

# Recurrent coronary spasm necessitating primary percutaneous coronary intervention

## Introduction

A 23-year-old woman presented on multiple

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occasions with chest pain caused by variant angina relieved by smooth muscle relaxants. However, she ultimately re-presented with ongoing chest pain and ST segment elevation myocardial infarction despite maximal medical therapy. Owing to refractory chest pain and worsening ST segments percutaneous coronary intervention with drug-eluting stents was performed. Subsequently her ST segment elevation resolved. Since stent implantation she has been asymptomatic for 8 months.

This case highlights the recurrent course of coronary spasm and demonstrates the role of primary percutaneous intervention for the management of coronary spasm in life-threatening situations.

## Discussion

Variant angina can be managed medically with a combination of calcium-channel blockers, nitrates and nicorandil, all acting to reduce smooth muscle contractility and prevent coronary artery spasm. Drug-refractory variant angina does not respond to treatment with two calcium antagonists plus a long-acting nitrate, and occurs in up to 30% of patients. Variant angina can be a life-threatening condition. Hung et al (2007, 2014) found that 3.2% of patients with coronary artery spasm will present with life-threatening complications, most commonly complete atrioventricular block and ventricular fibrillation. Given its life-threatening nature, drug-refractory variant

## CASE REPORT

A 23-year-old Caucasian woman presented with central chest pain. She reported a 2-month history of intermittent non-exertional chest pain. Her only past medical history was of asthma. She was a smoker, denied illicit drug use and did not have any significant family history. Clinical examination was unremarkable. Her electrocardiogram showed sinus rhythm with anterior Q waves. Bloods on admission revealed elevated levels of troponin I (13 ug/litre), creatine kinase (1443 U/litre) and D-dimer (600 ng/ml); all other blood results, including autoimmune and vasculitis screen and lipid profile, were within reference range. Her urine drug test was negative.

Computed tomography pulmonary angiography showed normal opacification of both pulmonary arteries and the thoracic aorta. There was no evidence of pulmonary emboli. Computed tomography coronary angiogram indicated minor concentric proximal atheromatous disease in the left anterior descending artery. Transthoracic echocardiogram showed severe non-dilated left ventricular systolic impairment. Invasive coronary angiogram revealed unobstructed coronary arteries (*Figure 1a*).

Cardiac magnetic resonance imaging performed 4 days after baseline echocardiogram demonstrated moderately impaired left ventricular systolic function, myocardial oedema of the septum and anterolateral wall, and extensive subendocardial delayed enhancement involving the anterior, septum and inferior wall with all 17 segments viable. Magnetic resonance imaging of the aorta and visceral arteries revealed no inflammatory changes. Right heart biopsy showed no evidence of any inflammatory or infiltrative process. She was discharged on aspirin, ramipril, diltiazem and isosorbide mononitrate.

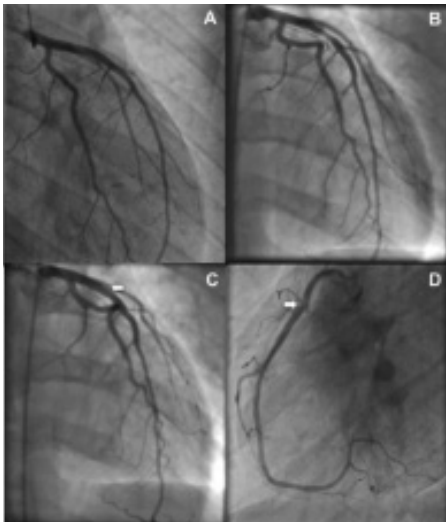
She re-presented 3 months after index presentation with troponin-positive chest pain (0.21 ug/litre), at which point her medication was uptitrated. She presented again at 6 months with troponin-positive chest pain (8.32 ug/litre). Subsequent echocardiogram revealed good left ventricular function and mild septal hypokinesia. Repeat invasive coronary angiogram revealed a moderate to severe proximal left anterior descending artery lesion (*Figure 1b*) which resolved completely after intracoronary nitrate was administered (*Figure 1c*). There was mild atheromatous disease noted in the proximal right coronary artery (*Figure 1d*). She remained

asymptomatic and was discharged home with nicorandil added to medical therapy.

She re-presented 1 week after discharge with ongoing chest pain and anterior ST segment elevation. Repeat coronary angiogram showed a severe lesion in the proximal left anterior descending artery (*Figures 2a and b*) and proximal right coronary artery (*Figures 2d and e*) that was refractory to intracoronary nitrates. She had worsening ST segments intra-procedure with ongoing chest pain, so the decision was made to proceed to percutaneous coronary intervention. The left anterior descending artery lesion was pre-dilated which resulted in partial improvement angiographically, followed by drug-eluting stent deployment, which resolved the ST segment elevation (*Figure 2c*). Subsequently the right coronary artery lesion was also stented (*Figure 2f*). There was good angiographic outcome in both vessels. Intracoronary imaging (e.g. intravascular ultrasound) was not performed because of the acute presentation of the patient.

