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Restoration of Arterial Blood Flow Access to Rhomboid Fossa Assists in Left Ventricular Hypertrophy Normalization †

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Abstract: We have found a logical way to prove a mechanism that allows us to demonstrate the relationship between the restoration of arterial blood flow through the cervical vertebral arteries to the rhomboid fossa and the normalization of left ventricular hypertrophy. The human body is considered a dissipative structure. The process of the restoration of the body should be considered a redirection of energy flows from decay to restoration. It is also necessary to take into account the role of information about the availability of oxygen coming from the rhomboid fossa to the cerebellum. We plan to conduct animal studies and create a mathematical model of the system. This may accelerate the development of this theory.

Keywords: arterial blood flow; left ventricular hypertrophy; arterial hypertension

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1. Introduction

The recently announced centralized aerobic-anaerobic energy balance compensation (CAAEBC) theory, which explains NCD (e.g., LVH) development via the loss of access to information about blood flow from the circulatory system to the rhomboid fossa, has raised some questions about correct ways to prove it [1–3]. During LVH, the thickened heart wall can become stiff. Blood pressure in the heart increases certain deformations that complicate the work of the heart; thus, the heart is not able to pump blood with the necessary force. A result of high blood pressure (hypertension) is often the hypertrophy of the left ventricle [4]. The main methods of diagnosis include electrocardiography, echocardiography and MRI. The best object to study it, to make valuable for the Medicine conclusions, is, obviously, the appropriate animal model [5–8]. Until recently, the relationship between brachiocephalic arterial blood [9–11] and AHT has been little studied and requires theoretical consideration. In one theoretical analysis, there is a mention of the correlation between AHT and the obstruction of blood access to the brain [12].

The left ventricular mass index (LVMI) is a diagnostic parameter for the identification of LVH, which is accepted by the European Association of Cardiovascular Imaging and the American Society of Echocardiography, and is calculated as follows:

$$\text{LVMI} = \text{LV Mass}/\text{BSA} \quad (1)$$

$$\text{LV Mass} = 0.8 \times (1.04 \times (((\text{LVEDD} + \text{IVSd} + \text{PWd})3 - \text{LVEDD3}))) + 0.6 \quad (2)$$

The parameters involved are defined below:

LVEDD: Left ventricular end-diastolic dimension;
IVSd: Interventricular septal thickness at end-diastole;
PWd: Posterior wall thickness at end-diastole;
LVMI: Left ventricular mass index;
RWT: Relative wall thickness;
BSA: Body surface area using the Mosteller formula.

The upper normal limit of the LVMI is 95 g/m^2 for women and 115 g/m^2 for men [4]. Depending on this, LVH can be eccentric or concentric. Concentric LVH leads to an increased left ventricular mass index (LVMI) with a relative wall thickness ≥ 0.45, while eccentric LVH leads to a relative wall thickness < 0.45 [11]. Concentric LVH can be found in patients with diabetes and older people. Eccentric LVH can be found in patients with obesity or coronary artery disease [12]. Figure 1 summarizes the above mentioned [4,11,12].

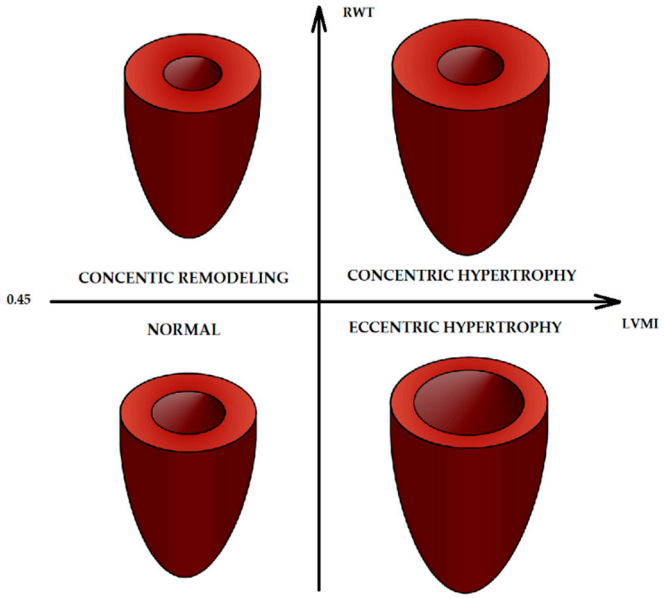

Figure 1. Geometric patterns of left ventricular hypertrophy.

According to the CAAEBC theory, we say that the restoration of the above-mentioned access with the subsequent strengthening of the cervical muscular corset will lead to the recovery of the main internal body functions. We can also observe the recovery process by controlling the corresponding parameters. Therefore, we need to set the acquisition of the LVMI before the therapy and maintain it until six months after its completion.

