Spontaneous Coronary Artery Rupture Causing Acute Cardiac Tamponade and Cardiogenic Shock

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Summary
Spontaneous coronary artery rupture (SCAR) is an extremely rare, life-threatening entity without any previous underlying diseases. The clinical presentation may differ according to the site of the rupture and some patients may deteriorate early into sudden death due to the abrupt evolution of the associated cardiac tamponade and cardiogenic shock.1 The correct diagnosis of SCAR deserves a high level of suspicion. It may be confirmed as a differential diagnosis in patients with cardiac tamponade using transthoracic echocardiography (TTE) and computed tomography angiography (CTA) following emergency pericardiocentesis, and a definite diagnosis can be achieved by selective angiography. Although SCAR is associated with a dismal prognosis, some patients have recovered through emergency surgical operations or catheter interventions.2 We report the case of a patient presenting cardiac tamponade and cardiogenic shock due to spontaneous rupture of the circumflex branch of the left coronary artery, which was successfully isolated by bilateral ligation.

Key words: Spontaneous Rupture, Coronary Disease, Left Coronary Artery, Surgery

Case Report
A 58-year-old man presented to our emergency department one hour after the onset of apsychia while taking a bath. His previous medical history only included a video-assisted left upper lobectomy for primary lung adenocarcinoma 3 months previously. He had no history of coronary artery disease or traditional risk factors. Alert on arrival, the patient appeared to be very uncomfortable and hemodynamically unstable with hypotension, tachycardia, dyspnea and cyanosis. Vital signs revealed a blood pressure of 60/30 mm Hg, pulse of 132 beats per minute, temperature of 36.2°C, and respiratory rate of 32 breaths per minute. Cardiovascular examination showed mild jugular venous distention, distant heart sounds with no murmurs, and an impalpable apical impulse. Pulmonary examination was unremarkable with clear breath sounds on auscultation bilaterally. Laboratory tests revealed a hemoglobin value of 17.7 g/dL, leukocytes of 14.7 × 10⁹/L, and platelets of 200.0 × 10⁹/L. Prothrombin time was 13.5 seconds (9.8-12.5 seconds) with an INR of 1.22 (0.84-1.19). N-terminal pro b-type natriuretic peptide and cardiac enzymes were normal. Arterial blood gas analysis showed a pH of 6.95, Paco2 of 82.0 mm Hg, and Pao2 of 13.9 mm Hg on room air. An electrocardiogram revealed sinus tachycardia with a rate of 120 beats per minute without signs of acute myocardial ischemia. A bedside TTE demonstrated cardiac tamponade with pericardial effusion of 10 mm anteriorly and 15 mm posteriorly compressing the atrium and ventricle. A chest CTA showed no dissection or aneurysm of the aorta or pulmonary thromboembolism (Figure 1A, B), but moderate pericardial effusion (Figure 1C, D). Emergency pericardiocentesis was initiated to drain 300 mL of bloody fluid and the circulation adjusted to acceptable levels, but soon after hemodynamic deterioration with hypotension (83/53 mmHg) occurred again in the emergency room so coronary angiography could not be performed. He underwent an emergency median sternotomy, and on opening the pericardium approximately 400 mL of fresh dark blood was evacuated. An intraoperative inspection revealed an isolated rupture in the circumflex branch of the left coronary artery with continuous spurting of blood (Figure 2A), confirming the diagnosis of SCAR. The coronary rupture was 0.4 mm in size

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with a ragged edge, which was successfully isolated by bilateral ligation with satisfactory hemostasis (Figure 2B); no coronary artery bypass grafting was performed because of his unstable condition. The patient was transferred to the intensive care unit without pericardial bleeding and myocardial ischemia, but he suffered low cardiac output syndrome and acute renal failure, and despite all resuscitative efforts, he died on postoperative day 2.

