

Department of Endoscopy

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General Summary

Our main area of research is performing clinical studies of endoscopy for the diagnosis and treatment of gastrointestinal (GI), hepatobiliary, and pancreatic diseases. In addition, we perform basic research to develop novel instrumentation, methods of image processing and analysis, and optical apparatuses, such as autofluorescence imaging (AFI), narrow-band imaging (NBI), endocytoscopy, confocal laser endomicroscopy, and therapeutic endoscopy with a high degree of procedural freedom. Our published research outcomes and recent reports are summarized below.

Research Activities

Pharyngeal, esophageal, gastric, duodenal, and colonic malignancies

1. Endoscopic diagnosis of neoplasia in the GI tract

Early detection and accurate diagnosis of premalignant and malignant lesions in the GI tract are essential for selecting the most appropriate therapeutic strategy for each patient. To evaluate these patients, we use several novel optical technologies, along with conventional white-light endoscopy. We have designed a series of prospective clinical studies to evaluate and validate these novel imaging technologies and their potential benefits.

a) Magnifying endoscopic observation with an NBI system

This new diagnostic system consists of a magnifying ($\times 90$) endoscope and an NBI light source and provides detailed morphological information about the capillaries on the mucosal surface of neoplastic lesions. We are investigating the clinical utility of NBI-magnifying endoscopy for identifying superficial neoplasms and developing algorithms that would allow the histological type and tumor extent of GI tract neoplasia to be determined. On the basis of our findings with magnified NBI, we have developed a novel classification system for gastric cancer and demonstrated, in a prospective study, its advantages over the conventional diagnostic system. We also joined a multicenter study of NBI-magnifying endoscopy for detecting superficial carcinomas of the pharynx and esophagus. Accurate preoperative evaluation of the depth of invasion into the submucosal layer is essential for appropriate decision-making and for determining the optimal therapeutic strategy for patients with colonic lesions. To maximize diagnostic accuracy, we use this magnifying endoscope with NBI and crystal-violet staining. Results of these studies have been reported at several conferences and have been published in several English-language journals.

b) Confocal laser endomicroscopy

We introduced confocal laser endomicroscopy, which provides subsurface imaging of the

GI walls with image quality equivalent to that of bench confocal microscopy. We have joined an international multicenter study to assess the advantages of the confocal laser endomicroscopy over conventional endoscopy for differentiating gastric neoplasia from nonneoplastic mucosa. The results were reported at international meetings and published in an internationally renowned scientific journal.

2. Endoscopic treatment of esophageal, gastric, and colonic malignancies

Recent advances in endoscopic diagnostic techniques and instrumentation have led to the expansion of indications for endoscopic therapy in patients with GI tract carcinomas. We now perform endoscopic submucosal dissection (ESD) for superficial neoplasms of the esophagus, stomach, and colon. En bloc resection with ESD is considered necessary to further develop endoscopic treatment. Successful development of a series of endoscopic knife traction devices and submucosal injection fluids reduced the technical difficulty of ESD and the risk of complications.

3. Diagnosis and treatment of oropharyngeal and hypopharyngeal malignancies

Detecting cancer at an early stage is important. We have found that, in combination with the NBI system, magnifying endoscopy has allowed hard-to-find cancers to be detected during their early stages, without the need for Lugol chromoendoscopy. In collaboration with the department of otorhinolaryngology, we introduced endoscopic removal of early-stage cancers in this area and are evaluating clinical outcomes.

Enteroscopy

1. Diagnostic techniques

Capsule endoscopy is a breakthrough modality that can be used to detect lesions in parts of the small intestine that are inaccessible with an ordinary endoscope system. However, because capsule endoscopy is purely diagnostic, we have introduced single-balloon enteroscopy, which allows biopsy and hemostasis to be performed for hemorrhagic lesions of the small intestine.

