Case report

Diffuse coronary artery spasm treated by extracorporeal membrane oxygenation

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Abstract

Diffuse coronary vasospasm is an unpredictable and serious complication following coronary artery bypass surgery. The treatment of this emergency is dependent on patient suitability for angiography and direct injection of vasodilators into the affected vessels. In patients unable to proceed to angiography the diagnosis can only be suspected but treatment is nevertheless still towards reinstitution of coronary blood flow. We present one such case in which re-grafting and extracorporeal membranous oxygenation proved successful in restoring cardiac function in a patient with diffuse coronary artery spasm.

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Keywords: Extracorporeal membrane oxygenation; Coronary artery spasm; Bypass

1. Introduction

Diffuse coronary vasospasm is an unpredictable and serious complication following coronary artery bypass surgery [1,2]. Clinical suspicion of this disorder is necessary to allow rapid treatment. We report here a case of diffuse coronary artery spasm that proceeded rapidly to sustained cardiac arrest. Furthermore, we demonstrate the effectiveness of re-grafting and extracorporeal membrane oxygenation (ECMO) for managing this emergency.

2. Case report

A 43-year-old female presented with a one-month history of increasing angina; at least five episodes per day with minimal exertion. Angiography revealed isolated 60% stenosis of the left main coronary artery (LMCA) and normal left ventricular systolic function. It was noted preoperatively that her cardiac symptoms were disproportionate relative to the angiographic findings. Her angina persisted despite maximal anti-anginal therapy with nitrates, a beta-blocker and low molecular weight heparin. Transthoracic echocardiogram showed normal left ventricular function. Stress electrocardiography was strongly positive.

The patient underwent coronary artery grafting of the left internal thoracic artery (LITA) to the left anterior descending (LAD) and the radial artery (RA) to the first obtuse marginal artery (OM1). The operation was routine, the RA was small (1.5 mm) but non-calcified and with good flow. The LITA was of good calibre (2 mm) and good flow. The LAD and OM1 were both 1.5 mm vessels.

Routine preparation of the conduits involved harvesting the arterial conduit as a pedicle, followed by intra-luminal injection of a blood/papaverine mixture and incubation in this same mixture at room temperature prior to grafting. The cardiopulmonary bypass time was 84 min and the cross-clamp time was 65 min.

After coronary grafting the cardiopulmonary bypass was discontinued with the patient in sinus rhythm without inotropic support. Routine glyceryl trinitrate infusion (100 mcg/min) was commenced prior to discontinuation of cardiopulmonary bypass and this was continued postoperatively. The patient returned to the intensive care unit (ICU) with a cardiac index of 2.1 L/m² and transoesophageal echocardiography (TOE) confirming good left and right ventricular function.

One hour after transfer to the ICU the patient developed sudden global ischaemia on electrocardiogram, hypotension, bradycardia and pulseless ventricular tachycardia. Cardiopulmonary resuscitation including resternotomy was performed at the bedside in ICU to provide internal cardiac massage and alleviate a potential tamponade. No tamponade was evident. The patient was transferred to theatre and cardiopulmonary bypass re-established.

On visual inspection the grafts were found to be functioning with good flow. Because diffuse coronary artery spasm was suspected, saphenous venous grafts (SVG) to the diagonal artery (DA) and a second obtuse...
marginal artery (OM2) were performed. However, weaning from cardiopulmonary bypass was unsuccessful and therefore extracorporeal membrane oxygenation (ECMO) was established.

After 48 h TOE confirmed significant improvement of left ventricular function with a left ventricular ejection fraction (LVEF) of more than 40% with no segmental wall abnormality. Successful weaning from ECMO was achieved at this point and the patient discharged to the ward after one week with no further complications.

3. Discussion

Several potential causes of postoperative coronary artery spasm have previously been described including direct manipulation of the epicardial vessels, release of inflammatory mediators during surgery, and withdrawal of intraoperative vasodilators in the early postoperative period [1]. Coronary artery spasm is also reported to be more common in females [2] and in the presence of single vessel disease of the left main stem [2].

Several treatment options for diffuse coronary artery spasm have been reported in case reports [1—4]. The reported treatments vary depending on the stability of the patient. Unstable patients warrant aggressive cardiopulmonary resuscitation. In haemodynamically stable patients, successful treatment of coronary artery spasm can be managed with angiography to diagnose vasospasm and to facilitate the injection of vasodilators directly into the affected vessel(s) [2—4].

In this particular case, haemodynamic instability precluded the use of coronary angiography to document the presence of coronary artery spasm. The main clues to the presence of spasm were the lack of correlation of her symptoms with the angiographic finding and the lack of segmental wall abnormality when the patient became unstable, which made graft dysfunction an unlikely cause. Furthermore, the potential for diffuse coronary artery spasm seemed likely given the fact that her coronary arteries were essentially disease free other than that in the left main stem, making the remaining vessels more prone to spasm when compared with calcified atherosclerotic vessels. This is supported by previous reports of diffuse coronary spasm in the presence of isolated disease of the left main stem [2].

Previous reports of ECMO to treat cardiogenic shock due to postoperative coronary artery spasm following coronary artery graft surgery exist [4] and our report adds to this body of data. In this case extensive myocardial recovery was observed after 48 h. The use of serial TOE for assessing this recovery was valuable in this setting.

References