Q: When should patients be allowed to drive after ICD implantation?

A: That depends on why the patient received the device, whether he or she has had any episodes of ventricular arrhythmias since the device was implanted, and, if the patient is a commercial driver, on the law. With more patients receiving an implantable cardioverter-defibrillator (ICD) prophylactically without ever having experienced a ventricular dysrhythmia, a “one-size-fits-all” approach should be avoided.

USE OF ICDs INCREASING

ICDs effectively prevent death from malignant ventricular arrhythmias. Since more than 400,000 sudden cardiac deaths occur in the United States each year, as many as 3 million US patients might be eligible for an ICD. The use of ICDs has increased steadily in the almost 20 years since the first ICD was commercially released in the United States. In 2000, more than 59,000 US patients received one. As the number of patients with ICDs increases, general cardiologists, internists, and general practitioners are more likely to see ICD patients and to face questions such as “When can I start driving again?”

CONCERNS ABOUT DRIVING

Patients with arrhythmias may suddenly lose consciousness—arrhythmias cause about 15% of syncopal episodes. Therefore, whether a patient with an ICD should drive is a matter of both personal and public safety.

After ICD implantation, driving privileges that were taken for granted are often curtailed as a matter of patient preference, physician recommendation, or law. Epstein et al note that physicians caring for ICD patients should make recommendations that are “fair to all persons, recognizing that restrictions may limit personal freedoms, job security, and feelings of well-being.”

IMPACT OF NOT DRIVING

Many patients with ICDs experience feelings of anxiety and helplessness, and revoking their driving privileges may worsen the psychosocial impact. Therefore, unnecessary driving proscription should be avoided, both as a matter of fairness and to avoid diminishing the patient’s quality of life. Simply telling all ICD patients that “doctors usually tell people like you to give up driving” is incorrect. Furthermore, such instructions are unlikely to be followed.

ASK WHY THE PATIENT RECEIVED THE ICD

The indications for ICD therapy have evolved rapidly over the last several years, markedly increasing the number of eligible patients. Symptomatic ventricular arrhythmias. At first, ICDs were mostly used in patients who had survived an episode of symptomatic ventricular arrhythmia. This restricted use continued through much of the 1990s. Inducible ventricular tachyarrhythmias on electrophysiologic testing subsequently became a reason for ICD implantation in some patients at high risk who had not yet experienced ventricular tachyarrhythmias or ventricular fibrillation, such as those with severe left ventricular systolic dysfunction.

The author has indicated that he is a consultant for St. Jude Medical Inc. and is a stockholder of Medtronic Inc.
It is not the ICD that makes driving dangerous, it is the arrhythmia.

**TABLE 1**

**MADIT I and MADIT II: ICDs reduce mortality, even without symptomatic arrhythmias**

<table>
<thead>
<tr>
<th>Inclusion criteria</th>
<th>MADIT I</th>
<th>MADIT II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior myocardial infarction</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Left ventricular ejection fraction</td>
<td>≤ 35%</td>
<td>≤ 30%</td>
</tr>
<tr>
<td>Arrhythmias</td>
<td>Required*</td>
<td>Not required</td>
</tr>
<tr>
<td>Reduction in mortality†</td>
<td>Relative: 54%</td>
<td>31%</td>
</tr>
<tr>
<td></td>
<td>Absolute: 18%</td>
<td>5.6%</td>
</tr>
</tbody>
</table>

ICD = implantable cardioverter-defibrillator, MADIT = Multicenter Automatic Defibrillator Trial

*Nonsustained ventricular tachycardia or inducible ventricular tachycardia not suppressible with intravenous procainamide

†Compared with best medical therapy without an ICD

High risk without ventricular arrhythmias. Most sudden cardiac deaths occur in patients with no history of arrhythmias. Because the likelihood of surviving an out-of-hospital cardiac arrest is quite low, attention has turned to primary prevention, ie, identifying people at high risk and implanting an ICD before an event occurs.

**MADIT I, MADIT II: ICDs in symptom-free patients**

Two of the most important clinical trials supporting ICD use for primary prevention in patients at high risk who have never had symptomatic arrhythmic events are the Multicenter Automatic Defibrillator Implantation trials (MADIT I and MADIT II; **TABLE 1**).

