

CATEGORY I – CLINICAL PRESENTATIONS: CARDIOLOGY AND SUBSTANCE USE

1.0 Introduction

Addictive drugs vary in their capacity to produce cardiovascular problems. These can be life threatening medical emergencies e.g. myocardial infarction or ventricular arrhythmias. Licit and illicit drugs may also interact with medications prescribed for cardiac and other medical conditions and have adverse effects on the cardiovascular system. Chronic use and addictive use exposes the cardiovascular system to high doses over prolonged periods. Drugs may contribute to the development and progression of cardiovascular disease. Tobacco is the substance that leads to the development of the majority of cardiovascular diseases that are related to substance use. Opiates and cannabis pose relatively little risk whereas cocaine can pose major risks e.g. myocardial infarction, stroke, cardiomyopathy and sudden death. Tobacco is harmful at any dose while more evidence is accumulating about the adverse impact of consumption of alcohol. Patients may present with symptoms related to the cardiovascular system as a result of substance use.

Hypertension may result from stimulant use, excessive alcohol consumption and withdrawal states while hypotension may be the result of opioid overdose. Stimulant use and withdrawal states may lead to tachycardia, alcohol may give rise to tachycardia, atrial fibrillation, cardiomyopathy or cardiac failure.

Vignette

A 33-year-old woman was admitted to hospital with sudden onset chest pain lasting for 60 min. It was gradually worsening, and radiating to the left arm. She did not have any syncope or palpitations. Because she also felt mildly short of breath, she was advised by her boyfriend to come to the hospital. She had no significant family history of heart disease. She has been smoking two packs of cigarettes per day for the past 5 years and reported social alcohol use. She was a regular cocaine user, using it monthly and frequently experiencing mild chest pain after use. The chest pain usually appeared on the day following cocaine use, was similar in nature to the presenting pain, but not as severe. She admitted to taking cocaine a week prior to admission.

Routine bloods revealed a small raise in troponin I levels of 134 µg/L at 4 h and 211 µg/L at 8 h (normal levels <40 µg/L). Initial electrocardiogram (ECG) demonstrated normal sinus rhythm with minor T wave inversion in the anterior leads. Her chest pain continued and a repeat ECG 2 hours after admission demonstrated ST elevation in the anterior leads (Fig 1). Due to her history of cocaine use, she was initially managed medically and acute cardiac intervention was withheld.

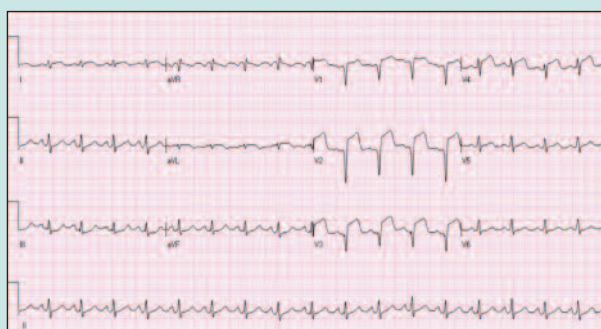


Figure 1.

LEARNING OUTCOMES

Medical students will:

1. Recognise the multiple cardiac symptoms associated with the use of alcohol, tobacco, opiates, stimulants and other substances.
2. Appreciate the need for a comprehensive substance use history in all patients presenting with cardiac symptoms.
3. Recognise life threatening cardiac medical emergencies that may be related to substance use.
4. Appreciate that treatment with pharmacological agents might have adverse effects on the cardiovascular system.
5. Understand that management of the medical condition may only be optimal if patients are supported to seek treatment for their substance problems.

Context

Cardiovascular complications include a range of conditions:

- Cardiomyopathy
- Arrhythmias
- Hypertension
- Myocardial infarction
- Endocarditis
- Vasculitis
- Vascular spasm
- Arterial injection with ischaemia or gangrene
- Embolism
- Arteriovenous aneurysm
- Mycotic aneurysm

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Assessment

On physical examination, important signs or symptoms related to substance use in general, and the cardiovascular system in particular include:

- General appearance: poor self-care
- Smell of alcohol on breath
- Facial flushing, telangiectasia, periorbital oedema
- Nicotine stains on fingers
- Skin abscess
- Tremors (alcohol or benzodiazepine withdrawal)
- Sweating (alcohol or benzodiazepine withdrawal or opiate withdrawal)
- Conjunctival injection – alcohol or cannabis related
- Pupil size – constricted in opiate use/intoxication, dilated in opiate withdrawal, unequal in head injury
- Bruises – alcohol
- Signs of injury or trauma
- Sepsis
- Vein damage – track marks
- Cardiac murmurs
- Ankle swelling
- Tachycardia
- Arrhythmia
- Hypertension
- Breathlessness
- Seizures
- Delirium

Examination of cardiovascular system might reveal:

- Hypotension – opioid overdose
- Hypertension – stimulants, alcohol, withdrawal states, anabolic steroid misuse
- Tachycardia – stimulant use, withdrawal states
- Atrial fibrillation – alcoholic cardiomyopathy, alcohol induced, stimulant use, energy drinks
- Cardiac failure – cardiomyopathy, anabolic steroid misuse
- Heart murmurs – bacterial endocarditis, cardiomyopathy

Clinical Presentations:

Common Presentations including special features, distinctive features, and barriers to detection, recognition and access.

