Letter by Ristagno and Li Regarding Article, “Waveform Analysis–Guided Treatment Versus a Standard Shock-First Protocol for the Treatment of Out-of-Hospital Cardiac Arrest Presenting in Ventricular Fibrillation: Results of an International Randomized, Controlled Trial”

To the Editor:

Real-time ventricular fibrillation (VF) waveform analysis has been advocated for several decades as a potential decision tool to optimize cardiopulmonary resuscitation intervention, that is, chest compression or defibrillation. Indeed, the search for a reliable predictor of successful defibrillation obtained from the VF features analysis began almost 30 years ago with the studies by Weaver and colleagues on VF amplitude and the introduction of the definitions of fine and coarse VF used worldwide. Although numerous retrospective studies confirmed the validity of this approach, until now, there were no prospective investigations. We therefore applaud the elegant study by Freese et al that evaluated this “old” new approach in a prospective, randomized, controlled trial. Nevertheless, we cannot hide our disappointment in discovering no improvements in overall survival with the use of a VF analysis–guided cardiopulmonary resuscitation compared with a standard shock-first protocol.

Is this the end of a dreamed/advocated waveform analysis–guided defibrillation? Or are we missing some points in the correct use of this approach? We are convinced that a real-time VF waveform analysis may be an accurate tool to predict defibrillation outcome and thus to prioritize cardiopulmonary resuscitation interventions. Nevertheless, we have to recognize that there is no single biomarker or predictor capable of providing a threshold value that can guarantee 100% specificity and 100% sensitivity. This is especially true when the selected threshold is known to yield a sensitivity of 80% and a specificity of 60% in predicting defibrillation success, as in the Freese et al study. Indeed, that was a threshold value below which resuscitation was unlikely to occur after defibrillation, and thus it was most likely capable to individuate mainly defibrillation failure rather than defibrillation success.

How can we overcome this limitation? In our recent retrospective study in which we evaluated a different VF analysis algorithm, namely amplitude spectrum area, on 609 VF patients, we highlighted the need to use 2 different threshold values to achieve higher accuracy in defibrillation prediction: a low value able to predict defibrillation failure with the highest negative predictive value and a high value able to predict a defibrillation success with the highest positive predictive value. Using 2 thresholds, we might be able to better individuate when an interval of chest compression would be more beneficial than an immediate defibrillation and vice versa. Indeed, we calculated that in the presence of an amplitude spectrum area value below the threshold for defibrillation failure prediction, >45% of unsuccessful and potentially detrimental defibrillations might have been avoided with a negative predictive value >97%, whereas interrupting chest compression for the delivery of defibrillation at an amplitude spectrum area higher than the threshold predictive for defibrillation success could have raised defibrillation success to 67% compared with 26% observed with the standard approach.

In conclusion, with the use of a more structured protocol optimized with 2 specific thresholds for the prediction of defibrillation failure and success, a continuous real-time VF waveform analysis would be a useful adjunct for guide cardiopulmonary resuscitation interventions, chest compression, or defibrillation, and has the potential to yield improvements in cardiac arrest outcome.

Disclosures

None.

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_Circulation_. 2014;129:e648
doi: 10.1161/CIRCULATIONAHA.113.007287
_Circulation_ is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the World Wide Web at:
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