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ORIGINAL ARTICLE

Cardiovascular morbidity–mortality associated to ankle-brachial index in the general population☆

C. Lahoz[a,*], M. Barrionuevo[b], T. García-Fernández[b], I. Vicente[c], M.F. García-Iglesias[a], J.M. Mostaza[a]

[a] *Unidad de Lípidos y Riesgo Cardiovascular, Hospital Carlos III, Madrid, Spain*
[b] *Centro de Salud Fuencarral, Madrid, Spain*
[c] *Centro de Salud Monóvar, Madrid, Spain*

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KEYWORDS
Ankle-brachial index;
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Abstract
Background and objectives: Abnormal ankle-brachial index (ABI) is associated with a high risk of cardiovascular disease. This study has aimed to investigate the association between low ABI and risk of cardiovascular death in a general population attended in a primary care center.
Patients and methods: A total of 1361 volunteers aged between 60 and 79 years without any evidence of peripheral artery disease who attended a primary care center participated in the study. They underwent a complete physical examination, together with standard blood tests and ABI was determined. The participants were contacted by telephone 4 years later and asked about any cardiovascular problems for that period. Causes of death and hospitalization were confirmed in the medical records in the primary care center and/or hospital.
Results: Information was obtained about the clinical evolution of 1300 participants (mean age 69.9 years, 38.2% men). Mean follow-up was 49.8 months. There were 13 cardiovascular death and 49 major cardiovascular events. Low ABI (<0.9) was associated with a significant higher risk of cardiovascular death (adjusted relative risk 6.83; 95% confidence interval 1.36–34.30, $P=0.020$), and with a higher risk of major cardiovascular events (adjusted relative risk 2.42; 95% confidence interval 0.99–5.91, $P=0.051$). High or uncompressible ABI was not associated with higher cardiovascular risk.
Conclusions: A low ABI was associated with higher risk of cardiovascular death in the general population followed up in a primary care center.

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* Corresponding author.
E-mail address: carlos.lahoz@salud.madrid.org (C. Lahoz).

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PALABRAS CLAVE
Índice tobillo-brazo;
Enfermedad arterial periférica;
Enfermedad coronaria

Morbimortalidad cardiovascular asociada al índice tobillo-brazo en la población general

Resumen
Antecedentes y objetivos: Un índice tobillo-brazo (ITB) anormal se asocia con un elevado riesgo de enfermedad cardiovascular. El objetivo del estudio fue investigar la asociación entre un ITB bajo con el riesgo de muerte de causa cardiovascular en una población atendida en un centro de salud.
Pacientes y métodos: Participaron 1.361 voluntarios de entre 60 y 79 años sin enfermedad arterial periférica conocida, reclutados en una consulta de atención primaria. Se les hizo una historia clínica, una exploración física, un análisis de sangre y se les determinó el ITB. Cuatro años después se contactó con ellos y se les interrogó sobre problemas cardiovasculares acaecidos durante ese periodo. Las causas de los ingresos o de las muertes se confirmaron en las historias clínicas del centro de salud y/o del hospital de zona.
Resultados: Se consiguió información sobre la evolución clínica de 1.300 participantes (edad media 69,6 años; un 38,2% eran varones). El seguimiento medio fue de 49,8 meses. Hubo 13 muertes de causa cardiovascular y 49 eventos cardiovasculares mayores. Un ITB bajo basal (<0,9) se asoció con un significativo mayor riesgo de muerte cardiovascular (riesgo relativo ajustado 6,83; intervalo de confianza 95%: 1,36-34,30; p = 0,020), así como con un mayor riesgo de eventos cardiovasculares (riesgo relativo ajustado 2,42; intervalo de confianza 95%: 0,99-5,91; p = 0,051). El ITB alto (>1,4) o incompresible no se asoció con un mayor riesgo cardiovascular.
Conclusiones: En población general seguida en un centro de salud, un ITB bajo se asocia con un mayor riesgo de muerte cardiovascular.

Background

The ankle brachial index (ABI) is a simple and very useful test for diagnosing peripheral arterial disease (PAD). A low ABI (when the ratio of the systolic blood pressure in the legs to that in the arms is <0.9) represents a diagnosis of PAD with high sensitivity and specificity,[1] despite the majority of patients having no clinical symptoms.[2] The ABI also indicates generalized arteriosclerosis given that it is associated with a high prevalence of atherosclerotic vascular disease in other vascular beds. Moreover, ABI is useful for predicting the risk of future cardiovascular events.[3] Thus, a strong and consistent association has been described between a low ABI and the incidence of coronary and cerebrovascular disease in various cohorts studies.[4–6] Moreover, a number of authors have reported an association between the presence of an ABI > 1.4 or an incompressible ABI with a increased risk of cardiovascular events and death.[4,5]

In our community, an association has been described between a low ABI and an increased incidence of cardiovascular events and with increased mortality in patients with high cardiovascular risk. Thus, in patients with acute coronary syndrome (ACS)[7,8] or with stable cardiovascular disease,[9] a low ABI is associated with increased mortality. It has also been reported that patients who have had an acute ischemic stroke and a low ABI have a greater recurrence of stroke and a higher number of cardiovascular events.[10] Lastly, in participants with permanent atrial fibrillation in anticoagulant therapy, a low ABI predicts higher mortality.[11] However, there is no study in Spain that has analyzed the potential association between a low ABI and a poorer cardiovascular prognosis in the general population.

The aim of this study was to investigate the association between a low ABI and the incidence of death due to cardiovascular causes in a population treated at a health center, after a mean follow-up of 4 years.

Materials and method

This was a prospective descriptive observational study performed in a primary care setting. Between 2003 and 2004, 1361 volunteers between the ages of 60 and 79 years and with no known PAD were recruited at the Fuencarral Health Center (Madrid) to participate in a study whose aim was to assess the risk factors associated with a low ABI.[12] A review of the participants' medical history was conducted, with special attention given to the cardiovascular risk factors and the medication the patients were taking. The participants underwent a physical examination to determine height, weight, abdominal circumference, blood pressure and ABI. In addition, fasting blood tests were performed to determine glucose, creatinine, total cholesterol, HDL-cholesterol and triglyceride levels using enzymatic methods. LDL-cholesterol levels were calculated using the Friedewald formula.

In 2008, all participants were contacted by telephone. Of the 1361 participants who attended the first visit, 71 (5.2%) had died, 61(4.4%) could not be located and the remainder (90.3%) were contacted. They were asked about any cardiovascular problems that might have occurred since the first visit. Medical reports were requested from all those who reported having some cardiovascular problem and these reports were checked against the medical history from the health center or reference hospital. The deaths were