Case report

Acute ischemic hepatic failure resulting from intraaortic balloon pump malposition

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Abstract

We describe a rare intraaortic balloon pump (IABP) vascular complication as a result of malpositioning of the IABP. A 61-year-old man with unstable angina underwent emergency coronary artery bypass grafting soon after the insertion of an IABP. Postoperative hemodynamics were stable, but acute hepatic dysfunction occurred on the second postoperative day. Doppler echography revealed the absence of hepatic arterial flow. The IABP was removed, and arterial flow was immediately restored. Thereafter, the hepatic function recovered rapidly. This is a rare case that demonstrates how IABP can cause mechanical abdominal arterial branch obstruction. Evaluations using Doppler echography are useful in detecting such IABP complications.

Keywords: Intraaortic balloon pump; Acute hepatic failure; Doppler echography

1. Introduction

The intraaortic balloon pump (IABP) is widely accepted as a convenient, effective mechanical circulatory assist method for management of unstable angina, cardiac failure following acute myocardial infarction, or postoperative low-output syndrome. Naturally, as clinical experience with the IABP increased and the quality of IABP catheters improved, IABP-related vascular complication rate decreased. However, the rate remains considerably high. We report a rare case of acute hepatic damage resulting from hepatic malperfusion caused by malpositioning of the IABP.

2. Case report

A 61-year-old man, 170 cm tall and weighing 64 kg, was admitted to our hospital on October 11, 1998 due to unstable angina. Coronary angiography performed soon after admission revealed severe triple-vessel disease with a 90% stenosis of the left main coronary artery. The patient became hypotensive during the angiography, and a common IABP catheter was inserted percutaneously using the sheathless technique while in the catheter laboratory. Systemic blood pressure increased above 100 mmHg soon after insertion of the catheter. The patient was transferred directly to the operating room, and a conventional coronary artery bypass graft operation was performed using the left internal thoracic artery and the reversed saphenous vein. The patient was weaned from the cardiopulmonary bypass easily with the assistance of IABP.

The general postoperative condition was stable and there were no findings of perioperative myocardial infarction. Hemodynamics were satisfactory, and the cardiac index was maintained at 3.0 l/min per m² or above. The IABP assist ratio was 1:1 on the 1st postoperative day (POD) and decreased to 3:1 on the 2nd POD without hemodynamic deterioration. Although all hepatic enzyme values, including LDH, GOT, and GPT, were reasonable on the 1st POD (LDH: 370, GOT: 67, GPT: 19 IU), on the 2nd POD, LDH, GOT, and GPT values increased drastically to 9650, 8160, and 6640 IU, respectively. Initially, the cause of the acute hepatic damage could not be found, and the only possibility appeared to be abrupt hepatic malperfusion. Doppler echography was performed in order to evaluate the hepatic blood flow. The examination revealed the presence of portal and hepatic venous flow but failed to detect hepatic arterial flow. At this time, arterial pulsation on the lower limbs was good and embolic spots were not observed. There were no abnormal abdominal findings, and diuresis was regular. However, an X-ray revealed the distal tip of the IABP catheter to be located distally, indicating improper positioning of the IABP catheter.
IABP catheter and a possible cause of the hepatic arterial malperfusion; thus the catheter was removed (Fig. 1). Restoration of hepatic arterial flow was detected on a Doppler echogram immediately after the removal of the catheter. (Fig. 2). Hemodynamics continued to be stable, even after the removal of the catheter, and the patient was extubated on the following day. Thereafter, the hepatic function, including serum bilirubin and prothrombin time, recovered dramatically, and hepatic enzyme values returned to normal prior to hospital discharge. Postoperative coronary angiography performed on the 23rd POD revealed all the bypass grafts to be widely patent and left ventricular ejection fraction to be 64%. The patient was discharged from the hospital in good condition and his hepatic function has remained good.

3. Comments

The IABP is a widely accepted and beneficial mechanical circulatory support for serious coronary artery disease or perioperative cardiac failure. However, the incidence of IABP-related complications, particularly vascular complications, is still quite high. The overall incidence reported in the literature ranges from 11 to 29% [1–4]. Vascular complications include false aneurysm at the site of catheter insertion, catheterized limb ischemia, ilioaortic dissection, arterial perforation, and renal or abdominal organ ischemia. Abdominal organ ischemia evokes small bowel infarction, splenic infarction, or hepatic damage. Possible causes of abdominal organ ischemia include thromboembolism, aortic dissection, and mechanical abdominal arterial branch obstruction by the balloon itself.

Since malpositioning of the balloon may result in arterial branch obstruction, proper placement of the catheter is essential in order to avoid this complication. Moreover, if the patient is small in stature, obstruction may occur even if the balloon positioned properly. Yosioka and colleagues have reported that mismatches between the length of the thoracic aorta and the balloon length can cause abdominal arterial branch obstruction [5]. IABP catheters having shorter balloons are now being widely used in short patients throughout Japan. Whether the assistance provided by a short balloon is equal to that provided by conventional-sized balloons is a concern, but in our experience, the difference does not appear to be considerable.

Once a disruption of abdominal organ blood flow is recognized, the restoration of blood flow must be attempted. If the
position of the balloon is improper, repositioning of the balloon under sterile conditions is one option. Alternatively, the IABP assist ratio may be reduced in order to extend the period over which the balloon is deflated. Itoh and colleagues have reported a case in which a malpositioned IABP catheter induced ischemic damage in the liver and kidney. The situation was improved by reducing the IABP assist ratio from 1:1 to 2:1 in order to extend the period over which the balloon was in the deflated condition [6]. In the present case, the IABP assist ratio had already been reduced to 3:1 when the obstructed hepatic arterial blood flow was detected. Thus, the IABP balloon must have been in contact with the aortic wall and occluding the artery even while the balloon was in the deflated condition.

In conclusion, IABP balloons can mechanically obstruct abdominal arterial branches if the balloon is improperly positioned or is too long for the patient’s body size. Doppler echography is a useful technique for detecting and avoiding this type of vascular complication.

References