Pancreatobiliary endoscopy

1. Diagnosis of biliary and pancreatic diseases

The establishment of a standardized, systematic diagnostic algorithm for biliary and pancreatic diseases are extremely important. We are comparing the diagnostic accuracy for hepatopancreatic diseases of endoscopic ultrasound-guided fine needle aspiration biopsy, multidetector-row computed tomography, magnetic resonance cholangiopancreatography, and endoscopic retrograde cholangiopancreatography. We are developing new diagnostic markers for pancreatic carcinoma and a system for their measurement. We will be applying these markers to the differential and prognostic diagnosis of pancreatic carcinoma with specimens obtained with endoscopic ultrasound-guided fine needle aspiration biopsy.

Publications

Furuhashi H, Ohya TR, Matsui H, Sumiyama K. A novel diathermy knife with suction function capable of keeping clear visibility while controlling bleeding. *VideoGIE*. 2019 Apr 5; **4**(5): 197-199. doi: 10.1016/j.vgie.

2019.02.001. PMID: 31061936; PMCID: PMC6494991.

Horiuchi H, Tamai N, Kamba S, Inomata H, Ohya TR, Sumiyama K. Real-time computer-aided diagnosis of diminutive rectosigmoid polyps using an auto-fluorescence imaging system and novel color intensity analysis software. *Scand J Gastroenterol.* 2019 Jun; **54**(6): 800-805. doi: 10.1080/00365521.2019.1627407. Epub 2019 Jun 14. PMID: 31195905.

Ide D, Saito S, Ohya TR, Nishikawa Y, Horie Y, Yasue C, Chino A, Igarashi M, Saruta M, Fujisaki J. Colorectal endoscopic submucosal dissection can be efficiently performed by a trainee with use of a simple traction device and expert supervision. *Endosc Int Open.* 2019 Jun; **7**(6): E824-E832. doi: 10.1055/a-0901-7113. Epub 2019 Jun 12. PMID: 31198847; PMCID: PMC6561769.

Goda K, Dobashi A, Yoshimura N, Hara Y, Tamai N, Sumiyama K, Ikegami M, Tajiri H. Dye solution optimizing staining conditions for *in vivo* endocytoscopy for normal villi and superficial epithelial tumors in the duodenum. *Ann Gastroenterol.* 2019 Jul-Aug; **32**(4): 378-386. doi: 10.20524/aog.2019.0382. Epub 2019 May 10. PMID: 31263360; PMCID: PMC6595928.

Dobashi A, Storm AC, Wong Kee Song LM, Deters JL, Miller CA, Tholen CJ, Gostout CJ, Rajan E. An internal magnet traction device reduces procedure time for endoscopic submucosal dissection by expert and non-expert endoscopists: ex vivo study in a porcine colorectal model (with video). *Surg Endosc.* 2019 Aug; **33**(8): 2696-2703. doi: 10.1007/s00464-019-06817-8. Epub 2019 May 8. PMID: 31069502.

Emura F, Sharma P, Arantes V, Cerisoli C, Parra-Blanco A, Sumiyama K, Araya R, Sobrino S, Chiu P, Matsuda K, Gonzalez R, Fujishiro M, Tajiri H. Principles and practice to facilitate complete photodocumentation of the upper gastrointestinal tract: World Endoscopy Organization position statement. *Dig Endosc.* 2020 Jan; **32**(2): 168-179. doi: 10.1111/den.13530. Epub 2019 Nov 6. PMID: 31529547.

Furukawa K, Onda S, Hamura R, Taniai T, Marukuchi R, Shiba H, Tsukinaga S, Sumiyama K, Yanaga K. Predictive Factors and Surgical Outcomes of Stent Dysfunction After Preoperative Endoscopic Biliary Stenting in Patients Who Underwent Pancreaticoduodenectomy. *J Laparoendosc Adv Surg Tech A.* 2020 Mar; **30**(3): 256-259. doi: 10.1089/lap.2019.0666. Epub 2020 Jan 27. PMID: 31985342.

Reviews and Books

Kato M. Endoscopic Therapy for Acute Diverticular Bleeding. *Clin Endosc.* 2019 Sep; **52**(5): 419-425. doi: 10.5946/ce.2019.078. Epub 2019 Aug 20. PMID: 31426626; PMCID: PMC6785408.