

# Heart transplantation mysteriously eliminates arrhythmia

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## Abstract

For a long time cardiologists have not been able to explain why the problem of cardiac arrhythmia in a heart transplant recipient practically disappears. In fact, this issue has never been raised for discussion. At the same time, my new theory of arrhythmias (NTA) has been discussed at conferences and in mass media for the last 4 years. The core proposition of NTA is as follows: the generation of extrasystoles and tachycardia in most cases occurs not due to bioelectric reentry, but owing to the action of mechanical pulse waves. A pathological pulse wave can travel to large veins along the walls of the arteriovenous anastomoses (AVA) and excite cardiomyocytes.

The developer of NTA has studied some peculiarities of the cardiac rhythm patterns which occur after heart transplantation and presents herein convincing evidence in favor of his new theory.

## Keywords

Arrhythmia, Heart transplantation, Pulse wave, Reentry, Anastomosis

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## Introduction

Discussions treating a new mechanism of cardiac arrhythmia in a human have been held for about 5 years. The matter is that the generally accepted cardiac arrhythmia theory, which attempts to take into account a great number of causes and mechanisms of arrhythmia, is not capable of giving answers to trivial questions given below.

Why do absolutely healthy people with a healthy heart, former or even active athletes, die of sudden cardiac death?

Why does medication used to treat arrhythmias show its ineffectiveness or even an opposite effect of increasing the probability of cardiac mortality in some cases?

What mechanism is involved in the arrhythmia treatment by the method of radiofrequency ablation?

On the other hand, the new theory of arrhythmia (NTA) proves that the principle mechanism of arrhythmia is not the bioelectric reentry as generally accepted in the medicine community, but it is the mechanical

reentry. It means that it is necessary to operate in a manner quite different from the way the present-day cardiology does. Who is right?

The NTA originator has pioneered in identification of some significant evidences for his fresh theory.

## Modern heart transplantation techniques

Nowadays a great variety of heart transplantation techniques are available, but the most widespread are only two of them: they are biatrial and bicaval heart transplantation procedures [1-3]. The biatrial technique was developed by Richard Lower and Norman Shumway and utilized by Christiaan Barnard in 1967, and it provides the donor's heart connection to the recipient's left and right atria, pulmonary artery and aorta, while the more advanced bicaval heart transplantation procedure uses the connection to the superior and the inferior vena cava instead of the right atrium. The bicaval anastomosis is considered as minimizing risks of heart rhythm abnormalities and conduction disorders in a recipient after heart transplantation [1-9].

The first step of heart transplantation is a removal of the heart ventricles in a recipient. The recipient's large blood vessels, the right and left atria should remain. Afterwards, the donor's heart is adjoined and sewn thereto.

There are different approaches to heart transplantation: an orthotopic ("single heart") approach and a heterotopic ("a double heart") one. The latter is accompanied by pulmonary compression, complications in further heart biopsies and the necessity of anticoagulant therapy. Nevertheless, the heterotopic transplantation should be selected in case of severe pulmonary hypertension [10-13].

Which transplantation technique is better: biatrial or bicaval?

The orthotopic heart transplantation is performed according to the Shumway-Lower method (with anastomosis of both atria) or the bicaval anastomosis technique [14]. The first method is technically easier and allows reducing ischemia time for 10-15 minutes. The bicaval technique has several advantages as follows: it makes possible to reduce the size of the right atrium and lower the rate of tricuspid regurgitation incidence.

Under a long-lasting period of ischemia (for example, when transportation takes a long time, or in case of long time heart surgery in the recipient(s) in his/her (their) history, as it happens with implanted ventricular bypass systems), the conditions of the donor heart can be improved by perfusion of cold blood cardioplegic solution through the coronary sinus of the donor heart. The principal means of preserving a donor organ is its local cooling.

When performing heart transplantation, the proper conditions for the sinus nodes both of the donor and the recipient should be maintained. Approximately three weeks later after the surgery, two P waves can be detected on ECG in such a patient. In any case, the electrical activity of the heart depends on an autonomous operation of the electrical system of the donor heart, and it is not regulated by the nerves of the recipient.

