

Clinical reviews

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Acute coronary disease, prognosis and prevalence of risk factors in young adults

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Abstract

Acute coronary disease is a rare entity in young people and is mostly related to atherosclerotic disease. However, other causes such as myocardial bridges, coronary artery dissection and antiphospholipid syndrome may be present.

The prognosis of the disease in this group of patients is favorable; although women may have a higher morbidity because diagnosis and treatment can be delayed. The goal of this review is to update the knowledge about risk factors and prognosis of young patients with an acute coronary event compared to the older population.

Introduction

"A 28-year-old patient, male, with a family history of acute coronary artery disease went to the emergency service with a 10-minutes duration event of typical chest pain. The electrocardiogram showed a ST segment elevation in leads DII, DIII and AVF and positive myocardial necrosis biomarkers were present. He underwent a cardiac catheterization, during which doctors discovered triarterial lesions, the most important of which being the circumflex with a 100% obstruction in the middle third. It was treated by angioplasty and stenting. The complementary tests were normal including the lipid profile and the tests for evaluation of hypercoagulability states".

The acute coronary disease is a relatively rare entity, with a prevalence of 1% in people under 40 years of age and 5% to 10% in people under 50 years of age [1],[2],[3].

The majority of cases is associated with atherosclerotic disease, developed at an early age, and influenced by factors such as cigarette smoking, male sex, obesity, dyslipidemia, and hereditary effect [1],[2],[3],[4],[5],[6].

Unlike older adults, young people with acute coronary events have a different risk profile, characterized by a higher prevalence of obesity and dyslipidemia; and a lower influence of hypertension and diabetes [7].

Other less frequent causes found in this population include coronary embolism, thrombosis *in situ*, coronary anomalies, spontaneous coronary artery dissection and acute myocardial infarction without obstructive coronary lesions [8],[9].

The aim of this review is to update the knowledge about the risk factors and prognosis of young patients suffering from an acute coronary event compared to the older adult population.

Methods

A non-systematic search of evidence was carried out through MEDLINE/PubMed database of scientific papers published in English between 2009 and 2017. In total, 40 studies were found, 27 of which were included, corresponding to original and review articles. We excluded

articles related to case reports, experimental studies, letters to the editor, and articles not available in their full-text version. The terms used for the search were "myocardial infarction and young adult", "acute coronary syndrome or coronary disease and young adult"

Results

Risk factors

Eighty percent of acute coronary events in young people are due to atherosclerotic disease [8]. However, unlike in older people, lesions are usually less complex (40% to 60% of cases occurs in only one arteria), mainly located in the anterior descending and right coronary arteries. Only 10% to 15% of cases may present angiographically important obstructive lesions (obstruction > 50% of vessel lumen diameter) [2],[5].

There is a relation between the atherosclerotic process in young people and dyslipidemia, which is present in up to 29% of patients younger than 40 years with a history of acute myocardial infarction [8]. It is characterized by low levels of HDL cholesterol (HDL₂ type), hypertriglyceridemia, and high concentration of particles with high atherogenic activity (VLDL and IDL cholesterol) [8],[10],[11],[12].

Some genetic and hereditary factors are related to dyslipidemia as the mutation of the E4 allele of apolipoprotein E, or the LDL cholesterol receptor gene mutation. Both favor the development of atherosclerotic disease. Therefore, these patients have an increased risk of presenting acute coronary events at an early age; and in some cases, may lead to a worse functional prognosis since myocardial cells did not achieve an adequate ischemic preconditioning process [1],[8],[13].

Another factor associated with the development of coronary disease at an early age is smoking [14]. Estimates indicate that on average, people start smoking at the age of 17 years with a higher prevalence in females [7]. It has also been reported a 2.5-fold greater chance of recurrence with a new ischemic coronary event in those youngsters who presented a history of acute myocardial infarction and had a consumption of 35 cigarettes per day, compared to those who had an infarct and were not exposed to cigarette consumption (HR = 2.394 95% CI: 1.468-3.905) (p < 0.001) [7].

The use of illicit drugs, especially cocaine and amphetamines is associated as a cause of coronary disease in this population group [2]. From a physiopathological approach, this consumption, is related to an excessive release of neurotransmitters such as noradrenaline and dopamine, causing an alteration in the supply-demand relation of oxygen in the myocardial cell secondary to an increase of heart rate and systemic arterial pressure [2],[8]. Other effects related to the consumption of these drugs are: an increased platelet aggregation, increased endothelial reactivity, and decreased coronary flow [2],[8].

