



Basis of the New Cardiac Mechanics. The Suction Pump

By Jorge C. Trainini, Benjamín Elencwajg, Néstor López-Cabanillas, Jesús Herreros, Noemí Lago, Jorge Lowenstein, Alejandro Trainini
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The book *Basis of the New Cardiac Mechanics. The Suction Pump* marks –without a trace of doubt– a major breakthrough in understanding the role of the diastolic function of the heart. When Jorge Trainini explained to me the concepts of this mechanism, I immediately realized we had not paid enough attention to cardiac diastolic function for long decades, as we explained ventricular filling by the notion of *vis a tergo*, and the end of diastole by atrial contraction, while in fact it is also complemented by the intrinsic action of the myocardium. Right away, I imagined initiating resuscitation with external or direct cardiac massage in a patient with cardiocirculatory arrest, zero blood pressure and interrupted circulation, and I realized that initial ventricular compression -while causing a first systolic wave- did not cause *vis a tergo* and the resulting ventricular filling. On the contrary, its repletion was made by another active mechanism of venous blood aspiration. Therefore, it was necessary and essential to research on these phenomena.

The richness of this book lies in its contribution of true electrophysiological data to support the theory posed in the 1980s by Dr. Francisco Torrent Guasp, who theorized that due to the characteristics of the different ventricular myocardial bands, a contraction occurs during systole together with the rotation among its different portions and the lowering of the base, resulting in a squeezing effect within the chamber. It also occurs in early diastole due to the mechanical activity of the myocardial bands with energy expenditure, a ventricular counter-rotation with base elevation and plunger aspiration effect, continuing this phenomenon in mid-diastole by spontaneous left ventricular elastic recoil.

The richness of the expressions in the cover and back cover of this book are worth sharing:

“Over time, there have always been clinical situations in daily practice for which classical pathophysiology was not enough to interpret them correctly. Many

times, just by the presentation -and acceptance- of diametrically opposed and resisted alternatives to current ones, different interpretations, and suitable, efficient therapeutic approaches were reached. On some occasions, these ideas were immediately implemented, but on others they were described years before and depended on subsequent studies to prove their validity. This is probably the case of the Torrent-Guasp model, extended and modified in our research study. In this text, his initial ideas have been taken up, completed and reinterpreted in the light of new evidence. Our study demonstrates the existence of a “three-phase heart”: systole, suction, and diastole. The data obtained are particularly important because they were registered in human beings with structurally and physiologically normal hearts. The clinical implications of this model require further discussion. It is likely that their verification in different syndromes and heart conditions will take years. In short, ventricular electrical activation is a very complex process. This should generate complex patterns in ventricular contraction caused by that activation. Electromechanical coupling factors, intrinsic contractility of various cardiac areas, and mechanical coupling, among others, add to that complexity and modify substantially the basic concepts of cardiac mechanics evidenced so far.. The mainly anatomical model of Torrent-Guasp extended and modified in this research study, offers –from the electromechanical point of view– endless opportunities for development both at the theoretical level as in clinical and therapeutic application. It is probable that considerable aspects of cardiology will have to be reviewed in the light of this new paradigm, with unpredictable results.”

I am sure that this book will trigger numerous research works resulting in advances in cardiac mechanics, as well as in the management and treatment of heart failure.

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