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EARLY PREVENTION: THE CORRELATION BEETWEN ARTERIAL RIGIDITY AND CARDIOVASCULAR RISK IN HYPERTENSIVE PATIENTS AND ITS SOCIAL IMPACT

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Abstract

There is a need for innovative strategies in health promotion. A healthy life-style is impacted by traditions established along generations which are influenced by their social life and the social relations. In recent years, great emphasis has been placed on the role of arterial stiffness in the development of cardiovascular diseases. Arterial stiffness may predict coronary heart disease beyond classic risk factors. Hypertension guidelines underline the importance of quantification of cardiovascular risk; an extensive evaluation of target organ damage may increase the number of patients classified at high-added cardiovascular risk. The measurement of PWV is generally accepted as the most simple and non-invasive method to determine arterial stiffness. The aim of the study was to establish the relationship

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between aortic stiffness measured through PWV and cardiovascular risk assessed through a Score Risk diagram in hypertensive patients and to show that PWV retains its predictive value independently of classic risk factors. 105 patients aged between 40-80 years suffering of primary hypertension have been selected and evaluated (secondary hypertension excluded). The risk assessment of coronary heart disease was made by calculating the Score risk according to gender, age, blood pressure, cholesterol and smoking for each of them. We have then correlated these parameters. Patients were classified in function of low-moderate cardiovascular risk and high-very high cardiovascular risk. Assessment of PWV in addition to Score risk calculating led to an increase of the proportion of patients at high risk (from 5 to 15%, $P < 0.001$). The following results have been found: SCORE risk = 5.65 (SD = ± 6.05); PWV = 9.2 m/s (SD = ± 1.94). Our results confirm that determining aortic PWV is a useful tool for Primary Practice, as it correlates with SCORE index, which is recommended by the European Society of Cardiology as an evaluation method of cardiovascular risk in patients.

Keywords: score risk, hypertensive patients, pulse wave velocity, arterial stiffness, cardiovascular risk, social impact.

Introduction

It is well known that most industrialised countries suffer from a burden of disease. In particular, the incidence of chronic diseases, e.g. diabetes type II, overweight, obesity and coronary heart disease (WHO 2003, WHO 2004), is increasing. There is a need for innovative strategies in health promotion. These strategies need to initiate social processes and promote an idea of health as something integrated in the normal course of life (Vintila *et al.*, 2009). A healthy lifestyle is impacted by traditions established along generations which are influenced by their social life and the social relations (Eglite *et al.*, 2009). In recent years, great emphasis has been placed on the role of arterial stiffness in the development of cardiovascular diseases.

Classical risk scores may underestimate the risk of cardiovascular events in specific risk groups suitable for early prevention, such as asymptomatic hypertensive subjects (Mancia, 2007). Arterial stiffness and wave reflection are now well accepted as the most important determinants of increasing systolic and pulse pressures in aging societies, thus affording a major contribution to stroke and myocardial infarction (Amaricai & Poenaru, 2015; Iurciuc *et al.*, 2017; Mancia, 2007). A major reason for measuring arterial stiffness in hypertensive patients comes from the demonstration that arterial stiffness has a predictive value for cardiovascular events, beyond classical cardiovascular risk factors (Iurciuc *et al.*, 2011; Iurciuc *et al.*, 2010). Aortic stiffening also gives direct evidence of target organ damage, and improves the determination of the overall cardiovascular risk of asymptomatic hypertensive subjects (Volpe *et al.*, 2012). In clinical practice, the measurement of aortic stiffness may avoid patients being mistakenly classified as at low or moderate risk, when they actually have an abnormally high aortic

stiffness placing them within a higher-risk group (Amaricai & Poenaru, 2015). Indeed, the assessment of arterial stiffness is increasingly used in the clinical assessment of patients as Guidelines of Management in Hypertension recommends. The measurement of PWV is generally accepted as the most simple, non-invasive, robust, and reproducible method to determine arterial stiffness (Iurciuc *et al.*, 2017; Van Bortel *et al.*, 2012).

