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Professor Jae Gwan Kim's research team uses near-infrared spectroscopy to monitor cerebral hemodynamics and conscious state change during anesthesia

□ GIST (President Seung Hyeon Moon) – The research team of Professor Jae Gwan Kim of the Department of Biomedical Science and Engineering has proposed a technique to use near-infrared spectroscopy to monitor cerebral hemodynamics and conscious state change during anesthesia.

◦ The results of this study suggest that the possibility of a new anesthesia depth monitoring indicator may be suggested by discriminating the changes in consciousness during ketamine anesthesia through changes in cerebral hemodynamics.

□ Anesthesia monitoring is based on EEG * to evaluate the depth of anesthesia. However, EEG-based anesthesia monitoring is not able to measure the depth of anesthesia for people with a central nervous system disease or those anesthetized with certain drugs (ketamine, nitric oxide). On the other hand, hemodynamic changes are more fundamental in that they reflect biological functions, so they can

reflect brain functions during anesthesia regardless of changes in brain waves. Recently, many related studies have been published.

* EEG (Electroencephalogram): used to evaluate the electrical activity in the brain

◦ To observe changes in cerebral hemodynamics, cerebral hemodynamics and brain metabolic imaging techniques such as fMRI * or PET ** are applied, but these are expensive. To monitor cerebral hemodynamics for a relatively low cost in the preclinical phase, Professor Jae Gwan Kim's research team applied NIRS *** to observe changes in the blood flow of living brain tissues.

* fMRI (functional magnetic resonance imaging): measures the small changes in blood flow that occur with brain activity

** PET (positron-emission tomography): used to produce detailed 3-dimensional images of the inside of the body by using a very small dose of a radioactive tracers

*** NIRS (near-infrared spectroscopy): a spectroscopic method that uses the near-infrared region of the electromagnetic spectrum

□ The research team developed a NIRS system to monitor changes in cerebral hemodynamics and observed changes in cerebral hemodynamics during ketamine anesthesia. They observed that the relative concentration of oxidized hemoglobin (OHb) was closely related to changes in the state of consciousness in rats.

□ The pharmacokinetics of ketamine and the changes in cerebral hemodynamics observed in this experiment were physiologically consistent and confirmed that the concentration of oxidized hemoglobin was correlated to the amount of anesthesia.

□ Professor Jae Gwan Kim said, "This study shows that the change of consciousness during ketamine anesthesia can be observed through the hemodynamic change irrespective of EEG changes, suggesting the possibility of developing new anesthetic depth measurement technology."

◦ The first author, Dr. Jae-young Bae, is an anesthesiologist specialist in Donga University and is a PhD student in the GIST Department of Biomedical Science and Engineering.

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