Although some cardiologists consider the bicaval technique to be more injurious, the respective studies comparing the two techniques show that the bicaval procedure provides for a more effective contraction function of the atria, a lower incidence rate of atrial arrhythmias, a lower averaged pressure in the pul-

monary artery and the right atrium, a greater left ventricle ejection fraction, a lower demand to use permanent cardiac stimulator and a diminished incidence rate of tricuspid regurgitation [15].

Upon heart transplantation, actually severe rhythm disorders are not reported [16].

According to the data of American Association for Thoracic Surgery, when the bicaval technique is applied, the use of the cardiac stimulator is required in a minority of cases, and the survival rate is higher, and the atrial fibrillation incidence rate is lower [17].

It has been detected that arrhythmias are not typical for the transplanted heart. No angina pectoris is available upon heart transplantation. Let us note that as a rule the transplanted heart has an elevated sinus rate (up to 90-110 bpm) because of the denervation. And this is the only failure in the transplanted heart performance, and just the higher heart rate is often called the rhythm disorder by the medical experts.

Thus, the bicaval technique, when two anastomoses between the donor's right atrium and two vena cava and an anastomosis between the donor's and recipient's left atrium are formed, is the most promising at the current stage of cardiac surgery.

In this connection, a question might come to mind about why just the bicaval technique leads to almost complete myocardium protection from many types of arrhythmias, both of atrial and ventricular type, and the biatrial method protects only from the ventricular one? Thus, the problem of arrhythmia in such patients is radically solved to our surprise. But what is the mechanism of the phenomenon? Why do these effects remain

unexplained by cardiologists and arrhythmologists? Why do they say so little about it? In advance, I would like to say: the facts of arrhythmia elimination are evidently not possible to explain from the point of view of the official conventional medicine, namely, from the conceptual standpoint of the mechanism of the bioelectric REENTRY. But we can bravely assume that both the recipient and the donor might have different forms of arrhythmia before heart transplantation, but thereafter all rhythm disorders suddenly disappear. Why? The answer is the following: the conventional, generally accepted theory of arrhythmia is evidently erroneous, and that is the reason that cardiology has come to the deadlock.

### Modern cardiology point of view

Cardiologists confirm that the majority of problem cases with arrhythmias disappear for a transplanted heart. But we have to deal with some other problems of quite different quality which might be as follows: acute transplant rejection, cardiac insufficiency, coronary artery disease of the transplanted heart (transplant vasculopathy), infections, renal insufficiency and cancer diseases. Transplant rejection and infections are the primary causes of mortality during the first three years after the heart transplantation, while the malignant neoplasms and transplanted heart coronary artery diseases manifest themselves in the next period of time upon transplantation [18-25].

### The revealed paradox in terms of NTA

The most promising bicaval heart transplantation technique provides for the formation of an anastomosis between the donor heart right atrium

and the vena cava under the formation of another anastomosis between the donor's and recipient's left atria. Besides, there always joining stitches on the aorta and the pulmonary trunk available, but they seem to play a significant role neither in generation of arrhythmias nor their suppression.

What do all these things mean in terms of NTA, the hypothesis of the pulse mechanical wave propagation from the arteries to the vein walls via the AVA, reaching further the atria and ventricles, which give their response to the mechanical action by extraordinary heart beats?

It means that, after the bicaval surgery, the donor heart is circularly isolated from the mechanical waves both in the vena cava and the pulmonary veins, since the stitch traces formed on the vessels and the atria envelop the vena cava and the pulmonary veins with a ring of scar tissue. The scar tissue, showing quite different mechanical characteristics, as compared to the living tissue, will effectively reflect a pathologic pulse wave running to the atria, excluding in such a way any mechanical cardiac excitation. I have been offering (for 4 years in the framework of NTA) just the similar manipulations with an artificial (targeted) scar tissue formation in veins as well as venous stent implantation as an alternative to radiofrequency catheter ablation (RCA) aimed at suppressing the mechanical waves, so that arrhythmia and SCD may be avoided at all! Now the bulk of evidence favors the above mentioned idea [26-28].

