

1125-92-1208

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Mathematical modeling of blood pressure and heart rate in response to the Valsalva Maneuver.

To elucidate the effects of the baroreceptor reflex (baroreflex) control mechanism on a healthy subject, we developed a cardiovascular model that predicts the dynamics of blood pressure (BP) and heart rate (HR) in response to the Valsalva Maneuver (VM). The VM is the action of forced exhalation against a closed airway and elicits a distinctive response when held for 15 seconds. This assay is used by clinicians to determine autonomic nervous system (ANS) function, and deviations from the VM response, due to a system-wide inflammatory response or adrenergic receptor blockage, may signify ANS dysfunction or failure. This study focuses on modeling various healthy subjects, employing a closed-loop model that uses the thoracic pressure as an input. The goal of this study is for this model to be used for multiple subjects and eventually to change parameters in order to accommodate various anomalies in ANS function. (Received September 15, 2016)