Discussion

SCAR is an extremely rare, life-threatening entity which is characterized by the rupture of a normal coronary artery without any previous underlying diseases or other causes, such as aneurysm, dissection, Kawasaki's disease, localized infection, percutaneous coronary intervention, and trauma.4–6 For our patient, his previous medical and family history revealed no hereditary disorder, such as Ehlers-Danlos syndrome, traumatic injury, hypertension, or atherosclerotic disease. Furthermore, a chest CT performed 3 months previously, soon after the previous lung cancer surgery, revealed no pericardial effusion or hematoma. Intraoperative findings indicated no localized infection. Thus, he had no history of anomaly, localized infection, coronary artery dissection, or trauma, whose etiologies have been suggested for coronary artery rupture. In the majority of reported cases of SCAR, the patient presented with clinical symptoms suggestive of acute coronary syndrome, acute aortic dissection, or pericardial tamponade. The clinical presentation may differ according to the site of the rupture. Rupture of the left and distal right coronary arteries commonly manifests as intrapericardial bleeding leading to pericardial tamponade and cardiogenic shock like this case, which may give rise to hypotension, tachycardia, dysorphic, an altered level of consciousness, and sudden death, while proximal right coronary artery rupture usually presents with a subepicardial hematoma, rather than pericardial hemorrhage.2,5,6

The correct diagnosis deserves a high level of suspicion. Chest X-rays, CT scans of the chest, ECGs, echocardiograms, and cardiac enzymes were the most commonly used investigations for the diagnosis. In less than one-third of reported cases there were some ECG abnormalities and positive cardiac biomarkers, but invariably in all case reports the patients were diagnosed to have large pericardial effusion or subepicardial hematoma. TTE and chest CTA play a crucial role in the diagnosis of SCAR. It may be confirmed in patients with cardiac tamponade using TTE following emergency pericardiocentesis. At the same time, aortic dissection and other cardiovascular ruptures are denied by the chest CTA like this case.2,5,6 But frequently it may be missed because the time window of its evolution seems to be very short or signs of acute coronary syndrome sometimes can happen, leading to delays in diagnosis or to misdiagnosis. A definite diagnosis of SCAR could be made by selective coronary angiography, but it could not be conducted because of an unstable condition.

Figure 1. A 58-year-old male with hypotension, tachycardia, dyspnea and cyanosis. A–D: Computed tomography angiography images. Computed tomography axial view angiography images showing no dissection or aneurysm of the aorta or pulmonary thromboembolism (A, B) and showing an apparent pericardial effusion at the apex and base of heart (C, D).
hemodynamic condition and was diagnosed intraoperatively like our patient.2

Treatment for SCAR depends on a variety of factors, such as the location and severity of the bleeding, and the age and condition of the patient. If coronary angiography is performed and the bleeding source identified, the coronary vessel might be treated by a stent.8,10 However, as a result of the acute and often dramatic nature of cardiac tamponade and cardiogenic shock that are usually present, coronary angiography could not be conducted, so timely recognition of SCAR should depend on TTE and chest CTA and prompt surgical intervention is therefore warranted in most patients. Surgical treatment options include ligating the coronary artery with subsequent bypass grafting, primary suture repair and venous patch repair. Rupture of the distal coronary artery and its branches might be treated by ligation of the coronary artery, but for one of the proximal and main coronary arteries, isolation of the coronary artery with subsequent distal revascularization is appropriate. If it is impossible to identify the coronary artery with bleeding, it can be covered with pericardium and glue can also be used to reinforce the patch over the defect.8,11,12 Although SCAR is associated with a dismal prognosis, most patients recover without complications by emergency surgery or catheter interventions for SCAR.8 For our patient, the circulation adjusted to acceptable levels and the condition became stable by pericardiocentesis, but soon afterwards hemodynamic deterioration with hypotension occurred again in the emergency room and cardiac resuscitation was performed before operation. Although the patient had no pericardial bleeding or myocardial ischemia after surgery, he still suffered from low cardiac output syndrome and acute renal failure, which were the main causes of his death.

Conclusions

SCAR may be confirmed in patients with acute cardiac tamponade and cardiogenic shock without obvious underlying pathology detectable on TTE and/or chest CTA. If coronary angiography is performed and the bleeding source is identified, the coronary vessel might be treated by a stent, but the acute and usually dramatic nature with cardiac tamponade and cardiogenic shock necessitates immediate pericardial drainage and prompt surgical intervention. Surgical treatment would obtain satisfactory hemostasis and prevent a fatal outcome.

Disclosures

Conflicts of interest: None.

References