Journal of Biomechanical Engineering

Editorial

2014 Richard Skalak Award

Each year, the Editors-in-Chief and the editorial board members of the *ASME Journal of Biomechanical Engineering* identify the most meritorious papers published in the Journal in the previous calendar year, and an external committee selects the top paper of the year from that list. The authors of this paper are the recipients of the Richard Skalak Award, named after an early leader within the ASME Bioengineering community. Richard Skalak (1923–1997) played a leadership role in the formative decades of the discipline of biomedical engineering through his technical contributions in biomechanics, his educational influence on students, and his service to many developing societies and journals. Richard Skalak believed in several central approaches to bioengineering and several central values in working with people. In bioengineering, these were: (1) the useful combination of mathematical and computational modeling with experimental results, to better inform the new biological understanding that is derived and (2) the inclusion of both micro- and macroscale phenomena in understanding complex biological systems. In terms of mentoring students and collaborating with colleagues, these were: (1) share ideas freely, (2) listen to ideas of others and integrate the best into new developments, and (3) show tolerance and respect for others at all times. These tenets help guide us as a community and as a journal, and we are honored by the opportunity to contribute to Richard Skalak's legacy by giving an award bearing his name. The Editors thank the 2014 Skalak Award committee: Jimmy Moore (chair), Ross Ethier, Michael Sacks, and Jennifer Wayne.

The 2014 Richard Skalak Award winner is Arena, C.B., Mahajan, R.L., Rylander, M.N., and R.V. Davalos, "An Experimental and Numerical Investigation of Phase Change Electrodes for Therapeutic Irreversible Electroporation," ASME J Biomech Eng, **135**(11), p. 111009 [1].

ABSTRACT: Irreversible electroporation (IRE) is a new technology for ablating aberrant tissue that utilizes pulsed electric fields (PEFs) to kill cells by destabilizing their plasma membrane. When treatments are planned correctly, the pulse parameters and location of the electrodes for delivering the pulses are selected to permit destruction of the target tissue without causing thermal damage to the surrounding structures. This allows for the treatment of surgically inoperable masses that are located near major blood vessels and nerves. In select cases of high-dose IRE, where a large ablation volume is desired without increasing the number of electrode insertions, it can become challenging to design a pulse protocol that is inherently nonthermal. To solve this problem, we have developed a new electrosurgical device that requires no external equipment or protocol modifications. The design incorporates a phase change material (PCM) into the electrode core that melts during treatment and absorbs heat out of the surrounding tissue. Here, this idea is reduced to practice by testing hollow electrodes filled with gallium on tissue phantoms and monitoring temperature in real time. Additionally, the experimental data generated are used to validate a numerical model of the heat transfer problem, which is then applied to investigate the cooling performance of other classes of PCMs. The results indicate that metallic PCMs, such as gallium, are better suited than organics or salt hydrates for thermal management, because their comparatively higher thermal conductivity aids in heat dissipation. However, the melting point of the metallic PCM must be properly adjusted to ensure that the phase transition is not completed before the end of treatment. When translated clinically, phase change electrodes have the potential to continue to allow IRE to be performed safely near critical structures, even in high-dose cases.

