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Combined association of liver and renal injury by intra-aortic balloon pump malposition

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Case Report

Abstract

BACKGROUND: We report an unusual visceral complication of intra-aortic balloon pump (IABP) due to the malpositioning of the catheter in the aorta.

CASE REPORT: A 55-year-old man with severe left ventricular dysfunction underwent coronary artery bypass grafting (CABG) with the preoperative use of an intra-aortic balloon pump. Postoperative course was complicated by renal and hepatic failure. The early occurrence of complications during 36 hours after operation exhibited a serious vascular complication. The combination of acute renal and hepatic failure led to the suspension to occlusive effect of intra-aortic balloon pump catheter on ostium of the aforementioned organs. The intra-aortic balloon pump was removed, and urine output immediately restored. Thereafter, daily slop dawn serum levels of aminotransferases were started, and became normal at the 10th day of operation.

CONCLUSION: This is an exceptional case that shows how intra-aortic balloon pump may be contributed to mechanical aortic side branches obstruction. A high index of suspension is mandatory in the diagnosis of such bizarre complications.

Keywords: Liver, Ventricular Dysfunction, Coronary Artery Bypass

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Introduction

The intra-aortic balloon pump (IABP) is a method of temporary mechanical circulatory support used in the management of candidates for cardiac surgery with following risk factors of refractory arrhythmia or angina, or congestive heart failure as the result of acute myocardial infarction or its complication (acute mitral regurgitation, post myocardial infarction ventricular septal defect), postcardiotomy stunning, or low cardiac output syndrome.[1]

We report an exceptional case of combined acute renal and hepatic injury resulting from both organ hypoperfusion caused by catheter low-lying or malpositioning of the IABP.

Case Report

A 55-year-old man, with severe left main coronary artery disease (CAD), and with short stature (150 cm height) and 76 kg weight, was referred to our center for coronary artery bypass grafting (CABG). The patient scheduled for off-pump CABG (OPCAB).

Due to unstable hemodynamic condition, an IABP catheter (Datascope, procure, state, dual lumen, 9.5F, 34 ml, Datascope Inc., Montreal, NJ, United States) was inserted percutaneously through the right femoral artery, and was attached to the Datascope system via a console. Immediately after device insertion, with a counter pulsation and 100% augmentation, and a ratio of 1:1, the systolic blood pressure increased up to 90 mmHg, and urine output increased.

The patient underwent an OPCAB operation using conventional grafts such as the left internal thoracic artery and saphenous vein grafts. Following the extubation, urine output was decreased that managed by diuretic and fluid therapy. Although, laboratory examination showed abrupt increasing of the following test: blood urea nitrogen (BUN): 70 mg/dl, creatinine (CR): 1.6 mg/dl, aspartate transaminase (AST): 80 IU, alanine aminotransferase (ALT): 70 IU, and acetate dehydrogenase (LDH): 350 IU. AST, ALT, and LDH values elevated seriously to 1200, 3500, and 5500 IU, respectively. The BUN and creatinine also increased to 80 and 2.1 mg/dl, respectively. The mean elevation of total bilirubin was also noted (total bilirubin: 2.5 mg/dl).

The distension caused the failure of Doppler to

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reveal the condition of portal and liver venous and arterial flow blood flow, but showed the reduction of renal arterial blood flow. However, in a thoracic X-ray catheter's tip was not detected, and an abdominal X-Ray showed that the balloon pump catheter's tip was displaced distally; uncovering of catheter dressing in right thigh revealed loosing of fixation suture of catheter to the skin in its correct position (Figure 1).

Figure 1. The displacement of catheter tip (black arrow)

The improper mismatching of the IABP catheter size with the patient length may be another possible cause of the liver, renal, and mesenteric arterial malperfusion in this specific case. After IABP removal, the patient urine output was abruptly increased on the following hours. Then, the liver function tests, including ALT, AST, LDH, total bilirubin, and prothrombin time continued to reduce, and recovered drastically at the 10th day of catheter removal; liver function tests returned to normal value at time of hospital discharge, too.

Discussion

The use of the larger catheter and displacement of the catheter distally by the loosening of fixation suture may lead to other unwanted complications. The sole way to avoid the visceral ischemia is proper selection of catheter size to the patient's body mass index (BMI); but catheter-induced ischemia is still considered as an important factor in premature device removal in a huge number of subjects.[2] Displacement or improper location of the IABP device, however, may result in a reduction in the visceral blood supply. These exacerbating ischemia is poorly tolerated by these critically ill patients. However, we consider the proper location of the proximal catheter tip at the lower or at the level of the aortic arch or in the lower aspect in the 2nd or 3rd intercostal space.

Sirbu et al. reported at least an important lower extremity complication in 38 of 509 patients, while visceral ischemia were reported in 4 cases.[3] In Moulopoulos et al. report, the major vascular complication of IABP was poorly tolerated in these critically ill cases with a low cardiac output syndrome, and marginal respiratory renal reserve.[4] Kantrowitz et al. reported that a mismatch between the length of the aorta and the balloon could result in visceral arterial branch obliteration and abdominal ischemia.[5] Arafa et al. showed that inferior mesenteric artery obliteration radiologically occurred in 30% of patients with the use of a large size balloon catheter.[6] Gol et al. found that senile collapse and degeneration and shortening of the vertebral body height led to the shortening of the aortic long axis, which might be an important contributor to mismatch of balloon and aorta in elderly cases.[7]

In Creswell et al. study, by autopsy of patients with cardiac surgery, IABP insertion was an important risk factor for the occurrence of fatal visceral ischemia.[8] Aside from diastolic malperfusion, plaque debris emboli due to the mechanical effects of balloon on intra-luminal atherosclerotic plaque may be related to abdominal ischemia. However, the augmentation produced by a smaller balloon is less than that provided by normal-sized balloons; but in Creswell et al. study, this difference does not seem to be clinically important. They reported that preventive measure was a reduction of IABP assisting ratio from 1:1 to 1:3. The ischemic time was reduced simply by lagging the time interval, in which the device remained in an inflated phase.[8]

Seeing the inability to insert a catheter from femoral artery due to obstruction of aorto-iliac vessel, or to avoid complication related to balloon, it could be possible to insert the balloon surgically from ascending aorta proximally into the aortic arch. However, Creswell et al.[8] believed that this solution would be an undesirable alternative method in critically ill patients. No alternative way is presented for IABP insertion, because this approach may be associated with compromising of aortic arch vessels flow or aortic plaque embolization into cerebral arteries.

In Urban et al. study, by autopsy of patients with cardiac surgery, IABP insertion was an important risk factor for the occurrence of fatal visceral

ischemia.[9] Aside from diastolic malperfusion, plaque debris immobile due to the mechanical effects of balloon on intra-luminal atherosclerotic plaque may be related to abdominal ischemia.[10]

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Conflict of Interests

Authors have no conflict of interests.

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