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Research Article

Peripheral arterial disease and cardiovascular risk. The importance of Doppler in multi-pathological population

Abstract

Objective: The aim of this study is to calculate cardiovascular risk (CVR), vascular age (VA), and prevalence of peripheral arterial disease (PAD) in the multi-pathological population admitted to Internal Medicine services, as well as to study the relationship between PAD and Mönckeberg's calcification with VA and cardiovascular risk factors (CRF) in this population.

Material and method: Cross-sectional observational study, including multi-pathological patients admitted to Internal Medicine, excluding those with diagnosed PAD. Demographic variables, ankle-brachial index (ABI), presence of multi-pathology, CRF present, CVR measured by SCORE and VA were recorded.

Results: 414 patients were included: 54.8% were men and 45.2% were women. The most prevalent pathology was heart failure followed by chronic respiratory insufficiency, ischemic heart disease and chronic anaemia secondary to digestive bleeding. 25.3% of patients have PAD, which is significantly associated with ischemic heart disease and type 2 diabetes mellitus with target organ injuries. 21.2% of the sample suffers from Mönckeberg calcification and in 53.5 the ABI is normal. CVR and VA were calculated in patients younger than 65 years (22.16%), PAD was associated with SCORE> 5% and a high VA.

Conclusion: This study highlights the importance of the determination of ABI, CVR and VA in patients admitted to Internal Medicine services. Since PAD is in the majority of cases asymptomatic and, therefore, underdiagnosed, its presence forces us to a comprehensive treatment of the patient to avoid any of these events.

Abbrevations

ABI: Ankle-Brachial Index; AHT: Arterial Hypertension; AMBP: Ambulatory Monitoring Of Blood Pressure; CRF: Cardiovascular Risk Factors; CVD: Cardiovascular Diseases; CVR: Cardiovascular Risk; DBP: Diastolic Blood Pressure; DL: Dyslipidemia; DM: Diabetes Mellitus; PAD: Peripheral Arterial Disease; OGOT: Oral Glucose Overload Test; SBP: Systolic Blood Pressure; SMBP: Self-Monitoring of Blood Pressure; VA: Vascular Age; WHO: World Health Organization

Introduction

Cardiovascular diseases (CVD) are the second leading cause of worldwide mortality following communicable diseases and being the first cause in industrialized countries, according to the World Health Organization (WHO) [1]. The future of these pathologies is not encouraging, since the increasing life expectancy of the population, the decrease in acute event mortality and the poor control of cardiovascular risk factors (CRF) predict that mortality in our environment is likely to continue rising [2].

Peripheral arterial disease (PAD) is an atherosclerotic manifestation associated with an increased risk of ischemic heart disease or stroke, which is associated with different cardiovascular risk factors: arterial hypertension (AHT), diabetes mellitus (DM), dyslipidemia (DL) and smoking [3]. An early detection of this process and the setting of timely treatments are associated with a decrease in the morbidity and mortality of these patients [4].

It is a symptomatic and under-diagnosed entity. Its diagnosis is made, among other tests, with the measurement

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of the ankle-brachial index (ABI), which is a simple and very useful exploration, with a high sensitivity and specificity [5]. It is accepted that a low ABI (<0.9) is a diagnosis of PAD. There are several studies that demonstrate a strong association between low ABI and the incidence of coronary or cerebrovascular diseases [6].

The control of the CRF is fundamental and essential to achieve this objective; however, this control is not adequate either in Primary Care or in Specialized [7]. Estimating cardiovascular risk (CVR) is useful for adjusting the intensity of interventions to the absolute risk of the patient, which allows us to improve clinical efficiency [8].

However, the lack of time in the consultations and, sometimes, the poor communication or the difficulty to understand the increase of CVR on the part of the patients, make their adherence to the measures to be adopted low.

In order to increase such adherence and facilitate communication between professional and patient, a new term, easier to explain and understand, was introduced: vascular age or age of the heart (VA). It was introduced by D'Agostino et al. [9], who established that the subject's VA is equal to the age of a person with the same level of estimated cardiovascular risk, but with all risk factors at normal levels. It has a direct correlation with the risk measured by SCORE [10].

