



Acute Mesenteric Ischemia after Coronary Artery Bypass Grafting

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Acute mesenteric ischemia is a rare but severe complication after open heart surgery. Its incidence is quite low, but the mortality rate is reported to be tremendously high. This study reported a 63-year-old male who underwent coronary artery bypass grafting due to three-vessel coronary artery disease and non-ST segment elevation myocardial infarction. The operation of coronary artery bypass grafting was performed smoothly without immediate complication. On postoperative day 2, acute abdominal pain developed and acute mesenteric ischemia was considered via physical examination and computerized tomographic scan. An exploratory laparotomy revealed segmental necrosis of jejunum and bowel resection followed by end-to-end anastomosis was performed. This patient had an uneventful recovery and was discharged under a good functional status.

Key words: acute mesenteric ischemia; acute abdomen; coronary artery bypass grafting

INTRODUCTION

Gastrointestinal complications following cardiac surgery with cardiopulmonary bypass are rare events with an incidence of 0.6 to 2%; however, they are important causes of significant morbidity and subsequent mortality.¹ Prediction of abdominal complications is impossible; hence, early diagnosis and therapeutic intervention are keys to lower mortality. This is case report of ischemic bowel disease following coronary artery bypass grafting that was successfully treated by surgical intervention.

CASE REPORT

A 63-year-old male with a history of adenocarcinoma of lung was evaluated for chest tightness and exertional dyspnea for 3 months. He has undergone four courses of chemotherapy to treat lung malignancy and has been taking medication to control hypertension for years. He had no previous history of diabetes mellitus and his renal

function was normal. The coronary angiography revealed coronary artery disease involving three vessels. He was referred for coronary artery bypass grafting due to unfavorable coronary lesions for percutaneous coronary intervention. The preoperative Doppler's scan of carotid artery revealed atheroma formation without significant stenotic lesion and the segmental blood pressure examination of bilateral low limbs demonstrated normal perfusion pressure with an ankle-brachial index around 1.0. Coronary artery bypass grafting was performed using cardiopulmonary bypass with cardioplegic arrest. The left internal mammary artery was anastomosed to left anterior descending coronary artery and saphenous vein grafts were anastomosed to right coronary artery and left circumflex coronary artery. The pump flow was about 3.8 L/min and the mean blood pressure was maintained around 60-70 mmHg without vasopressor infusion during cardiopulmonary bypass. The whole procedure was completed smoothly without events. No intra-aortic balloon pumping was necessary after the procedure.

Postoperatively, the hemodynamic situation became stable under minor positive inotropic support using dopamine with the dose around 5 μ g/kg/min. On postoperative day 1, atrial fibrillation with rapid ventricular heart rate was noted; continuous amiodarone infusion was done for conversion to sinus rhythm. On postoperative day 2, the patient developed diffuse and progressive abdominal pain associated with poor NG feeding condition. Arterial blood gas analysis showed respiratory alkalosis with lactate level elevated to 3.4 mmol/L. Physical ex-

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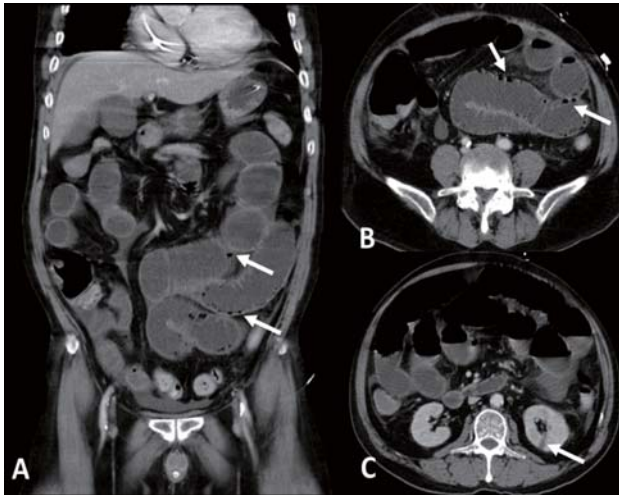


Fig. 1 (A) Coronal and (B) sagittal views of contrast-enhanced computed tomography of abdomen demonstrated long segmental dilated small bowel loops with pneumatosis intestinalis (white arrows). (C) A wedge-shaped area with poor enhancement over lower pole of left kidney (white arrow) was noted.

amination demonstrated diffuse abdominal tenderness and decreased bowel sounds. Computerized tomographic scan with contrast of abdomen showed long segmental dilated small bowel loops with pneumatosis intestinalis, (Fig. 1A, 1B). Accumulation of some fluids in the mesenteric leaf and wall thickening near the right lower abdomen were also revealed. Although atherosclerotic plaques were noted over the abdominal aorta, the visceral arteries appeared patent having a wedge-shaped area with poor enhancement over lower pole of left kidney. (Fig. 1C) No significant stenotic lesion over the orifices of celiac trunk, superior and inferior mesenteric arteries. Under the impression of acute mesenteric ischemia, immediate exploratory laparotomy was performed to verify the diagnosis. During laparotomy, turbid ascites of about 300 ml was noted. There was a segmental ischemic change measuring about 200 cm in length of jejunum, started 50 cm from the ileocecal valve. (Fig. 2) Bowel resection and end-to-end anastomosis were performed after decompression of intestine. The remnant bowel was about 100 cm in length. Marked transmural necrosis with cellular debris was reported in the resected specimen, which was compatible with ischemic bowel disease.

