ESC European Society of Cardiology

European Heart Journal - Case Reports (2018) **2**, 1–5
doi:10.1093/ehjcr/yty042

CASE REPORT
Coronary heart disease

A 16-year-old boy with bronchial asthma and prinzmetal angina: case report

Lilit Baghdasaryan*

Saint Grigor Lusavorich Medical Center, Gyurjyan 10, Yerevan 0056, Armenia

Received 20 March 2018; accepted 22 March 2018; online publish-ahead-of-print 10 April 2018

Introduction Prinzmetal's angina is a very rare disease in children and adolescents. Adults' studies suggest that vasospastic angina is more common in patients with bronchial asthma than in the general population.

Case presentation A 16-year-old boy with a history of bronchial asthma was admitted to the hospital after successful resuscitation from asystole. On the day of admission, he had a severe left shoulder pain and developed cardiac arrest. He was complaining of left shoulder pain throughout the previous year. During his hospital stay, a second cardiac arrest took place with inferior ST elevation of the electrocardiography recorded after the second successful resuscitation. Diagnostic coronary angiography revealed multiple spasms throughout the coronary bed, which was completely resolved after intracoronary nitroglycerine administration. The patient was diagnosed Printzmetal's vasospasic angina, and the symptoms disappeared gradually with up-titration of a calcium channel blocker and a nitrate.

Discussion Previous studies have suggested that the pathogenesis of Prinzmetal's vasospastic angina may be similar to that of bronchial asthma, as we see in the presentation of this young patient.

Keywords Case report • Vasospastic angina • Prinzmetal angina • Bronchial asthma • Coronary vasospasm • Adolecent

Learning points

- Prinzmetal's angina and bronchial asthma may share similar pathogenesis; which include dependence on circadian variation, autonomic dysfunction, and inflammation.
- Bronchial asthma may increase the risk of new-onset coronary vasospastic angina. Therefore, we should be cautious even when the patient has atypical symptoms.

Introduction

Prinzetal's vasospastic angina is a rare disease among children and adolescents, there are only a few cases described in the literature.[1,2] Adults' studies suggest vasospastic angina is more common in patients with bronchial asthma than in general population.[3,4] Complications of Prinzmetal's angina are arrhythmias, myocardial infarction, and the most devastating complication is sudden cardiac death.

Timeline

During 10 days before hospital admission	Frequent asthma episodes
At first presentation	Severe left shoulder pain, cardiac arrest
On the 6th day in hospital	Shoulder pain, another cardiac arrest
On the 7th day	ST elevation episodes on 24 h electrocardiography monitoring
On the 8th day	Diffuse coronary spasm on coronary angiography
On 8th day	Treatment with amlodipin and nitrates initiated
During 6 months	Slow up-titration of medication, which resulted to decrease of the frequency of shoulder pain episodes
In a year	Almost no shoulder pain and good physical growth
In 1.5 years	Patient quitted the medications and didn't survive another cardiac arrest

* Corresponding author. Tel: +37491-554054, Email: dr.baghdasaryan@yahoo.com; lbaghdassarian@yandex.ru. The case report was reviewed by Hosam Hasan, Dejan Milasinovic, and John Kanakakis.

Case summary

A 16-year-old male patient was admitted to the hospital after successful resuscitation from cardiac arrest due to asystole. He had a medical history of bronchial asthma for 3 years duration and was currently taking Salmeterol/Fluticasone 50/100 for a year and Salbutamol as needed. His parents reported that during the last 10 days he had more frequent asthma episodes. He was complaining of left shoulder pain on the day of admission and had taken a non-steroidal anti-inflammatory drug for pain relief. Shortly afterwards, he fell unconscious as a result of cardiac arrest. After successful resuscitation with standard cardiopulmonary resuscitation with chest compressions and epinephrine, he was transferred to the hospital. On admission, the patient was pale and confused. SaO_2 90%, heart rate 62 b.p.m., blood pressure (BP) 70/40 mmHg, normal heart sounds with no additional murmurs, and his chest was clear on auscultation. There was no elevation of cardiac enzymes. And his electrocardiography (ECG) was unremarkable. Echocardiography was performed, which also showed no abnormalities. In the absence of any cardiac abnormalities, his case was managed as exacerbation of bronchial asthma and he was transferred to the paediatric department. During his stay on the ward, he continued to complain of left shoulder pain from time to time. A shoulder X-rays found no abnormalities. On the 6th day of the hospital stay, he suffered another episode of asystole and cardiac arrest following severe left shoulder pain. This time there was small ST elevation recorded on inferior leads and inverted T waves on precordial leads on ECG after resuscitation (*Figure 1*). This episode was also not associated with any elevation of cardiac enzymes. A 24-h ECG Holter monitor was performed the next day and showed transient ST elevations on inferior leads during the day (*Figure 2*). ST-T changes were not related to