Multiple studies in the hypertensive and diabetic population show their relationship with PAD. However, these studies do not exist in the multi-pathological population.

The objective of this study is to calculate the CVR, VA and prevalence of PAD in the multi-pathological population admitted to Internal Medicine services, as well as to study the relationship between PAD and Mönckeberg's calcification with VA and CRF in this population.

Materials and Methods

Study design

This is a cross-sectional observational, hospital-based study designed to assess the prevalence of asymptomatic PAD, as well as its association with different CRF.

Study Population (inclusion and exclusion criteria)

Over 18-year-old patients admitted to the Internal Medicine Service of the Hospital Clínico Universitario de Valladolid, with definitive criteria for the multi-pathological patient, who agreed to participate in the study. A pluri-pathological patient is considered that who suffers from at least two of the pathologies described in table 1.

Patients diagnosed with PAD or exhibiting symptoms associated with PAD such as intermittent claudication, absence of pulses or pain in their lower limbs were excluded from the study.

Study variables

The data recorded were: demographic variables (age and sex), ABI, presence of pluri-patologies and diseases according to table 1, present multimorbidity, CRF (AHT, smoking habit, DM, DL and obesity), CVR measured by SCORE and VA.

AHT was defined as the presence of systolic blood pressure (SBP) greater than 140 mmHg and/or diastolic blood pressure (DBP) greater than 90 mmHg, diagnosed by means of self-monitoring of blood pressure (SMBP) or continuous ambulatory monitoring of blood pressure (AMBP) [11].

It is established that the patient has DM in the presence of at least one of the following parameters [12]: HbA1c ≥ 6.5%, fasting plasma glucose ≥ 126 mg / dl, plasma glucose at 2 hours of an oral glucose overload test (OGOT) ≥ 200 mg / dL or classic symptoms of hyperglycemia (polyuria, polydipsia and unexplained weight loss) and a random determination of plasma glucose ≥ 200 mg / dl. The first three premises require two confirmations.

DL is defined as the presence of total cholesterol levels greater than 240 mg / dl and / or triglyceride levels greater than 200 mg / dl [13].

A smoker is considered to be a patient who does this activity at present or who has stopped doing it less than 1 year ago, and he is obese [14], in the presence of a body mass index (BMI) greater than 30 kg/m2.

Table 1: Functional definition of polypathological patient: the patient who suffers chronic diseases included in two or more of the following clinical categories.

Categories	Chronic diseases
A	Chronic heart failure with past/present stage II dyspnea of NYHAa. Coronary heart disease.
B	Vasculitides and/or systemic autoimmune diseases. Chronic renal disease (creatininaemia N1.4/1.3 mg/dL in men/women or proteinuriab, during ≥3 months.
C	Chronic lung disease with past/present stage 2 dyspnea of MRCc, or FEV1b65%, or basal SatO2≤90%.
D	Chronic inflammatory bowel disease. Chronic liver disease with evidence of portal hypertensiond.
E	Stroke. Neurological disease with permanent motor deficit, leading to severe impairment of basic activities of daily living (Barthel index < 60). Neurological disease with permanent moderate–severe cognitive impairment (Pfeiffer's test with ≥5 errors).
F	Symptomatic peripheral artery disease. Diabetes mellitus with proliferate retinopathy or symptomatic neuropathy.
G	Chronic anemia (Hbb10 g/dL during ≥3 months) due to digestive-tract losses or acquired hemopathy not tributary of treatment with curative intention. Solid-organ or hematological active neoplasia not tributary of treatment with curative intention.
H	Chronic osteoarticular disease, leading to severe impairment of basic activities of daily living (Barthel index < 60).

a Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity
results in fatigue, palpitation, or dyspnea.
b Albumin/Creatinine index >300 mg/g, micro albuminuria >3 mg/dL in urine, albumin > 300 mg/day in 24-h urine, or albuminuria/min >200 μg/min.
cShort of breath when hurrying or walking up a slight hill.
dPresence of clinical, analytical, echographic, or endoscopic data of portal hypertension

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Measuring techniques

To perform Doppler, the patient is placed in supine position, proceeding to the measurement of the SBP of the brachial artery of both arms and pedia or posterior tibial artery of both legs. The highest value obtained in each of the legs is divided by the highest value obtained in the arms, obtaining an ABI for each leg. Final ABI is considered the lowest value of both. It is considered normal if the values are between 0.9 and 1.3; presence of PAD if ABI<0.9 and presence of Mönckeberg's calcination if ABI> 1.3.

