



## **Improvement of cardiac function through subthreshold electrical stimulation.**

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The pumping function of the heart depends on undisturbed electrical excitation of the myocardium. Pulsatile excitation has two functions: to induce contraction of the myocardium and to maintain its functional integrity. In the case of impaired cardiac performance, it is therefore plausible to try to optimize the function with external electrical impulses, which is quite successful to a limited extent.

However, it is often forgotten that physiologically the heart is surrounded by a bioelectrically active shell - a electric potential gradient - the integrity of which is a prerequisite for normal cardiac function.

Under clinical conditions, however, this can hardly be determined in patients with disturbed cardiac function and is therefore largely ignored.

On the basis of clinical data, we discuss here whether direct application of an external electric current (in the physiological subthreshold range) together with an electric field to hearts with impaired pump function can compensate for the disturbed potential gradient.

Currently, two main mechanisms by which the subthreshold electrical stimulation occurs are being discussed. One is that the myocardial edema typically associated with heart failure is reduced, which is measurable by a reduction in the size of the heart immediately after the current is turned on, and the other is the anti-inflammatory effect of subthreshold current, which has been demonstrated experimentally but occurs later in the course of current application.

In a pilot study with 10 patients with non-ischemic dilated cardiomyopathy class NYHA III, a highly significant improvement in left ventricular ejection fraction, 6 min walk test, exercise capacity, and quality of life was achieved within 6 months by the application of a subthreshold continuous electrical current.



An ongoing open multicenter pivotal trial (RCT; N = 100) fully confirms the results of the pilot study. Initial results of this study will be presented

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