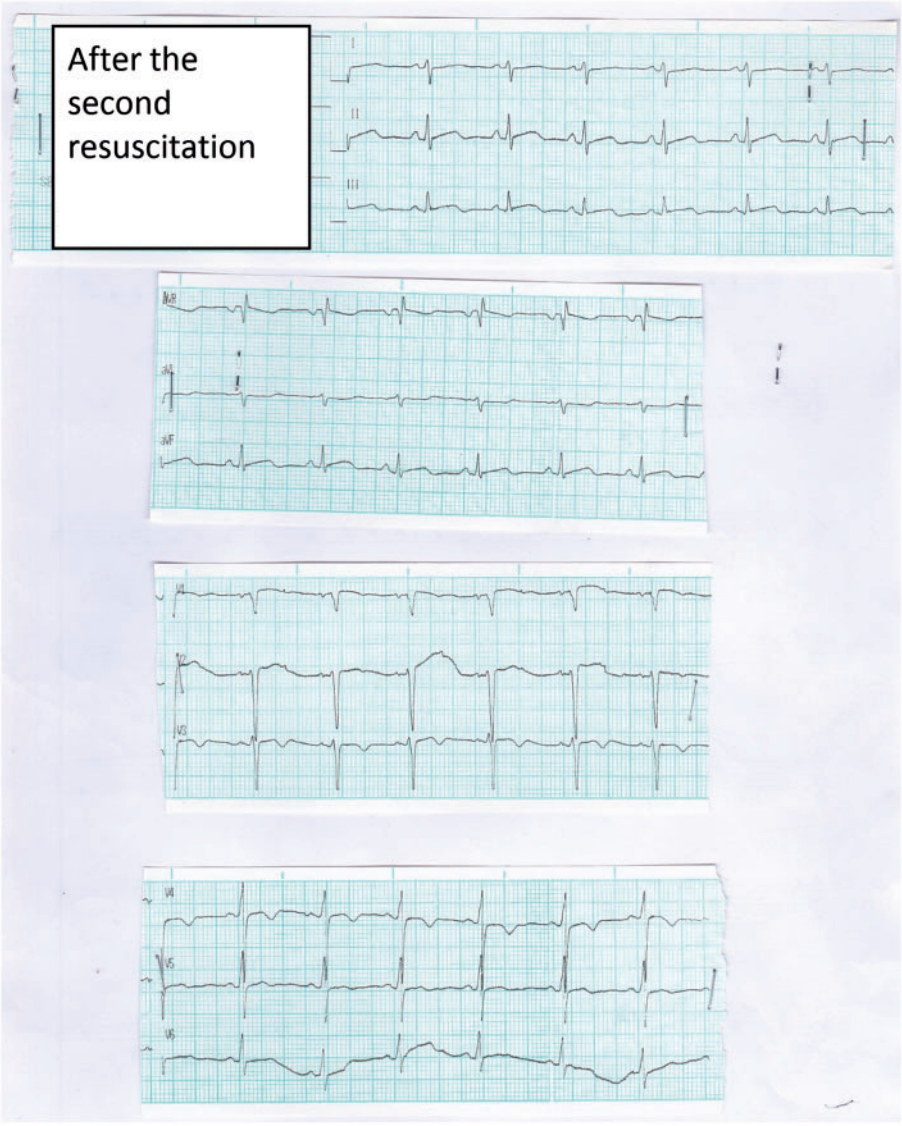

Figure 1 ECG after the second resuscitation.