The calculation of the CVR is determined by the risk tables of the SCORE project for southern European populations. The variables used were sex, age, SBP, the presence or absence of smoking habit, the presence or absence of DM and total cholesterol. High risk subjects were defined as those with a 10-year risk of vascular mortality greater than or equal to 5%; intermediate risk to those with a 3-4% risk; and low risk to those with a risk lower than 3% it is done to people in a range of age between 40 and 65 years.

The VA calculation is based on the 10-year Framingham SCORE for total cardiovascular events (www.framinghamheartstudy.org/risk/genncardio.html), taking into account the following variables: age, sex, smoking, antihypertensive medication, BMI and SBP. "Delta" was defined as the difference between VA and chronological age. It is done to people in a range of age between 40 and 65 years.

Statistic analysis

All statistical analyses were performed using the SPSS-22 statistical package. Quantitative variables are presented as mean (standard deviation) and qualitative variables as a percentage. To test the normal distribution of variables, a Kolmogorov-Smirnov test was performed. Comparisons between qualitative variables were performed using the chi-square test. Comparisons between quantitative variables were performed using the Variance Analysis Test (ANOVA) with multiple comparisons a posteriori using the Bonferroni test. The association between asymptomatic peripheral arterial disease and the rest of the variables was performed by logistic regression analysis using the "forward" method, using as a dependent variable the presence of a pathological ABI. Differences were considered statistically significant when the p value was less than 0.05.

Results

The study included 414 patients with a mean age of 78.48 ± 12.86 years. 227 were men (54.8%) and 176 were women (45.2%). The baseline characteristics of all patients and gender are shown in table 2.

Of the population initially selected, 22 patients (5.31%) were excluded because they were diagnosed with PAD, had symptoms of PAD, or refused to perform the study, without changing the characteristics of the initial population, except for PAD patients who are excluded from the study.

Table 2: Characteristics of f polypathological patients according to gender.

	Total N= 414	Male= 227 (54.8 %)	Female= 187 (45.2 %)	p
Age (SD)	78.48 (10.4)	76.62 (12.8)	80.64 (12.5)	< 0.001
A1 n (%)	206 (49.8)	104 (50.5)	102 (49.5)	0.093
A2 n (%)	106 (25.6)	70 (66.0)	36 (34.0)	0.009
B1 n (%)	16 (3.9)	6 (37.5)	10 (62.5)	0.201
B2 n (%)	87 (21.0)	50 (57.5)	37 (42.5)	0.629
C1 n (%)	103 (24.9)	67 (65.0)	36 (35.0)	0.017
D1 n (%)	16 (3.9)	10 (62.5)	6 (37.5)	0.614
D2 n (%)	12 (2.9)	9 (75.0)	3 (25.0)	0.239
E1 n (%)	55 (13.3)	28 (50.9)	27 (49.1)	0.563
E2 n (%)	50 (12.1)	30 (60.0)	20 (40.0)	0.453
E3 n (%)	59 (14.3)	20 (33.9)	39 (66.1)	< 0.001
F1 n (%)	20 (4.8)	11 (55.0)	9 (45.0)	1
F2 n (%)	42 (10.1)	25 (59.5)	17 (40.5)	0.624
G1 n (%)	104 (25.1)	56 (53.8)	48 (46.2)	0.81
G2 n (%)	96 (23.2)	67 (69.8)	29 (30.2)	< 0.001
H1 n (%)	53 (12.8)	18 (34.0)	35 (66.0)	0.002
Smoker n (%)	191 (46.1)	126 (66.0)	65 (34.0)	< 0.001
AHT n (%)	278 (67.15)	147 (52.9)	131 (47.1)	0.343
DM n (%)	179 (43.2)	98 (54.7)	81 (45.3)	0.915
DL n (%)	161 (38.8)	87 (54.3)	74 (45.7)	0.915
Obesity n (%)	173 (41.79)	93 (53.8)	80 (46.2)	0.831