The general idea of the experimental hypothesis verification is demonstrated in Figure 2.

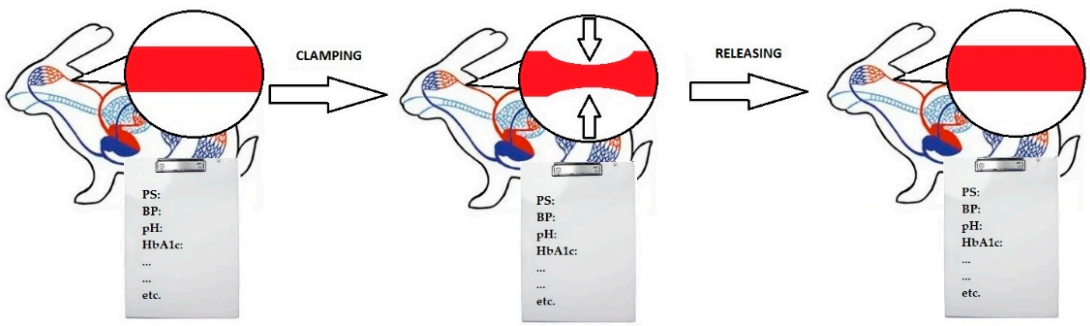

Figure 2. The animal model to check the CAAEBC theory's applicability to AHT.

2. Discussion

It is necessary to select an animal to collect statistical data. The animal must be chosen in such a way that the studied processes of the vital activity of the organism correspond to

the human body. Table 1 compares applicability of different animal models for the checking of CAAEBC.

Table 1. Comparison of mammalian models required to check CAAEBC parameters [5–8]. "+" confirms fitting, at least partial, the model to the criteria.

Model Animal	Easy to Transfer Results to Human Clinical Situation(s)	The Absence of Reserve Arterial Way to Rhomboid Fossa	Easy to Measure Blood Pressure	Easy to Boost Blood for Biochemical Analysis	Easy to Measure Linear Blood Flow Velocity through Brachycephalic Arteries
Mice	+	–	+	+	+
Rats	–	–	+	+	+
Rabbits	+	–	+	+	+
Minipigs	+	+	+	+	+
Goats	–	–	+	+	+
Sheep	–	–	+	+	–
Guinea pigs	–	–	+	+	+
Cats	+	+	+	+	+
Dogs	+	+	+	+	+

We underline that the main feature of the animal model is the simplicity of the translation of the results to human clinical situations [13,14]. Very often, it is very difficult to choose the optimal model for a specific purpose; thus, it becomes necessary to select it after the pilot experiment [15,16].

Let us consider the disadvantages of the minipig. There are reports that this model can form collateral blood flow to duplicate vertebral arteries in the case of obstruction [17], but there is no information on cervical vertebral arteries. The main advantage of the minipig model for checking the CAAEBC theory is its similarity to humans in terms of physiology and vascular anatomy [18]. It is for this reason (because similar clinical situations apply to both in a similar way) that this model is so popular.

As for dog and cats, these models exhibit similarities, to some extent, to the arterial system in humans, which makes them more advantageous for our purpose than, e.g., rabbits for several cases of cardiovascular modeling [19–21]. However, there are some issues in terms of public attitude in using these models [22]; therefore, we will consider them as a last resort.

The rabbit as a model possesses a homosegmental blood supply from the abdominal aorta. It has almost no intraspinal collateral arterial system [21], which is an important advantage of such a model. The main advantage is the lower cost of keeping the animal and easier manipulation.

The guinea pig model has more segmental blood. This is due to guinea pigs' small segmental arteries. This greater segmental arterial blood supply makes it impossible to block blood access to the rhomboid fossa, which makes this model the less favorable for modeling the CAAEBC theory.

For rats, the arterial blood supply demonstrates a heterosegmental arrangement [9]. This fact looks unfavorable, but available data on atlantoaxial misalignment which causes hypertension [23] place rat model on the top of the list.

The mouse model is similar to other rodent models [24]. In spite of all the advantages of this model (the short times necessary for experimental symptoms to develop, low costs and easy manipulation), we consider it improper for the same reasons as for rats.

Knowledge of the anatomy of the cervical part of the spinal cord vascular organization is extremely important to plan the proper experiment.

3. Conclusions

The accumulated knowledge will lead to the following:

- The development of a mathematical model to determine the correlation between the LVMI and access to information about the flow of blood from the circulatory system to the rhomboid fossa;
- Conducting an experiment on animal model(s) to collect statistical data.

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