Catheter-Mediated Linear Block in the Atria
To the Editor:

In a recent issue of Circulation, Pappone et al report their experience with catheter ablation for atrial fibrillation using long atrial linear lesions. Because they emphasized their difficulty in assessing the completeness of lines, we would like to clear up certain misconceptions concerning this issue.

First, the idea that the spatial continuity of marked lesional points indicates line completeness is erroneous because no information about the electrophysiological consequences is incorporated.

Furthermore, the completeness of linear lesions can be verified simply by recording widely separated double potentials all along the line (during orthogonal activation). The requirement for $\geq 60$ ms of conduction delay between 2 points separated by $<1$ cm has no rationale because the interval obviously depends on the length of the line as well as on the site of pacing, average velocity, and relationship to other regions of anatomical block. We reported endocardial (all along the line) and epicardial (through the coronary sinus) double potentials of 104±35 ms with complete lines from the right superior pulmonary vein ostium down to the mitral annulus. For such a line, a coronary sinus catheter recording double potentials provides the simplest evidence of its completeness. The addition of another complete line joining both superior pulmonary veins typically increases the double potential interval to 160 to 200 ms.

The ablation schema chosen by Pappone et al in the left atrium is, in fact, ideal for demonstrating the completeness of linear lesions because it creates regions of complete electrical isolation (which should produce either dissociation or no recordable electrical activity). Any evidence of 1:1 activation in these encircled regions (as indicated by the late activation in Figure 2) is proof of $\geq 1$ electrically incomplete boundary.

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Response
We thank Dr Haïssaguerre and his colleagues for their interest in our article. Concerning the problem of completeness of block lines, we specified in the article that “completeness” of block lines does not mean total absence of conduction; instead, it means a delay in conduction of $\geq 60$ ms between points close to each other on the 2 sides of the line.

Theoretically, a “complete” block, resulting in total isolation of an atrial area, should be characterized by either the absence of activation of this area or complete dissociation of its electrical activity from the rest of the atrium. However, complete block is difficult to obtain in an atrial chamber using a catheter technique, and it is also far beyond the purpose of catheter ablation to treat atrial fibrillation.

We are aware that the presence of double potentials across the line is a demonstration of block provided that the whole line is carefully investigated; we are currently using this approach in our ablation procedures for atrial fibrillation. In the published article, however, we relied on Carto technology to demonstrate significant delay (not block) across the line, because our purpose was not to isolate some atrial areas completely but to create a marked conduction delay, which would make the propagation of fibrillatory wave fronts very difficult or impossible.

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