

ERECTILE DYSFUNCTION OF VASCULAR CAUSE

Statistical Evaluation on the Plurimetabolic Syndrome's Risk Factors and Their Correlation with Penile Eco-Doppler Rates

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SUMMARY

Introduction: The Plurimetabolic Syndrome is a clustering of vascular risk factors (dyslipemia, abdominal perimeter, HTA and impaired glucose tolerance) with great importance in the development of cardiovascular disease (CVD) and diabetes (DM). CDV and DM are responsible for near 70% of the erectile dysfunction causes. Eco-doppler is the first line exam for the evaluation of cavernous arterial integrity.

Methods and Materials: A epidemiologic retrospective study and statistic evaluation of the risk factors was made from a population of 176 patients who were submitted to penile eco-doppler with a 12 MHz BK ultrasound. The procedure was done with 20 to 40 µg of prostaglandin E1 and by the some investigator. The criteria of ED of arterial origin were the peak systolic velocity (PSV) < 30 cm/seg and the resistance index (IR) < 0,75. For the ED of venous-occlusive origin was the peak diastolic velocity (PDV) > 10 cm/seg with normal PSV. The control group was the patients without risk factors and with normal eco-doppler values.

Results / Conclusion: The mean age was 49 (17-77) years old. The vascular diseases were present in 41% of the population. The venous-occlusive correspond to 11% of the diagnosis of vascular diseases and 89% to arterial origin. The PSV and the IR become lower with the age and the PDV has no variation (Spearman correlation coefficient, $p < 0,001$). The PSV and the IR become lower when the risk factors are present and when there are more than one risk factor (Mann-Whitney test, $p < 0,001$). The PDV had no variation. We were not able to prove the risk grade of the vascular factors analysed in the PSV and the IR (Kruskal-Wallis test, $p = 0,2048$).

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RESUMO

DISFUNÇÃO ERÉCTIL DE CAUSA VASCULAR

Avaliação estatística dos factores de risco do Síndrome Plurimetabólico e correlação com índices do eco-doppler peniano em doentes submetidos a prova vaso-activa

Introdução: O Síndrome plurimetabólico constitui um clustering de vários factores de risco vasculares (dislipidémia, obesidade abdominal, HTA e aumento da resistência à insulina), com importância em termos de risco de doença cardiovascular (DCV) e diabetes (DM). As DCV e a DM são responsáveis por cerca de 70% das situações de disfunção eréctil. O eco-doppler é o exame de 1ª linha para avaliação da integridade vascular das artérias cavernosas.

Material e Métodos: Efectuou-se a análise epidemiológica e estatística dos factores de risco da DE numa população de 176 doentes, submetidos a eco-doppler com prova vasoactiva, com aplicação de prostaglandina E1, nas doses de 10 a 40 µg. Todos os exames foram

efectuados por um único investigador, num ecógrafo BK com sonda linear de 12 MHz. Os critérios de DE de causa arterial foram os valores de pico de velocidade sistólica (PSV) < 30 cm/seg e o índice de resistência (IR) < 0,75. Para a DE de causa veno-oclusiva usou-se valores de velocidade diastólica (PDV) > 10 cm/seg, com PSV normais. Utilizou-se como grupo de controlo, os doentes examinados, sem factores de risco vasculares e com respostas normais no eco-doppler.

Resultados e Conclusões: Foram examinados 176 doentes, com idade média de 49 (17-77) anos. As doenças vasculares estão presentes em 41% da população. As alterações veno-oclusivas correspondem a 11% dos diagnósticos de doenças vasculares, sendo os restantes 89% de origem arterial. O PSV e o IR diminuem com o aumento de idade dos doentes e o PDV não tem qualquer correlação com a idade (coeficiente de correlação de Spearman, $p < 0,001$). O PSV e o IR diminuem com a presença de factores de risco vascular, bem como a associação de vários factores de risco (teste de Mann-Whitney, $p < 0,001$). O PDV não tem associação. Não se provou diferença no grau de risco vascular dos diversos factores relativamente à variação do PSV e do IR (teste de Kruskal-Wallis, $p = 0,2048$).