Women had an average age significantly higher than men (80.64 ± 12.5 vs. 76.62 ± 12.8 years, $p < 0.001$), showing a higher prevalence of permanent cognitive impairment ($p < 0.001$) and chronic osteoarticular disease ($p = 0.002$). Men showed a higher prevalence of ischemic heart disease ($p = 0.009$), chronic respiratory disease ($p = 0.017$) and presence of solid neoplasms ($p < 0.001$). The remaining pathologies are proportionally higher in men, except for autoimmune diseases.

As to the distribution of pathologies suffered by the patients in the sample, the most prevalent was heart failure, diagnosed in 49.8% of patients, followed by chronic respiratory failure, ischemic heart disease, chronic anaemia secondary to digestive bleeding or liver disease, kidney disease and neoplasms.

A pluripatological patient is the patient who has at least two of the described pathologies. Of the patients in the sample, 60.7% had two pathologies, while 39.3% suffered from three or more pathologies. The prevalence of CRF is homogenous in both groups, except for smoking prevalence in men ($p < 0.001$). The most frequent CRF is hypertension (67.1%), followed by smoking, DM, obesity and DL (Graph 1).

As for ABI, normal values were found in 53.5% of patients, PAD in 25.3% and Mönckeberg's calcification in 21.2% of the patients studied (Graph 2). 50.9 % of the male patients presented an ABI compatible with normality; 29.7% with the PAD and 19.4% with Mönckeberg's calcification. As for the female patients, 56.8% presented normal ABI, 23.3%, Mönckeberg's calcification and 19.9% presented PAD (Graph 3).

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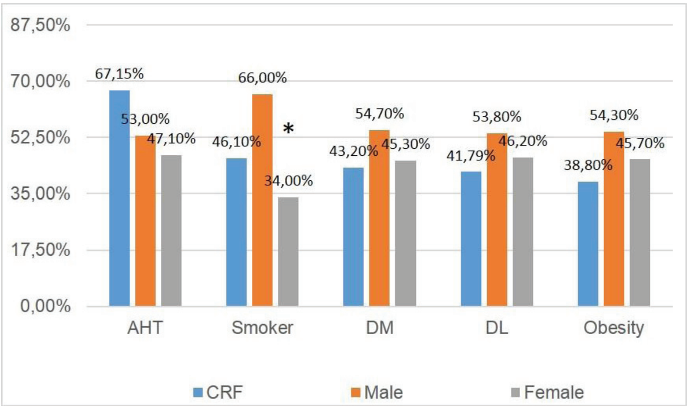
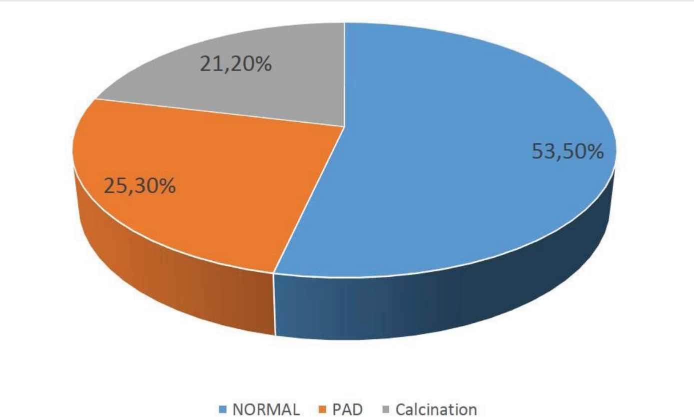
PAD is significantly more frequent in men than in women (p = 0.035), whereas Mönckeberg's calcification and normal values are more common in women (Table 3).

