

The role of psychosocial factors and physical training for patients with implantable cardioverter defibrillators

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Abstract

Implantable cardioverter defibrillators (ICD) significantly reduce the mortality rate in those at high risk of sudden cardiac death. In contrast to the obvious survival benefits in this category, there are a number of psychosocial and physical-related complications with drastic repercussions on patient quality of life, and eventually on survival. The main post-implantation ICD complications are: anxiety, depression, post-traumatic stress and avoidant behaviors often associated with inactivity. So far, there is no consensus on ICDs post-implant rehabilitation programs despite the evidence proven to reduce anxiety and depression, lowering the risk of arrhythmia and improving the net quality of life. In most studies up to date, cardiac rehabilitation through aerobic exercises and psychotherapeutic interventions are categorized as safe and beneficial; whereas other authors see it as necessary as cardiovascular recovery after myocardial infarction, by-pass surgery or heart failure.

Key words: *physical training, psychological impact, implantable cardioverter defibrillator*

Sudden cardiac death is responsible for half of all cardiovascular deaths, of which 80% is caused by ventricular tachyarrhythmias. In response to this threat, ICDs have been developed to stop arrhythmia with a success rate of up to 97% [1]. ICD therapy demonstrated a significant reduction in mortality, both in primary and secondary prevention, with a mortality reduction of 31% and 23% respectively (according to MADIT II, SCD-HEFT trials) completed in 2001 and demonstrating the unquestionable effectiveness of these devices, with more than 100,000 devices being implanted annually in Europe. [2][3][4].

Besides the proven benefits, the presence of the defibrillator in the human body presents itself with a complexity of factors that cause psychological and social dysfunctions, often requiring careful monitoring. The most common factors are: anxiety, depression, and fear of movement, affecting patients' quality of life and increasing morbidity and mortality. Thus, patients with ICDs present indication class I for the evaluation of anxiety and depression; these features being directly related to arrhythmia and short and long-term prognosis [5] requiring emergency treatment, especially in the case of arrhythmic storms, in order to reduce its recurrence [6]. A hypothesis studied since the 1970s on the arrhythmogenic effects of negative emotions [7] subsequently proven by T-wave alternation presence, a sign of electrical cardiac instability and increased arrhythmogenic risk. [8],

which may cause fatal cardiac events. ICDs carriers particularly present this risk [9].

For this purpose, we aim to analyze what are the effects of physical exercise and psychological impacts upon ICD recipients, those being important components of cardiovascular rehabilitation programs, with important effect on quality of life.

It has been observed that anxiety and depression are present in 20 to 63% of the cases of ICD recipients [10][11], reaching high intensity in the event of appropriate or inadequate electrical shocks. The presence of anxiety or depression at the time of implantation increases the incidence of post-implant complications and the development of severe depressive episodes, the latter being associated with increased mortality [5] [12]. The most important predictor in the development of anxiety and depression is the number of shocks received by the patient throughout recovery; considered being at high risk those who received more than 5 shocks. Bourke et al. (1997;1978) research over a 6-year follow-up period concluded the need for psychiatric support in 17% of cases who develop anxiety or depression; this being more frequent in youth [12].

A second observation is the high prevalence of sedentarism, with 21% higher than in the total general population, especially generated by anxiety being triggered due to electrical shock by physical bodily movements; sedentarism being related with the presence of ICDs for primary prevention, and

increased mortality [OR 3.9]. Unfortunately, only 30% of these patients have been or are following cardiovascular post-implant recovery programs[13] [14][15].

Fear of movement is not always unfounded, with rigorous physical activity imposing a risk in parasitizing the electrocardiogram by the appearance of myopotentials, especially from the diaphragm, and which in turn produce false signals of ventricular fibrillation as well as oversensing of the T-wave or by increasing the cardiac frequency with leads to secondary unsuitable electrical shocks discharge. It appears that within a 12-month recovery program, it is necessary to readjust ICDs sensing parameters in 22% of the cases [14]. Thus, receiving electrical shock favors the formation of avoidance behavior, with further deterioration to a persons quality of life. 91% of patients mistakenly attribute the activity they were engaging in during electrical shock as the trigger factor, and subsequently developing an evasive behavior according to personal misinterpretation [15]. In a study conducted on a group of 143 participants, avoidance behavior was found in 55% of those who received one electrical shock, from which 39% avoided physical activity, 27% objects, and 17% inclosed or open spaces [16]. In a cohort study of ICDs-bearing patients under the age 40, it was reported that 32% of ICDs recipients show anxiety in conducting any form of physical activity, and 50% experience shock anxiety during sexual intercourse [17].

For a significant reduction in anxiety, major depressive episodes and sexual dysfunction, the most approached therapy was the cognitive behavioral, with or without psychiatric medication, with beneficial net effects observed especially on participants exposed to electrical shocks[18]. The recommended recovery therapy and applied in most studies were performed under medical supervision, with a minimum duration of 30 minutes twice or three times per week with 60-80% success rate from maximum heart rate, without the occurrence of fatal arrhythmic events during the program rehabilitation. However, Pashwok et al. points out an increased risk of ventricular arrhythmia in the early recovery phase, especially for the types of exercises not finalized by progressive recovery. The risk of ventricular arrhythmia is higher in those who end their exercises sharply, without progressive recovery, signaling higher catecholaminergic discharges[15] [19] [20].

Young et al. have studied the incidence of arrhythmias on 263 participants tested in 1377 maximum conveyor belts trials. All participants had a history of malignant ventricular arrhythmias, with the occurrence of 9.1% in this category compared to 0.12% in the population reference. From all arrhythmias 28% of the arrhythmias were ventricular fibrillation, 69% ventricular tachycardia, and 3% sinus bradycardia, with no evidence of death [21].

In this context, David et al. noticed that ICD carriers who had an average of 5.2 METs during the effort tests had a lower risk of electric shock compared to those with less capacity to effort -3.2 METs on average [22].

In another study, involving 39 patients, in which a group of patients with ischemic heart failure and ICDs were evaluated, constant aerobic exercise determined improvements in the quality of life and depression symptoms; compared to another group of patients that have not received any physical training programs[23].

According to a 2009 review of 52 articles, over 70% of cases had a favorable outcome for those involved in physical exercise and cognitive behavioral therapy reducing anxiety from 67% to 25%[13] .

Even if sudden death anxiety decreases in intensity after ICD implantation, most patients understand its usefulness, this being replaced by other types of anxiety (fear of electric shock, fear of physical activity, etc.). In some cases, despite additional healthcare regimes/programms, the quality of life does not seem to be positively influenced by the implantation of the defibrillator; on the contrary, it becomes affected by the development of avoidant behaviors and permanent anxiety.

Regular physical activity reinforced in recovery programs after ICD, helps the patient learn to better interpret bodily signals and limits, strenghtening confidence and reducing the degree of anxiety. In this context, physical effort along with positive psychological status acts synergistically.

In conclusion, the introduction of recovery programs that respond not only to physical exercise, but also to standardized psychological intervention programs after ICD implantation become a necessity, with multiple beneficial effects in the patient's outcome: decreased anxiety levels related to physical activity, reduced number of shocks, reduction of morbidity, mortality and the number of hospitalizations, decreased risk of depressive symptoms, improved

sexual life, social and professional reintegration. All this ultimately leads to a significant improvement in life quality and lifetime.

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