Hypoglycemia imitating cardiac ischemic symptoms: A case report and review of literature

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Abstract

Ischemic heart disease is the most common cause of mortality in all low and high-income countries. Diabetes mellitus is also a major public health challenge increasing rapidly worldwide and is reported as an equivalent to coronary heart disease (CHD) in some studies. Hypoglycemia is a common complication in diabetic patients that can stimulate the sympathetic nervous system in its severe form, eventually leading to the destabilization of atherosclerotic plaques and cardiovascular events. Therefore, preventing hypoglycemia is crucial in diabetic patients, especially those with a previous history of CAD, in order to prevent cardiovascular events. In this study, we report a diabetic patient presented with multiple hypoglycemic episodes and chest pain.

Keywords: Diabetes; Hypoglycemia; Ischemic heart disease; Autonomous nervous system.

Introduction

Diabetes mellitus (DM) is known as one of the largest global health challenges in current century. Diabetic patients have a higher mortality risk due to cardiovascular diseases, and ischemic heart disease (IHD) is considered the leading cause of death among this population [1]. Serum insulin and glucose levels can affect the sympathetic nervous system and noradrenaline release [2]. Autonomic nervous system stimulation triggers hemodynamic changes, including tachycardia, increased peripheral systolic blood pressure, myocardial contractility, stroke volume, cardiac output, and decreased peripheral arterial resistance and central blood pressure. These transient changes could lead to life-threatening stress in diabetic patients, especially those with a previous history of coronary heart disease [3].

Case presentation

A 57-year-old female with a history of diabetes mellitus made an outpatient visit to our clinic with a chief complaint of chest pain. Her chest pain episodes during the past months were non-exertional, non-radiating, and retrosternal, accompanied by headache and sweating. In addition to tightly controlled diabetes mellitus, she also mentioned a positive family history of coronary artery disease (CAD). Her medications included metformin, glibenclamide, pioglitazone, aspirin, lovastatin, and captopril. Her physical examinations revealed a II/VI systolic murmur with the greatest intensity at the apex, but the rest of the examinations were unremarkable. The electrocardiogram (ECG) obtained at the clinic showed normal sinus rhythm, with normal QRS voltage and non-specific ST-T changes. Transthoracic echocardiography (TTE) revealed normal left ventricular ejection fraction (LVEF=55%), without any regional wall motion abnormality, in addition to mild mitral valve prolapse and regurgitation. In her laboratory results, a hemoglobin level of 12.8 g/dL, creatinine= 0.9 mg/dL, and HbA1c=5.3% were detected. She also underwent outpatient coronary CT angiography, which revealed normal coronary arteries. Due to the continuation of the chest pain episodes, the patient was asked to check her blood sugar (BS) at the time of chest pain. The BS measurements were in the range of 47 to 49 mg/dL, at time of chest pain which proved simultaneous hypoglycemia.
performed in diabetic patients considering the benefits and recognized complications of long-term diabetes mellitus (6). Many disease complications are the most common and well-recognized complications of long-term diabetes mellitus (6). Many studies have demonstrated that severe hypoglycemia is associated with increased mortality rates in diabetic patients [7]. Hypoglycemic symptoms consist of autonomic (anxiety, tremor, palpitation, diaphoresis) and neuroglycopenic (headache, dizziness, blurred vision, confusion) symptoms, which can vary according to the patient’s age or duration of diabetes [8]. Severe hypoglycemia can trigger the sympathetic nervous system, the pro-inflamatory state, platelet aggregation, and endothelial dysfunction, eventually leading to an atherogenic state with the destabilization of atherosclerotic plaques, and cardiac arrhythmia presenting with cardiovascular events [7]. A meta-analysis including more than 900000 patients reported a 2-fold increase in the cardiovascular mortality risk in patients with type-2 diabetes and severe hypoglycemia, which was a result of the sympathoadrenal response, increase in blood levels of catecholamines and their direct effect on the myocardium, vascular system and platelet activation [8].

Diabetes is also a major public health concern, with a prevalence of 8.8% in 2015 which is expected to increase to 10.4% in 2040 [1]. The prevalence of diabetes mellitus (DM) is growing rapidly worldwide due to the aging population, economic development, increasing urbanization, consuming less healthy diets, and reduced physical activity levels [1]. Diabetes can influence individuals in different age groups, from almost every nation, and with different economic statuses throughout the world [6]. Some studies have reported DM as equivalent to coronary heart disease (CHD). DM without previous history of myocardial infarction (MI) and prior MI without a history of DM have the same mortality risk due to CHD [1].

Serum glucose levels affect the sympathetic nervous system. The autonomous nervous system can control the heart rate and contractility by innervating the epicardium and distributing to the entire heart afterward. The sinoatrial (SA) node, atrioventricular (AV) node, and atriums have the highest concentrations of norepinephrine compared to the ventricles. Stimulation of the sympathetic nervous system leads to the release of norepinephrine into the synaptic cleft and activation of the postsynaptic beta adrenoreceptors by binding to them [2].

Microvascular (neuropathy, nephropathy, retinopathy) and macrovascular (cardiovascular disease, peripheral artery disease) complications are the most common and well-recognized complications of long-term diabetes mellitus (6). Many trials have suggested that tight glycemic control should be performed in diabetic patients considering the benefits and risks of hypoglycemia. Poor glycemic control can cause an increased disease burden and mortality rates (7). However, setting a lower glycemic target in diabetic patients to prevent microvascular and macrovascular complications has led to an increased risk of hypoglycemia [8].

Cardiovascular diseases (CVDs) are responsible for about one-third of the deaths occurring worldwide, and ischemic heart diseases (IHD) are recognized as the most prevalent type of CVD. Increased prevalence of obesity, diabetes mellitus, metabolic syndrome, and population aging has led to a higher incidence of IHD in recent years [4]. IHD is the first cause of mortality in all low to high-income countries. Although the mortality rates of IHD have declined significantly in developed nations during the past decades, it is still considered a crucial public health challenge in developing countries [5].

Management of hypoglycemia in diabetic patients should be done along with identifying and eliminating the underlying causes. Aging, tight glucose control, renal insufficiency, pregnancy, previous hypoglycemic episode, multiple DM medications, and low knowledge about DM are known risk factors of hypoglycemic events. Patient education about symptoms of hypoglycemia, setting individualized glucose targets for diabetic patients, self-monitoring of blood glucose, dietary modifications, and exercise should be considered preventive methods [9].

Conclusion

Diabetes has been increasing in the past decades and is characterized as a threatening condition for public health worldwide. Besides an increase in the prevalence of diabetes, patients are also susceptible to complications of the disease. Educating the patients about the symptoms of hypoglycemia and its preventive measures can help prevent cardiovascular events in diabetic patients, especially those with a previous history of CVD.
References


