CASE REPORT

Pseudo-Wellens' syndrome secondary to concurrent cannabis and phencyclidine intoxication

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Accepted 17 June 2018

SUMMARY

Wellens' syndrome is an electrocardiographic pattern of T-wave changes associated with critical stenosis of the proximal left anterior descending artery, signifying imminent risk of an anterior-wall myocardial infarction. The Wellens' electrocardiographic pattern can also be noted in several cardiac and non-cardiac diseases. We chronicle here a unique case of a patient who presented with atypical left chest pain and dizziness for 6 hours. His pain started after he smoked phencyclidine-laced cannabis. Cardiac panel demonstrated normal troponin T levels. Electrocardiogram showed sinus rhythm with new deep biphasic T-wave inversions in anterolateral leads. Coronary angiography showed no pathological processes. Subsequently, ECG changes resolved coincidentally with the resolution of chest pain. He was eventually diagnosed with pseudo-Wellens' syndrome. This paper illustrates that physicians should be vigilant for Wellens' syndrome mimicked by acute phencyclidine and cannabis intoxication. Additionally, we present a review of various aetiologies of pseudo-Wellens' syndrome, especially in patients with substance abuse.

smoking, HIV infection and hypertension increase the risk of WS.²

Some cardiac and non-cardiac disorders, with low propensity to cause a myocardial infarction, can partially or entirely present with replica findings of WS. The presentation in this scenario is referred to as pseudo-Wellens' syndrome (PWS). While WS is a preinfarction state, PWS is theorised to be secondary to temporary interruption in anterior myocardial perfusion that does not lead to myocardial infarction.^{1 2} The differentiation between PWS and true WS carries paramount importance for prognosis. Prompt cardiac catheterisation can help to solve this mystery. In management of patients who present with PWS, beta blockers should be avoided as the transient LAD vasospasm in such cases can be significantly worsened with these medications.^{3 4} Herein, we present an interesting case of a patient who developed PWS following phencyclidine (PCP) and cannabis (marijuana) intoxication. This report underscores the importance of early detection of PWS that can help to avoid inadvertent outcomes, especially in illicit drug users.

BACKGROUND

Wellens' syndrome (WS) is a constellation of ECG changes that were first identified in 1982 by de Zwaan *et al* among 14%–18% of the sample population presenting with unstable angina.¹ Main features of WS include T-wave abnormalities (biphasic in type A pattern and deep symmetrically inverted in type B pattern) in anterior precordial leads V2–V3 and normal or marginally raised serum level of cardiac enzymes with no ECG findings suggestive of an acute or old anterior-wall myocardial infarction.^{1 2} This syndrome is highly suggestive of proximal left anterior descending coronary artery (LAD) stenosis that heralds a devastating myocardial infarction. In the cohort studied by de Zwaan and colleagues, seventy-five per cent of patients with WS who received only medical therapy developed acute myocardial infarction.¹ Therefore, timely detection of WS and prompt management as an acute coronary syndrome can avoid significant myocardial necrosis. All risk factors that increase the possibility of having acute coronary syndrome may also increase the likelihood of WS. Coronary atherosclerosis, vasospasm and/or myocardial hypoperfusion are major contributors to the development of WS. Furthermore, diabetes mellitus, hyperlipidaemia, metabolic syndromes, obesity, higher levels of stress,

CASE PRESENTATION

A 41-year-old African-American male with a medical history of asthma, current tobacco and alcohol abuse, and seizure disorder presented to the emergency department for atypical left chest pain and dizziness for 6 hours. The chest pain was constant, severe in nature, non-positional and radiating to his left arm. He stated that pain started after he smoked cannabis dipped in PCP. At the time, he experienced marked dizziness, chest numbness, nausea and diaphoresis. His friends noted slurring of speech and shaking of his right arm. The patient has been a regular cannabis and PCP user but he had never experienced these symptoms. He denied palpitations, vision changes, focal weakness, vertigo, shortness of breath, syncope, fever, chills or headache. He had no history of cardiopulmonary disorders. On admission, vital signs indicated a regular pulse rate of 102 beats/min and blood pressure of 156/89 mm Hg. Physical examination was unremarkable. Sublingual nitroglycerin did not relieve his chest pain.