Common presenting symptoms e.g. chest pain, palpitations, breathlessness, ankle swelling, blackouts, fits, confusion and loss of consciousness, can be related to the use of substances.

Depressant drugs generally have effects opposite to those of stimulants. Thus, withdrawal from depressants e.g. alcohol, will lead to symptoms similar to intoxication from e.g. cocaine and amphetamines. Withdrawal or intoxication might include signs such as tachycardia and hypertension.

Palpitations, breathlessness and ankle swelling may be the

presenting features not only of ischaemic heart disease, atrial fibrillation and cardiac failure but also stimulant intoxication or alcoholic cardiomyopathy.

Chest pain may be the result of myocardial ischaemia or infarct and could point to the misuse of cocaine or amphetamine, especially in a young person.

Blackouts may be the result of alcohol intoxication, while convulsions may be the presenting feature of alcohol and benzodiazepine withdrawal and stimulant intoxication.

Delirium can be a presenting feature of cerebrovascular accidents or cardiac failure, and alcohol or benzodiazepine withdrawal can cause delirium. Overdose of depressant drugs may lead to coma.

Tobacco

Smoking reduces life expectancy by about 8 years. It affects multiple organs, but its greatest impact is on the cardiovascular system. Smoking has an acute (through nitric oxide) and a chronic effect (through carbon monoxide) on the cardiovascular system. Acute effects impair vasodilation and chronic effects causes endothelial inflammation and atheroma formation, thus most of its effects are on the vasculature by the development of atherosclerosis. Smoking increases the risk of hypertension, arrhythmias, acute myocardial infarction, fatal coronary artery disease and sudden death, aortic aneurysm, stroke, peripheral vascular disease and right sided heart failure (cor pulmonale). Cigarette smoking is a risk factor for diabetes and aggravates insulin resistance in diabetic patients. There is a very low threshold for the increase of cardiovascular risk with smoking, effectively from few cigarettes per day. Smoking cessation reduces the risk of cardiovascular morbidity and mortality; this has not been established for reduction of cigarette consumption. Smoking increases the risk of heart defects in infants whose mothers smoke during pregnancy. Second-hand smoke increases the risk of cardiovascular disease. (Carter, 2015)

Alcohol

Heavy consumption of alcohol is associated with hypertension, coronary artery disease, cardiomyopathy, arrhythmias, stroke and sudden death. These are increased by binge drinking. Atrial fibrillation is the most common form of arrhythmia and part of 'holiday heart' syndrome which follows binge drinking over the weekend or holiday. It is estimated that alcohol is the causative factor in up to two thirds of patients with atrial fibrillation. Alcohol is associated with a dose dependent increase in blood pressure both chronically and acutely.

Cardiac injury, as the direct toxic result of ethanol and its metabolites, leads to myocyte death or dysfunction and eventually to a cardiac phenotype of alcohol-induced dilated cardiomyopathy. This is characterised by the presence of left ventricular or biventricular systolic dysfunction and dilatation and presents with symptoms and signs of heart failure. Maternal alcohol consumption may cause foetal heart defects.

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Stimulants

Cocaine: Cocaine stimulates the sympathetic system, increasing the heart rate, blood pressure, and myocardial contractility and thus leads to an increased myocardial oxygen demand. Cocaine also reduces myocardial blood supply because it constricts blood vessels, including the coronary arteries. When the increased myocardial oxygen demand exceeds the reduced myocardial oxygen supply, it leads to myocardial ischaemia and/or infarction.

Most of the toxic effects are acute and are associated with myocardial ischaemia and infarction, cardiac arrhythmias, left ventricular hypertrophy, uncontrolled hypertension, myocarditis, cardiomyopathy, stroke, aortic dissection, infective endocarditis and mesenteric ischemia. Cocaine use is also associated with a prothrombotic state as it stimulates platelet aggregation. Cocaine accounts for up to a quarter of cases of myocardial infarction in patients between 18 and 45 years of age. 6% of patients who presented to the emergency department with chest pain after using cocaine had developed cocaine-associated myocardial infarction. This should be included in the differential diagnosis of young patients presenting with chest pain or angina pectoris.

After a few years of regular use cocaine increases the risk of premature heart attacks as it accelerates atherosclerosis. Cocaine users have a seven-fold increased lifetime risk of non-fatal myocardial infarction compared with non-users. Use is also linked to congenital cardiac disease e.g. atrial septal defects, ventricular septal defects, patent ductus arteriosus and pulmonary stenosis. (Kloner, 2003)

Amphetamine: Like cocaine, amphetamine toxicity produces tachycardia and hypertension, chest pain and myocardial ischaemia and infarction, stroke, acute hypertension, cardiac arrhythmias, cardiomyopathy, and aortic dissection in addition to pulmonary hypertension. Sudden cardiac death, infective endocarditis and premature coronary artery disease are recognised features. In large doses, methamphetamine can lead to collapse and hypotension.

