ORIGINAL RESEARCH

Vascular and Chronological Age in Subjects with Erectile Dysfunction: A Cross-Sectional Study

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ABSTRACT

Introduction. Vascular age, as derived from the SCORE project algorithm for cardiovascular (CV) risk estimation, is an effective way for communicating CV risk. However, studies on its clinical correlates are scanty.

Aim. To evaluate if the difference between vascular and chronological age (Δage), in a population of subjects with erectile dysfunction (ED), can identify men with a worse risk profile.

Methods. A consecutive series of 2,853 male patients attending the outpatient clinic for erectile dysfunction (ED) for the first time was retrospectively studied. Among them, 85.4% (n = 2,437) were free of previous MACE and were analyzed.

Main Outcome Measures. Several clinical, biochemical, and penile color Doppler parameters were studied. Vascular age was derived from the SCORE project algorithm, and the Δage was considered.

Results. Higher Δage is associated with several conventional (family history of CV diseases, hyperglycemia, elevated triglycerides, and increased prevalence of metabolic syndrome) and unconventional (severity of ED, frequency of sexual activity, alcohol abuse, lower education level, fatherhood, extramarital affairs, compensated hypogonadism, and low prolactin levels) risk factors. Δage is inversely related to penile color Doppler parameters, including flaccid and dynamic peak systolic velocity and flaccid acceleration ($\beta = -0.125$, -0.113, and -0.134, respectively, all $P < 0.0001$).

Conclusions. In subjects referring for ED without a personal history of CV events, Δage is associated with an adverse cardio-metabolic profile and worse penile color Doppler ultrasound parameters. Δage provides a simple method for identifying high-risk men that must undergo significant modification in their lifestyle and risk factors. In addition, it can be considered a simple, inexpensive, and safe surrogate marker of penile arterial damage. **Rastrelli G, Corona G, Mannucci E, and Maggi M. Vascular and chronological age in subjects with erectile dysfunction: A cross-sectional study. J Sex Med 2015;12:2303–2312.**

Key Words. Erectile Dysfunction; Vascular Age; Cardiovascular Risk Factors; SCORE Project Algorithm; Penile Color Doppler Ultrasound

Introduction

Cardiovascular (CV) diseases (CVDs) are the leading cause of death worldwide, and their incidence is increasing mainly due to unhealthy lifestyles. The Framingham study is a milestone in CV epidemiology, as it was the first large-scale observational study on the general population that helped in recognizing CV risk factors. On the basis of the results of that survey, algorithms were developed for calculating the 10-year risk of new CV events. Since the application of algorithms for CV

risk estimation derived from US data and applied to European populations overestimates the risk in countries with a lower incidence of coronary heart disease—such as most of those in Southern Europe, including Italy [1–3]—different algorithms have been developed for Europe, including the SCORE (Systematic COronary Risk Evaluation) project scales [4]. When using any algorithm for the estimation of CV risk, the same rate could be the result of different combinations and extent in risk factors. For example, according to the SCORE project algorithm, a 40-year-old man, smoker, with a systolic blood pressure of 180 mm Hg and a total cholesterol of 310 mg/dL has a 10-year CV risk of 2%. The same CV risk is conferred to a 61-year-old man, nonsmoker, with a systolic blood pressure of 120 mm Hg and a total cholesterol of 230 mg/dL, where 120 mm Hg and 230 mg/dL are considered normal values for systolic blood pressure and a total cholesterol, respectively, in the construction of the SCORE project algorithm [4,5]. This is the basis for the concept of vascular age. According to the definition provided by D'Agostino [1], vascular age of an individual with a certain pattern of CV risk factors is equal to the chronological age of a subject without any risk factor, but age. Hence, considering the aforementioned example, the 40-year-old man has a vascular age of 61 years, accounting for a difference between vascular and chronological age (Δage) of 21 years.

In observational studies in the general population, vascular age has been associated with an adverse metabolic profile, including dyslipidemia, hypertension and obesity [6], and unhealthy lifestyles, such as smoking and sedentary behaviors [7], and it has been used for identifying subjects that need to undertake lifestyle modification or medical treatment to avoid CVD. The change in vascular age determined by lifestyle interventions [8] or bariatric surgery [9] have been evaluated in two studies that showed a significant improvement of estimated vascular age after a medical supervised intervention for reducing CV risk factors. Vascular age has also been assessed in specific high-risk populations, such as cancer survivors [10] or HIV-infected patients [11,12], for estimating their CV risk as compared with that predicted on the basis of their chronological age, or in comparison with the general population and to assess possible factors that can mediate such risks.

Erectile dysfunction (ED) is now considered a condition associated with an elevated CV risk [13] and, accordingly, subjects with ED are plagued by CV risk factors such as hypertension, dyslipidemia, hyperglycemia, obesity, and metabolic syndrome [14–16]. ED is often associated with an impairment in penile artery blood flow, which might reflect a systemic vascular disease [13,17–19]. Hence, consulting for ED becomes an opportunity for considering CV health, and physicians involved in sexual medicine need to identify and quantify CV risk and to convince men with ED to change their lifestyles.

The aim of this study is to evaluate if, in a population of subjects with ED, a discrepancy between vascular and chronological age, computed as the algebraic difference between vascular and chronological age (i.e., Δage), can identify men with a worse risk profile, thus providing a useful tool for easily communicating CV risk and for convincing men to take actions to modify risk factors.

Methods

Data from a consecutive series of 4,890 male patients attending the outpatient clinic for ED for the first time were retrospectively collected. Among these subjects, only those who had all the parameters for calculating the SCORE project algorithm (N = 2,853) were studied. According to the applicability of SCORE project [4], men who had a previous CV event (N = 415) were excluded from the analysis, leaving 2,437 men in the sample. The sociodemographic and clinical characteristics of the sample studied (i.e., having all the parameters for calculating SCORE project and free from previous CV events) are reported in Table 1. All patients enrolled underwent the usual diagnostic protocol applied to newly referred subjects at the Andrology Outpatient Clinic. All the data provided were collected as part of the routine clinical procedure. An informed consent for the study was obtained from all patients. Patients were interviewed prior to the beginning of any treatment, and before any specific diagnostic procedures, using ANDROTEST [20] and Structured Interview on Erectile Dysfunction (SIEDY [21]). In our clinical practice and for research purpose, we favor structured interviews, respect to questionnaires, because they have the advantage that the questions are proposed by trained physicians in an established order and rephrased, if necessary, according to the education level of the patient, so that misunderstandings are avoided [22]. The interviews are reported as Files S1 and S2. Briefly, ANDROTEST is a 12-item structured interview