

ACOUSTICS2008/1702 Characterization of Ultrasound Propagation Through Ex-vivo Human Temporal Bone

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Knowledge of cranial and intracranial ultrasonic properties is essential for optimal results in brain vasculature imaging and therapy. The aims of this study were to perform measurements of the intracranial acoustic pressure field, to identify ultrasound parameters that maximize penetration and minimize beam aberration, and to estimate the speed of sound and the attenuation per unit length in the temporal bone (TB). In vitro experiments were conducted on five human skulls. In a water-filled tank, two unfocused (0.12 and 1.03 MHz) and one focused (2.00 MHz) transducers were consecutively placed near the TB of each skull. The acoustic pressure field was measured in a volume estimated to encompass the middle cerebral artery (MCA). For each measurement, the intracranial distance from the position of maximum acoustic pressure to the estimated MCA origin was quantified. The pressure reductions at these locations relative to the free field were also estimated. The intracranial -3 dB depth of field and beam width were investigated as a function frequency. The speed of sound in TB at 1.03 MHz was 1752.1 to 3285.3 m/s. This work provides quantitative information on the cranial and intracranial ultrasound properties, which are needed for optimal insonation of the brain vasculature.