On the other hand, according to the performed studies, the biatrial technique protects the patient from only (attention!) the ventricular rhythm disorder, but not from the atrial ar-

rhythmia, i.e. from the narrow QRS extrasystole, atrial fibrillation (Afib) and atrial flutter (Aflutter). Why do we deal just with the above listed phenomenon? It can be explained by the fact that, when the biatrial technique is applied, the joining stitch is located just at the level of the ventricular valves. And just the recipient's own atria and the venous orifices unaffected by scalpel maintain and even enhance the generation of the excitation pulses, since the working atria are not isolated at all from the vena cava and the pulmonary veins after the surgery. A different situation arises with the ventricles: under the utilization of the biatrial technique, they are isolated from the pathologic pulse wave, and that is just the reason that only ventricular extrasystoles and tachycardia disappear. The mechanical pulse generated by the pulse wave cannot reach the cardiac apex, and the said pulse loses its power, when passing the circular scar formed by sewing the donor's ventricles to the recipient's unaffected atria. It is just the evidence for NTA! It is a great additional argument in favor of NTA!

Now it becomes clear that it is possible to avoid additional experiments I always speak about in my articles to finally prove the correctness of New Theory of Arrhythmia. A great number of such experiments (they are already tens of thousands) are already available: the experimental evidence data have been already obtained in a multitude of heart transplantation operations both with the bicaval and biatrial techniques.

The transplantation results provides strong evidence that stitches, scars and seams on the vessels and the atria reliably block the pulse wave ways, so that it results in terminating arrhyth-

mias, and the heart performance is managed by the only "setting generator", namely, by the impulses of the donor's cardiac conduction system (CCS). Thus, having analyzed the above conceptual statements, the following uncomfortable questions in cardiosurgery and general cardiology may arise:

Why the heart should be "hacked" with a scalpel in case of some forms of arrhythmia, with telling a good deal about elimination of the "ectopic centers"?

Why in some other cases the myocardium tissue should be burnt using the radiofrequency catheter ablation, suggesting that at the same time it produces "a treatment effect"?

Why a great many of medical drugs should be taken by a patient to change the microlevel characteristics of cardiac conduction system, cardiomyocytes and fibroblasts?

Why do researchers and cardiologists ignore the MECHANICAL component of the myocardium excitation when developing the reentry mechanism during the last 100 years?

(No doubt, in some cases, especially under severe pathology, it is a MUST to use scalpel, RCA, effective medications and injections, but all these methods will not dominate in the heart arrhythmia treatment).

As there is nothing unusual or harmful about the processes which occur in the performance of our heart, especially at initial arrhythmia stages, or when considering the cardiac performance in young people, we can say that our heart gives only responses to additional mechanical excitations, travelling along the veins together with the pulse wave. It would be strange if the heart would not response to such excitations. These responses are clearly seen on

an ECG, and to attribute these effects to “the wild performance” of the CCS to some segments of the myocardium tissue in the form of “ectopic centers” is probably not correctly. The data given herein and NTA in general allow us to solve the problem of arrhythmia in a very easy way, namely, it is required to suppress the mechanical waves in large veins travelling to the atria with any suitable means like venous stenting (or “venous clamping” to be more precise), incisions or with use of other eligible devices.

Thus, the idea of bioelectrical RE-ENTRY existing for about 50 years in cardiology has been proven practically wrong, and official (conventional) medicine must admit its own defeat and accept its powerlessness, when evaluating development of an adequate theory of the mechanism responsible for cardiac arrhythmias. NTA states that in the majority of cases the arrhythmic cardiac beats are generated by the pulse wave travelling from the arteries via the arteriovenous anastomoses to the vena cava, further to the atria and the ventricles.

### List of abbreviations

NTA – New Theory of Arrhythmia.  
AVA – arteriovenous anastomoses.  
Afib – atrial fibrillation  
SCD – sudden cardiac death  
Aflutter – atrial flutter  
CCS – cardiac conduction system

### Statement on ethical issues

Research involving people and/or animals is in full compliance with current national and international ethical standards.

### Conflict of interest

None declared.

### Author contributions

The author read the ICMJE criteria for authorship and approved the final manuscript.

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