Implantable cardioverter-defibrillators (ICDs) have become standard therapy for life-threatening ventricular arrhythmias. The clinical research on mortality outcomes has been compelling. Successful secondary prevention strategies have been augmented with data in support of primary prevention implantation, and ICD prevalence has risen accordingly. With more devices in place and a broader range of patients receiving devices, interest in the neuropsychiatric consequences of devices and quality-of-life (QoL) outcomes of ICD recipients has grown.

Although the causes and mitigating factors associated with neuropsychiatric disorders in patients with ICDs are complex, there are 2 primary, nonconflicting hypotheses that can clarify and simplify the discussion. One hypothesis suggests that the presence of the device itself may have a long-term impact on patients. The implication of life-threatening disease, the experience of shocks (both appropriate and inappropriate), the risk of device failure or manufacturer’s recall, and other psychological concerns may change mood and QoL. The second hypothesis is that episodes of cardiac fibrillation and low output with insufficient cerebral perfusion may have cognitive and psychiatric consequences. These episodes occur at discrete times: during clinical presentation and evaluation, during implantation, and with subsequent appropriate shocks.

The first hypothesis implies that the patient’s underlying medical condition and experience with their device, along with their awareness of its indications and consequences, has an impact on neuropsychiatric outcomes. Early work suggested that there was deterioration in QoL that recovered about a year after ICD implantation. More recent studies, however, showed that ICD implantation may not diminish or may even improve QoL and that patients who received a significant number of shocks after implantation had a poorer QoL than those who did not receive subsequent shocks. Other work suggested that even the effects of shocks may be highly attenuated by the patient’s preimplantation psychological makeup. In short, QoL after ICD implantation is multifactorial. Sears suggests that the cardiologist’s role in this setting is to provide the “4 A’s”: asking, advising, assisting, and arranging for intervention through a multidisciplinary care team.

The second hypothesis implies that ventricular tachycardia or fibrillation events (VT/VF) and subsequent hypoperfusion or cerebral ischemia may have implications on neuropsychiatric outcomes, especially cognition. The most striking complications of these events are exceedingly rare (death, stroke, prolonged resuscitation). However, acute changes in brain chemistry and activity have raised questions about long-term neurological effects. De Vries et al noted changes in cerebral oxygen uptake during defibrillation threshold (DFT) testing. Dworschak et al noted an increase in serum levels of brain injury markers (neuronal specific enolase and S100) after DFT testing. Several authors have noted changes in cerebral perfusion and electroencephalograms during ventricular arrhythmias and DFT testing, although their conclusions on long-term neurological results are mixed.

The current study by Hallas et al in this month’s Journal is a prospective evaluation of patients before implantation of an ICD and then at 3 additional time points, using a repeated-measures design. The authors enrolled 67 patients and performed follow-up analysis on 52 available subjects, focusing primarily on cognition. Approximately 30% of patients at each follow-up time point had significant cognitive impairment. Interestingly, the patients with cognitive impairment were not the same at each time point, creating a fluctuating population of the impaired. As the authors point out, impairment that varies with time has been described previously in patients after undergoing cardiac bypass. The results in the present study differ somewhat from those findings, but they highlight an important similarity in that the timing and severity of cognitive impairment is not yet predictable in any individual patient.

Unlike other authors, Hallas et al do not attempt to directly link ICDs and QoL, except by comparing their testing data with population normative data. Instead, they demonstrate cognitive decline in some patients with ICDs and note that this decline does not appear to impair QoL. In this study, depression and anxiety were both linked with the mental health subscale of the SF-36. The authors point out that this may represent a direct effect of depression and anxiety or may be related to subjective perceptions of impairment in patients with mood disorders and not strictly related to QoL testing. This article adds further data to an already highly fragmented discussion about QoL and ICD recipients. We still have
farther to go to determine which patients are at risk for a decline in QoL. A robust model that predicts which patients will benefit most from psychiatry intervention still remains elusive.

The authors discuss in detail the hypothesis that DFT testing and VT/VF cause significant reductions in cerebral oxygen flow. During their study, the subjects had 4 occasions in which they may have had VT or VF: first, during clinical presentation as candidates for ICD therapy; second, during electrophysiology study before implantation; third, during implantation and DFT testing; and fourth, in those patients who received shock therapy during the next year (24%). The authors considered both DFT frequency and postoperative shock status. They were unable to find any correlation between these variables and neuropsychological outcomes. Currently, some implanters choose to test DFT during most or all implantations, with single-shock or multiple-shock stepwise analysis; others choose not to test DFTs at all during the implantation procedure. There is a broad middle ground of practice and a wide range of clinical management for sedation and anesthesia during ICD implantation and DFT testing. Evidence has not appeared yet in support of one best protocol. Although patient safety and adequate device functioning should remain paramount, determining the effects of DFT testing on measures of neurocognitive outcome will be important to help guide optimization of implantation protocols.

In summary, the authors of this novel and intriguing prospective clinical study uncovered a changing incidence of postprocedural cognitive dysfunction and noted some association between patients with mood disorders and lower QoL scales. Notably, they did not find an association between frequency of DFTs or postoperative shocks and neuropsychiatric outcomes. However, the data in this study, and others, continue to suggest that there are clinically important neuropsychological risks of ICDs. The causes for these impairments are still unclear. It remains difficult to predict in advance which patients are at risk for subsequent changes in mood, cognition, and QoL. In addition, this study, like many others, does not take into account other patients who currently receive ICDs and merit special attention, such as children and those patients with preexisting cognitive delay.

As the authors of the present study suggest, psychological adjustment and cognitive abilities have important effects on patient’s long-term clinical care. Further research is needed to predict the emotional and mental health of individual patients with ICDs in a clinically useful fashion. Although ICD therapy has been shown to protect the heart from sudden cardiac death, the current study highlights the importance of also protecting the head.

Disclosures

None.

References


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Safety First: Protecting the Heart, Then the Head
Gregory Webster and Charles I. Berul

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