Regarding age, patients with Mönckeberg's calcification presented a significantly higher age of 82.10 ± 8.87 years (p = 0.021), compared to patients with normal ABI or PAD, whose age was of 77.48 ± 13.85 years and 76.92 ± 13.68 years respectively.

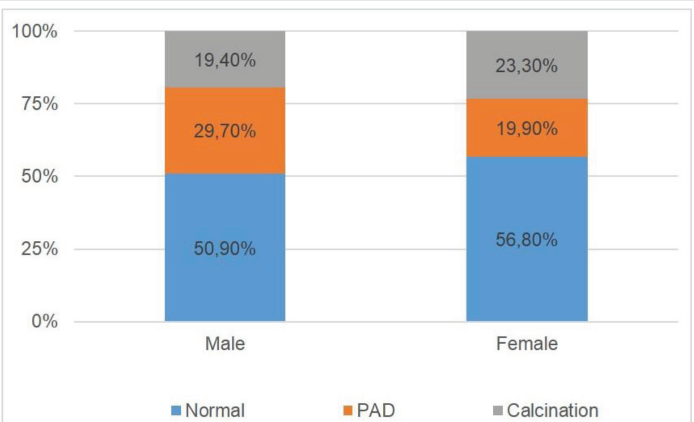
Among those multi-pathological patients suffering from two pathologies, 58.9% have normal ABI, whereas 22.3% are compatible with Mönckeberg's calcification and 18.8% with PAD. As for those with three or more pathologies, 41.7% had normal ABI, 34.1% EAP and 24.2% Mönckeberg's calcification. The presence of PAD is statistically significant in patients with three or more pathologies (p = 0.002).



Graph 1: Percentage total and according to gender of cardiovascular risk factors. (* p <0.001).



Graph 2: Results ABI.



Graph 3: Distribution of ABI values according to gender.

Table 3: Characteristics of ABI values by gender.

	Total N= 392	Male= 216 (55.1 %)	Female= 176 (44.9 %)	p
Normal n (%)	210 (53.5)	110 (52.4)	100 (47.6)	0.831
PAD n (%)	99 (25.3)	64 (64.6)	31 (35.4)	0.035
Calcination n (%)	83 (21.2)	42 (50.6)	41 (49.4)	1

The ABI has mostly normal values in autoimmune diseases, hepatic diseases, intestinal diseases, neoplasias, chronic anemias or osteoarthropathies. In the rest of pathologies it is more frequent to find an abnormal ABI (PEE or calcification), especially in diabetes mellitus with nephropathy or retinopathy, in which a high prevalence of PAD is objectified (Table 4).

Regarding the relationship between PAD and different pathologies, statistical significance was found for ischemic heart disease (p = 0.01) and type 2 diabetes mellitus with target organ lesions (p <0.001). As for Mönckeberg's calcification, it presents statistical significance with chronic kidney disease (p = 0.04). Among the different CRF studied (smoking, AHT, DM, DL and obesity), the presence of PAD was significantly related to all of them (p <0.001).

Of the initial 379 patients, 84 (22.16%) were under 65, with an average age of 57.33 ± 9.19 years. 50 were men (59.5%) and 34 were women (40.5%). The baseline characteristics of patients younger than 65 years old and in terms of gender are shown in table 5.

CVR through SCORE and VA were calculated in 84 patients. Patients with a SCORE> 5% are considered high cardiovascular risk subjects. In our sample, 44% presented SCORE> 5%, with a significant difference of men within this group (p <0.001) (Table 6).

Among patients with a SCORE <5%, 80.9% had a normal ABI, being pathological in 19.1% (12.8% presented PAD and 6.4%, Mönckeberg's calcification). Among those patients presenting a Score> 5%, they had a normal ABI of 40.5%, whereas 48.6% had PAD and 10.8% presented calcification, establishing a significant relation between both the PAD and the calcification with a SCORE> 5% (P <0.001) (Table 7).

