

Psychological impact of chronic coronary artery disease

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Introduction to chronic ischemic heart disease

Atherosclerosis is a chronic arterial disease and represents the first leading cause of vascular disease worldwide [1]. In addition, forecast estimates that by 2020 cardiovascular diseases, especially atherosclerosis, will become the most widespread diseases in the world [2]. Atherosclerosis is at the basis of the most frequent cardiovascular disease: chronic ischemic heart disease (CIHD) [3]. In Europe (WHO data 2014) CIHD is responsible for almost half (46%) of all deaths (30% in individuals <65 years old and 37% in those <75 years old) [4]. Atherogenesis (i.e. the formation of atheromatic plaques) takes place at the endothelium level, involving arteries of the all human body and their growth lasts for decades [5]. After a silent and prolonged period, the atherosclerotic plaque tend to cause the obstruction to the passage of blood downstream the stenosis (a process called ischemia) either by a reduction in lumen vessel's size (chronic process) or by the rupture of the plaque itself with consequent embolization of atherogenic material (acute process) and subsequent acute ischemia, in most cases [6]. If different arteries of our body are affected, the signs and symptoms of atherosclerosis will depend on the affected sites; more frequently atheromatic plaques are formed at the level of coronary arteries whose principal symptom is represented by chest pain ("angina"); if plaques involve carotid arteries the main manifestation will be a transient

ischemic attack (TIA) or a cerebral stroke; finally if plaque form at peripheral arteries' level, patients will experience pain during the march ("claudicatio intermittens")[6].

Although in developing countries chronic ischemic heart disease is continuously increasing, its mortality and morbidity is dramatically decreasing over time since the middle of the 20th century. For example, in the United Kingdom, the probability of death from vascular disease in middle-aged men (35–69 years) has decreased from 22% in 1950 to 6% in 2010 [7].

The total cost of CIHD in 2014 consisted of €81.1 billion in healthcare costs; by 2020 healthcare costs attributable to CIHD has expected to rise to €9 8.7 billion [8].

Main clinical features of chronic ischemic heart disease

From a pathogenetic point of view, atherogenesis is the basis of CIHD.

The risk factors for this pathology are nowadays well established and identified and are divided into two main categories: the modifiable and the unmodifiable [9]. The modifiable risk factors are represented by a series of pathologies or conditions on which it is possible to intervene pharmacologically or by changing patient's lifestyle to reduce them; the non-modifiable are instead intrinsic conditions that cannot be influenced by external actions.

The principals among the first category are: smoking, systemic arterial hypertension, high plasma cholesterol levels, obesity and diabetes mellitus. The second category includes: male sex, age and some genetic disorders [9].

CIHD is called the "silent killer" because it remains asymptomatic for decades without manifestation of itself, until the atherosclerotic plaque reaches that size which causes a significant obstruction of blood flow downstream the stenosis (this generally occurs when the plaque determines an obstruction of blood stream of more than 70% of its physiological flow) or, following an acute rupture, causes local thrombosis leading to partial or total occlusion of the affected artery [10]. The site, size and velocity of vessel occlusion are intrinsic characteristics of atheromasic plaque on which the clinical consequences of ischemic heart disease depend [11]. As already mentioned, the most relevant clinical manifestation of ischemic heart disease is represented by acute myocardial infarction, which means

irreversible death or necrosis of a portion of myocardial tissue. The main symptom is angina, which is defined as a retrosternal constricting or oppressive pain that can radiate to the jugular or right arm and less frequently to the upper left limb or retroscapular level [6]. Another extremely frequent symptom is the difficulty in breathing or lack of air (dyspnea) which can occur either under stress or at rest. Less frequent symptoms are paresthesias of the upper limbs, gastric burning or dyspepsia and algid sweating. In some cases, acute myocardial infarction occurs directly with syncope, cardiac arrhythmias and sudden cardiac death.

Main tools for the diagnosis

The diagnostic algorithm of CIHD is divided into first, second and third level examinations. Laboratory tests such as hs-TnI, CPK and BNP values are certainly useful even if they are not always illustrative [12].

