

## Inappropriate Use of Atrioventricular Nodal Vagal Stimulation in Atrial Fibrillation

To the Editor:

Zhuang et al<sup>1</sup> showed well that slowing the ventricular rate by atrioventricular nodal vagal stimulation (AVN-VS) improved hemodynamics during atrial fibrillation (AF). This gave better hemodynamic responses than slowing the ventricular rate by atrioventricular nodal ablation with right ventricular pacing, which caused adverse effects that the authors cited. The authors then wrongly concluded, “. . . we believe that this novel strategy (AVN-VS) might be applicable in some patients, eg, postoperative patients with AF.”

However, atrial fibrillation after surgical operations, especially cardiac operations, is peculiar because it is self-limiting. This arrhythmia commonly starts on the second or third postoperative day, and it reverts to regular sinus rhythm in a few days if the fast ventricular rate is slowed. The ventricular rate can be slowed promptly and safely by giving intravenous digoxin, 15 to 19 micrograms per kg of lean body weight,<sup>2,3</sup> using the dosing calculations of Roger Jelliffe et al.<sup>4</sup> Digoxin stimulates the vagus nerve actively.  $\beta$ -blockers can be used in addition to digoxin.

Many doctors are rightly reluctant to estimate these higher digoxin doses because estimating can cause toxicity. In contrast, the calculations by Jelliffe et al of doses for dangerous drugs, including digoxin, are used in more than 100 institutions and are available (Laboratory of Applied Pharmacokinetics, University of Southern California, Los Angeles, Calif. contact@lapk.org). AVN-VS is an effective treatment. However, doctors should give postoperative patients the benefits of digoxin therapy controlled by the same calculations of doses that they use for other dangerous drugs, such as aminoglycosides. This costs less money and is less disturbing to the patients than other treatments.

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1. Zhuang S, Zhang Y, Mowrey KA, et al. Ventricular rate control by selective vagal stimulation is superior to rhythm regularization by atrioventricular nodal ablation and pacing during atrial fibrillation. *Circulation*. 2002;106:1853–1858.
2. Krohn BG, Saenz JM, Eto KK. The critical dose of digoxin for treating supraventricular tachycardias after heart surgery. *Chest*. 1989;95:729–734.
3. Krohn BG, Kay JH, Mendez MA, et al. Rapid sustained recovery after cardiac operations. *J Thorac Cardiovasc Surg*. 1990;100:194–197.
4. Jelliffe RW, Buell J, Kalaba R. Reduction of digitalis toxicity by computer-assisted glycoside dosage regimens. *Ann Int Med*. 1972;77:891–906.

### Response

Although we appreciate the comments of Dr Krohn, it appears that he has inappropriately interpreted our study.<sup>1</sup> We reported a novel method for slowing of the ventricular rate during atrial fibrillation (AF) and evaluated it in juxtaposition to the atrioventricular (AV) nodal ablation accompanied by right ventricular pacing. We suggested that because of the demonstrated advantages of the selective AV nodal vagal stimulation, this alternative approach might deserve clinical consideration in a selected group of patients.

This suggestion, however, does not deserve to be presented as an “inappropriate use of atrioventricular nodal vagal stimulation in AF.” Indeed, one cannot make any conclusions about its appropriateness before an objective evaluation is performed and comparisons between alternatives are made. Dr Krohn’s letter,

therefore, simply refers to his experience using digoxin for ventricular rate control. This neither relates to our study nor compares digoxin with other pharmacological agents.

We felt that the novel technology reported in our study would be most suitable for evaluation in postoperative patients because temporary pacing wires are frequently used and kept for several days in this group of patients. In fact, 2 clinical laboratories have already used similar technologies in patients. In one,<sup>2</sup> the presence of the AV nodal fat pad and its use for modulation of the conduction were confirmed in open-heart surgery patients. The other,<sup>3</sup> using standard intracardiac electrophysiological catheters, concluded that parasympathetic nerve stimulation “may serve as an adjunctive tool for the diagnosis/treatment of supraventricular tachycardias and may be beneficial for ventricular rate slowing during tachycardiac AF in patients with congestive heart failure.” In view of the preliminary observations of its effectiveness and ease of use, selective vagal stimulation may prove to be an appropriate tool in certain cases.

As to use of digoxin in postoperative AF patients, it was never a goal of our report to evaluate its appropriateness. This has been done repetitively by others, however, and it is well established that digoxin has no advantages as a single agent. In fact, ventricular rate control occurs more rapidly with both  $\beta$ -blocking agents and calcium antagonists than digoxin,<sup>4,5</sup> and in general a combination of drugs is most often the recommended approach.<sup>6</sup>

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