INTRODUCTION

In the last years several situations have assumed the impact of epidemic conditions in the developed countries. The increase on longevity and the expectations in what concerns quality of life changed the way to manage some pathologies. In this context, obesity assumes a central role. Increase in adiposity, especially in visceral adiposity, is associated with several pathological conditions. The android adiposity is the central axis of metabolic syndrome (MS)^{1,2} which also includes glucose intolerance, insulin resistance, dyslipidemia and hypertension^{3, 4, 5} and it is a major risk factor for diabetes⁶ and cardiovascular diseases (CVD).

In men both diabetes and CVD are causes of erectile dysfunction (ED) acting in several domains namely hemodynamic and metabolic/ hormonal mechanisms. ED became one major issue not only due to its psychological and physical impact but especially in what concerns to its financial budget impact⁷. ED due to a large number of causes affects up to 70% (1 in each 3) men, mainly across the last decades of life⁸. Estimations show that more than 152 million men worldwide were affected by ED in 1995⁷, and indicate that 320-322 million men will be affected by the year 2025^{7, 9}.

The association between MS and ED has been recognized for several years^{3, 10, 11, 12} and evidence has been accumulating as to classify ED as a vascular disorder^{13, 14}. Endothelial dysfunction (EnD)^{7, 10, 14, 15, 16} appears as the common denominator in both ED and CVD. The endothelium controls the vascular tone by releasing neurotransmitters and biochemical factors such as nitric oxide (NO), acetylcholine, and prostaglandins, among others^{7, 15}. It is, so being, commonly accepted that many cases of both ED and CVD result from an impairment of the vascular reactivity and relaxation of the smooth

muscles cells coating the arteries¹⁵. The reduction of NO synthesis may be an important link between CVD and ED as an arterial insufficiency of the cavernosal bodies. The eco-doppler evaluation of cavernosal arteries can be an option to analyse the patients' penile vascular function^{4, 15}.

ED's diagnosis and therapeutic processes should assume that these dysfunctions may present themselves as symptoms of a general cardiovascular problem^{7, 8, 9, 15}. This study's main objective was to evaluate the association between erectile dysfunction and metabolic syndrome. The analysis of population's MS risk factors and the relation between age and risk factors with PSV, PDV and RI also constituted study's objectives.

METHODS

Retrospective epidemiological study that included a cohort of 176 patients who undergone a doppler ultrasonography due to suspicion of ED diagnosis. The exam was conducted through a BK ultrasound, using a linear tube of 12 MHz and applying 20 μ gm of E1-prostaglandin. The patients' exams were conducted by a single investigator. The diagnosis criteria for arterial cause ED were either peak systolic velocity - PSV < 30 cm/sec or resistance index - IR < 0.75. As for the diagnosis criteria regarding veno-occlusive cause ED, it was assumed end diastolic velocity - EDV > 10 cm/sec.

All categorized, nominal and quantitative variables were crossed over, on one hand, and on the other, frequency tables, measures of central tendency and dispersion measures were constructed, according to their adequacy to the data.

Differences between more than two groups were assessed with Kruskal-Wallis or Mann-Whitney tests. A 95% confidence interval was assumed.

RESULTS

Seventy one patients were confirmedly ED diagnosed (mean age 56 years), and 105 did not (mean age 49 years). On the population with ED, 6 also had diagnosis of MS. In what concerns the ED cause, 8 patients were diagnosed veno-occlusive disease, 62 had arterial insufficiency and 1 patient had superficial dorsal penile right vein thrombosis. The arterial insufficiency was classified in mild or moderate in 26 cases and severe in 37 cases, the severity of the remaining 39 cases is unknown.

