

Potential Application of Low Intensity Pulsed Ultrasound in Obstetrics

CME
Credits

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Low-intensity pulsed ultrasound (LIPUS) has been mainly used as adjuvant treatment in skeletal tendon and muscle injuries. The initial concept was to achieve local tissue warming and stimulate blood circulation through remote energy transfer. Subsequent studies^[1-3] have found that low energy level with intermittent stimulation did not generate heat accumulation and instead promoted the generation of various growth factors and reduced inflammatory reactions, thus effectively achieving tissue repair and healing.

The National Yang-Ming University team has been applying LIPUS to the treatment of neurological diseases for many years. So far, there have been extensive animal experiment results, including treatments for posttraumatic brain injury,^[1] local vascular occlusion,^[2] and Alzheimer's disease.^[3] Much valuable experience and results have been gained, the treatment mechanism has been thoroughly discussed, and no injury to the brain tissue was found throughout the entire experimental process. Currently, treatment for Alzheimer's disease has progressed to clinical trials [Figure 1], and LIPUS is expected to be extended to treating other neurodegenerative diseases, severe depression, and other psychiatric disorders.

In the field of obstetrics and gynecology, LIPUS reduces inflammation and stimulates growth factor properties and appears to possess the potential to develop as treatment for many diseases. However, its biological effects on cells from the brain seem to be more significant than cells from other tissues, and there are already many available results on the biological effects on these cells. Therefore, neonatal ischemic-hypoxia encephalopathy is the first-choice of the entry point.

Neonatal ischemic-hypoxia encephalopathy is an important clinical problem to gynecologists and pediatricians. It may lead to subsequent cerebral palsy, cognitive dysfunction, or epilepsy, and affected children may need various medical resource assistance for their lifetime, which creates a heavy

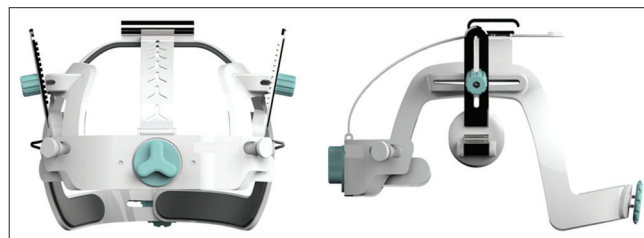


Figure 1: The low-intensity pulsed ultrasound therapy instrument currently used in clinical trials. It is worn on the patient's head, and ultrasound is irradiated to the hippocampus through the bilateral temporal area

burden on families. The disease often occurs in a term neonate and can only be found after birth, which makes it hard to effectively prevent. Therefore, there must be an effective remedy that can improve the current treatment of the disease.

The current primary treatment method is therapeutic hypothermia, which begins to reduce the neonate's core body temperature within the first 6 h of brain damage, to prevent cell damage caused by energy metabolism disorders. Therapeutic hypothermia cannot change injury caused by the primary metabolism disorder. If the protection intervention for the brain can be done before cell apoptosis, then it could reduce injury caused by ischemia and hypoxia, and improve future neurological prognosis. However, the treatment effect is not as significant if intervention is done during the cell apoptosis stage after reperfusion. Current LIPUS studies on rats were all provided intervention period after injury, and the results were still adequate, and allow LIPUS the chance to be the remedying treatment choice.

At present, animal experiments on neonate rats are still in progress. Preliminary results have shown significant

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improvements in the neuromotor development of neonatal rats. Further studies will focus on molecular signaling pathways and anatomical evidence. It is hoped in the future to achieve more evidence to support this innovative treatment method and truly bring help for the effected babies.

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Conflicts of interest

There are no conflicts of interest.

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