Editorial

Artificial heart creation: what problems are to be solved?

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Introduction

Attempts to create an artificial heart were highlighted by our journal one year ago [1-3]. Now we can say that there is no break-through news in this field: no technological progress, no pioneering research and no spectacular advancements are reported. An imperfect understanding of the cardiovascular system performance hinders any progress in the R & D activities aimed at the artificial heart creation. But from our point of view, all the existing design & engineering difficulties can be mastered. However in this connection another question comes to mind: is it reasonable in principle to design and produce an artificial heart? Let us leave this question open for future discussions and offer our list of issues to be solved as given below:

1. A lack of knowledge on the performance of half of the cardiac cycle phases.

In this context it is just cardiometry that is capable of providing the most precise concept of the performance and significance of all of the 10 cardiac cycle phases [1, 4-6]. But unfortunately the recognized American and French artificial heart developers do not take this novel concept into account [7-12]. As a rule they use only 5 cardiac cycle phases which are incompletely and inconsistently described and interpreted in the classical research. Is it possible to solve a problem based on 50% of incomplete and inconsistent data basis? It is doubtful. Fig.1 illustrates ECG related data used by the above developers versus the data provided by cardiometry.

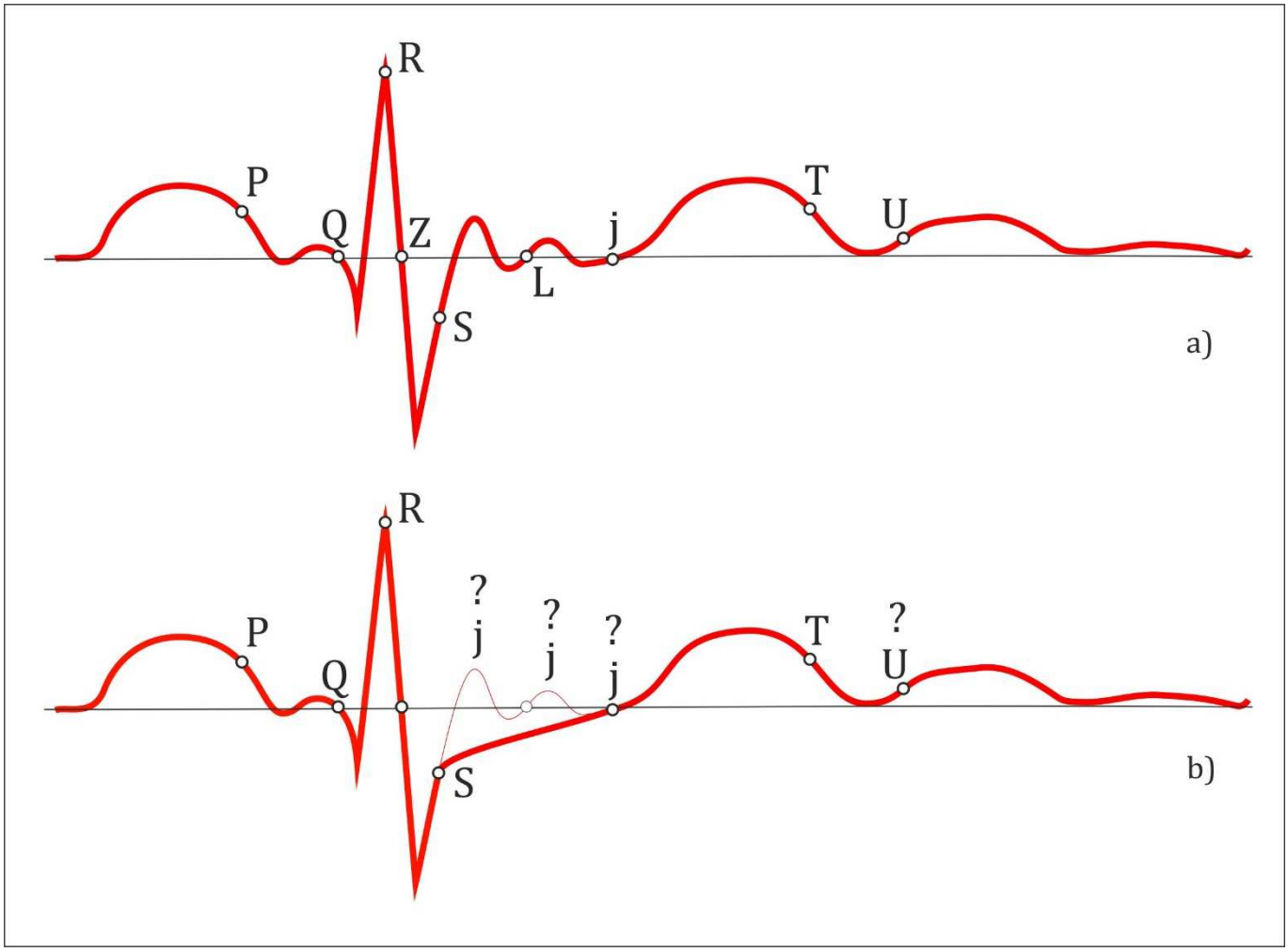

Figure 1. Identification of the boundaries in each cardiac cycle phase based on the laws of cardiometry (a) or by ignoring them and using generally accepted concepts (b): point L to indicate the beginning of the rapid ejection phase cannot be identified; the location of the j point as the beginning of the slow ejection phase cannot be found; significance of the U wave as the interval of the coronary blood flow filling is not understood. Cardiometry is capable of accurately identifying all the phase boundaries and properly locating all significant points on the ECG.

The knowledge on the cardiac cycle phase pattern is build upon the relevant axiomatic and logic system. And it is the basis for any science, including cardiometry. Moreover, cardiometry offers its own original mathematical description of all hemodynamic processes in a human body. It is just the thing that is urgently required for the American and French scientists who are involved in research and development of artificial heart. The above figure shows the ST segment ST on the ECG which consists of four most important systolic phases. In fact the conventional cardiology is not capable of delivering such valuable information. Ignoring the valuable information is the most critical deterrent to make progress in engineering of artificial heart.

This problem did not appear at once. Victor Froelicher and John P.A. Ioannidis have clearly defined the problematic topics in their papers [13, 14]. Our intention is to suggest new ways how to handle this challenging task in research [3, 4].

The latest research results and methodology initiate re-consideration and re-evaluation of the existing expertise. The same is applicable to our case with cardiology and cardiometry. Upon the fresh expertise, taking into account original comprehensive capabilities in the modern cardiac diagnostics, we are inclined to believe that it is not reasonable to create artificial heart today and that we should pay more attention to cardiac disease prevention and treatment. Following this way, it is vital to establish a system of preventive children's cardiology based on monitoring, screening and effective correction measures. We should address interdependence between the heart performance and health as a whole. Every effort should be made to maximize the health of children because children's health is a prerequisite for the future nation's wealth. As our practice shows, unfortunately, not so many healthcare officers share this opinion. And sometimes some health care officers think the creation of an artificial heart will automatically resolve all the health care problems.

We are very interested to hear our readers' opinion: what advantages does the artificial heart creation have? Or is it better to improve the efficiency of diagnostics and prevention instead?

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