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Ultrasound interstitial applicators for thermal ablation in liver

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Aggressive treatment of localized hepatic metastases, by surgery or other means, was proven to be a viable strategy for improving the prognoses of many patients. In that context, thermal ablation by high intensity ultrasound was proposed and used in clinics. However, for treating deep-seated tumors and in most cases, radiofrequency and cryotherapy probes are applied interstitially. Interstitial ultrasound applicators were proposed as an intermediate solution. The treatment can be focused, deeper than with other physical agents, and the transducer can eventually both treat and image tissues. In our experience, two approaches were investigated: percutaneous and intratissular, or endo vascular. The active element was a miniature flat transducer operating at a frequency of 5 MHz, for a satisfactory tradeoff between beam penetration and energy absorption. In vivo trials on a porcine model demonstrated that both procedures are minimally invasive and that large thermal lesions, up to 20mm deep, can be obtained. Technological improvements such as the use of dual mode transducers (for imaging and therapy) or the performance under MRI guidance allowed monitoring the treatment in real-time.