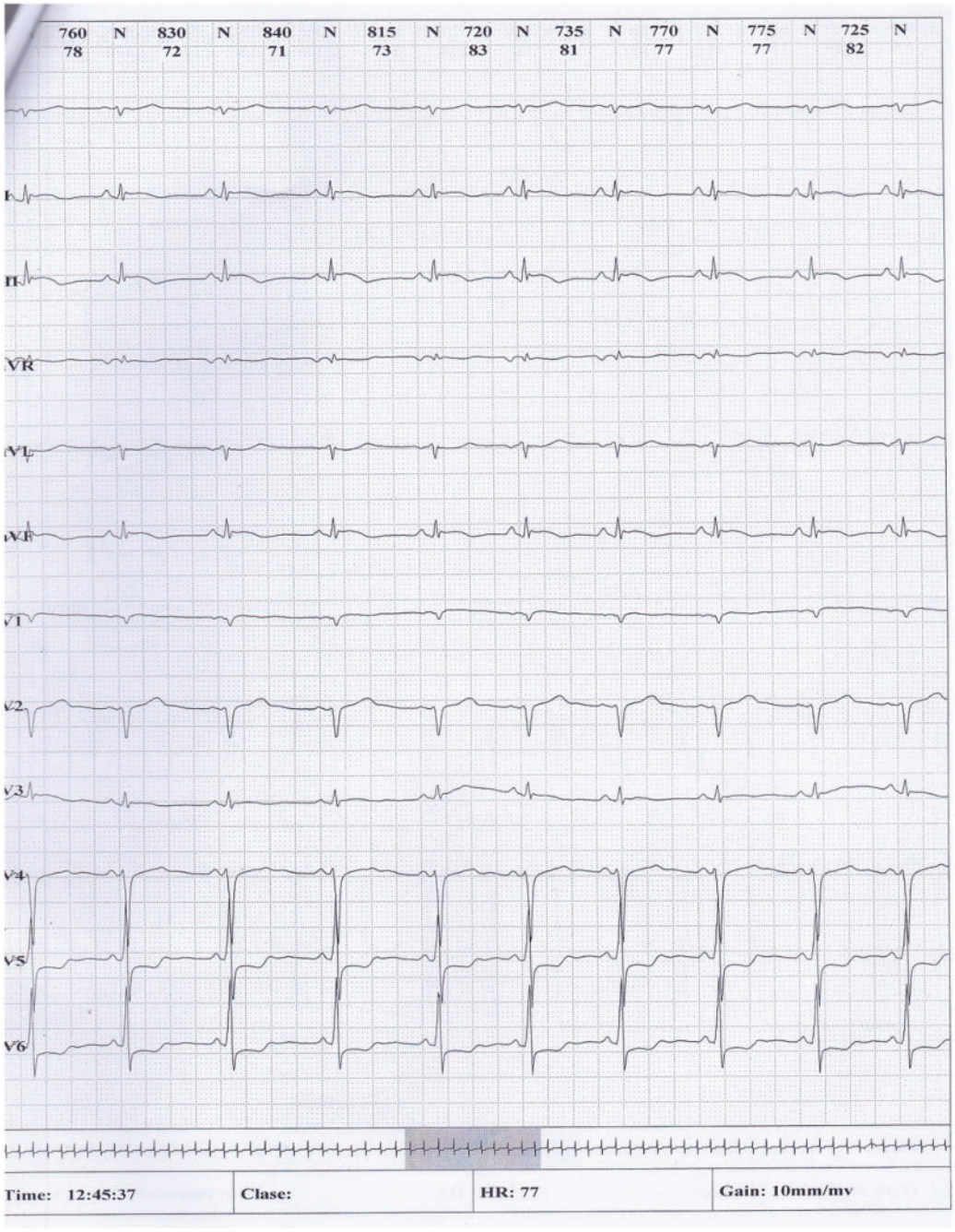

Figure 2 Twenty-four hours Holter monitoring, which revealed transient ST elevations during the day.

physical activity, and no arrhythmia or pauses were recorded. A diagnostic coronary angiogram showed spontaneous diffuse vasospasm after the second injection of contrast. This was completely resolved after intracoronary nitroglycerine administration (*Figure 3*, Supplementary material online, Videos *S1* and *S2*).