Regarding the influence of sex on acute coronary disease, we know there is a higher prevalence of acute myocardial infarction in men than in women [2]. This association may be related to other risk factors such as alcohol consumption, dyslipidemia or cigarette smoking that are more common in the male population [15],[16]. It is also related to certain hormonal factors such as low levels of androgens and an increased activity of stress-associated hormones such as cortisol, adrenaline, and noradrenaline [17].

The antiphospholipid syndrome and the hypercoagulability states constitute less than 5% of the causes of acute myocardial infarction in young people. However, it has been predicted that as many as 21% of patients with antiphospholipid syndrome could debut with an acute myocardial infarction [3],[8],[18],[19]. These patients have been characterized by an increase in the platelet activity due to a higher sensitivity of the platelets in the presence of adenosine diphosphate, by the increase of the activity of the plasminogen inhibitor factor, the increase of the lipoprotein A expression and high levels of oxidized LDL antibodies [3],[8].

Less common causes of acute coronary events in young people include the presence of myocardial bridges (0.5% to 2.5%); spontaneous dissection of the coronary arteries (0.07% to 0.1%), especially in those exposed to vigorous isometric exercise or during the peripartum period; and acute myocardial infarction without evident coronary obstructive lesions in 1% to 14% of cases [8],[9],[20],[21].

Finally, several factors classically associated with acute coronary disease such as hypertension, insulin resistance, and type 2 diabetes mellitus are diagnosed in less than 5% of young patients with acute myocardial infarction and are less relevant compared to patients of older age [1],[8].

Prognosis

The morbidity reported in young patients who have suffered an acute myocardial infarction is 1.5% and in-hospital mortality during the 30 days after the event is 8.3% [5],[9],[15],[22].

Likewise, in relation to gender, no relevant differences in mortality were reported. However, there are some characteristics in women that could worsen the prognosis, such as the presentation of atypical symptoms, less alteration of cardiac biomarkers at the time of diagnosis, later access to reperfusion therapy and are more likely to not receiving adequate doses of beta-blockers and antiplatelet agents [6],[14],[16],[23],[24],[25],[26].

In the "Variation in Recovery: Role of Gender on Outcomes of Young AMI Patients (VIRGO)" study, made in a cohort of 3,572 patients (1,175 men and 2,397 women), the percentage of patients with atypical chest pain was higher in women than in men (16% vs 10%, p < 0.001). There was a higher elevation of troponin values in males (9.6 ng / mL) compared to females (5.8 ng / mL) (p < 0.001), and there was a higher risk of death in women that do not receive

coronary reperfusion treatment (RR = 2.31; 95% CI: 1.32 - 4.06) [23],[24].

Other studies as those carried out by Dreyer *et al.* showed that women have a higher risk of not being treated with primary angioplasty when compared to men (HR = 1.65; 95% CI: 1.55 - 1.75) [25]. Davis *et al.* showed that within the group of female patients, those who were younger were more likely to not receive optimized medical treatment after discharge compared to older women [14].

In the case of patients with acute myocardial infarction, but without injury in the coronary arteries, long-term mortality can reach up to 18% [27]. However, patients who were treated with angiotensin converting enzyme inhibitors or angiotensin II receptor blockers had a reduction in the number of cardiovascular events greater than 18% (HR = 0.82; 95% CI: 0.73 - 0.93), and in those patients to whom statins were added to the treatment, the reduction was 23% (HR = 0.77; 95% CI: 0.68 - 0.87). Nevertheless, in this group of patients, no benefit was evidenced with the use of antiplatelet agents at one year follow-up (HR = 0.90; 95% CI: 0.74-1.08) and an increase in the rate of in-hospital bleeding was verified [27].

Conclusions

Atherosclerotic disease is the main cause of acute coronary events in young patients.

Cigarette smoking is one of the main risk factors associated with the development of acute coronary disease at an early age. Other causes, especially hypercoagulability disorders, should be excluded in patients with no other apparent risk factors.

The prognosis of this group of patients is favorable; however, it must be individualized case by case since there are more vulnerable groups such as the case of young women.

There is divergence between the different studies regarding the age at which people are considered as young patients. This variable waits for standardization in order to have an adequate interpretation of the results in this population group.

Notes

From the editor

The authors originally submitted this article in Spanish and subsequently translated it into English. The Journal has not copyedited this version.

Declaration of conflicts of interest

The authors have completed the ICMJE Conflict of Interest declaration form, and declare that they have not received funding for the report; have no financial relationships with organizations that might have an interest in the published article in the last three years; and have no other relationships or activities that could influence the published article. Forms can be requested by contacting the author responsible or the editorial management of the Journal.

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