Future expectations in GI endoscopy : competition with other novel surgical and diagnostic techniques

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Remarkable developments have occurred in the field of endoscopy over the past 40 years. The era that began with the fiberoptic endoscope has now moved to the videoscope and, more recently, to the capsule endoscope (CE). Digestive endoscopy has been evolving from primary diagnosis to extensive therapeutic approaches in the management of gastrointestinal diseases.

For the endoscopic imaging, various technologies such as point enhancement, e.g., confocal endomicroscopy, field enhancement such as chromoendoscopy NBI and FICE, endoscopic ultrasound (EUS), virtual colonoscopy or CT/MR colonography and enterography, single or double balloon enteroscopy and CE have been developed.

EUS has been established as a valuable diagnostic modality as it offers high-resolution imaging and fineneedle biopsy, which is essential in detecting and staging malignancies and future personalized targeted cancer therapy. Since the introduction of EUS-guided fine needle aspiration (EUS-FNA) in 1992, numerous novel interventions and techniques have emerged. Currently, established interventional EUS techniques include celiac plexus block and neurolysis for pain control, drainage of pancreatic pseudocysts, and implantation of fiducial markers and radioactive seeds into the malignant tumors. Emerging EUS-guided experimental techniques include antitumor injection, ablation of tumors, and vascular access. Diagnostic and therapeutic access to the biliary tree and pancreatic duct is increasingly being used for failed ERCP procedures or inaccessible ducts. Interventional EUS is a very promising technique with many potential applications. The future holds promise for substantial progress in EUS-guided therapeutic interventions and their applications in clinical gastroenterology.

CE that was launched 10 years ago has become a first-line procedure for examining the small bowel, especially in the case of obscure gastrointestinal bleeding. More recently, CE has been adapted for examining the colon, opening up larger perspectives for colorectal cancer screening or colon examination. Other new developments, including remote magnetic manipulation, power management, drug delivery capsule, microbiopsy capsule, and adaptation of technologies such as chromoendoscopy, are sure to enhance the capabilities of wireless endoscopy in gastrointestinal disorders

For the therapeutic endoscopic procedures, endoluminal surgery such as endoscopic mucosal resection(EMR), endoscopic submucosal dissection(ESD), endoscopic myotomy and endoscopic submucosal tumor resection, Natural Orifice Transluminal Endoscopic Surgery (NOTES) and LaparoEndoscopic Single Site(LESS) surgery, etc. have been also emerged.

Endoluminal surgery has been widely accepted as a standard procedure for the precancerous and very early

stage of cancer lesions within the range of indication. With the advances of imaging technologies and governmental screening program, the detection rate at precancerous or early stage of gastric or colon cancer has been increased remarkably in Korea. The patients performing endoluminal surgery for the gastric cancer will exceed the number of patients underwent surgical gastrectomy in the near future.

NOTES has ushered in a new era in flexible endoscopy. NOTES proposes the possibility of less-invasive, incisionless surgery. Initially conceived to replace abdominal procedures, recently interest has also focused on mediastinal and thoracic procedures as possible logical applications of transluminal approaches. Despite these encouraging initial efforts significant obstacles to widespread acceptance of NOTES as a surgical option persist. Moreover, due to the well-documented safety and efficacy of laparoscopic techniques, the question remains as to the best candidate NOTES procedure. Presently, interest has shifted from true NOTES to hybrid procedures and single incision laparoscopic surgery. Additionally, there is also a growing awareness of the potential applications of natural orifice surgery techniques to the present field of therapeutic endoscopy. Research into transluminal access and closure has born several techniques and devices that are now being explored in endoscopic procedures such as full-thickness resection, endoscopic myotomy, direct endoscopic pancreatic necrosectomy and bariatric endoscopy. These NOTES "spin-off" procedures will be more expanding the armamentarium of today's therapeutic endoscopists, and they will play a significant role in the evolution of therapeutic endoscopy in the future.

Various new therapeutic procedures will emerge, however these new approaches will need to compete with related traditional, established techniques, like as NOTES will need to compete with advances in laparoscopic techniques. It remains to be seen whether any of these future developments will prove their clinical utility over standard methods in terms of safety, efficacy and convenience for the patients, simplicity for the doctors, and cost benefit advantages. We should consider that health administrators faced with escalating medical costs will demand that new and more expensive procedures not only facilitate patient care but result in superior health outcomes. Balancing between gorgeous handskill of magician in endoscopic surgical field and imaginary world of engineering field during the development is also important to put the novel medical devices to practical use.