronary artery bypass surgery. Currently, she presented with the rare constellation of a hemodynamic relevant and interventionally intractable stenosis of the left subclavian artery proximal to a crucial coronary bypass from left internal mammary artery to the left anterior descending. To protect this patient from perioperative myocardial infarction, an intra-aortic balloon pump was successfully used.

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INTRODUCTION

Along with the demographic development the number of elderly and multi-morbid patients that need to undergo major noncardiac surgery is increasing. With a prevalence of up to 25%, cardiovascular diseases represent one of the main perioperative co-morbidities. These patients are prone to perioperative cardiac complications and death.[1] Except from perioperative beta-blockade and statin therapy data on prophylactic or therapeutic approaches to improve these patients outcome are scarce.[2] Thus, potential measures in an interdisciplinary patient-targeted mode have to be chosen to be successful.

While the use of an intra-aortic balloon pump (IABP) is well established to provide hemodynamic stability in patients with cardiogenic shock or high-risk patients undergoing coronary artery bypass grafting, reports of its use in major noncardiac surgery are rare.[3]

The application of an IABP device has been advocated to decrease cardiac complications in patients with severe coronary artery disease (CAD) undergoing noncardiac surgery in extraordinary settings.[4,5] In this article we would like to present a special constellation very suitable for the use of an IABP.

CASE REPORT

A 76-year-old female was admitted to our university hospital with an obstructing tumor of the proximal jejunum for a curative surgical approach. Her past medical history included a severe three-vessel CAD with myocardial infarction (MI), complex coronary artery bypass surgery and reconstruction of the mitral and tricuspid valve 6 month prior to admission.

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During the preoperative evaluation, she reported intermittent chest discomfort during exercise or stress. Thus, percutaneous transluminal coronary angiography was performed to evaluate further interventional options. The angiography showed a global hypokinesis of the left ventricle (LV) and akinesis of the posterior wall with a LV ejection fraction (EF) of 33%. Whereas the aorto-coronary vein bypass to the right coronary artery showed no pathology, the left internal mammary artery (LIMA) to left anterior descending (LAD) bypass was compromised by a 70% stenosis of the subclavian artery proximal the bypass graft. This stenosis was technically intractable for revascularization [Figures 1 and 2].

As she developed symptoms of an upper intestinal obstruction due to tumor progression, the operation could not be postponed. To stabilize LV function and diastolic blood flow via the crucial LIMA to LAD bypass graft the perioperative use of an IABP was advocated.

To minimize perioperative cardiac stress and to obtain a sufficient postoperative analgesia a combined epidural and general anesthesia was attempted under invasive hemodynamic monitoring. General anesthesia was induced with midazolam, sufentanil, and propofol. Balanced Anesthesia was maintained with sevofluran continuous infusion of sufentanil. After placing a transesophageal echocardiography (TEE) probe, the IABP was inserted via the right femoral artery. The first TEE examination showed a severely reduced LV function (EF 30%), an akinesis of the posterior wall and an II° insufficiencies of the mitral and the tricuspid valve. With an augmentation rate of 1:1 and moderate catecholamine support, LV function and mean arterial blood pressure could be stabilized and kept in the range of ±10% of baseline values. TEE examination after 30 min of IABP augmentation showed an EF of 40% and a MI I°. The LV diastolic diameter was significantly reduced. TEE and continuous electrocardiogram monitoring revealed no signs for myocardial ischemia throughout the surgery. The intestinal tumor mass could sufficiently be removed and a primary end-to-end anastomosis of the proximal jejunum was established. After 113 min operation time, the patient could be transferred to the intensive care unit in a hemodynamic and pulmonary stable condition. To prevent thrombo-embolic complications associated to the use of an IABP, a partial thromboplastin time between 40 s and 50 s was attempted postoperatively. By achieving sufficient pulmonary gas exchange and hemodynamic stability the patient could be extubated at the same day. Under further extended invasive hemodynamic monitoring and normovolemic volume substitution, catecholamine therapy was ceased and the IABP was removed on the second postoperative day. The following postoperative course was uneventful. Myocardial markers for ischemia were not elevated and stayed within the normal range. Consistently transthoracic echocardiography revealed no further myocardial damage. The epidural catheter was removed at the third postoperative day and the patient could be transferred to the normal ward. The patient left the hospital 15 days after surgery to the associated rehabilitation center and was undergoing chemotherapy 1.5 years after discharge.

