Apparatus and methods for photoacoustic Intrapartum fetal and neonatal brain monitoring based on ultrasound neuromodulation evoked contrast

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Technology description

Unmet Need

Treatment of developmental brain injury has had many recent advances with developments in obstetric and neonatal medicine. However, perinatal hypoxic-ischemic encephalopathy (HIE) remains a significant cause of this brain injury. Fetal brain injury that is caused during labor is currently monitored by electronic fetal heart rate monitoring. This methodology, however, is very nonspecific and has a high false-positive rate for predicting childhood neurological abnormalities- as high as 99% in some studies. In addition, other methodologies such as near-infrared spectroscopy are limited in application and also have insubstantial accuracy. Furthermore, imaging techniques such as MRI cannot be performed until 7-10 days after birth to detect HIE. This necessitates a diagnostic tool solution that is not only cost effective, but needs to continually monitor the perinatal brain in real time with extreme accuracy.Technological Overview

The inventors have developed a non-invasive photoacoustic technology that utilizes ultrasound neuromodulation to produce enhanced contrast imaging. They have proposed a miniature probe that can be applied for use during early labor, when cervical dilation is only a few centimeters, in order to detect brain hypoxia throughout labor and allow for rapid diagnostics and decision-making. This probe is beneficial for its utilization of ultrasound neuromodulation to produce noninvasive excitation. Combining the ultrasound and optical modalities of photoacoustic allows for the probe to accurately provide information on the brains of newborn brains.

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