

Application of a fiber-optical probe hydrophone for in vivo measurements of therapeutical ultrasound [Abstract]

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ABSTRACT

Knowledge of sound fields used in therapeutical applications with focused strong ultrasonic pulses *in vivo* is of great importance to the user and researcher. In this study the ultrasonic field of an experimental high energy pulsed ultrasound (HEPUS) device for tumor treatment is investigated. Using HEPUS, the mechanism of acute tissue destruction is based mainly on cavitation effects in the focal region. A self-focusing piezoelectric transducer generates the applied pressure signal which is a high-amplitude sinusoidal burst with a duration of about 12 μ s. These burst signals differ significantly from those in lithotripsy, but have similar amplitudes. A fiber-optical probe hydrophone provides the possibility of minimal invasive pressure measurements *in vivo* because of its small sensor diameter. During insonification in rabbits, the focal sound pressures and spatial pressure distributions were recorded in the liver and the back muscle *in vivo*. The fiber tip of the hydrophone was placed directly in the tissue by puncturing, using a cannula. The results obtained are compared with *in vitro* measurements. They are discussed regarding the influence of attenuation and nonlinear propagation in tissue. Additionally, an error estimation for the pressure measurement *in vivo* is presented. [Work supported by Wilhelm Sanders Stiftung Gz. 89.030.2.]