

Magnetic Resonance Imaging Guided Thermal Ablation for Cancer

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Although thermal treatment of localized malignancies has been practiced under direct surgical and laparoscopic visualization, much of the excitement over expanding the therapeutic uses of radiofrequency and other forms of thermal energy has been provoked by the advancements in imaging technology. The ability to perform thermal treatment of cancer percutaneously under image guidance has changed thermal ablation from an adjuvant surgical technique to a minimally invasive alternative that is more suited to poor surgical candidates. Unlike radiation therapy, thermal ablation can be repeated multiple times without concern for cumulative dose effects.

The primary contribution of image guidance to needle-based thermal treatment is securing safe, precise electrode delivery into the targeted pathology. The ideal electrode trajectory during actual procedure execution is sometimes significantly different from that suggested on the pre-procedure imaging data owing to shift of anatomical structures when using modified patient positions during treatment. Once the electrode is successfully delivered into the targeted tumor, image guidance adds to treatment efficacy by optimizing electrode position within the pathological tissue and by enabling confident inclusion of an adequate 'safety margin' to the ablated volume.

Compared to ultrasound and CT, the major contribution of MR imaging is its ability to monitor the zone of tissue destruction during the procedure therefore providing real-time guidance for energy deposition and permitting accurate tumor destruction. Other than its ability to define the treatment endpoint, MRI guidance is also advantageous in certain situations such as when a tumor is not adequately visualized on ultrasound or CT or when the complex anatomical location of a tumor renders multiplanar image guidance a safer approach, such as in liver dome lesions.

Biography

Dr. Nour is one of the world's leaders in the field of interventional MRI. For more than a decade, he dedicated his pre-clinical and clinical research to optimizing MRI guided interventions and to developing new minimally invasive treatment approaches under MRI guidance. He is currently the Director of interventional MRI program at Emory University. He has 25 peer-reviewed original manuscripts published in leading medical journals. He also has 60 peer-reviewed proceedings manuscripts and research abstracts, 8 textbook chapters, and 7 filed patent applications in the field of interventional MRI.