CASE REPORT

Beating heart myocardial revascularisation of a sudden cardiac death survivor with spontaneous coronary artery dissection: pitfalls from diagnosis to surgery

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Accepted 26 October 2014

SUMMARY

Spontaneous coronary artery dissection is a rare clinical condition with a wide range of clinical presentations ranging from asymptomatic cases to life-threatening ventricular arrhythmias and sudden cardiac death. The exact pathophysiological mechanism has not been fully established yet. We would like to present a survivor of sudden cardiac death presenting with ventricular fibrillation due to spontaneous coronary artery dissection. The prompt evaluation, medical management, surgical myocardial revascularisation and value of off-pump coronary artery bypass surgery are discussed.

BACKGROUND

Primary spontaneous coronary artery dissection (SCAD) is a rare but fatal aetiology of acute myocardial infarction (aMI).¹ This entity is more commonly encountered in pregnant or postpartum females. Shamloo *et al*² collected a total of 440 cases in literature from 1931 to 2008. In their study the mean age which was coincidentally the same as the age of the first reported case in 1931 was 42.³ The clinical presentation of SCAD includes unstable angina, aMI and ventricular arrhythmias to sudden cardiac death (SCD).⁴ Surviving after a SCD due to a documented SCAD is an extremely rare condition with a couple of patients reported in literature.⁵ We would like to present the medical and surgical management of a young non-pregnant woman with documented SCAD who survived after cardiopulmonary resuscitation due to ventricular fibrillation.

CASE PRESENTATION

A 32-year-old non-pregnant woman was admitted to emergency department in an unconscious situation. Her husband had given the information that she had encountered a sudden onset chest pain during the prior couple of hours. She did not have any risk factors for atherosclerosis or premature coronary artery disease. She had given birth to three children and she was not pregnant at that time. She also did not have any known history of connective tissue disorders or drug abuse. She was conscious until they had arrived to the hospital gate. She had become unconscious just before they arrived the emergency room (ER). She was intubated and external cardiac compression was initiated immediately in the ER. The cardiac

rhythm was detected to be in ventricular fibrillation and after three trials with 200 J, the cardioversion provided the sinus rhythm. The patient's blood pressure was 80/45 mm Hg after the resuscitation. Intravenous amiodarone was administered with the dosage of 300 mg in 15 min. After the initial assessment, portable echocardiography was performed which ruled out any intimal flap in the ascending aorta as well as any pericardial tamponade. The ECG revealed elevated ST segments in the anterior deviations. All the peripheral pulses were palpated symmetrically. The patient was immediately taken to cardiac catheterisation laboratory. The coronary angiography revealed an intimal flap beginning from left main coronary artery (LMCA) extending until the end of proximal segment of left anterior descending (LAD) artery which was leading to a critical stenosis at that point (figures 1 and 2). The circumflex (Cx) and right coronary arteries (RCA) did not have any stenosis or the image of an intimal flap. The patient was taken to operation room for coronary artery bypass grafting (CABG). The patient's blood pressure was 70/35 mm Hg under positive inotropic support, which improved gradually to 85/45 mm Hg. Following the induction of anaesthesia, midline sternotomy was performed. The left internal thoracic artery (LITA) was harvested. Stay sutures were put in the

Figure 1 The dissection flap at the left main coronary artery (arrow).

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To cite: Cetin E, Ozyuksel A. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2014-207188

Figure 2 The intimal flap beginning at the left main coronary artery extending through the proximal left anterior descending artery (arrows).

pericardium. The target zone of the LAD was determined and a couple of stay sutures were positioned with 6/0 polypropylene. LITA-LAD anastomoses were completed with running 8/0 polypropylene sutures on the beating heart (figure 3). The zone of anastomosis was free of dissection, but two separate 8/0 polypropylene 'U' sutures were put to the posterior wall of LAD in order to prevent any propagation of the proximal dissection to the distal segments in future. The patient was extubated in the sixth postoperative hour without any neurological impairment. The inotropic support was gradually decreased and ceased. She did well after surgery and she was discharged at the sixth postoperative day. The echocardiography which was performed 10 days after the operation revealed an ejection fraction of 60% with mild mitral insufficiency.

Figure 3 Intraoperative view demonstrates the left internal thoracic artery (black arrow) anastomosed to left anterior descending artery (white arrow).

DIFFERENTIAL DIAGNOSIS

Coronary artery disease.

OUTCOME AND FOLLOW-UP

The patient was discharged without any complications or neurological sequel.