Opiates

Most naturally occurring opioids do not alter cardiac rhythm. Synthetic opioids e.g. methadone, commonly used to treat opiate dependence, may result in QT interval prolongation and torsades de pointes, a life threatening ventricular arrhythmia.

Opioids can lead to orthostatic hypotension, and overdose of opiates can lead to respiratory and cardiac arrest.

However, the major contribution of opiate use to cardiovascular problems is through injecting drug use. Infective endocarditis is a medical emergency and develops as a result of intravenous drug use where bacteraemia causes damage to heart valves, heart failure and systemic or pulmonary embolization.

Effects of injecting drug use:

Cardiac complications of injecting drug use may be due direct actions of the drug, unsafe injecting practices, contaminants and adulterants in the drugs, and other factors eg chaotic lifestyle,

poor health care and self-care, increased risk of infections.

Unsafe injecting practices may lead to vascular and tissue damage as a result to repeated trauma and chemical irritation, aseptic thrombophlebitis and thrombosis, intra-arterial injection causing limb ischaemia or gangrene, injection of particulate matter which give rise to microemboli, injection sites which cause pulsatile aneurysms in the neck or groin.

Systemic bacterial infections may lead to endocarditis or septicaemia and this can be a medical emergency to be considered in injecting drug users with high or chronic or unexplained fever and weight loss. Endocarditis may affect the tricuspid, mitral and aortic valves. Furthermore, septic embolization from left sided endocarditis may also lead to abscesses in the brain and other organs.

Cannabis

Cannabis can result in tachycardia and bradycardia, hypertension and orthostatic hypotension, syncope, worsening of angina pectoris, myocardial infarction, ischemic stroke and arrhythmias. It raises the risk of ischemic stroke and heart failure. As it is often used with tobacco, the risks of cannabis use may be compounded by those of tobacco use. (Franz, 2016)

Anabolic Steroids

Case studies have linked misuse of anabolic steroids with, myocardial infarction, stroke and death. Anabolic steroid use has also been linked to hypertension, and hypercholesterolemia. It is well established that it can lead to concentric thickening of the walls of the left ventricle (left ventricular hypertrophy) and ECG abnormalities. The significance of anabolic steroid misuse in athletes and their role in cases of sudden death in athletes is currently largely unknown. Recent studies have reported non-therapeutic exposure to anabolic steroids as an independent risk factor for cardiovascular morbidity and premature death (Thiblin 2015, Angell 2012).

Barriers

- Patients may not realise that some cardiac symptoms are related to substance use
- Patients may be unaware that the symptoms can be life threatening
- Patients may be fearful of disclosing substance use
- Practitioners may not be aware of the relationship of cardiac symptoms to substance use, or unqualified or ill-equipped to manage the symptoms

Treatment

The management of cardiovascular disease needs to take account of the use of substances in the individual patient and it needs to be optimistic, appropriate and realistic.

Patients may be receptive to advice to improve their lifestyle following an acute event, and practitioners should use opportunities for intervention as they arise. Psychosocial and pharmacological treatments should be utilized. It is vital to check that the pharmacological agents used do not have adverse effects on the cardiovascular system, or indeed, might

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have been the cause of some of the symptoms. The choice of medication may be determined by the cause of the cardiovascular problem.

Smoking cessation is effective in reducing mortality from cardiovascular disease. This can be achieved by the use of nicotine replacement in the form of patches, spray or lozenges, other medications, and participation in support groups or specialised smoking cessation clinics.

The physical condition of patients who are supported and manage to reduce or stop drinking often improves. However, if patients continue to drink, anti-hypertensive medication will not be as effective as it could be. Abstinence from alcohol is associated with reductions in blood pressure comparable with anti-hypertensive medication. Similarly, abstinence from alcohol is crucial to treatment of cardiomyopathy. Abstinence is also the most appropriate management strategy for vascular disease along with tobacco cessation and other measures eg nutritional and vitamin supplementation. As it is becoming increasingly clear that there is likely to be a dose dependent relationship of alcohol consumed to cancer risk and cognitive decline, advice to reduce or stop alcohol should be carefully considered in all cases. If medication is indicated, it is worth bearing in mind that while naltrexone, acamprosate or nalmefene do not have cardiovascular effects, disulfiram does.

Injecting drug users need to be encouraged to stop injecting or at least to use safer injecting techniques as well as to seek treatment for drug problems if they are not already attending a service. This is of proven effectiveness in terms of health and social outcomes.

Referrals/networks/services

There is every reason if possible to develop channels of communication between addiction services and cardiac units. This offers the chance for further joint assessments and ongoing communication about a patient's physical and mental health, as well as links with primary care. Patients need to be encouraged and supported to improve their general life style e.g. alcohol, tobacco and illicit drug use, review of prescription medications and over the counter products, in addition to undertaking regular physical activity and monitoring physical and mental health problems.

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