The patient was diagnosed with Prinzmetal's angina.

His past medical records revealed that he had been complaining of left shoulder pain throughout the past year at almost every doctor's appointment. X-rays were unremarkable, and the pain was dismissed.

There were multiple discussions regarding implantable cardioverter-defibrillator (ICD) vs. pacemaker implantation. Pacemaker was preferred over ICD, because during all the events asystole was recorded, with no evidence of a ventricular arrhythmia, and also because of cost effectiveness, as state insurance didn't cover all expenses. The parents refused both ICD and pacemaker implantation.

The treatment with small doses of nitrates and Amlodipine was initiated (Amlodipine 2.5 mg and Isosorbide dinitrate 5 mg). Uptitration proved to be challenging as the patient had low BP, which

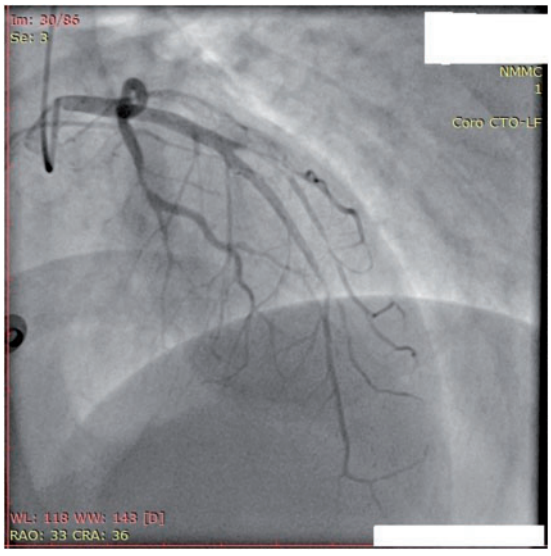

Figure 3 Coronary angiography demonstrating multivessel spasm.

decreased further with the nitrates and Amlodipine, making the boy sleepy and the parents anxious. Together with Almodipine and nitrates, the patient continued to receive Salmeterol/Fluticasone inhalations, as he was suffering from a severe asthma with frequent exacerbations, and it was impossible to manage it without b-agonists/corticosteroid.

During the next 6 months, the patient had less frequent episodes of shoulder pain. Although up-titration was challenging, this led to a favourable influence on patient's physical growth and shoulder pain episodes in next 6 months. After 1-year follow-up, the patient had almost no shoulder pain. In 1.5 years after the discharge, the patient was completely asymptomatic for a long time, he stopped the medications without seeking medical advice. Ten days after cessation of his medications, he developed another episode of shoulder pain and cardiac arrest, but unfortunately resuscitation was not successful this time.

Discussion

Our patient was an adolescent with a medical history of bronchial asthma who developed coronary vasospastic angina (CVsA). The patient's only complaint was left shoulder pain. This was an unusual presentation of Prinzmetal's angina in young age making the diagnosis easy to be missed.

Several studies have suggested that there may be similarities in pathogenesis of bronchial asthma and CVsA. Circadian variations play an important role in the pathogenesis of bronchial asthma and CVsA. In both cases the majority of attacks occur between mid-night and early morning, when vagal tone dominates. Its neurotransmitter acetylcholine, which induces vasodilation in healthy adults, induces vasoconstriction in patients with vasospastic angina. If sympathetic activity is increased suddenly, as it can be in early morning, when dominant tone is still vagal, it also may induce vasoconstriction. In asthma, there is autonomic dysfunction, which is expressed with marked sensitivity to cholinergic constrictors and decreased sensitivity to adrenergic dilators (decrease of responsiveness of β2 receptors) and hyper-reactivity to α adrenergic receptors, which relies on the pathogenesis of vasoconstriction in Prinzmetal's angina.[5,6]

In both cases, inflammation and smooth muscle dysfunction may play a significant role, inflammatory factors may be high in both cases.[7–12] In one retrospective study, asthma significantly increased the risk of new-onset CVsA independent of other comorbidities and was significantly higher in previous users of oral or inhaled corticosteroids. It is considered that such correlation is rather due to the severity of the disease, which has led to corticosteroid prescription, than is an adverse effect of prescribed corticosteroid.[4] Our patient had frequent asthma episodes with frequent exacerbations and was prescribed inhaled corticosteroids.

