A novel wearable fluorescence surgical navigation system for segmentectomy

Kunshan He[1], Chongwei Chi[1], Yamin Mao[1], Xiuyuan Chen[2], Hao Li[2], Jian Zhou[2], Fan Yang[2], Jie Tian[1]

[1] Key Laboratory of Molecular Imaging, Chinese Academy of Sciences, Beijing, China;
[2] Peking University People's Hospital, Beijing, China;

Introduction: Optical molecular imaging is a new in-vivo and real-time imaging technology, which can truly reflect the expression of a gene or the biological characteristics of a macromolecular, and dynamically record and display molecular events and their dynamic processes. Molecular imaging technology can, on the one hand, precisely locate the embedded tumor, realize the complete resection of the tumor and reduce the unnecessary damage to normal tissues and organs;On the other hand, it can greatly shorten the time of drug development, screening and pre-clinical research.However, the existing molecular imaging system is relatively complex and difficult to operate, which needs further improvement in practical performance and design. So we developed a novel wearable fluorescence surgical navigation system and conducted a preclinical trial of pulmonary segmentectomy in swine.

Methods: The new fluorescent image-guided system comprised a multi-spectral light transceiver configured to transmit a multi-spectral light to a detected subject in a detection region and acquire an emitting light regarding the detected subject, transmit a visible light to the detected subject and acquire a reflecting light regarding the detected subject ; an image processor configured to receive the reflecting light and the emitting light from the multi-spectral light transceiver, execute a three-dimensional reconstruction and fusion process on the reflecting light and the emitting light to obtain a fusion image; a wireless signal processor configured to enable a wireless communication; and a wearable device, configured to receive the fusion image from the image processor via the wireless signal processor, display the fusion image and control the multi-spectral light transceiver and the image processor based on instructions received. The system may achieve an intelligent operation and extend its application fields.