

Fluorescence-guided visualization of pancreatic neuroendocrine tumor borders

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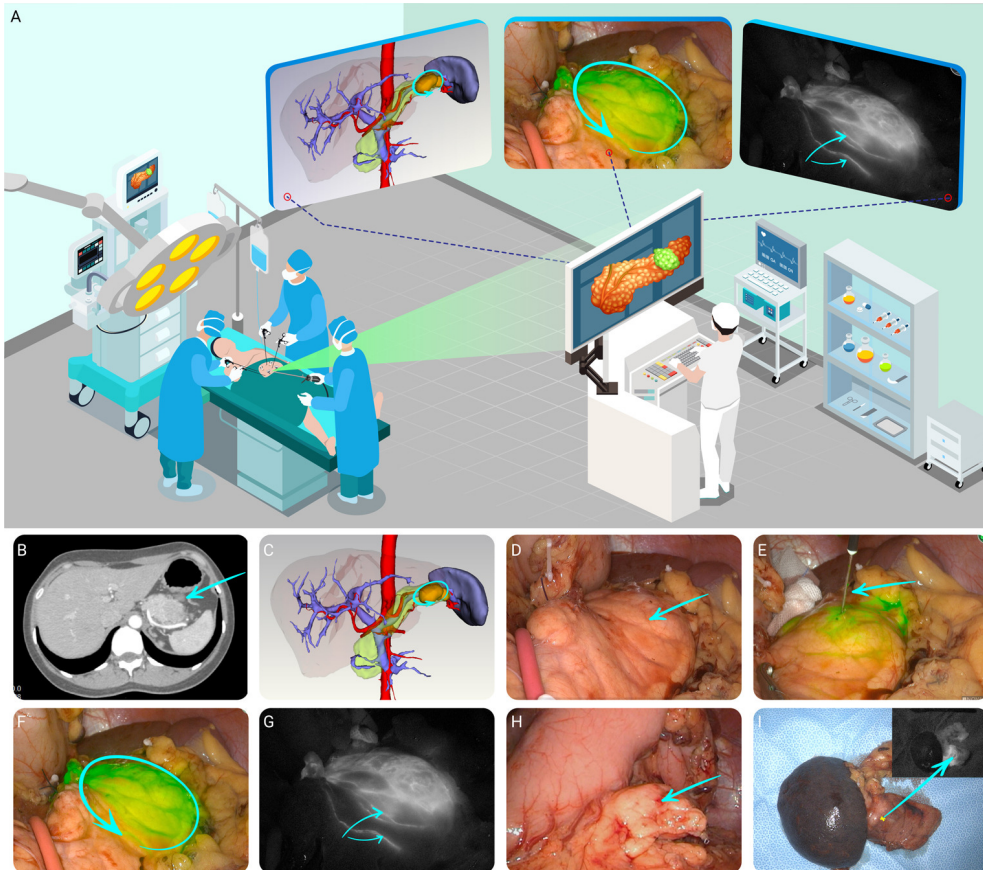


Figure 1. The visualization of pancreatic tumor and peripheral lymphatic vessels by fluorescence (A) Scenarios of fluorescence technique navigation in pancreatic tumour surgery (B) Preoperative CT examination revealed a 32.1 mm × 28.1 mm tumor located in the tail of pancreas (arrows) (C) Preoperative evaluation of pancreatic tumor was performed by 3D visualization (D) The location of the tumor was initially determined by intraoperative exploration (E) The tumor was injected with ICG using a puncture needle (arrows) (F) Precise display of pancreatic tumor border in green fluorescence mode (G) Magnified black-white fluorescence mode for precise visualization of lymphatic vessels (arrows) (H) Radical resection of pancreatic tumor (arrows) (I) Pancreatic tumor specimen (arrows).

Diverse modes of fluoroscopy offer the potential to more accurately determine the location, size and extent of pNETs, as well as the morphology of the surrounding lymphatic vessels. This capacity contributes to enhanced surgical precision and effectiveness, presenting an innovative approach previously unexplored. Notably, the intraoperative puncture for ICG injection into the pancreatic tumor has been demonstrated to be safe and devoid of adverse effects. Nevertheless, we acknowledge the limitations intrinsic to this study, given its retrospective nature. To expand on these findings, we propose prospective studies with larger sample sizes to provide a more rigorous validation of the clinical utility of fluorescence imaging in the context of pancreatic tumor resection.

Pancreatic neuroendocrine tumors (pNETs) represent a rare subset of neoplasms, accounting for only 1%-5% of all pancreatic neoplasms, yet exhibiting a consistent rise in incidence rates over the years.^{1,2} However, the surgical management of pNETs remains inadequately explored, presenting significant challenges for surgeons.³ The application of indocyanine green (ICG) fluorescence imaging technology holds the promise of enhancing surgical visibility and precision (Figure 1A).

In this report, we present the case of a 39-year-old woman who was admitted to the hospital with a confirmed diagnosis of pNETs. Preoperative CT examination identified a 32.1 mm × 28.1 mm tumor located in the tail of pancreas (Figure 1B). The initial diagnosis indicated pNETs with clear surgical indications. To facilitate precise surgical planning, a three-dimensional model was constructed before surgery. This model enabled an accurate assessment of the tumor's location, size and scope (Figure 1C). However, the intraoperative determination of the tumor's size and extent proved challenging (Figure 1D). To improve the radical resection rate of pNETs, intraoperative puncture of pNETs with ICG injection was performed (Figure 1E). This approach allowed for the visualization of the tumor border and lymphatic vessels (Figures 1F-G), guiding the radical resection of the pancreatic tumor based on fluoroscopic imaging (Figures 1H-I).

ETHICAL STATEMENT

The informed consent had been obtained from the patient for fluorescent-guided surgical procedure.

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DECLARATION OF INTERESTS

The authors declare no competing interests.