Among the first level exams the former to include is certainly the resting electrocardiogram which consists of a peripheral voltages recording that reflect cardiac electrical activity, permitting to understand if the patient is affected by myocardial ischemia and suggesting about the coronary lesion's location responsible for the ischemia. Specific electrocardiographic changes such as ST segment upper or under elevation > 1 mm in two or more contiguous leads, the appearance of a new left bundle-branch block or a Q wave with a depth $> 1/3$ of the subsequent QRS complex are highly indicative of myocardial infarction [13]. Unfortunately, the electrocardiogram does not have a one-hundred per cent sensitivity; this means that it cannot identify all the subject suffering from CIHD.

Exercise electrocardiography consists of an electrocardiographic recording of a patient while he/she is making a physical effort (e.g. cycling or running) and simultaneously monitoring his/her blood pressure. This test has a sensitivity of 68% and a specificity of 77% [12].

The echocardiography represents another non-invasive first level exam, easy to perform, which enables doctors to directly visualize alterations in cardiac motion; however, it remains

a qualitative more than quantitative exam in CIHD evaluation, highly operator-dependent so that it does not give sufficient data to decide if treat a patient with CIHD or not.

In recent years among the second level imaging technique, cardiac CT-scan is gaining a growing consensus into scientific community for its ability to determine the size reduction of coronary vessels [14]. CT-scan main advantage is the non-invasiveness and the relative low cost. The main limitation for CT-scan, to be assumed as gold standard technique to diagnose CIHD, is the unreliable results when it is applied on extremely calcified coronary arteries; since calcium deposits in the atheromasic plaque interfere with CT acquisition sequences.

Nowadays the gold standard imaging technique for the diagnosis of CIHD is accounted by invasive coronary angiogram, which consists in imaging acquisition, under fluoroscopic vision, of the coronary artery tree after somministration of contrast medium enhancement via percutaneous catheter inserted in the radial or femoral artery (Fig.1). The main disadvantage of this procedure is the inherent risk of coronary or aortic dissection, anaphylaxis to the contrast medium and, ultimately, death (15).

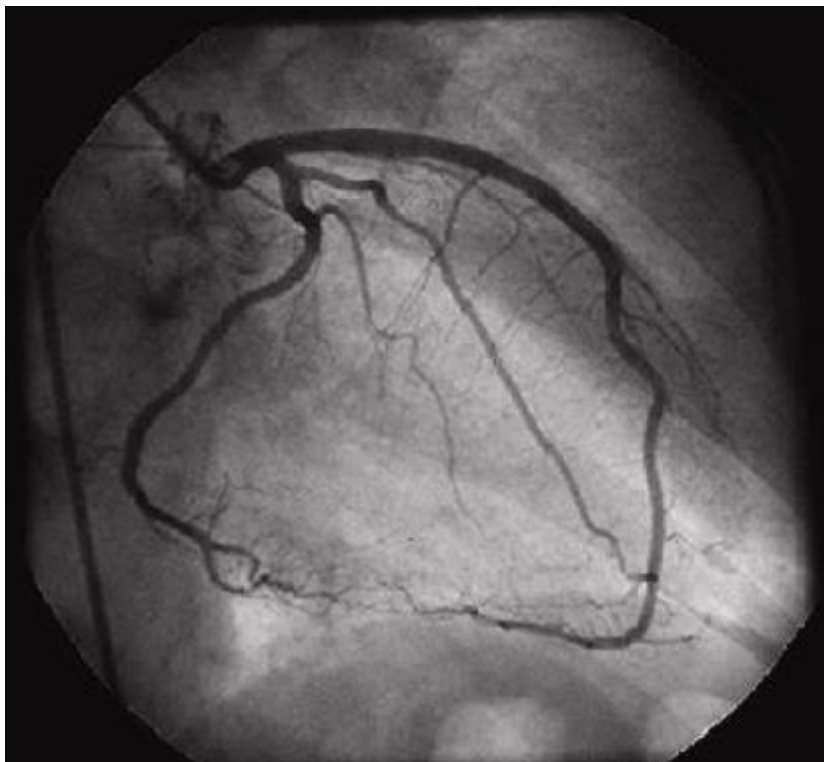


Fig.1 Normal angiographic coronary aspect.