DISCUSSION

SCAD is defined as a non-traumatic and non-iatrogenic separation of the coronary arterial wall by intramural haemorrhage creating a false lumen with or without an intimal tear.⁶ The intramural haematoma eventually leads to compression of the arterial lumen and varying degrees of antegrade blood flow compromise. The clinical presentation may be acute coronary syndrome and sudden death but it can completely be asymptomatic.

Although SCAD was thought to be most often related to pregnancy and postpartum period, other precipitating and predisposing factors have been identified such as atherosclerosis, hypertension, connective tissue disorders (Marfan and Ehlers-Danlos syndromes), systemic inflammatory diseases, vasculitis, coronary artery spasm, intense exercise, oral contraceptive and cocaine usage.⁶ A detailed history of our patients revealed none of the factors associated with SCAD or premature coronary artery disease. She had given birth to three children without any occurrence of adverse events both in pregnancy, labour and postpartum periods. More elaborate clinical, imaging and laboratory examinations were scheduled for the patient in order to detect any associated risk factors. A recent association of SCAD with fibromuscular dysplasia (FMD) has been reported in literature but whether FMD leads to SCAD or this association is a coexistence is not proved yet.⁷

The incidence of SCAD among cases of acute coronary syndrome is reported to be 0.2% in angiographic studies.⁸ The two proposed mechanisms in the pathogenesis of SCAD include the spontaneous rupture of vasa vasorum resulting in intramural haematoma and intimal or medial tear which is usually complicated with a superimposed thrombus.⁹ Therefore, the initial management of patients with SCAD admitting with unstable angina and acute coronary syndrome is critical. Although administration of acetyl salicylic acid, clopidogrel, β -blockers and nitroglycerine are on routine basis of such a clinical situation, the administration of thrombolytic therapy is controversial.¹⁰ The systemic thrombolytic drug infusion in such SCAD cases may lead to degradation of the thrombus in the false lumen which eventually leads to propagation of dissection with a more compromised coronary arterial flow.

Emergent coronary angiography in patients with SCAD should be performed with great caution, since aggressive intubation of the coronary ostium and contrast injection may lead to extension of dissection.⁹ We did not prolong the catheterisation process after we had seen the dissection flap beginning from LMCA to LAD, provided that Cx and RCA branches are free of dissection or critical stenosis. When there is proper time for further investigation, intravascular ultrasonography and coronary CT scan may be beneficial.

There are no specific guidelines for the treatment of SCAD, therefore the decision-making process is based on the clinical presentation, the location and extent of dissection and the amount of ischaemic myocardium.⁹ Asymptomatic cases with non-occlusive dissection and a good distal flow may be treated medically.¹⁰ The long-term benefits of invasive revascularisation compared with medical treatment are uncertain in

non-life-threatening cases.¹¹ However CABG and percutaneous coronary intervention provides with statistically significant longer symptom free period and a lower mortality rates compared with medical management of SCAD.² Angioplasty with placement of an intracoronary stent may be considered in localised dissections, but it may lead to progression of dissection and intramural haematoma formation as well as failure to enter the true lumen.¹² Surgical myocardial revascularisation is the preferred treatment options in cases with main stem or multivessel involvement as well as the patients with haemodynamic instability.¹³

We preferred off-pump surgical myocardial revascularisation in our patient. The possible underlying pathology in the whole

vasculature of these patients may involve the ascending aorta, which is the cannulation site for the implementation of cardiopulmonary bypass.¹⁴ Therefore the cannulation site may be the focus of dissection in future in these patients. Second, the untoward effects of low blood pressure levels at the cardiopulmonary bypass are eliminated in off-pump revascularisation.

Contributors Both of the authors equally contributed to the manuscript preparation based on the following criteria: substantial contributions to the conception or design of the work; or the acquisition, analysis or interpretation of data for the work; drafting the work or revising it critically for important intellectual content; and gave final approval of the version to be published.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

Patient's perspective

I was a survivor of sudden cardiac death. After a successful surgical myocardial revascularisation, I was discharged without any complications or neurological sequel due to cardiopulmonary resuscitation.

Learning points

- ▶ Spontaneous coronary artery dissection is a rare cause of acute coronary syndrome.
- ▶ This entity must be kept in mind in the differential diagnosis especially in young women without a known risk factor for atherosclerosis or premature coronary artery disease.
- ▶ Uncontrolled administration of thrombolytic drugs may end up with mortality due to propagation of the dissection.
- ▶ When surgical revascularisation is concerned, off-pump coronary artery bypass is advantageous in order to prevent the manipulation, cannulation and/or cross-clamping of the ascending aorta, since aortic dissection may occur in the rest of the lives of these patients due to the underlying pathology in the arterial vasculature.

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