Regarding the calculation of vascular age, patients have an average vascular age of 71.63 ± 19.53 years. Patients with PAD have an average vascular age of 85.75 ± 21.38 years, those with calcification have an average vascular age of 83.29 ± 24.78 years, while patients with normal ABI have a vascular age of 63.70 ± 12.69 years, with a Significant difference between patients with abnormal ABI and those with normal ABI [29].

These patients were compared using the ANOVA tes, which showed a statistical significance between a high vascular age

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and the presence of PAD and Mönckeberg's calcification (p <0.001).

Discussion

This study is representative of the pluripatological patients admitted to the Internal Medicine Service of the Hospital Clínico Universitario de Valladolid. In most clinical trials in hospitalised patients, women have been underrepresented

Table 4: Distribution of ABI values in the different pathologies.

	Total N= 392	Normal= 210 (53.5 %)	PAD= 99 (25.3 %)	Calcination= 83 (21.2 %)	p
Age (SD)	78.48 (12.8)	77.48 (13.8)	76.92 -13.6	82.10 (8.8)	0.021
A1 n (%)	196 (50.0)	92 (46.9)	56 (28.6)	48 (24.5)	0.068
A2 n (%)	98 (25.0)	38 (38.8)	40 (40.2)	20 (20.4)	0.01
B1 n (%)	16 (4.1)	12 (75.0)	2 (12.5)	2 (12.5)	1
B2 n (%)	84 (21.4)	40 (47.6)	19 (22.6)	25 (29.8)	0.049
C1 n (%)	102 (26.0)	50 (49.0)	23 (22.5)	29 (28.5)	0.831
D1 n (%)	16 (4.1)	13 (81.2)	2 (12.5)	1 (6.3)	0.915
D2 n (%)	12 (3.1)	8 (66.6)	3 (25.0)	1 (8.4)	0.872
E1 n (%)	53 (13.5)	23 (43.4)	20 (37.7)	10 (18.9)	0.089
E2 n (%)	49 (12.5)	35 (71.4)	5 (10.2)	9 (18.4)	0.654
E3 n (%)	56 (14.3)	32 (57.1)	9 (16.1)	15 (26.8)	0.453
F2 n (%)	29 (7.3)	7 (24.1)	17 (58.6)	5 (17.3)	<0.001
G1 n (%)	104 (26.5)	59 (56.7)	25 (24.0)	20 (19.3)	0.863
G2 n (%)	93 (23.7)	52 (55.9)	24 (25.8)	17 (18.3)	0.239
H1 n (%)	51 (13.0)	27 (52.9)	13 (25.5)	11 (21.6)	0.915

Table 5: Baseline characteristics in patients younger than 65 years.

	Total N= 84	Male= 50 (59.5 %)	Female= 34 (40.5%)	p
Age (SD)	57.33 (9.19)	56.8 (9.32)	58.11 (9.07)	0,390
A1 n (%)	24 (28.6)	14 (58.3)	10 (41.7)	1
A2 n (%)	17 (20.2)	12 (70.6)	5 (29.4)	0.409
B1 n (%)	8 (9.5)	1 (12.5)	7 (87.5)	0.007
B2 n (%)	21 (25.0)	11 (52.4)	10 (47.6)	0.454
C1 n (%)	19 (22.6)	12 (63.2)	7 (36.8)	0.795
D1 n (%)	8 (9.5)	6 (75)	2 (25.0)	0.464
D2 n (%)	6 (7.1)	5 (83.3)	1 (16.7)	0.394
E1 n (%)	4 (4.8)	2 (50.0)	2 (50.0)	1
E2 n (%)	13 (15.5)	6 (46.2)	7 (53.8)	0.361
E3 n (%)	5 (6.0)	1 (20.0)	4 (80.0)	0.153
F1 n (%)	0 (0)	0 (0)	0 (0)	1
F2 n (%)	10 (11.9)	6 (60.0)	4 (40.0)	1
G1 n (%)	27 (32.1)	17 (63.0)	10 (37.0)	0.812
G2 n (%)	33 (39.3)	26 (78.8)	7 (21.2)	0.006
H1 n (%)	11 (13.1)	4 (36.4)	7 (63.6)	0.111
Smoker n (%)	46 (54.7)	35 (76.1)	11 (23.9)	< 0.001
AHT n (%)	45 (53.5)	28 (62.2)	17 (37.7)	0.152
DM n (%)	29 (34.5)	19 (65.5)	10 (34.5)	0.394
DL n (%)	25 (29.7)	15 (60.0)	10 (40.0)	0.464
Obesity n (%)	29 (34.5)	18 (62.1)	11 (437.9)	0.462