Main non-invasive treatments

Firstly, it is mandatory to intervene on the eliminable risk factors: quitting smoking, implementing a correct Mediterranean diet, weight loss and physical activity. In some cases, it is required to combine these measures of modification in patient lifestyle with a pharmacological therapy [16]. The pharmacological armamentarium for the treatment of CIHD includes several drugs. The main medication is represented by the category of anti-platelets (the most widely used of which is Cardioaspirin) which, by inhibiting platelet aggregation, prevents on the one hand the increase in the size of the atheromatic plaque and on the other hand its rupture otherwise increasing the risk of bleeding [17].

Among these, those that have been identified as drugs capable of having a protective effect on the progression of ischemic damage, beta-blockers occupy certainly the first place. These medications act by reducing heart rate and blood pressure by blocking β_2 receptors action. Ace Inhibitors or Sartans and aldosterone antagonists are commonly used in clinical practice because randomised controlled trials have shown that they increase survival in patients with CIHD [18]. In addition to these drugs, others are also commonly used to relieve the symptoms of CIHD itself. These include nitrates with the function of increasing venous return and vasodilating the coronary arteries and Ranolazine (a recently marketed drug).

Main invasive treatments

The invasive treatment of CIHD is divided into two main branches of action: 1. the percutaneous and 2. the surgical ones.

The percutaneous coronary approach consists in the release of a medicated or non-medicated stent which is inflated inside the coronary vessel at the level of the plaque. This procedure named percutaneous transluminal coronary angioplasty (PTCA) involves the delivery of the stent using catheters inserted by peripheral arteries (radial or femoral artery).

It is mostly used in single or multiple coronary artery lesions in non-diabetic patients. The main risk of coronary stents is their thrombosis and therefore the risk of intrastent restenosis [19]. In case of coronary lesions that cannot be treated by PTCA (for anatomical characteristics), in patients who have to undergo cardiac surgery for other reasons (e.g. for heart valve surgery) with associated coronary lesions or in diabetic patients with multiple

coronary artery disease, coronary artery bypass graft (CABG) surgery is indicated [20]. CABG consists in bypassing the atherosclerotic plaque with arterial or venous ducts capable of conveying blood flow from the aorta directly beyond the coronary artery injury, through direct suturing of the duct with the coronary artery. The main advantage of CABG over PTCA is its longer duration (the patency of the anastomosis between the left internal thoracic artery and anterior interventricular artery has been demonstrated to be 90% at 20 years of age) (Fig.2)[21].