INVESTIGATIONS

Cardiac panel demonstrated a normal level of troponin T. ECG showed sinus rhythm with new deep biphasic T-wave inversions in anterolateral leads, consistent with Wellens' pattern type B

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To cite: Inayat F, Riaz I, Ali NS, *et al*. *BMJ Case Rep* Published Online First: [please include Day Month Year]. doi:10.1136/bcr-2018-225755

Figure 1 ECG performed in the emergency department showing sinus rhythm with biphasic deep T-wave inversions in anterolateral leads.

(figure 1). Urine toxicology screen was positive for PCP and cannabis. Bedside 2D transthoracic echocardiography (TTE) showed mild hypokinesis of left ventricular (LV) apex. Due to refractory chest pain, new ECG changes and wall-motion abnormality in LV apex, he underwent urgent cardiac catheterisation. However, coronary angiography showed no obstructive disease (figures 2 and 3). CT scan of head was negative for intracranial bleeding.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis included WS, costochondritis, acute myocardial infarction, panic disorder, pericarditis, pneumonia, pulmonary embolism, aortic dissection, Takotsubo cardiomyopathy, haemorrhagic stroke and drug intoxication-related chest pain. On the basis of clinical features, findings of TTE and exclusion of other probable aetiologies, the patient was thought to have PWS-related chest pain due to concurrent PCP and cannabis intoxication.

Figure 2 Coronary angiography showing no obstructive disease in the left anterior oblique cranial view of right coronary artery.

Figure 3 Coronary angiography showing no obstructive disease in the right anterior oblique caudal view of left coronary artery.

TREATMENT

He was initiated on medical therapy with oral nifedipine 10 mg daily for blood pressure reduction as well as for antianginal effects. He was monitored on continuous cardiac monitor for 24 hours.

OUTCOME AND FOLLOW-UP

The patient recovered well with diminution of chest pain. His hospital course was unremarkable for any inadvertent events. On day 3 of admission, he was discharged to a substance abuse rehabilitation centre in stable condition. At the 12-week follow-up, repeat ECG in outpatient clinic showed complete resolution of PWS pattern (figure 4). Repeat 2D TTE also showed resolution of hypokinesis of LV apex.

DISCUSSION

PWS encompasses conditions that mimic the ECG pattern of WS but seldom cause critical left LAD occlusion. It is a diagnosis of exclusion. Therefore, whenever the criteria of WS are met, it is imperative to rule out all the predictable causes of this pattern before labelling a case with PWS. Criteria to diagnose WS comprise of deeply inverted or biphasic T waves in anterior precordial leads V2–V3 of the ECG (inverted T waves can also be present in other precordial leads), absence of ST-segment elevation or Q waves, especially in the precordial leads, normal R-wave progression on the ECG, minimal or no elevation in the serum levels of cardiac enzymes and persistence of these ECG changes in the pain-free interval.^{1–3} Mild ST-segment elevations (<1 mm) may be noticed. These changes can be acute or chronic. Twenty-four per cent of patients with WS have type A pattern of T waves that are biphasic while the rest have deeply inverted and symmetrical type B pattern on presentation. In most cases, type A pattern of T waves had been observed initially, which gradually progressed into type B pattern with time.^{4,5}

The precise pathophysiology of ECG changes associated with WS or PWS remains unknown.⁶ It has been hypothesised that myocardial oedema or stunning due to unsteady LAD flow leads

Figure 4 Repeat ECG performed at the 12-week follow-up showing resolution of pseudo-Wellens' pattern.

to the development of these ECG patterns.³ It is important to consider that inverted T waves may present in other conditions, including LV hypertrophy, persistent juvenile T waves, digitalis intoxication, pheochromocytoma, pulmonary embolism, cerebral haemorrhage, Takotsubo cardiomyopathy, bundle branch blocks, myopericarditis and pulmonary oedema.^{7–10} Therefore, a proper clinical screening for these disorders is particularly warranted to reach an accurate diagnosis in patients with PWS.

