Noninvasive device developed for rapid parathyroid detection during thyroid surgery

July 7 2023, by Zhang Nannan

The Parathyroid Detection System. Credit: Zhang Yang

Researchers from the Hefei Institutes of Physical Science of the Chinese Academy of Sciences have developed a fluorescence-based noninvasive detection device to allow for the rapid and non-invasive identification of parathyroid glands during thyroid surgery.

This device, called the Parathyroid Detection System (PTS), was developed by a collaborative team led by Prof. Liu Yong and Prof. Wang Yikun. Now it has received the official medical device registration certificate.

Thyroid nodules diagnosed by ultrasonography have become more common. Surgery intervention is the preferred treatment for thyroid cancer, but distinguishing the parathyroid gland from surrounding tissue during surgery is challenging. This increases the risk of damaging the parathyroid glands, leading to postoperative symptoms and even mortality. Therefore, there is an urgent need for rapid identification of parathyroid glands during surgery.

"We have been looking for a unique near-infrared fluorescence-based approach for parathyroid detection," said Zhang Yang, a member of the team, "Parathyroid tissue exhibits highly specific expression of a specific protein, resulting in autofluorescence, so we took advantage of this autofluorescence for rapid and non-invasive intraoperative detection of parathyroid glands."

Years of difficult research and development have resulted in the effective implementation of three key technologies: weak fluorescence detection, ambient light adjustment, and automatic noise reduction, as well as the construction of an optical device structure that provides

excellent optical performance and accuracy.

The developed parathyroid detector is a non-invasive identification technology that can detect fluorescence signals in parathyroid tissue and surrounding tissues during surgery. Based on the fluorescence signals, real-time analysis and feedback are provided to determine the result.

Clinical research has confirmed the important clinical value of this technology.

This clinical trial was conducted from February to March 2023 in the general surgery and thyroid surgery departments of two hospitals, and a total of 50 patients were enrolled based on the inclusion criteria. The combined statistical results from Clinical Center 1, Clinical Center 2, and the merged center showed that the PTS had sensitivities of 96%, 96%, and 96% for detecting parathyroid tissue in these three situations, respectively. The specificities for detecting non-parathyroid tissue were 100%, 100%, and 100% in the respective situations.

These results indicate that the PTS has a high diagnostic accuracy. In addition, no adverse events were observed throughout the study, demonstrating a high level of safety.

The PTS is expected to improve surgical efficiency and reduce surgical risks and assist surgeons, according to the team.

Provided by Chinese Academy of Sciences