Methodology

In this study we selected and evaluated 105 patients aged between 40-80 years suffering of primary hypertension (secondary hypertension has been excluded) by determining aortic stiffness from carotid-femoral pulse wave velocity (the gold standard for arterial rigidity) (Figure 1) and calculating the cardiovascular risk using the diagram of Score risk (Figure 2) according to the categories of gender, age, blood pressure, cholesterol and smoking for each of them.

The baseline clinical characteristics of our patients are summarized in *Table 1*.

Table 1. Characteristics of Study Patients. SD=standard deviation

Values are mean±SD or No. (%).	Score Risk>5%	Score Risk<5%	Level of Significance, <i>P</i> Value
No. of patients	62	43	
Age, y	63.8±10.3	50.7±11.7	<0.01
Current smokers (%)	35	(24)	0.84
Total cholesterol, mg/dl	245.7±44.9	203.1±37.4	0.58
LDL cholesterol, mg/dl	141.3±40.7	117.5±33.1	0.56
Peripheral systolic blood pressure, mm Hg	151.9±19.9	130.9±17.8	0.73
Peripheral diastolic blood pressure, mm Hg	95.3±13.7	83.2±11.2	0.009
Peripheral pulse pressure, mm Hg	63.6±15.5	47.7±15.0	0.007
SCORE risk	6.6±1.5	3.5±1.4	0.96
PWV	10.8±1.9	8.7±1.3	0.005

Figure 1. Measurement of

Figure 2. Score risk Chart

Results

Patients were classified as follows: 41% at low and moderate cardiovascular risk (Score Risk<5%), 59% at high and very high cardiovascular risk (Score Risk>5%). Assessment of PWV in addition to Score Risk calculating led to an increase of the proportion of patients at high risk (from 5 to 15%, $P < 0.001$). The following results have been found: SCORE risk = 5.65 (SD=+/-6.05); PWV=9.2m/s (SD=+/-1.94); Pearson correlation index between SCORE and PWV $r=0.7845$ is

highly significant for a direct type correlation.

Discussion

Our results confirm that determining aortic PWV is an useful tool for Primary Practice, as it correlates with SCORE index (Eur Heart J, 2010) which is recommended by the European Society of Cardiology as an evaluation method of cardiovascular risk in patients.

For many years systolic and diastolic blood pressure were the exclusive mechanical factors predicting cardiovascular risk in populations of normotensive and hypertensive individuals. However, if hypertension acts as a mechanical factor with deleterious consequences on the arterial wall, the totality of the blood pressure curve should be considered to evaluate the risk (Erbel *et al.*, 2014). Recent findings in hypertensive populations illustrate that increased pulse pressure is an independent predictor of myocardial infarction, congestive heart failure and cardiovascular death, even in hypertensive patients undergoing successful antihypertensive drug therapy; and also increased aortic pulse wave velocity is an independent predictor of cardiovascular mortality in individuals with essential hypertension (Bhatt *et al.*, 2006; Iurciuc *et al.*, 2011; Iurciuc *et al.*, 2017). Currently, increased pulse pressure and increased pulse wave velocity may be considered either as simple markers of an underlying vascular disease or as strong cardiovascular risk factors.

Conclusion

Our results confirm that determining aortic PWV is an useful tool for Primary Practice, as it correlates with SCORE index, which is recommended by the European Society of Cardiology as an evaluation method of cardiovascular risk in patients. In clinical practice, the measurement of aortic stiffness may avoid patients being mistakenly classified as at low or moderate risk according to Score risk chart calculation, when they actually have an abnormally high aortic stiffness placing them within a higher-risk group. Moreover, in order to obtain valid and robust results, future studies should take into consideration to use a validated and culturally adapted instruments (Tudorel *et al.*, 2018; Vintila *et al.*, 2018).

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