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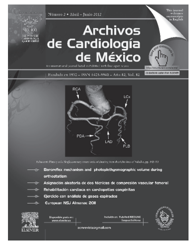

EDITORIAL COMMENT

Can we study the baroreflex mechanisms with other variables than blood pressure and heart rate?

¿Podemos estudiar los mecanismos barorreflejo con otras variables de la presión arterial y la frecuencia cardiaca?

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The baroreflex (BR) is a fundamental physiological mechanism that keeps the blood pressure (BP) stable by buffering the disturbances that arise in the system during the activities of the daily life.[1] These disturbances alter the control system and deviate the mean BP either increasing or decreasing it. The BP is maintained tonically around a "set point" and the disturbances oscillate around it; they me be profound or relatively minor.[2] Sometimes the disturbances occur at predictable times such as those seen during non-Rem sleep or rhythmic breathing.[3] The disturbances could be considered "phasic" changes that are randomly added or subtracted to the tonically maintained set point. The set point is dynamic and changes according to the mean BP maintained during a determined period of time, computed, perhaps, in hours or days or even minutes.[4,5]

It is a phylogenetically old mechanism that probably arose in the branchial arteries of the cyclostome fish.[5] The BR is a negative feedback system composed in the afferent side of high pressure baroreceptors located at the carotid sinus and the aorta and a central mechanism whose putative integrative centers are located at the medulla in the nucleus of the tractus solitarii (NTR).[1-5] The effectors of the reflex in the heart are the sinus node, the conduction system and the ventricular system. At the heart level may influence heart rate and contractility (stroke volume, SV).[5,6] At the blood vessel level it may constrict the arteries, the arterioles and the venous system. It has one vagal arm and one sympathetic arm to the heart, whereas the arm to the resistant blood vessels is only sympathetic.[5-8]

The high pressure baroreceptors discharge during the stretching of the walls of the arteries (loading of the reflex) and decrease or abolish its discharge rate during the collapse of the walls or decrease of the lumen of the arteries (unloading of the reflex). During the loading of the reflex the cardiovagal system is activated, whereas during the unloading of the reflex the cardiosympathetic and vasoympathetic systems are activated.[5,6]

The BP system is intrinsically "noisy" and there are external and internal disturbances constantly acting on the system requiring dampening or buffering of these signals.[5,7,8] The external disturbances including, changes from the supine or sitting to the upright position, respiratory movements, changes in temperature, pain, straining and others. Internal disturbances are related to cognitive activities, emotions, voluntary muscle contraction, and have been designated under the generic name of "central commands".[5,] The baroreceptor reflex is a polysynaptic reflex but the cardiovagal reflex is faster than the cardiosympathetic and vasosympathetic reflex. These different time constants impose different types of oscillations to the system.[1-3.5]

The baroreceptor reflex has been studied for a number of years by determining the relationship of the change in systolic BP to the change of the RR intervals observed in the ECG or in the interbeat interval (IBI). When the BP increases the heart rate (HR) decreases (+BP-HR) (cardiovagal reflex) and when the BP decreases the HR increases (-BP+HR) (cardiosympathetic reflex). The relationship of the BP to the HR has been termed barorereflex sensitivity index (BRS) and is measured as the ratio of IRRs measured in ms divided by the BP changes measured in mmHg: ms/mmHg.[2-7] This relationship has been evaluated with great many maneuvers including pharmacologic manipulation, leg and neck suction and others and also during "spontaneous sequence" changes.[2-7] In this issue of *Archivos de Cardiología de México*, Martínez P et al. propose a novel variable to be used in the evaluation of the BR function. The proposed variable is the photopletysmographic volume or pulse volume (PV). The PV is measured using the amplitude of the systolic pulse and can be used as a dependent variable. The authors measured the BRS with the sequence technique and the effect of systolic BP on the PV also with the sequence method and with spectral techniques.[1] The authors demonstrated a significant correlation in the frequency domain at 0.04-0.14 Hz "sympathetic frequencies" between the PV and the systolic BP during the upright position (orthostatism).

The PV signal was obtained with an infrared photopletysmograph that is relatively inexpensive and this signal was added to a channel of the Finometer. The measurement of the PV signal is easy and precise but it is measured in a non physiological unit either as mm or microvolts. The cross correlation is high with the blood pressure. In my view, this represents a significant advance in the understanding of the autoregulation of BP and may be applied to a number of diseases in which the heart rate is fixed or its variability is significantly decreased. The authors conclude: "The sequence method showed a strong baroreceptor reflex upon peripheral blood volume that became more apparent during orthostatism". Whether the PV represents vasomotion or it also has a component related to the stroke volume (SV) remains to be studied in the future.

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