Reviewer's report

Title: A Simulation Study of Biphasic Defibrillation Shocks

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Reviewer: Stephen Knisley

Reviewer's report:

General
The paper attempts to examine with a computer model the superiority of biphasic defibrillation shocks in human ventricular tissue. The goal is worthwhile since some biphasic defibrillation waveforms are more effective than some monophasic waveforms for defibrillation either by exhibiting a lower threshold voltage or energy, or higher probability of success. Understanding why this occurs may lead to better biphasic defibrillation waveforms with higher probability of success. A weakness of the paper is that there is no fibrillation ongoing in the model when the shocks are delivered. Thus the conclusion concerning defibrillation efficacy of these waveforms in the human ventricle is not supported. The authors assume that a shorter time to excite the modelled tissue indicates superiority of a waveform for defibrillation. While a rationale for this assumption could be developed, the assumption that is not obviously supported by data or background literature cited. The intended meanings of some statements in this computer modeling study are not clear (for example "human ventricle," "virtual patch," "always the same").

The results show shorter total excitation times for biphasic waveforms tested compared with monophasic. Also, both planar electrodes and a ring electrode were tested. In addition, the effect of discontinuities at cleavage planes was examined. Authors conclude that effects of discontinuities occur for planar wavefronts but not for heterogeneous wavefronts.

Major Compulsory Revisions (that the author must respond to before a decision on publication can be reached)

The paper would be better rewritten in a manner that gives background, specific hypotheses tested and how each hypothesis was tested. It appears the study only addresses the total excitation time of the modelled tissue subjected to the modelled shocks. Conclusions need to be limited to that which is well supported by the results.

Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

Figures would be easier to understand if the electrode locations and locations of clefts were indicated. As it is, the text is unclear about how the clefts were modeled and located in the tissue, and exactly where the electrodes were located.

Specific: Results para 4: How do authors know these data give a measure of whether a defibrillation shock will be succesful or not?
Results para 5: It is not clear how the cleavage was represented in the model.
Conclusions: How do the authors know what outcome from the model will represent more efficient defibrillation or failure of the therapy?

Time required to depolarize the tissue is not the same as defibrillation efficacy.
It is interesting and surprising that the cleavage planes only have an effect if the wavefront is planar. Authors need to develop the evidence in support of this conclusion.

Discretionary Revisions (which the author can choose to ignore)
A revision that carefully develops each hypothesis, clarifies methods and assumptions used in the interpretation of the results and shows evidence in support of each conclusion could substantially improve this paper.

**What next?:** Reject because too small an advance to publish in any journal

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Acceptable

**Statistical review:** No

**Declaration of competing interests:**

None