ECG changes during attack and the extent of coronary vasospasm may predict the type and severity of arrhythmia. Bradyarrhythmias are found to be more common in cases of inferior ST segment elevation,[4] ventricular arrhythmias in anterior ST elevation, and lethal arrhythmias, such as ventricular fibrillation and advanced heart block are usually seen in cases of multivessel spasm.[13,14] In the case of our patient, who developed asystole, ST elevation was recorded in inferior leads after the attack and during Holter monitoring, and coronary multivessel spasm was noticed during coronary angiography.

Supplementary material

Supplementary material is available at *European Heart Journal – Case Reports* online.

Consent: The author/s confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient's next of kin (parents) in line with COPE guidance.

Conflict of interest: none declared.

References

1. Lim CW, Hia CP, Chia BL, Quek SC. Variant angina in a 6-year-old boy. *Int J Cardiol* 2007;**115**:e24–e26. PubMed PMID: 17067693
2. Wilkes D, Donner R, Black I, Carabello BA. Variant angina in an 11 year old boy. *J Am Coll Cardiol* 1985;**5**:761–764. PubMed PMID: 3973275.
3. Rich MW. An association between Prinzmetal's angina pectoris and obstructive lung disease. *Am J Cardiol* 2005;**96**:1612–1613.
4. Hung MJ, Mao CT, Hung MY, Chen TH. Impact of asthma on the development of coronary vasospastic angina: a population-based cohort study. *Medicine (Baltimore)* 2015;**94**:e1880. PubMed PMID: 26496346; PubMed Central PMCID: PMC4620748
5. Yasue H, Kugiyama K. Coronary spasm: clinical features and pathogenesis. *Intern Med* 1997;**36**:760–765.
6. Lewis MJ, Short AL, Lewis KE. Autonomic nervous system control of the cardiovascular and respiratory systems in asthma. *Respir Med* 2006;**100**:1688–1705.
7. Hung MJ, Cherng WJ, Cheng CW, Li LF. Comparison of serum levels of inflammatory markers in patients with coronary vasospasm without significant fixed coronary artery disease versus patients with stable angina pectoris and acute coronary syndromes with significant fixed coronary artery disease. *Am J Cardiol* 2006;**97**:1429–1434. PubMed PMID: 16679078.
8. Itoh T, Mizuno Y, Harada E, Yoshimura M, Ogawa H, Yasue H. Coronary spasm is associated with chronic low-grade inflammation. *Circ J* 2007;**71**:1074–1078.

9. Hung MJ, Hsu KH, Chang NC, Tsimikas S, Hung MY. Prevalence of coronary artery spasm after stent placement and its association with inflammation. *Int J Cardiol* 2015;**179**:252–255.
10. Tang XQ, Sun WP, Xu HB, Liu WB, Wang TS, Liu HJ. The changes in the levels of IL-6, IL-17, and IL-21 in the acute stage of childhood asthma. *Clin Lab* 2013;**59**: 1381–1387.
11. Takemura M, Matsumoto H, Niimi A, Ueda T, Matsuoka H, Yamaguchi M, Jinnai M, Muro S, Hirai T, Ito Y, Nakamura T, Mio T, Chin K, Mishima M. High sensitivity creactive protein in asthma. *Eur Respir J* 2006;**27**:908–912.
12. Hartley R, Berair R, Brightling CE. Severe asthma: novel advances in the pathogenesis and therapy. *Pol Arch Med Wewn* 2014;**124**:247–254.
13. Nakamura M, Takeshita A, Nose Y. Clinical characteristics associated with myocardial infarction, arrhythmias, and sudden death in patients with vasospastic angina. *Circulation* 1987;**75**:1110–1116.
14. Myerburg RJ, Kessler KM, Mallon SM, Cox MM, DeMarchena E, Interian A Jr, Castellanos A. Life-threatening ventricular arrhythmias in patients with silent myocardial ischemia due to coronary artery spasm. *N Engl J Med* 1992;**326**: 1451–1455.