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Research Article

Laparoscopic Partial Duodenectomy Using Fluorescent Clip Marking with Endoscopic Ultrasound and Virtual Reality Holographic Guidance for Gastrointestinal Stromal Tumors

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1. Background

Laparoscopic partial duodenectomy for gastrointestinal submucosal tumors (GISTs) is a rare and unestablished procedure. The varied reconstruction methods depend on the location and the extent of resection, make laparoscopic surgery difficult and the intraoperative identification of tumor is important [1, 2].

2. Methods

This duodenal GIST case exhibited an intraluminal growth pattern. Fluorescent clip marking (FCM) with a Zeoclip FS (Zeon Medical, Tokyo, Japan) with built-in near-infrared fluorescent resins along with holographic guidance (HG) using virtual reality techniques were used to locate the tumors [3, 4]. Preoperative FCM was performed under endoscopic ultrasound. Surgery and fluorescence observation were performed with VISERA ELITE II. For HG, three-dimensional anatomical images created from computed tomography using synapse VINCENT were downloaded to Meta Quest 2 (Meta Platforms, Inc., Menlo Park, USA) using the Holoeyes service (Holoeyes, Inc., Tokyo, Japan).

3. Results

FCM revealed the precise tumor location. Preoperative HG intuitively revealed the tumor location between the descending and transverse duodenal sections. While viewing the tumor location using FCM, the duodenum was transected without an intraoperative gastroscope on the anorectal side of the pancreatic head and duodenojejunostomy was performed as per the preoperative planning.

4. Conclusions

Preoperative understanding of the tumor location in relation to the surrounding organs was important in preparing for the specific surgery. HG was useful for the preoperative simulation. FCM was useful for the duodenal tumor, similar to gastric and colorectal cancers [3, 4]. However, intraoperative visualization of the biliary tract, such as fluorescent cholangiography, is important for tumors more closer to the vater's papillae.

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Declarations of Interest

None.

Informed Consent

Written informed consent was obtained from the patient for publication of this study.

Data Availability

The data that support the findings of this study are available from the corresponding author upon request.

VIDEO 1: Preoperative virtual reality holographic guidance. See Video

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