

THEORETICAL STUDY OF THE END-SYSTOLIC PRESSURE-VOLUME RELATION AND ITS CLINICAL APPLICATION

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The theory of large elastic deformation was applied to the myocardium in a way to obtain a mathematical expression for the pressure-volume relation (PVR) as well as for the end-systolic pressure-volume relation (ESPVR) in the heart ventricles. Several relations between the ejection fraction (EF) and the parameters describing the ESPVR have been derived. A relation between EF and percentage of heart failure (HF) has been extended in a way to obtain new relations between percentage of HF and the parameters describing the ESPVR, these relations give new insight into the problem of heart failure with preserved ejection fraction (HFpEF). Non-invasive application of the results of this study in routine clinical work is possible when ratios of pressures in the heart ventricles are calculated. Applications to clinical data published in the medical literature give consistent results; they show the possibility to classify the state of the ventricles into normal state, mildly depressed state, severely depressed state. Results show that bivariate (or multivariate) analysis of data give better classification for the purpose of clinical diagnosis.

Biography

Rachad Shoucri has completed his BSc in Electrical Engineering from Alexandria University, Egypt. He has completed his MSc in Optical Physics and PhD in Theoretical Physics from Laval University, Quebec, Canada. Later, he worked for five years at the Hopital du Saint-Sacrement and the Institut de Cardiologie de Quebec, where he developed his current interest in Mathematical Physiology and The Application of Mathematics in Cardiology. Since 1981, he is with the Department of Mathematics and Computer Science of the Royal Military College of Canada, Kingston, Ontario, wherein presently he is an Emeritus Professor.

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