

Early Postoperative Bacteremia Following Cardiac Surgery After Recent Surgery for Colon Cancer

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DURING CARDIAC SURGERY with cardiopulmonary bypass (CPB), a systemic inflammatory response is triggered, which is related to postoperative organ dysfunction, coagulation disorders, and an impaired immunity against infections and malignancies.¹⁻³ In this report, the authors present a patient who underwent cardiac surgery with CPB shortly after she was surgically treated for a malignant tumor of the gastrointestinal tract.

CASE REPORT

A 66-year-old woman, with no known medical history, was admitted to another hospital with acute abdominal complaints. She was diagnosed as having an ileus caused by a tumor in the transverse colon. The same day, she underwent a laparotomy, including hemicolectomy with ileotransversostomy. Because of the postoperative development of angina pectoris that did not sufficiently diminish with medical treatment, the patient was transferred to this hospital the next day (day 1). On arrival, coronary angiography was performed, which showed a significant left mainstem stenosis and several stenoses of the ramus interventricularis anterior artery (left anterior descending). Because of sustained angina pectoris, an intra-aortic balloon pump was inserted, and she was scheduled for coronary artery bypass graft (CABG) surgery. Cardiac surgery was canceled because the pathologic-anatomic examination of the resected tumor revealed adenocarcinoma of the transverse colon with one lymph node positive for malignancy (Dukes C adenocarcinoma). Percutaneous transluminal coronary angioplasty was performed on day 4, including implantation of four stents, and the patient was transferred back to the first hospital.

Because of the recurrence of angina pectoris, the patient was treated with heparin and nitroglycerin intravenously and metoprolol, acetylsalicylic acid, and ticlopidine orally. On day 9, a cardiac murmur, suggestive of mitral valve leakage, was diagnosed, which was confirmed by transthoracic echocardiography. During extended medical treatment with optimal anticoagulation, the patient developed congestive heart failure. Abdominal echography showed no indication of metastases. The patient was once more scheduled for CABG surgery but without the use of cardiopulmonary bypass (CPB) (Octopus procedure).⁴

On day 10, the patient was transferred to this hospital because of cardiogenic shock, including low blood pressure, tachycar-

dia, anuria, and pulmonary edema. A newly planned coronary angiography scan was canceled, and the patient underwent emergency surgery. After induction of anesthesia, transesophageal echocardiography was performed, which showed good left ventricular function with a small basal aneurysm and mitral regurgitation (degree II-III/IV). These findings rendered surgery with the Octopus (Medtronic Corp, Minneapolis, MN) method impossible, resulting in CABG surgery with CPB, including four venous anastomoses and a mitral valvuloplasty including a Carpentier-Edwards ring.

Postoperatively the patient was in poor hemodynamic condition necessitating considerable inotropic support and the use of an intra-aortic balloon pump. The second day after the operation, the patient developed a high fever with signs of inflammation with a white blood cell count of $12 \times 10^9/L$ and a C-reactive protein of 340 mg/L. Routine antibiotic prophylactic coverage consisted of cefamandole, 1,000 mg every day over 48 hours. Cultures were taken from blood samples, and all central venous as well as intra-arterial catheters were replaced. All cultures tested positive for *Enterococcus faecalis*. The patient was treated with piperacillin and tazobactam, which was later changed to vancomycin because of the recurrence of elevated infection signs and the bacterial resistance pattern. From the 5th day postoperatively, temperature and infection signs normalized, and inotropic support could be reduced. Because of difficulties in weaning from mechanical ventilation, mainly resulting from muscle weakness, a tracheotomy was performed. One month after cardiac surgery, mechanical ventilation could be terminated. Two days later, the patient was discharged from the intensive care unit, and 2 months after the first admission, the patient went home in a relatively good condition (Fig 1).

DISCUSSION

It is assumed that during CPB, hypoperfusion of the splanchnic circulation exists, which may lead to a loss of intestinal barrier function and an increased permeability allowing translocation of endotoxins and bacteria to the systemic circulation.^{6,7} Lipopolysaccharides associated with cell membranes of gram-negative microorganisms have been measured in elevated concentrations in plasma during CPB.² Endotoxins in the systemic circulation stimulate the host to produce inflammatory mediators causing a systemic inflammatory response with increased capillary permeability and accumulation of intestinal fluid, organ dysfunction, bleeding diathesis, neurologic changes, fever, leukocytosis, and a suppressed immunity against infections and tumor growth.^{2,6-9}

During CPB, the systemic inflammatory response, which is the product of a complex interplay of humoral and cellular components, can also be initiated in other ways.³ Contact of blood with the foreign surface of the extracorporeal circuit leads to activation of complement, coagulation, kallikrein, and fibrinolytic cascades.^{1,3} Ischemia and reperfusion injury can result in activation of neutrophils with degranulation and protease en-

