

Cardiovascular Variability Signals : the Epiphany of Complex Regulating System

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Abstract

Cardiovascular system regulating mechanisms are known to be complex as they have to act in very different physiological conditions and also must play a crucial role in pathological situations where the objective is most often to maintain the vital signs within determined value ranges compatible with stable clinical states. Furthermore, cardiovascular system in its functioning has direct interactions with other physiological systems (i.e. respiratory, central nervous, endocrine-metabolic, renal systems etc), thus making more intricate the network of information exchange. In clinical studies it could not be easy to have access to the main signals which directly carry information about the functioning of the cardiovascular system: the beat-to-beat variability of the main cardiovascular parameters (heart rate, systolic and diastolic blood pressure, respiration and others) is an indirect measurement of the effect of the regulating mechanisms. Variability signals are therefore the epiphany, the manifestation of the normal or the pathological cardiovascular behaviour. The paper describes a few approaches which are employed to enhance physiological and clinical information from cardiovascular variability signals: in particular, applications of the integration between parametric modelling and signal processing as well as time-variant power spectral estimation are introduced. Finally, the multiorgan approach involvement of cardiovascular system will be considered in the case of sleep and stress cases, by taking into account signals from different bodily compartments.