Since stent implantation she has been asymptomatic for 8 months and a repeat echocardiogram revealed preserved left ventricular function and mild septal hypokinesia.

**Figure 1. a.** Right anterior oblique view of left coronary system demonstrating unobstructed left anterior descending artery and left circumflex artery. **b.** Right anterior oblique view of left coronary system demonstrating severe obstructive proximal left anterior descending artery stenosis secondary to coronary spasm. **c.** Right anterior oblique view of left coronary system after intracoronary nitrate demonstrating resolution of proximal left anterior descending artery stenosis. Arrow shows mild atheromatous disease in left anterior descending artery. **d.** Left anterior oblique view of right coronary artery demonstrating unobstructed vasculature with mild atheromatous disease. Arrow shows mild atheromatous disease in right coronary artery.



angina must be treated effectively, although the evidence base is scarce.

Chou et al (2009) and Chou and Huang (2012) described two cases of patients presenting with severe chest pain, hypotension and ventricular fibrillation, both requiring percutaneous coronary intervention. Both

patients remained asymptomatic after 1 and 2 years follow up. Marti et al (2006) described a series of five patients who were refractory to medical treatment admitted with acute myocardial infarction requiring percutaneous coronary intervention – three of the five patients required further stenting during their inpatient stay, and a fourth patient developed a de novo lesion requiring stenting 2 years later.

Given the paucity of data on late clinical outcomes it remains unclear if percutaneous coronary intervention is effective at preventing variant angina. Long-term follow up of these patients is confined to case studies that report asymptomatic patients at intervals between 10 months and 2 years. One major limitation is that spasms may occur at different sites in the coronary bed to the one that was originally stented. Many patients must remain on medical therapy to control symptoms and if recurrences do occur, further stents can be placed.

### Conclusions

Considering the increased risk of complications and the possibilities of recurrence, the decision to proceed to percutaneous coronary intervention should be carefully considered. Until further evidence is available, the role of percutaneous coronary intervention in variant angina must remain limited to patients with variant angina which is refractory to maximum medical therapy or who are admitted with life-threatening complications. **BJHM**

Chou MT, Huang TY (2012) Coronary stenting for coronary vasospasm complicated with refractory ventricular tachycardia and fibrillation. *Acta*

### LEARNING POINTS

- Variant angina can usually be managed medically with a combination of calcium-channel blockers, nitrates and nicorandil, to reduce smooth muscle contractility and prevent coronary artery spasm.
- Drug-refractory variant angina occurs in up to 30% of patients, of which 3.2% present with life-threatening complications.
- Vasodilator-refractory variant angina with potentially life-threatening complications can be treated with percutaneous coronary intervention.
- Given the increased risk of complications and the possibilities of recurrence, the decision to proceed to percutaneous coronary intervention should be carefully considered.

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Chou HH, Lim KE, Ko YL (2009) Treatment of spontaneous left main coronary artery spasm with a drug-eluting stent. *Acta Cardiol Sin* 25: 43–6

Hung MJ, Cheng CW, Yang NI et al (2007) Coronary vasospasm-induced acute coronary syndrome complicated by life-threatening cardiac arrhythmias in patients without hemodynamically significant coronary artery disease. *Int J Cardiol* 117: 37–44 (doi: 10.1016/j.ijcard.2006.03.055)

Hung MJ, Hu P, Hung MY (2014) Coronary artery spasm: Review and update. *Int J Med Sci* 11: 1161–71 (doi: 10.7150/ijms.9623)

Marti V, Ligerio C, Garcia J et al (2006) Stent implantation in variant angina refractory to medical treatment. *Clin Cardiol* 29: 530–3 (doi: 10.1002/clc.1)

Tanabe Y, Itoh E, Suzuki K et al (2002) Limited role of coronary angioplasty and stenting in coronary spastic angina with organic stenosis. *J Am Coll Cardiol* 39: 1120–6 (doi:10.1016/S0735-1097(02)01746-1)

**Figure 2. a.** Right anterior oblique caudal view of left coronary system demonstrating severe obstructive proximal left anterior descending artery stenosis secondary to coronary spasm refractory to intracoronary nitrates. **b.** Left anterior oblique cranial view of left coronary system demonstrating severe obstructive proximal left anterior descending artery stenosis secondary to coronary spasm refractory to intracoronary nitrates. **c.** Left anterior oblique cranial view of left coronary system after drug-eluting stent implanted into proximal left anterior descending artery demonstrating resolution of stenosis. **d.** Left anterior oblique view of right coronary artery demonstrating severe discrete obstructive stenosis in proximal segment refractory to intracoronary nitrates. **e.** Left anterior oblique view of right coronary artery demonstrating severe discrete obstructive stenosis in proximal segment refractory to intracoronary nitrates. **f.** Left anterior oblique view of right coronary artery after drug-eluting stent implanted into proximal segment demonstrating resolution of stenosis.