Table 6: Distribution of SCORE calculation according to gender.

	Total N= 84	Male= 50 (59.5 %)	Female= 34 (40.5%)	p
AGE (SD)	57.33 (9.19)	56.8 (9.32)	58.11 (9.07)	0,390
SCORE <5%	47 (56.0)	23 (48.9)	24 (51.1)	1
SCORE > 5%	37 (44.0)	27 (73.0)	10 (27.0)	< 0.001

Table 7: Distribution of ABI results according to SCORE.

	Total N= 84	Normal= 53 (63.1%)	PAD= 24 (28.6%)	Calc= 7 (8.3%)	p
SCORE <5% n (%)	47 (56.0)	38 (80.9)	6 (12.8)	3 (6.3)	<0.001
SCORE > 5% n (%)	37 (44.0)	15 (40.5)	18 (48.7)	4 (10.8)	<0.001

Calc: calcination.

[15]. However, in real life they account for more than 50% of hospital admissions. Thus, according to the hospital morbidity and mortality survey carried out in 2014, there were 4,719,667 hospital discharges, of which 52.9% were women16.

Men, as reported in the literature, have a higher prevalence of COPD and ischemic heart disease [17,18,19]. Neoplastic diseases are more frequent in this sex, with a high mortality [20]. In the case of women, different studies show a higher prevalence of cognitive impairment in this sex [21], although there are studies where this trend is not confirmed [22]. The debate is less in terms of the prevalence of chronic osteoarticular disease, since most studies show a higher prevalence in women [23].

CRF are more frequent in men, with a significant percentage of smokers, which confirms the results of the survey on Spanish national health, carried out by the Health Ministry [24], which corroborates a greater number of male smokers, especially at an advanced age: from 65 years old, 16.2% of men declared themselves active smokers as compared to 4.6% of women.

AHT is the most frequent CRF present in more than 65% of the patients studied. AHT has a high prevalence in developed countries, affecting almost 40% of the adult population [25]. In Spain, its prevalence is approximately 35% of the general adult population, affecting 40% of middle-aged people and 60% in patients over 60, reaching some 10 million adult individuals [26,27].

Type 2 DM affected 43% of the population under study, with a slight non-significant predominance in men. The prevalence of DM is very disparate in the literature, as it can vary widely depending on geography, age, sex or race. In Europe, the prevalence of DM is 8.5% of the adult population in 2010, estimated to reach 10% in [20,30,28]. According to the latest study di@bet.es, the prevalence of diabetes is 13.8%: 7.8% of the patients are diagnosed of the same, as opposed to 6% who are not. In a study carried out in the pluripathological population, a prevalence of diabetes was close to 50% [30].

38.8% of the patients from the studied sample, mainly men, presented DL. In Spain, 20 to 25% of middle-aged adults, studied in Primary Care visits, have total cholesterol levels above 250 mg/dl; with 50 and 60% being above 200 mg/dl,

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which means that one in four subjects is diagnosed as DL, presenting a lower frequency in women [31,32].

Obesity is diagnosed in 42% of the patients, predominantly in men, contrary to what is proposed by most articles, which refer to a higher proportion of women suffering from this disease [33].

This study is carried out on pluripathological population, which justifies a higher prevalence of different CRF; and given that in our sample there was a higher proportion of men, some diseases that are more frequent in women in the literature, were not such in our sample. Likewise, the differences existing in pathologies with age are revealed: in people under 65 the most prevalent pathologies are neoplasias and chronic anemia.