**MADIT I** included patients with asymptomatic nonsustained ventricular tachyarrhythmias and moderately impaired systolic left ventricular function (an ejection fraction ≤ 35%) after a myocardial infarction, and in whom an electrophysiologic study revealed inducible but nonsuppressible ventricular tachyarrhythmias. The average age was 62 years.

During an average follow-up of just over 2 years, patients in the ICD group showed an impressive 54% relative reduction and an 18% absolute reduction in all-cause mortality. Vice President Cheney received his ICD presum-ably on the basis of MADIT I indications.

**MADIT II** included patients with prior heart attacks and an ejection fraction of 30% or less, but not necessarily any history of arrhythmias. During an average follow-up of just over 2 years, patients in the ICD group (average age 65) showed a 31% relative reduction and a 5.6% absolute reduction in all-cause mortality.

From now on, therefore, most patients who receive an ICD will not have had a clinical episode of symptomatic ventricular tachyarrhythmia. Indeed, the current guidelines for implantation do not require symptoms or spontaneous ventricular arrhythmias, but only a low ejection fraction (≤ 30%) due to a prior infarction, plus a slightly prolonged QRS interval.

**RECOMMENDATIONS**

It is not the ICD that makes driving dangerous, but rather the tachyarrhythmia, which may cause unexpected and sudden dizziness or loss of consciousness. Epstein et al contend that irrespective of the clinical circumstances leading to ICD implantation, “the available data do not support the contention that sudden cardiac death while driving is a significant
public safety issue.” Akiyama et al\textsuperscript{10} note that overall “these patients appear to have a low risk of being in a motor vehicle accident—a risk that is not greater than that in the general driving population.”

Despite these reassurances, cardiovascular societies throughout the world have issued guidelines on driving restrictions.\textsuperscript{7,15,16} The rules vary among countries (and even among US states), but the principles are in general the same (\textit{FIGURE 1}).\textsuperscript{5}

Patients with ICDs can be divided into two broad categories; those who have experienced symptomatic ventricular dysrhythmias and those who have not. It is not always possible to document an arrhythmia, and patients who have experienced syncpe thought to be due to dysrhythmia are included in the group with documented symptomatic ventricular tachycardia or ventricular fibrillation. This group might include patients with syncpe after a myocardial infarction who have inducible ventricular tachyarrhythmias on an electrophysiologic study. The syncpe would be assumed to have been due to a spontaneous ventricular tachyarrhythmia that “self-terminated.”\textsuperscript{17}

\textbf{No commercial driving}

Recommendations are most clear for commercial driving: it is permanently prohibited, whatever the clinical circumstances leading to ICD therapy.

\textbf{Noncommercial driving}

ICD patients who have not had symptomatic ventricular dysrhythmias (ie, MADIT I and II patients) can resume driving after 1 to 2 weeks,\textsuperscript{16} much like patients who receive pacemakers. As Smith\textsuperscript{18} recently noted, “the guidelines regarding driving are (and should be) less restrictive for patients like Mr. Cheney who have received an ICD but have never had an episode of arrhythmia affecting consciousness.”

ICD patients who have had nonsustained symptomatic arrhythmia should not drive for 3 months after implantation.

Patients who received an ICD after an episode of sustained symptomatic ventricular dysrhythmias should not drive for at least 6 months.

Episodes restart the clock. Anytime after the initial driving restriction that the patient experiences another episode of ventricular tachycardia or ventricular fibrillation that triggers the ICD, the “clock starts over,” and the patient should abstain from driving for 6 months—long enough to adjust the medical therapy and to judge whether the new regimen is adequate.\textsuperscript{7}

Thus, because driving status can change

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure1}
\caption{Driving privileges apply only to noncommercial vehicles. ICD = implantable cardioverter-defibrillator.}
\end{figure}
on the basis of the frequency of arrhythmias and their symptomatic consequences, it has been wisely suggested that "specific instructions regarding driving need to be given to the patient on a continual basis."  

Idiopathic ventricular tachycardia. While most ICD patients have structural heart disease, a few have idiopathic ventricular tachycardia (normal coronary arteries, normal ventricular function) and no impairment of consciousness. Such patients should refrain from driving a private vehicle for 3 months after implantation of the ICD. Driving of commercial vehicles remains prohibited after ICD implantation irrespective of the cause.

REFERENCES

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