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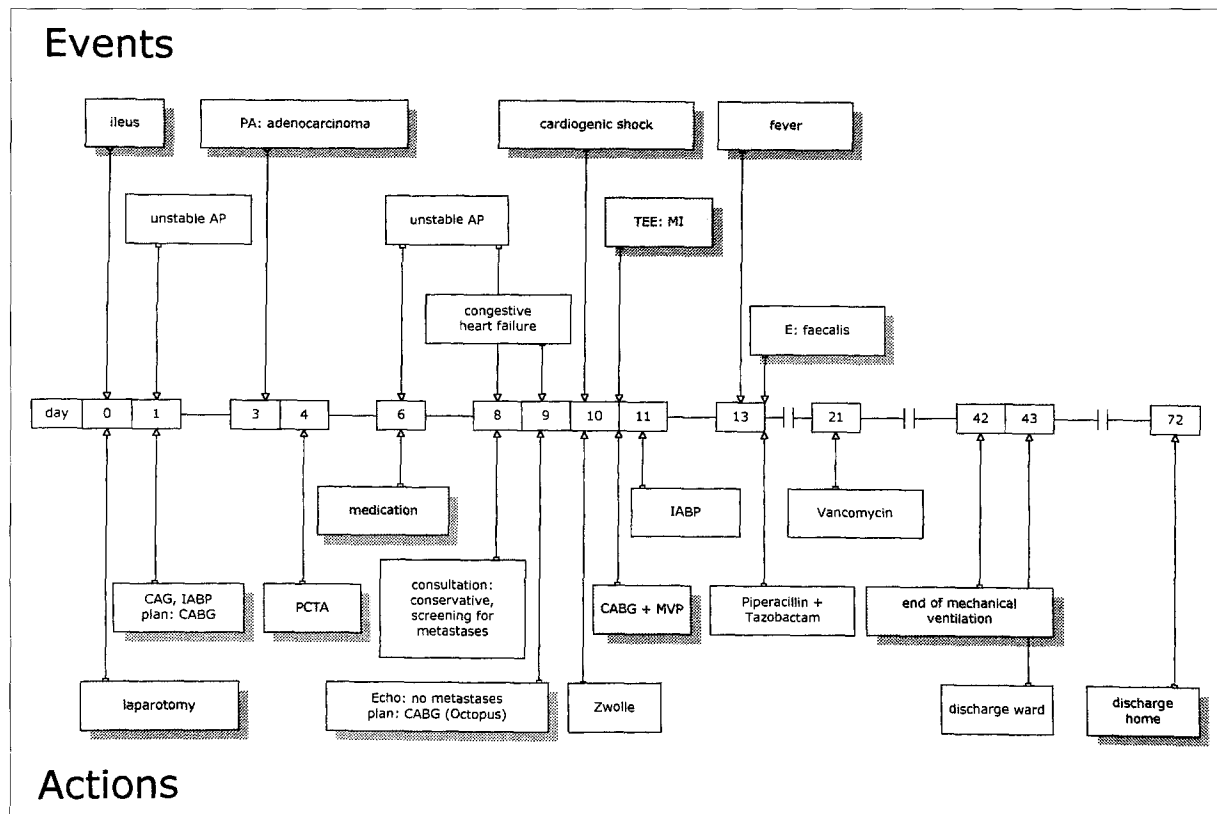


Fig 1. Time scale of events and actions. Abbreviations: AP, angina pectoris; CAG, coronary angiography; IABP, intra-aortic balloon pump; CABG, coronary artery bypass graft; PA, pathologic anatomic examination; PTCA, percutaneous transluminal coronary angioplasty; TEE, transesophageal echocardiography; MI, mitral valve insufficiency; MVP, mitral valvuloplasty; *E. faecalis*, *Enterococcus faecalis*.

zyme release, oxygen radical production, and synthesis of various cytokines from mononuclear cells (including tumor necrosis factor, interleukin-1, and interleukin-6).^{1,5}

Usually the clinical manifestation of a systemic inflammatory response is mild. Postoperatively, the patient in this case developed a septic syndrome with fever and hemodynamic instability, including bacteremia with *E. faecalis*, a gut-derived microorganism. Bacteremia is a rare complication immediately after cardiac surgery.¹⁰ There are several explanations, including the poor hemodynamic condition preoperatively with a jeopardized splanchnic perfusion, resulting in a compromised mucosal integrity to permit bacterial translocation; the possible presence of bacteria in the circulation already after the first operation, with faster multiplication because of the diminished immunologic defense; and the patient's diminished immunologic defense caused by malignancy.¹¹

The traditional treatment of choice of unstable angina pectoris consists of cardiac surgery with the use of CPB,¹² but this was considered undesirable because of the recent operation for malignancy. The alternative procedure (percutaneous transluminal coronary angioplasty), however, proved to be insufficient. The next option was to perform a so-called Octopus procedure.⁴ This procedure includes sternotomy and the use of a special device (Octopus) to restrain the site of the anastomosis on the beating heart to enable CABG surgery without the use of

CPB. This procedure, which has the advantage of not inducing a severe systemic inflammatory response, can be applied especially in patients with additional risk factors, as in the case of this patient.^{13,14} Because a serious mitral valve regurgitation with detrimental hemodynamic consequences was diagnosed, however, valvular surgery with CPB was inevitable.

Several options are described to reduce the inflammatory response during CPB. Corticosteroids may be administered before the start of surgery,^{3,5,15,16} as was the case in this patient. In the possible presence of a malignancy, corticosteroids may be disadvantageous with respect to their influence on cellular immunity. The activation of blood components can be reduced by using heparin-coated circuits,¹⁷ by using pulsatile flow during perfusion,⁸ and by cooling.² The prophylactic use of antibiotics and selective bowel decontamination could also have a positive effect by reducing the amount of intraluminal bacteria and endotoxins in the gut.⁸ Many of these measures could not be taken in time in this patient because of the life-threatening condition leading to emergency surgery.

In conclusion, this case report describes the sequelae of emergency cardiac surgery with the use of CPB in a patient with recent abdominal surgery because of an intestinal malignancy. Immediate postoperative onset of bacteremia and sepsis caused serious hemodynamic and respiratory failure and a prolonged hospital stay.

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