According to our structured literature search of medical databases, MEDLINE and PubMed, three reports of cocaine, one report of marijuana and one report of morphine-induced PWS have previously been published.^{4 10–13} PWS has also been reported in association with other conditions, such as vasospastic angina, congenital myocardial bridge, acute cholecystitis and in some suspected cases of myocardial infarction.^{8 14–17} In 2006, Langston and Pollack described PWS in a patient who was using marijuana, cocaine and alcohol. Cocaine was assumed to be the main agent that led to the development of this presentation.¹⁰ However, a case of PWS with exclusive cannabis abuse has recently been reported.¹² The mechanism by which cannabis leads to the development of PWS is controversial. However, coronary vasospasm has been considered as the likely underlying aetiological process.

In our patient, simultaneous PCP and cannabis abuse was confirmed by urine toxicology screening. Although PWS has been previously reported in cases with marijuana toxicity, it has never been associated with PCP intoxication. To the best of our knowledge, the present case represents first report of PWS secondary to concurrent PCP and marijuana intoxication. As PCP is not a common drug of abuse, there is dearth of human studies regarding the effects of its intoxication on coronary vasculature. However, studies on animals have revealed marked vasoconstrictive effects of PCP on coronary vasculature.¹⁸ Furthermore, acute coronary syndrome after PCP abuse was reported in a recent case report, supporting the findings of the bench research in this regard.¹⁹ In the present case, we speculate that cannabis-related coronary vasospasm was augmented with PCP use because of its vasoconstrictive effects on LAD, eventually resulting in PWS-related chest pain.

Early recognition of WS or PWS is a matter of utmost importance. A delay in the diagnosis of WS significantly increases the risk of anterior wall myocardial infarction in these patients.²⁰ All patients with WS or PWS need critical care monitoring. As WS is very specific for LAD stenosis, stress testing is contraindicated in cases of WS or PWS. Therefore, urgent intervention by cardiac catheterisation is the best line of management.²¹ It is notable that coronary intervention has little benefit in a vast majority

of patients with PWS. However, it is the only way to rule out critical LAD occlusion and to confirm the diagnosis of PWS after exclusion of probable aetiologies. The segregation of these two clinical entities is imperative as medical management alone in patients with WS has been associated with fatal outcomes.^{2 22}

One report suggests the use of cardiac MRI (cMRI) in the cases with PWS to avoid the potential complications associated with coronary angiography, but cMRI has limited availability.¹⁷ Until percutaneous coronary intervention, WS or PWS are managed as acute myocardial infarction with antiplatelet, anticoagulant, nitrate, beta blocker and oxygen administration as appropriate. Cautious use of beta blockers is warranted in cases of illicit drug intoxication presenting with ECG findings suggestive of PWS because of the fatal risk of unrestrained alpha adrenergic vasoconstriction in cocaine abusers.^{23 24} In the present case, we used calcium channel blockers as these are the preferred alternatives of beta blockers in cases of poisoning.

With advocacy of cannabis legalisation in some regions, new users of cannabis are on the rise.²⁵ Clinicians should be promptly updated regarding newer adverse events observed in patients following short-term and long-term cannabis abuse, with special emphasis on their respective treatments.^{26–28} Therefore, all the possibilities associated with PWS should be considered in young and middle-aged individuals with no prior history of angina; relevant probing of cannabis abuse is essential. Further research is needed to investigate the mechanisms by which cannabis and/or PCP affect the myocardial perfusion.

Learning points

- This paper highlights a remarkably rare occurrence of pseudo-Wellens' syndrome secondary to concurrent phencyclidine and cannabis intoxication.
- Physicians should maintain a high index of clinical suspicion for this clinicopathological entity when cannabis abusers present with chest pain in association with Wellens' ECG pattern.
- Early differentiation of pseudo-Wellens' syndrome is particularly warranted as Wellens' syndrome is considered highly specific for impending myocardial infarction.

Contributors FI: designed the study, performed the literature review, drafted the manuscript and reviewed the manuscript. IR: contributed to the case presentation. NSA: contributed to the discussion. VMF: revised the manuscript critically for important intellectual content and gave the final approval for the version published.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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