DISCUSSION

Patients with a history of MI, impaired LV function, angina or chronic heart failure are prone to

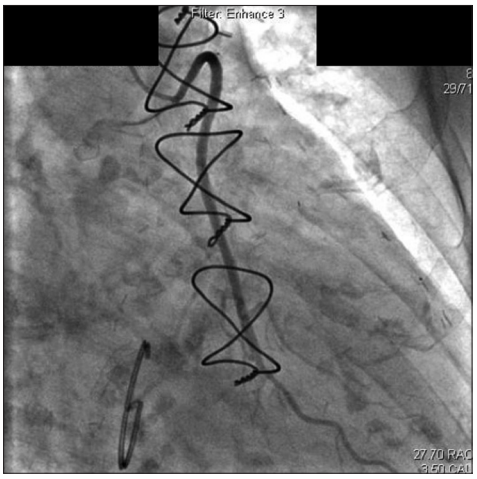

Figure 1: Left internal mammary artery to left anterior descending coronary artery bypass graft

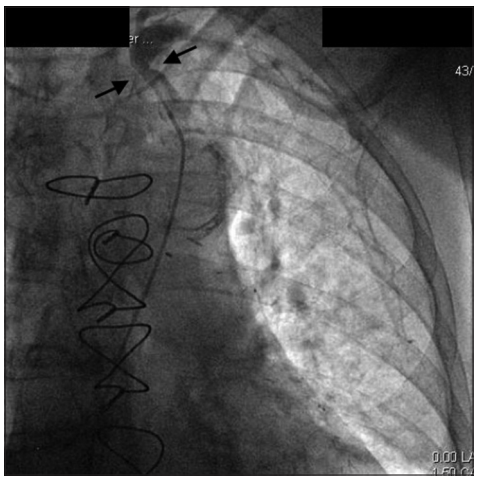

Figure 2: 70% stenosis (arrows) of the left subclavian artery proximal to the origin of the left internal mammary artery to left anterior descending bypass

perioperative cardiac events due to hemodynamic instability.[6] European and American guidelines recommend revascularization before elective surgery.[7,8] However, there are a growing number of patients that are unsuitable for prior revascularization and improvement of the cardiac status or the urgent nature of the surgery makes it impossible to postpone the procedure.

Intra-aortic balloon pump is widely used to provide hemodynamic stability in a setting of cardiogenic shock, during or after percutaneous transluminal coronary angiography or weaning from coronary artery bypass surgery.[9] In these settings, it could be shown that by augmentation of the diastolic blood flow the IABP, coronary and systemic perfusion increases and thereby stabilizes LV function and CO. Recent reports on the prophylactic use of IABP in patients undergoing urgent noncardiac surgery implicate the potential use in patients that are unsuitable for preoperative revascularization or pharmacological optimization.[4]

In the present case the patients had an unlucky constellation of intraabdominal tumor mass with an inhibited bowel passage and a severe stenosis of the left subclavian artery proximal to the LIMA, which served as bypass to the LAD. Revascularization via percutaneous coronary intervention was considered as impossible due to the difficult coronary anatomy, the urgency of surgery and the postinterventional need of dual anti platelet therapy.

Despite the favorable outcome the use of IABP devices is not without risk. Potential complications are thrombo-embolism, bleeding, balloon leakage and infection[10] and related risk factors are duration of therapy, peripheral artery disease, diabetes mellitus and female gender.[11]

At present, there are no randomized clinical studies that show an overall reduction in mortality for classical IABP indications such as cardiogenic shock, MI and percutaneous transluminal coronary angioplasty.[12] However, there are multiple nonrandomized studies that advocate the use of IABP therapy and show favorable results in cardiogenic shock.[13]

In contemporary literature there have been 15 reported cases of elective or urgent IABP insertion in a setting of noncardiac surgery.[4,13] However, to our knowledge this is the first time IABP provides hemodynamic stability and protection of myocardial tissue at risk in a patient with a compromised coronary artery bypass perfusion due to a critical stenosis in the subclavian artery.

In comprehensive view of the other case reports and the recent guidelines on the perioperative management of high risk cardiac patients undergoing noncardiac surgery,[5] its elective application should be taken into consideration especially if the patient is not suitable for revascularization, due to urgency, severe co-morbidities or a limited life expectancy.

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