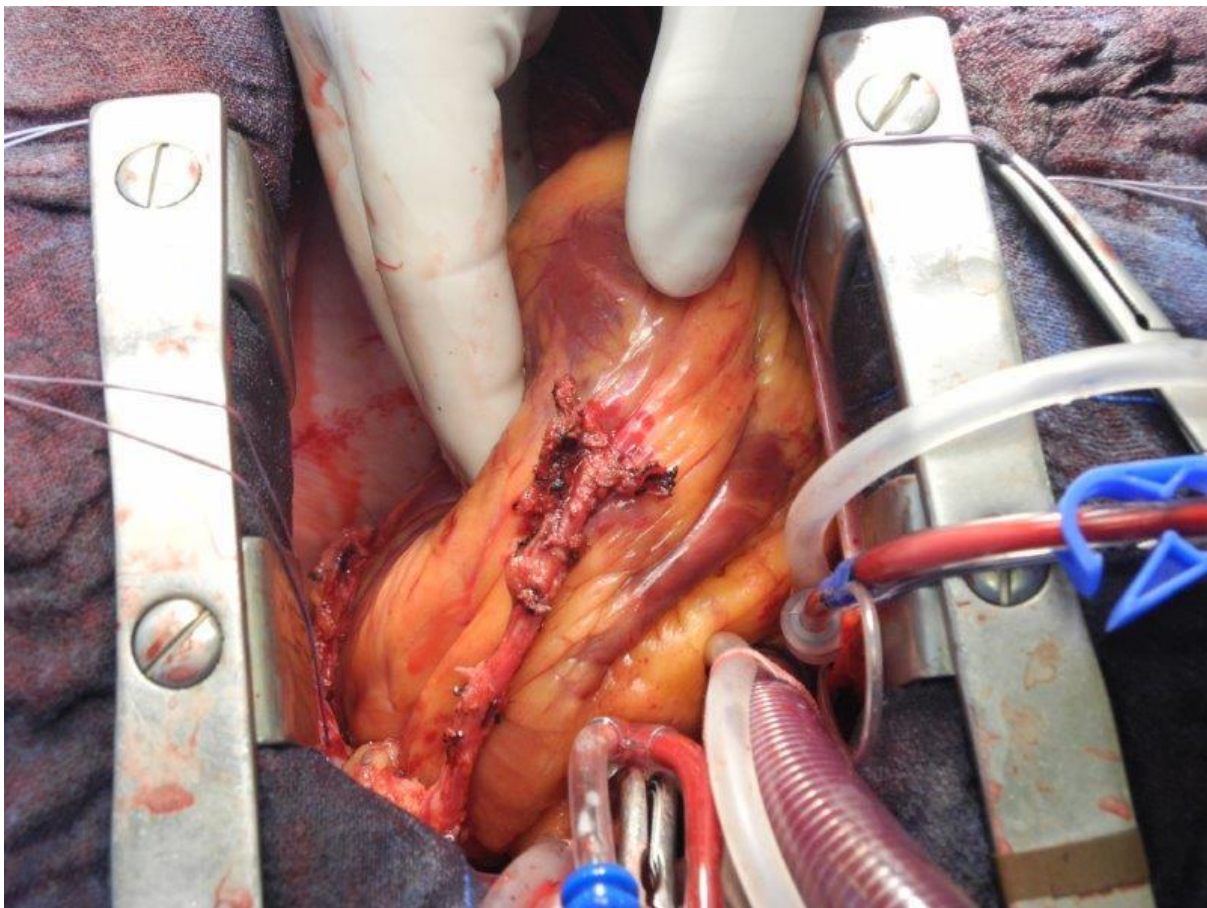


Fig.2 shows an anastomosis between the left internal mammary artery and the interventricular artery.

Among the major drawbacks of CABG, it has to be mentioned: the necessity for the patient to be subjected to a general anesthesia and median sternotomy (i.e. the opening of the sternum to access the heart).

Psychological point of view

CHID must be considered as a stressful psychological event for the patient's life [22].

First of all it is necessary to take into consideration the aspect of the disease itself and the difficulty in taking into account the change of one's health status from "healthy" to "sick", from which comes the consideration of being fragile and approaching the normal activities of daily life with fear and apprehension. On the other hand, it is also needed to consider the change in lifestyle and quality of life that the diagnosis of ischemic heart disease entails (23). First of all, it is required to start taking medication to reduce CHD progression, on the other hand, angina limits patient's daily life from sports activities (in the mildest cases) up to simpler everyday activities (such as walking or tying shoes) in the most serious instances.

In addition to these aspects, other factors related to drug therapy and its adverse effects must also be considered.

Sex life in coronary heart patients is severely limited for three main reasons [24;25]:

1. Physical activity elicits chest pain that forces the patient to rest.
2. The drugs used in the treatment of CHD such as nitrates contraindicate the use of other vasodilator drugs including Sildenafil, commonly used for erectile dysfunction.
3. Other drugs such as beta-blockers have an inherent risk (due to their mechanism of action) of depression and sexual impotence in men.

Last but certainly not least, it must be considered that many of these patients receive a diagnosis of ischemic heart disease in a "sudden" way for the appearance of symptoms even though the disease has been going on for years; many of them are forced to suddenly undergo a very heavy surgery such as CABG without having the time to realize and arriving psychologically unprepared at the time of surgery. In our clinical experience this is extrinsic with phases of mood reduction in the first post-operative days up to cases of diagnosed depression. In our clinical practice there have also been cases of patients who have put in place important removal mechanisms during the post-operative stay for which they were no longer able to remember the intervention or the acute episode that had led them to hospital admission.

In conclusion, for the above mentioned reasons it is essential to provide a full psychological support within the health facilities of a psychologist consultant who can accompany patients

both in the path of "realize" of their "sick" condition either in the difficult post-operative period following open heart surgery.

Abbreviations

Chronic Ischemic Heart Disease= CIHD;

World health organization = WHO;

Transient Ischemic Attack= TIA;

High sensitive Troponine I= Hs-TnI;

Creatine phosphor kinase = CPK;

Brain Natriuretic Peptide = BNP;

Computed Tomography = CT

Percutaneous Transluminal Coronary Angioplasty= PTCA;

Coronary Artery Bypass Graft= CABG.

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