

# Ankle–Brachial Index: a Useful Tool for Stratifying Cardiovascular Risk

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All clinical guidelines on cardiovascular disease prevention recommend estimation of the overall individual risk as the basic tool to carry out an effective intervention. Unfortunately, the predictive power of risk equations and tables is not optimal, since many individuals who experience cardiovascular events are not identified as being at high-risk.<sup>1</sup> For this reason, attempts have been made to improve risk estimation by direct detection of arteriosclerosis in various vascular regions through imaging. Several techniques are available for the diagnosis of subclinical arteriosclerosis, including magnetic resonance, electron beam computed tomography scanning, helical computed tomography, and echo-Doppler of the supra-aortic vessels. Nevertheless, these techniques have important limitations, such as a limited accessibility, elevated cost, and the need for specialized personnel, all of which make their use in daily clinical practice impracticable.<sup>2</sup> There is, however, a simple, low-cost, reproducible test performed in the physician's office that is highly useful for the diagnosis of peripheral arterial disease (PAD) and for identifying individuals at a high risk of cardiovascular disease,<sup>3</sup> namely, the ankle-brachial index (ABI).

The ABI is calculated by dividing the systolic arterial pressure (SAP) of each ankle (choosing the highest value between the pedal artery and the posterior tibial artery) by the highest SAP value of either of the brachial arteries. Thus, 2 ABI values are obtained, one for each leg, and the lowest is selected as the definitive value. The test is short (an experienced professional can perform the technique in

less than 20 min), it is inexpensive, requiring only a sphygmomanometer and portable Doppler unit with an 8 MHz probe, and it is reproducible, with minimal intraobserver and interobserver variability.<sup>4</sup> As related to arteriography, an ABI value less than 0.9 has a very high sensitivity and specificity to identify an obstruction greater than 50% in the vascular territory of the lower limbs.<sup>5</sup> Ankle-brachial index values less than 0.9 are diagnostic for PAD, despite the fact that more than 80% of individuals with this finding have no clinical manifestations.<sup>6</sup> Moreover, the presence of a decreased ABI is associated with a higher incidence of coronary and cerebrovascular complications and a higher risk of death due to the increase in cardiovascular mortality<sup>7-9</sup> seen in patients receiving primary and secondary prevention and even after adjusting for the classic risk factors. Therefore, in addition to being diagnostic for PAD, an ABI<0.9 is synonymous with high cardiovascular risk and indicates the need for intensive treatment of the risk factors and initiation of antiplatelet therapy.<sup>10</sup>

In this issue of the REVISTA, Manzano et al<sup>11</sup> present the interesting results of the VITAMIN study, in which the prevalence of low ABI values was investigated in 493 individuals with no history of cardiovascular disease, seen in internal medicine services. The authors found that 1 in every 5 individuals without diabetes and 1 in every 3 with diabetes had PAD. These figures are undoubtedly high because of the elevated baseline risk of the population studied (half identified as being at high risk); therefore the sample is not representative of the general population. In a recent study performed at a health center in our setting with more than 1000 participants over 60 years of age with no known cardiovascular disease or diabetes, the prevalence of a low ABI was 3.8%, with 9% of the population identified as high-risk.<sup>12</sup> Therefore, although the true prevalence of a low ABI in our country remains unknown, it is clear that it is rising as the cardiovascular risk of the population increases, regardless of which tables are used for the calculations.<sup>12,13</sup>

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Diabetes, smoking, and age are the risk factors most closely related with a low ABI, and diabetic patients are known to have an elevated prevalence of PAD.<sup>6</sup> The risk of developing this disease mainly depends on the age of the patient and the severity and duration of the diabetes.<sup>6,14,15</sup> In addition, according to the NCEP ATP III<sup>16</sup> criteria, nondiabetic individuals with metabolic syndrome have an increased prevalence (up to 3-fold) of low ABI, as compared to those without the syndrome.<sup>17</sup>

In the VITAMIN study, 7.3% of participants presented an ABI >1.4 or incompressible arteries; that is, the arterial beat persisted despite application of compression above 200 mm Hg. This is attributed to arterial rigidity, in all likelihood due to arteriosclerosis or wall calcification, and is more common among diabetic patients. An elevated ABI (incompressible arteries) is not synonymous with PAD; hence, when peripheral disease is suspected, other diagnostic tests should be performed.<sup>10</sup> The ABI of these patients before elevation or incompressibility, and their evolution over time, are still currently unclear. Recent reports suggest that the risk of cardiovascular death among these individuals, who are excluded from the majority of studies, is similar to that of individuals with ABI values <0.9.<sup>18,19</sup> Therefore, patients with a pathological ABI value (<0.9 or >1.4 or incompressible arteries) should be considered at high cardiovascular risk.

Determination of the ABI is a useful tool for stratifying cardiovascular risk because it identifies individuals with subclinical arteriosclerosis and a high risk of developing cardiovascular disease. However, given the low sensitivity and high specificity of the test, it is necessary to select the ideal candidates for the determination to be effective. The American Heart Association recommends ABI testing in all patients older than 70 years of age, in patients 50 to 69 years old who are diabetics or smokers, and in those younger than 50 years old who are diabetics and have another risk factor, in addition to individuals who have signs or symptoms suggestive of PAD.<sup>10</sup> The American Diabetes Association, however, recommends ABI testing in all diabetic patients older than 50 years of age and those younger than 50 who have various risk factors or diabetes of more than 10 years' evolution.<sup>15</sup> We believe that the population who will most benefit from ABI testing comprises individuals with intermediate cardiovascular risk (10%-20% according to the Framingham equation, or 3%-4% according to the calibrated Framingham equation [SCORE]), because a pathological result will change their risk classification and mandate more intensive treatment of the risk factors and antiplatelet therapy (if the ABI is <0.9). In individuals older than 60 years in our setting, 1 out of every 10 subjects with intermediate risk status according to the NCEP-ATP III criteria<sup>12</sup> and 1 in

every 11 according to the SCORE<sup>13</sup> have a pathological ABI. For optimal efficiency, we would select patients over 70 years old at intermediate risk and those over 60 who are smokers or have abnormal fasting glucose concentrations.<sup>13</sup>

Other groups that would benefit from ABI testing are diabetic patients and high-risk individuals without cardiovascular disease. All the individuals in these 2 groups should already be receiving intensive treatment for risk factors and many of them antiplatelet therapy; hence, the presence of a pathological ABI would not modify the therapeutic approach used. Nevertheless, this population might benefit from examinations to detect asymptomatic coronary or cerebrovascular atherosclerosis using a myocardial ischemia test or echo-Doppler study of the supra-aortic vessels.<sup>3</sup>

In the search for improved cardiovascular risk stratification in our patients, ABI determination is a useful technique with a favorable cost-benefit ratio when it is performed in selected populations. Studies such as the one published in this issue of REVISTA ESPAÑOLA DE CARDIOLOGÍA<sup>11</sup> help to identify the optimum candidates for ABI determination in our setting.

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