Data regarding smoking habits, hypertension, dyslipidemia, diabetes *mellitus*, abdominal perimeter and testosterone levels were collected from the 71 ED diagnosed subjects (table 1).

Vascular diseases were diagnosed in 41% of the observed population, being that 11% of those diagnosis corresponded to veno-occlusive changes. The remaining 89% were associated with arterial changes.

It was observed that both PSV and RI values decreased as the patients' age increased ($p < 0.001$ and $p = 0.0003$, respectively).

No significant correlation was found between EDV levels and patients' age ($p = 0.548$).

A decrease in both PSV and RI levels was associated with an increase in the number of risk factors (from 0 up to 2) shown by the analysed patients. This association retained statistical significance (PSV - $p < 0.001$ and RI - $p = 0.004$). No significant correlation was found regarding EDV values.

These results make it possible to extrapolate a significant association between PSV and RI values and risk factors *per se*, independent of the actual number of risk factors observed. These data were also obtained in the present study ($p < 0.001$ for both correlations).

DISCUSSION

The eco-doppler, in the evaluation of ED, is non invasive and broadly used, and, after the clinical exam, it is the first choice exam for studying ED (Lehmann et al. 1996; NIH 1993). The erection's functional aspects and its characterization after vasoactive injection are the most important features of the real-time exam¹⁷.

Though the correlation between MS and an increase in both metabolic and cardiovascular risk has been assumed for many years^{3, 4, 6}, one of this study's aims was to specifically assess whether a relation between MS and ED is also observed. It was found that 75% of the patients who presented MS symptoms were also ED diagnosed. These results are consistent with those of several other studies which have concluded that MS constitutes a potential risk factor for ED and that ED is more often diagnosed in MS patients compared to patients without MS^{1, 3, 7, 11, 18, 19, 20}. In fact, an increase in the number of MS risk factors has been shown by other authors to constitute a source of increased ED risk^{1, 18}. Still, it is important not to extrapolate that a MS risk reduction could lead to a decrease in ED episodes^{1, 18}.

Fifty four percent of the ED analysed patients showed severe arterial insufficiency. Some other studies, which have been carried out throughout the past years, corroborate the results of our study by providing data that suggests that CVD increases the probability of developing ED^{6, 20}.

The present study provides information as to confirm that an EnD can manifest itself as ED, namely based upon the data provided by PSV and RI levels measurements. The same supportive data and conclusions have been obtained in other studies^{7, 15}. It has also been shown that an EnD may be considered as an independent risk factor in what CVD is concerned^{7, 15}.

It could be assumed, though carefully, that the correction of some of the metabolic parameters could result in improvement in what regards to ED^{3, 11}. It is important that all vascular risk factors are assessed in ED patients as

Table 1 Population clinic parameters

	With ED N (%)	Without ED N (%)	p
Smoking habits	16 (23)	16 (15)	0.218
Hypertension	16 (23)	24 (23)	0.960
Dyslipidemia	8 (11)	3 (3)	0.024
Waist circumference (> 92cm)	39 (55)	7 (7)	< 0.001
Diabetes Mellitus	26 (37)	13 (12)	< 0.001
High testosterone levels (> 20nmol/L)	28 (39)	84 (80)	< 0.001

a way of combating cardiovascular morbidity¹.

CONCLUSION

Both an increase in men's age and number of MS risk factors are related to a decrease in PSV and RI levels. MS per se seems to be a risk factor regarding ED, being that an increase in the number of metabolic disturbances appears to increase its risk.

Being that EnD is considered a "common point" for ED and CVD, its function's testing may identify irregularities which can contribute to the development of ED.

More than recognizing the correlation between MS, ED, and CVD, it is of utmost importance that the assessment of ED by all physicians, independent of speciality, becomes a reality that may, as demonstrated, improve CVD prevention and therapeutic approach.

Conflict of interests:

The Authors who have taken part in this study declared that they do not have anything to disclose regarding funding or conflict of interest with respect to this manuscript.

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