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Editorial
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Development of Coronary Risk Stratification

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Editorial

The importance in risk stratification lies in the fact that the diseases of the heart and circulatory system are the leading cause of mortality in the world. The last report from European Cardiovascular Disease Statistics (2017 edition) identified that there were more than 6 million new cases of cardiovascular disease in the European Union in 2017 [1]. Each year cardiovascular disease causes 3.9 million deaths in Europe and over 1.8 million deaths in the European Union [1]. Death rates from both ischemic heart disease and stroke are generally higher in Central and Eastern Europe than in Northern, Southern and Western Europe [1]. The main forms of cardiovascular disease are ischemic heart disease and stroke [1]. Ischemic heart disease is the leading single cause of mortality in Europe, responsible for 862,000 deaths a year (19% of all deaths) among men and 877,000 deaths (20%) among women each year [1].

In relation to cardiovascular risk stratification there have been many study published [2-12], that have as an objective the calculation of the probability of cardiac death, non-fatal myocardial infarction, heart failure, stroke, and coronary revascularization. Also in patients with stablished coronary artery disease. The risk stratification of patients for myocardial infarction, coronary revascularization or cardiac death is very complex. In the cardiology area, the first score used was proposed by Diamond and Forrester [13]. They analyzed the prevalence of coronary artery stenosis at autopsy of 4952 persons. The prevalence of coronary artery stenosis was 90%, 50% and 16% in persons with typical angina, atypical angina and nonanginal chest pain; respectively. The pretest likelihood of coronary artery disease was calculated according to age, gender and type of chest pain; and the post-test likelihood after electrocardiographic stress test was calculated according to age, gender, type of chest pain and depression of ST segment. Subsequently, the method proposed by Epstein was used [14]. At that moment, Epstein proposed that the electrocardiographic exercise stress testing may offer a reasonable alternative to determine which mildly symptomatic patients should undergo coronary angiography for detection of this disease. Three years later, Pryor et al. [15] developed a new algorithm to estimate the likelihood of significant coronary artery disease. These authors examined 3627 consecutive symptomatic patients referred for cardiac catheterization and concluded that accurate predictions of the likelihood of significant coronary artery disease can be estimated applying a nomogram using age, sex, paint type, previous evidence of myocardial infarction, presence of electrocardiographic ST-T wave changes, and risk factors (including smoking, hyperlipidemia, and diabetes mellitus). Though currently, the Duke Treadmill Score (DTS) is the most widely used [16]. DTS is well recognized as a simple prognostic score in patients with suspected coronary artery disease; and it is positioned as a valid clinical tool when clinicians need to make a decision about the catheterization of patients with suspected CAD [17]. Mark et al. [16] prospectively studied 613 consecutive outpatients with suspected coronary disease who were referred for exercise testing. The treadmill score was calculated using duration exercise in minutes, maximal ST-segment deviation in millimeters during or after exercise, and treadmill angina index. DTS ranged from high risk (< -25) to low risk (≥ + 5). The DTS accurately separated patients who subsequently died from those who lived for four years. Although, it is well demonstrated that the study of myocardial perfusion images provide additional information for prognosis and diagnosis of coronary artery disease [18]. Recently a new score was published for coronary risk stratification according to clinical, exercise and gated SPECT variables (Figure 1) [18]. This score named Vall d'Hebron Risk Score (VH-RS), stratify into four risk levels: very low risk (<0.7 cardiac events/year), low risk (between 0.7 and 1 cardiac events/year), moderate risk (>1 and <3 cardiac events/year) and high risk (≥ 3 cardiac events/year). Cardiac events (non-fatal myocardial infarction, coronary revascularization, and/or cardiac death) were recorded during a mean follow-up of 4.1 ± 2.7 years. The stratification of risk begins by dividing the population in two groups of patients: patients with suspected coronary artery disease and patients with established coronary artery disease (Figure 2). The VH-RS method has several particular useful features: it focuses on patients with different

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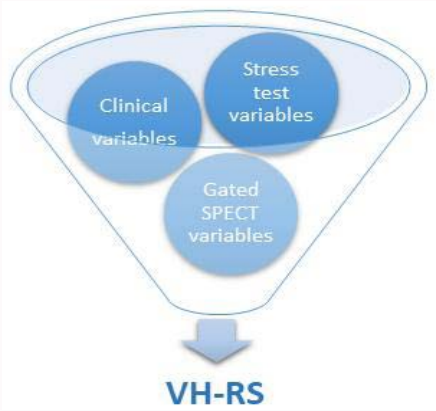

Figure 1: Variables used to obtained the Vall d'Hebron Risk Score (VH-RS).

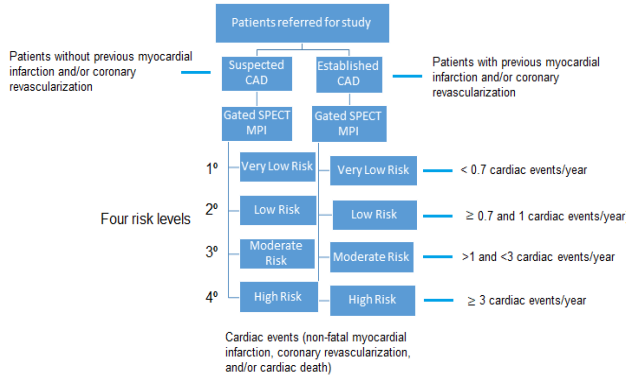

Figure 2: Flow chart to stratify the risk of Coronary Artery Disease (CAD). MPI: Myocardial Perfusion Imaging.

clinical variables, who underwent exercise tests, and myocardial perfusion gated SPECT, and it assesses an individual's cardiac risk for non-fatal myocardial infarction, coronary revascularization, and/or cardiac death, at 4 years of follow-up in a long series of patients [18]. This was a prospective study of 6441 (derivation cohort: 5707 patients, validation cohort: 734 patients) consecutive patients who underwent noninvasive assessment by gated SPECT myocardial perfusion imaging. The ability of the model to stratify patients with suspected coronary artery disease and patients with established coronary artery disease were high (C-statistic: 0.8 [95% CI: 0.78-0.81]; p<0.001; C-statistic: 0.7 [95% CI: 0.67-0.71], respectively). This was confirmed in a validation cohort of 737 patients. In conclusion, we recognize that the stratification of coronary risk was, is and will always be a challenge. There is no perfect stratification, although this novel VH-RS can improve the risk stratification of a disease that is one of the main causes of death in the world.

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