CBmeter- a new medical device for early screening of metabolic diseases

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Background: Type 2 diabetes mellitus (T2DM) is a highly prevalent disease worldwide which is asymptomatic in about 44% of patients being critical to search for new ways of early diagnosis. Recent studies have demonstrated that the etiology of this disease may be associated with alterations in the function of the carotid body (CB), a chemosensor organ located within the bifurcation of the carotid artery. In animal models of metabolic syndrome it was observed that the CBs are overactivated, underlying diseases such as obesity, hypertension and T2DM. This discovery provided a new paradigm in the neuroendocrinology field, suggesting that diagnostic function of the CBs has predictive value for the development of metabolic diseases. Despite this fact, it is not common in clinical practice to look at the CBs as organs associated with endocrine dysfunction and we believe this is probably due to the nonexistence of a user-friendly, portable medical device that diagnosis the function of the CBs.

Objectives: The general aim of this work is to develop a novel device that evaluates the function of the carotid bodies - a CBmeter. We are also developing a standard test meal to be used as a physiological dynamic test during CBmeter utilization.

Methods: This medical device will synchronously assess several physiological variables: heart rate, respiratory rate, blood pressure variation, arterial pulse oximetry and circulating glucose, as well as the physiological responses to hyperoxia and meal ingestion. The results obtained will be analysed using MatLab, in order to develop an algorithm with predictive value for early diagnosis of metabolic diseases. We are also developing a standard test mixed- meal to assess post-prandial glucose excursions with the CBmeter. The work is currently in the prototype development phase.

Results: A preliminary pilot-test performed with the prototype revealed that all the proposed variables are assessable with the CBmeter. The standardized test meal used in the pilot-test caused a glucose excursion curve that stabilized 30 minutes after ingestion, being suitable for metabolic evaluation with the CBmeter. Interstitial glucose variation was 16,6mg/dl glucose with a latency time of 21min. Heart rate did not vary significantly after the meal ingestion.

Conclusion: The CBmeter prototype is currently optimized to be used in a medical device clinical-trial with healthy volunteers. The mixed meal developed has proven to be suited in healthy volunteers to determine variations in CB-related cardiorespiratory parameters.

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