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Minimally Invasive Focused Ultrasound (MIFUS) for Brain

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Technology description

UNMET NEED

Clinical HIFU procedures are typically image-guided to permit treatment planning and targeting before applying a therapeutic or ablative level of ultrasound energy. When MRI is used for guidance, the technique is called Magnetic Resonance-guided Focused Ultrasound (MrgFU). In HIFU therapy, ultrasound beams are focused on diseased tissue, and due to the significant energy deposition at the focus, temperature within the tissue rises to 65° to 85°C, destroying the diseased tissue by coagulation necrosis.

PROBLEM SOLVED

Most brain surgeries involving deep tumor resections are done using invasive craniotomies, the surgical removal of part of the bone from the skull to expose the brain. During 2013, a total of 3,666,000 craniotomy procedures were performed worldwide, out of which 1,594,000 procedures were performed in the U.S. alone. This invasive process entails hours of surgery blood loss, potential infection and long recovery periods. High intensity focused ultrasound for brain, is a concept that uses high energy focused ultrasonic waves to destroy brain targets through coagulation necrosis. While several devices have been proposed and are in various testing phases, they suffer from huge drawbacks in versatility, cost and risk. Most of the problems with current technology result from the sonic wave attenuation while passing through the thick skull bone or from inability to reach targets deep in the brain without significant risk.

TECHNICAL DETAILS

Our proposed technology would get around these shortcomings by using the lateral ventricles as a “room to work” to place a specially designed ultrasound transducer for the purpose of targeting diseased areas of brain. Such a specialized device that uses the ventricles for placement of a HIFU (High Intensity Focused Ultrasound) device has not been previously attempted. The novelty for this approach lies in the fact that it eliminates the need for the ultrasound waves to pass through the skull, minimizing the electrical power necessary for the device, thus minimizing the engineering complexity, and cost; resulting in improving device efficiency and patient outcome.

Institution

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Inventors

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