

Method for Non-Invasive Complete Vascular Occlusion Using MR Guided Focused Ultrasound Surgery

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Technology description

Summary

Researchers have developed a non-invasive method for creating vascular occlusions at specific locations within a vessel using magnetic resonance guided focused ultrasound (MRgFUS). The speed and efficacy of this approach is better than traditional vascular occlusion methods, and the method can be further enhanced through the use of phase shift nano-droplets.

Addressed Need

Image-guided ultrasound technology has gained wide recognition as an alternative to surgery for the treatment of uterine fibroids, tumors and pain due to a lack of systemic effects that are commonly associated with chemotherapeutic agents or invasive treatments. However, the lack of a fast and efficacious method for vascular occlusion limits MRgFUS usage in applications that are affected by respiratory motion or heat sink effects. This technology overcomes these challenges by using multi-focal targeting and phase-shift nano-droplets to amplify acoustic effects and facilitate vascular occlusion.

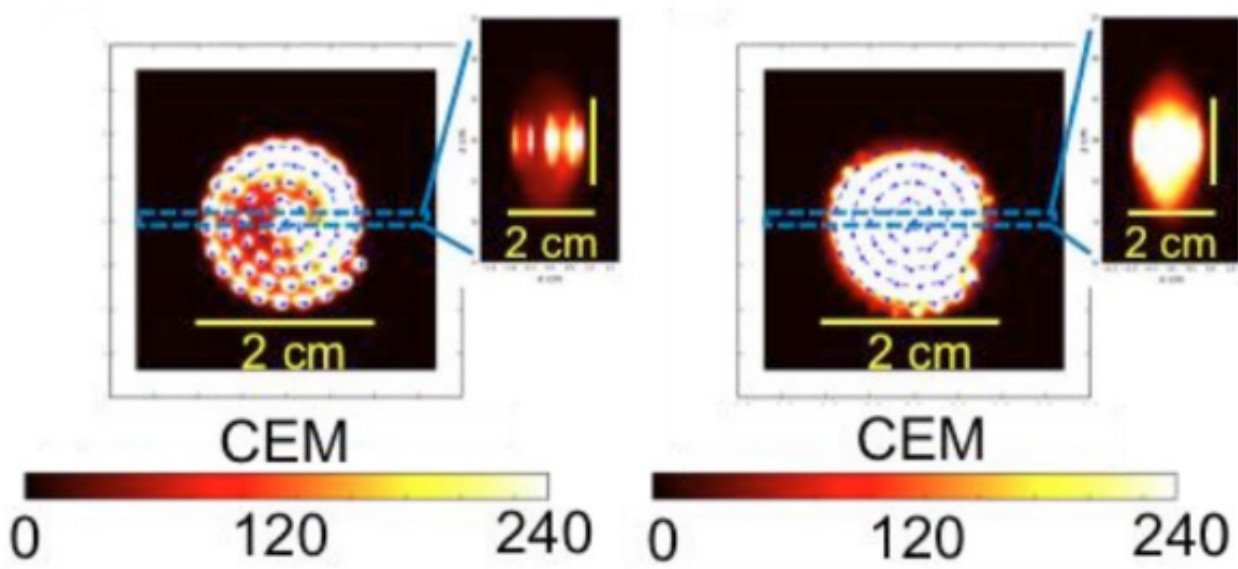


Figure 1: A comparison of single-focus ablation (left) and multi-focus ablation (right) shows more effective heating with the multi-focus approach.

Application area

The approach is even applicable to large vessels that can be extremely challenging to ablate due to the heat sink effect. Ultimately, the ability to occlude selected vasculature could aid in the treatment of vascular malformations, hemorrhage control, and tumor devascularization.

Advantages

This technology employs multi-focal targeting to improve the heating time, with early results indicating a 5-fold improvement over single focus heating. The method can also be used in combination with phase change nano-droplets to further decrease the ablation time, substantially lower the required acoustic energy dosage, and even allow vascular occlusion of large vessels such as the portal vein. Multi-focal targeting decreases blood flow and allows for fast vascular occlusion. Used in combination with an accelerant, the technology can decrease ablation time and enable occlusion of large vessels.

Institution

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