The patient was monitored in intensive care units after exploratory laparotomy and recovered smoothly postoperatively. The feeding condition improves gradually without symptoms or signs related to short bowel syndrome. Then, he was discharged from hospital unevent-



Figure 2. A segmental ischemic change over jejunum, about 200 cm in length was noted during exploratory laparotomy.

fully under satisfactory functional status.

DISCUSSION

Acute mesenteric ischemia represents 5 to 27% of gastrointestinal complications after cardiac surgery and has a mortality rate of 30 to 93%.^{1,2} Risk factors for such complications after cardiac surgery may include perioperative hypotension, hypovolemia, prolonged cardiopulmonary bypass, use of vasoconstrictor inotropic agents, postoperative arrhythmia, hemorrhage, low cardiac output and pre-existing vascular disease that all combine to result in mucosal injury and subsequent bowel damage.² Other factors such as advanced age, sepsis, renal failure and emergent surgery are also relevant.³ About a quarter of acute mesenteric ischemias are of nonocclusive origin resulting from splanchnic hypoperfusion and vasospasm while others are caused by stenotic atherosclerosis and embolization.¹ However, even in cases of splanchnic vasospasm without occlusion of major intestinal vessels, the mortality is still high.⁴⁻⁶ A high index of suspicion for mesenteric ischemia after cardiopulmonary bypass in patients with identified risk factors may decrease the diagnostic delay and lead to an improvement in mortality rate. Ileus, abdominal distention, tenderness, poor feeding tolerance, unexplained metabolic acidosis and azotemia should lead to prompt investigation for intra-abdominal complication.

Cardiopulmonary bypass (CPB) has long been recog-

nized as one of the major causes of the systemic inflammatory response, which may contribute to postoperative complications and multiple organ dysfunction. Several studies have suggested prolonged use of cardiopulmonary bypass (CPB) as a risk factor for the development of gastrointestinal complications.⁷ Bacterial overgrowth, mucosal atrophy, loss of barrier function, and bacterial translocation are reported to occur due to intestinal changes following CPB. In the present era, off-pump coronary artery bypass grafting (CABG) is now increasingly being used as an alternative to conventional coronary revascularization with CPB in selected patients but it does not reduce gastrointestinal complications from previously published data.⁸ Moreover, the use of intraaortic balloon pumping (IABP) may also result in acute mesenteric ischemia due to atheroemboli formation.⁹

Among these intraabdominal complications after cardiac surgery, mesenteric ischemia carries the highest mortality rate.^{2,10} Many patients undergoing cardiac surgery are sedated and on ventilators which may mask symptoms and signs of this abdominal catastrophe. Although laboratory tests, such as lactate level, may be helpful for detecting abdominal emergency, the importance of physical examination is never overstressed. Since precise timing of the first manifestation of the ischemic event is unpredictable, close monitoring of high-risk patients is necessary. Irreversible intestinal necrosis will develop after intestinal ischemia of more than 2 to 3 hours, death could be predicted in such a critical situation without immediate management.¹¹ Early recognition and intervention are crucial to improve outcomes.¹²⁻¹⁴ Mesenteric angiography and mesenteric infusion with vasodilator have been suggested and may be helpful in some patients,¹⁵ but it should not be allowed to delay prompt surgical intervention when indicated. The emphasis is that abdominal surgery should not be avoided only because the patient has undergone a recent cardiac surgery. There is no doubt that cardiac performance needs to be taken into consideration, but many patients have improved cardiac function compared with their condition prior to the open heart surgery and should be able to tolerate general anesthesia and most surgical procedures. In this report as well as those of other series,¹⁰ early appropriate surgery in acute mesenteric ischemia can result in optimal outcomes.

In the present case, distal embolization resulted from atrial fibrillation can be the possible reason because of ischemic signs over small bowel and left kidney with patent visceral arteries. Postoperative atrial fibrillation (POAF) is the most common arrhythmia after cardiac

surgery. The prevalence of POAF varies from 30% after isolated coronary artery bypass surgery (CABG) to 40% after valve surgery and 50% after combined CABG and valve surgery.¹⁶ The hazard effects of POAF are prolonged hospital stay and higher incidence of ischemic complications. A recent study of 16,169 patients undergoing isolated coronary artery bypass surgery showed that new-onset atrial fibrillation (AF) independently predicted mortality during a mean follow-up period of 6 years.¹⁷ The therapeutic goals in the treatment of POAF include prevention of thromboembolism, control of ventricular rate, as well as conversion and maintenance of sinus rhythm. Both pharmacological and electrical cardioversions are associated with the risk of thromboembolism. The transesophageal echocardiography is considered an important modality in the postoperative period to exclude mural thrombus, particularly in the left atrial appendage. The patient should be placed on heparin immediately, and anticoagulants should be administered for at least 3 to 4 weeks after successful cardioversion of POAF to sinus rhythm.¹⁶ However, the clinician must weigh the benefits of anticoagulation against the risk of increased bleeding and monitor the therapeutic efficacy closely.

In conclusion, this report aims to raise the early awareness of the uncommon but life-threatening acute mesenteric ischemia after cardiac surgery. Rapid recognition, early diagnosis and timely exploration are mandatory to save patients in this dangerous scenario. A close cooperation between cardiac and general surgeons is of critical importance for a successful management of serious abdominal complications such as acute mesenteric ischemia after cardiac surgery.

DISCLOSURE

All authors declare no competing financial interests.

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