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3D U-Net based real-time prediction model for radiofrequency ablation induced thermal damage region

*Kyungho Yoon[1)], Minjee Seo[2)]

[1), 2)] *School of Mathematics and Computing (Computational Science and Engineering), Yonsei University, Seoul 03722, Korea*
[1)] yoonkh@yonsei.ac.kr

ABSTRACT

Radiofrequency ablation (RFA) stands as one of the most effective minimally invasive technique for treating tumors. RFA treatment success depends on accurately destroying tumor tissues while minimizing damage to healthy tissues and organs, but predicting the extent of ablation is challenging due to factors such as patient characteristics. In this study, we present U-Net model for real-time prediction of thermal damage during RFA treatment. The training data was generated by serially solving three computational model of electrostatic, bioheat transfer, and thermal damage. The segmented tumor geometry from magnetic resonance (MR) image and the placement of electrode were used as network inputs while the heat distribution and the damaged tissue region were set to outputs. The trained network model can accurately predict damaged area with the conformity over 95% in real-time.

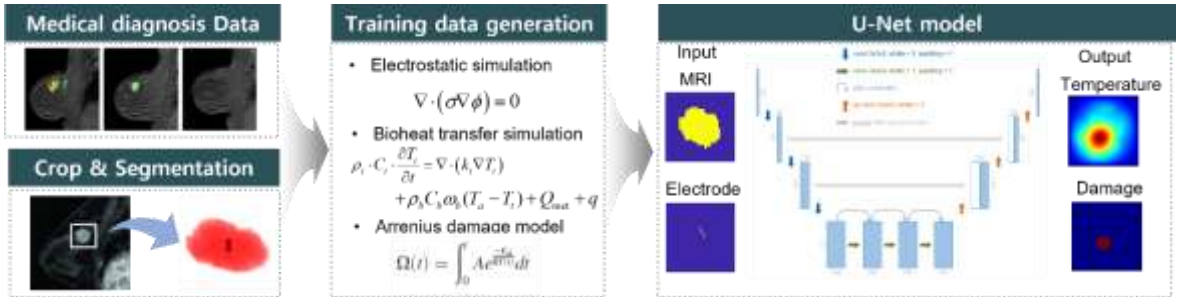

Fig. 1 Schematics of 3D U-Net based RFA thermal damaged prediction model

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[1)] Professor
[2)] Graduate Student