The ABI calculation is a technique with a high specificity and sensitivity for the diagnosis of peripheral arterial disease6: a value lower than 0.9 is diagnostic of the disease, which is a synonym for high cardiovascular risk and mortality [4,34]. On the other hand, a value equal to or greater than 1.3 diagnoses arterial calcification, whose presence increases cardiovascular mortality values. In the studied population, 53.5% of the patients have normal ABI, compared to 46.5% of the patients with an abnormal ABI: 25.3% had a PAD and 21.2% had Mönckeberg's calcification.

The prevalence of asymptomatic PAD is estimated at approximately 12% of the general population35, although it varies widely according to the studied population36. Thus, different studies show that in Spain the prevalence of PAD is 4.4% in people between 35 and 79 years old; 7, 6% from 50 and 20% from 80 years old [37].

PAD is an important predictor of cardiovascular morbidity and mortality [38], independent of age, sex and the presence of different CRF [39]. In this study the presence of PAD is significantly associated with smoking, hypertension, DM, DL and obesity.

The most important risk factor for developing PAD is smoking, and since the beginning of the 20th century smoking has been associated with a frequency of intermittent claudication three times greater than that of non-smokers. The cessation of smoking has been associated with an accelerated decrease in the risk of PAD [40].

AHT has been associated with an increase in the prevalence of PAD [41], as well as being twice as frequent in the diabetic population [42]. An early detection of PAD in these patients has been shown to reduce mortality considerably, since it allows earlier and stricter metabolic control [4].

Some studies support the association between DL and obesity with the presence of PAD, although not as consistently as the association with smoking, DM and hypertension, since they lose their statistical significance in multivariate analyses [43].

This is the first study on PAD to be carried out in pluripathological patients, demonstrating a significant association between them. The presence of PAD is related to having at least three pathologies ($p = 0.002$), establishing a statistically significant relationship between PAD and ischemic heart disease, as well as with DM and target organ injuries.

Patients with PAD have an increase of 20-60% risk of acute myocardial infarction (AMI); and 2 to 6 times greater coronary mortality, and 40% risk of stroke or transient ischemic attack (TIA); all of this with a much greater probability than the possibility of undergoing amputation of the lower extremities [44].

In the studied population, a significant relationship was established with ischemic heart disease but not with cerebrovascular disease, which may be due to the low prevalence of this disease in the study sample.

Since the PAD has an important relation with the different cardiovascular risk factors, it has been calculated by the SCORE for the countries of low incidence and the vascular age.

Taking into account that cardiovascular risk and vascular age scales are not used for patients over 6545, the studied population is reduced, and 84 patients are the subject of the study.

Given that high-risk cardiovascular patients are those with a SCORE> 5% 46, our sample has been divided into two groups: those patients with high or very high cardiovascular risk and those patients who have a low or intermediate risk. The percentage of men is significantly higher in the high or very high risk group, coinciding with the studies byother authors, and opposed to that of women in which the percentage of low or intermediate risk predominates.

The presence of PAD is significantly associated with a high cardivascular risk calculated with SCORE, like in other studies. Numerous studies associate PAD with cardiovascular risk calculated with SCORE [47]. In our study, although the proportion of PAD is higher in the high-risk cardiovascular group, a statistical association is not established, which is probably due to the sample size.

VA has been associated with a direct correlation with cardiovascular risk measured through SCORE [10]. This study establishes a statistical association between vascular age and the presence of both PAD and Mönckeberg's calcification.

There are currently no published data concerning any medical treatment of PAD other than revascularisation. However, it is important to correct any modifiable risk factors for cardiovascular disease, especially perioperatively and during the follow-up. This study shows the importance of controlling CRF in these patients.

In conclusion, our study highlights the importance of the determination of ABI, cardiovascular risk and vascular age in patients admitted to Internal Medicine services. Since PAD is in most cases asymptomatic and therefore underdiagnosed, its presence forces us to a comprehensive treatment of the patient to avoid any of these events.

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