THE CORRELATION BETWEEN THE ANKLE-BRACHIAL INDEX AND THE METABOLIC SYNDROME

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THE CORRELATION BETWEEN THE ANKLE-BRACHIAL INDEX AND THE METABOLIC SYNDROME (Abstract): On a global scale, the cardiovascular diseases constitute the prime factor of death and invalidity. The premature mortality percentage caused by these varies from 4% in high developed countries to 40% in underdeveloped countries. Atherosclerosis is the most important etiological factor. The presence of various degrees of atherosclerosis in a certain vascular area (in our case, the lower limb arteries), increases the probability of affecting other areas as well (coronary, cerebral, renal, mesenteric arteries). Aim: The evaluation and description of the correlations between the ankle-brachial index levels and the cardiovascular risk factors, taken individually or as part of the metabolic syndrome. Material and method: The values of the ankle-brachial index were divided in normal and abnormal. The evaluated cardiovascular risk factors were: age, sex, arterial hypertension, obesity, smoking, high levels of cholesterol and basal glucose, low levels of HDL-cholesterol. Results: There were significant statistical differences between the normal ankle-brachial index lot and the one with abnormal values, specifically in patients with diabetes mellitus and metabolic syndrome. More so, the study demonstrates that the ankle-brachial index is considerably smaller in patients with metabolic syndrome. Conclusions: The simple measurement of the afore mentioned index, as a atherosclerosis marker for the lower limb arteries, represents an independent prediction over the metabolic syndrome and the conventional risk factors, in the development of the cardiovascular diseases. The routine measurement of this parameter in medical practice might imply the early diagnosis of high risk manifested cardiovascular disease patients. Keywords: ANKLE-BRACHIAL INDEX, METABOLIC SYNDROME, CARDIOVASCULAR RISK FACTORS

The ankle-brachial index (ABI) is defined as the ratio between the systolic blood pressure, measured on ankle level, and the brachial level one, lying down, 5 minutes after resting.

The ratio is derived as follows: the blood pressure is measured on both arms, and the highest value is considered; then it is measured in the pedis and tibial bilateral posterior arteries (using a sphygmomanometer and a Doppler instrument), selecting the highest value as well. From the resulted two values of the ratio, the lowest value is further considered (1). This technique is maneuverable, non-invasive and reliable. It is applied on a large scale in medical practice to confirm the diagnosis and severity of the peripheral arterial disease (2). More
so, ABI is an indicator of generalized atherosclerosis, as the literature associates low values with an increased rate of coronary and cerebrovascular damage, as well as with the presence of numerous cardiovascular risk factors, that suggest the independent nature of it predicting cardiovascular events (3).

The metabolic syndrome, heterogeneous entity considering the gender differentiation, is currently defined, as the association of at least 3 out of 5 criteria, each with its own established reference values (4).

**MATERIAL AND METHODS**

A retrospective observational study was performed on 189 patients hospitalized in the Cardiovascular Rehabilitation Clinic of the Clinical Rehabilitation Hospital Iasi, between September 2011 and April 2012 (7 months).

The patients were divided in two batches, based on the values of ABI: first batch, with abnormal values (ABI ≤ 0.9) and the latter, with normal values (ABI between 0.9 and 1.4) (5).

Subjects with ABI values higher than 1.4 were excluded from the study, due to an increased level of errors determined by the arterial stiffness (6). Other exclusion criteria were: secondary arterial hypertension, severe chronic renal disease (dialyzed patients), major cardiovascular events (myocardial infarction, stroke, and chronic heart failure, myocardial or peripheral revascularization) (7).

**RESULTS AND DISCUSSION**

The gender repartition varied: 74.1% (140) male subjects, and 25.9% (49) female. Patients’ age ranged from 37 up to 83 years. In addition, 59.8% (113) came from urban areas, while the remaining 40.2% (76) resided in rural areas. No statistic age difference was observed amongst the study group, between the two genders (p=0.606) (fig. 1).

The maximum systolic blood pressure level, depending on the ABI values, registered the following results:

- ABI ≤ 0.9 batch, values between 120-290 mmHg, with an average value of 180 mmHg;
- ABI > 0.9 batch, values between 135-260 mmHg, with an average value of 190 mmHg.

There were no significant differences between the two batches (8) (fig. 2).

The statistical analysis of the cholesterol (fig. 3) and HDL-cholesterol levels (fig. 4) depending on the ABI values revealed the following:

- Normal distribution of cholesterol and HDL-cholesterol levels on ABI ≤ 0.9 subjects (107-345 mg/dl, with an average of 187 mg/dl for cholesterol and 19-82 mg/dl, with an average of 40 mg/dl for HDL-cholesterol);
- Non normal distribution on ABI > 0.9 patients (110-351 mg/dl, with an average of 193 mg/dl, and 27-80 mg/dl, with an average of 41 mg/dl respectively).

Fig. 2. The correlation between ABI and SBPmax

Fig. 3. ABI and cholesterol levels
Again no significant differences were observed (9).

In ABI ≤ 0.9 batch, there were 26 patients with diabetes mellitus, compared to 43 from the second batch, with a significant statistical difference between the two (p=0.049) (10).

The analysis of the correlation between smoking and ABI values showed no differences (11) (fig. 5).

The study batches’ average body mass index (BMI) was 29 kg/m², with a variation between 18 and 49 kg/m², without a significant difference (p=0.227) (12, 13) (fig. 6).

In the ABI ≤ 0.9 batch, there were 16 patients with left ventricular hypertrophy (LVH), compared with 20 patients from the second batch, with no significant statistical difference between the two (p=0.714).
The correlation between the ankle-brachial index and the metabolic syndrome

Fig. 6. ABI and BMI smoking and ABI

Regarding the main objective of the present study, establishing a correlation between the ABI values and the presence of the metabolic syndrome, it was demonstrated that the distribution of the latter was non-normal for both batches; the metabolic syndrome was present on 49 patients with ABI ≤ 0.9 and 32 patients with ABI > 0.9, with a significant statistical difference (p=0.003); moreover the ABI values were considerably lower on patients with metabolic syndrome (14) (fig. 7).

Fig. 7. ABI and the metabolic syndrome
CONCLUSIONS
This study strengthens the literature results and demonstrates that the low ABI values (as a marker for atherosclerosis in lower limbs arteries) represent an independent predictor in relation with the metabolic syndrome and conventional risk factors, in the development of cardiovascular disease. Introducing the routine measurement of this parameter in medical practice might imply the early diagnosis of high risk manifested cardiovascular disease patients.

REFERENCES