

# Should We Routinely Place Atrial Leads to Reduce Inappropriate Defibrillator Shocks?

FRANK PELOSI, JR., M.D.

From the Cardiovascular Division, Department of Internal Medicine, University of Michigan Health System, Ann Arbor, Michigan, USA

*sudden death, ICD shock, inappropriate therapy, implantable cardioverter defibrillator*

## Editorial Comment

Eliminating inappropriate shocks is one of the most vexing challenges for clinicians and patients with implantable cardioverter-defibrillators (ICD). Though a frustration for physicians, inappropriate shocks are a source of despair and fear for patients. Inappropriate shocks often lead to burdensome emergency room visits, medication changes or interventions such as atrioventricular node ablation or device modifications.

Inappropriate therapies were once seen as an unavoidable price for a life-saving technology. However, we are learning that ICD shocks are associated with significant anxieties and depression, and perhaps reduced survival.<sup>1</sup> The associated increase in posttraumatic stress, anxiety, and depression, often brings desperate patients to request that all of their ICD therapies be disabled.

Technological advances and the use of ICDs in younger, more vital patients bring the reasonable expectation that inappropriate therapies—especially shocks—should be minimized if not eliminated. Early methods such as simple rate cutoff adjustments and measurements of rate stability have evolved to analysis of the electrogram morphology or the atrioventricular relationship of a given arrhythmia.

Two philosophies guide the decision to place an atrial lead to employ atrioventricular detection algorithms. First, some physicians routinely place an atrial lead in their ICD patients to hopefully reduce inappropriate shocks in a population with high rates of atrial arrhythmias. This is usually simple and involves a small increase in procedure time. However, there may be short- and long-term consequences of having these additional components. An analysis of the National Cardiovascular Data Registry (NCDR) demonstrated a 45% increase in complications in patients receiving dual-chamber versus single-chamber ICDs.<sup>2</sup> Additionally, as patients live longer with heart disease, they are surviving beyond the lifespan of their ICD components. With this comes lead replacements or extractions for both the inevitable and unexpected breakdown of these components. Recent lead recalls have

heightened our awareness of the long-term vulnerabilities of implantable ICD leads. These concerns have led implanters to take the opposite course by avoiding atrial lead placement unless there are established pacing indications. These differing practices raise an important question: Should dual-chamber ICDs be routinely placed to reduce inappropriate therapies?

This brings us to the report by Ruwald *et al.* in the current issue of the *Journal of Cardiovascular Electrophysiology*.<sup>3</sup> In this study, the authors used data from the Multicenter Automatic Defibrillator Implantation With Cardiac Resynchronization Therapy (MADIT-CRT) study to determine if dual-chamber ICDs reduced inappropriate therapies compared with single-chamber ICDs. They did this by analyzing 704 patients who received ICD therapy without cardiac resynchronization therapy. Of these, 410 received dual-chamber ICDs and 294 received single-chamber ICDs. The choice of device was at the discretion of the implanting physician. Over a 5-year follow-up period, there were 91 inappropriate therapies, and the use of dual-chamber ICDs was not associated with a reduced risk of inappropriate therapies. Perhaps due to the low number of events, there was a trend to a risk reduction in ICD shocks and shocks from atrial arrhythmias that did not meet statistical significance. There was no difference in mortality or complications from the implant procedure. The authors conclude that the empiric addition of an atrial lead does not reduce inappropriate therapies from ICDs, though they acknowledge the trend of reduced shocks.

Ruwald's study is the largest comparing the rate of inappropriate therapies between single-chamber and dual-chamber ICDs, and the study's design and findings have both insights and limitations. Since the patients could not have had atrial arrhythmias within 1 month of implant, we can speculate that the study population has a lower atrial arrhythmia burden. The decision to place the atrial lead in the study population was at the discretion of implanting physician, suggesting a "real world" view of the implant trends for dual chamber devices. Despite the large sample size, the trend to reduced inappropriate shocks in dual-chamber devices did not reach statistical significance in this population. Though a larger sample size may reveal such a difference, one can question if this would be clinically relevant to change one's practice.

The study does have limitations. The study population was not randomized, which prevents us from viewing these results with the strictest scientific rigor. As a subset of MADIT-CRT, the study was not designed or powered to answer the question proposed by Ruwald. The burden of asymptomatic atrial arrhythmias could be underestimated since this was not preoperatively assessed. Since only one manufacturer was

J Cardiovasc Electrophysiol, Vol. 24, pp. 680-681, June 2013.

No disclosures.

Address for correspondence: Frank Pelosi, Jr., M.D., University of Michigan Health System, Cardiovascular Center, SPC 5853, 1500 East Medical Center Drive, Ann Arbor, MI 48109-5853, USA. Fax: +734-936-7026; Email: fpelosi@med.umich.edu

used, other atrioventricular discriminator algorithms could not be evaluated. Finally, the particulars of the algorithm settings were not available to the investigators to determine if they were optimized.

The recent publication in Multicenter Automatic Defibrillator Implantation Trial - Reduce Inappropriate Therapy (MADIT-RIT) also shows us that reducing inappropriate shocks can be achieved by simply increasing an ICD's rate cutoff or detection time. In this study, inappropriate therapies in the 2 treatment arms were approximately 4% with demonstrated mortality reductions in the 2 treatment arms.<sup>4</sup> Since this is less than half the rate of inappropriate shocks found in the Ruwald study, we can speculate that with this strategy, an even larger study population would be necessary to determine the justification of empiric atrial lead placement.

From the results of Ruwald and other studies, the decision to place an empiric atrial lead to reduce inappropriate therapies should be individualized to particular circumstances of the patient. For patients with a history of atrial arrhythmias and rapid ventricular rates, placement of an atrial lead may be helpful. However, from the report by Ruwald, MADIT-RIT and others, the routine use of atrial lead placement to simply reduce inappropriate shocks is not justified. A recently

released defibrillator lead with an integrated atrial sensing electrode (VDD-ICD) could give us the "best of both worlds," having the advantages of available atrial electrograms without additional intravascular hardware.

## References

1. Ladwig KH, Baumert J, Marten-Mittag B, Kolb C, Zrenner B, Schmitt C: Posttraumatic stress symptoms and predicted mortality in patients with implantable cardioverter-defibrillators: Results from the prospective living with an implanted cardioverter-defibrillator study. *Arch Gen Psychiatr* 2008;65:1324-1330.
2. Dewland TA, Pellegrini CN, Wang Y, Marcus GM, Keung E, Varosy PD: Dual-chamber implantable cardioverter-defibrillator selection is associated with increased complication rates and mortality among patients enrolled in the NCDR implantable cardioverter-defibrillator registry. *J Am Coll Cardiol* 2011;58:1007-1013.
3. Ruwald AH, Sood N, Ruwald MH, Jons C, Clyne CA, McNitt S, Wang P, Zareba W, Moss AJ: Frequency of inappropriate therapy in patients implanted with dual versus single-chamber ICD devices in the ICD arm of MADIT-CRT. *J Cardiovasc Electrophysiol* 2013;24:672-679.
4. Moss AJ, Schuger C, Beck CA, Brown MW, Cannom DS, Daubert JP, Estes NA, III, Greenberg H, Hall WJ, Huang DT, Kautzner J, Klein H, McNitt S, Olshansky B, Shoda M, Wilber D, Zareba W; MADIT-RIT Investigators: Reduction in inappropriate therapy and mortality through ICD programming. *N Engl J Med* 2012;367:2275-2283.