Review Article

Recent advances in endoscopic management of gastrointestinal cancers

Maria Grazia Mancino[1], Marco Bianchi[2], Virginia Festa[2], Maurizio Koch[2], Angelo Dezi[2]

[1]Medical Department, Endoscopy Unit, Santa Maria Nuova Hospital, Florence, Italy; [2]Division of Gastroenterology, San Filippo Neri Hospital, Rome, Italy

Correspondence to: Mancino Maria Grazia. Endoscopy Unit, Santa Maria Nuova Hospital, Piazza Santa Maria Nuova 1, 50122, Florence, Italy. Email: maria_mancino@yahoo.it.

Abstract: Thanks to recently developed technologies, endoscopy is gaining an increasingly important role in the management of gastrointestinal (GI) tumors. Recent advances are very important for both the diagnosis and therapy of GI cancers resulting in a minor role for other approaches such as radiology or surgery. Patients submitted to endoscopic management of GI tumors receive great benefits avoiding major surgery and performing more targeted therapies. The development of new endoscopic platforms and devices led to new techniques such as natural orifice transluminal endoscopic surgery technique (NOTES), peroral endoscopic myotomy (POEM), endoscopic ultrasonography (EUS)-guided therapy, endobiliary radiofrequency ablation (RFA), *etc.* that offer alternative options to traditional therapy when performed by highly skilled and experienced endoscopists. This review will deal with the illustration of the most important recent findings in the field of diagnostic and therapeutic endoscopy of GI tumors both in animal models as well as in humans.

Keywords: Therapeutic endoscopy; gastrointestinal (GI) tumors; endoscopic innovations

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Introduction

Endoscopy was developed in the 19th century although numerous attempts were made previously for the exploration of hidden cavities in the human body. Since its introduction, endoscopy has gained more impact in the clinical setting as a consequence of technological improvement. At the beginning, a challenge was to find a safe source of light that did not damage tissue by generating heat. The first gastroscopy was performed in 1868. Later on, Thomas Edison solved the light problem but it was only after 30 years that the light source was fitted into endoscopes. The semi-flexible gastroscope was created by Wolf, a fabricator of medical instruments, and Schindler, a physician, around 1930 (1). In 1954 Hopkins generated a prototype of flexible fibre imaging device (2). In 1958, Basil Hirschowitz and Larry Curtiss built the flexible fiberoptic endoscope thanks to highly transparent optical quality glass (3). The creation of an electronic image that soon became digital led to the invention of an interface between endoscope and computer. From the development of fiberoptics the improvements that have occurred in equipment have transformed the field of gastroenterology. Endoscopic innovations derive from the explosion of technical achievements through the interaction between physicians and artisan-engineers and the incorporation of technology from other fields. One of the greatest technical development, was the discovery of endoscopic ultrasonography (EUS) in the 80s (4). By combining ultrasonography and endoscopy the endoscopic diagnosis completely changed. Digestive endoscopy, including endoscopic ultrasound, plays actually an important role in oncology regarding early diagnosis, tumor staging, and therapeutic procedures (*Table 1*). Indeed, improvement of endoscope and dedicated accessories allows increasing applications of therapeutic endoscopy in oncologic

Table 1 New diagnostic and therapeutic endoscopic techniques

New diagnostic endoscopic techniques	New therapeutic endoscopic techniques
Narrow band imaging/confocal laser endomicroscopy	Natural orifice transluminal endoscopic surgery
Endoscopic ultrasound/EUS-FNA	Submucosal tunnelling/POEM
Tumor suck ligate unroof biopsy/single-incision needle-knife biopsy	EUS-guided therapy
Full-spectrum view colonoscopies*	Radiofrequency ablation
Radio-controlled, motor-driven capsule*	Endoscopic full-thickness resection

Abbreviations: *, to be validated; EUS, endoscopic ultrasonography; POEM, peroral endoscopic myotomy; EUS-FNA, EUS-guided fine needle aspiration.

indications: curative resection of early carcinoma and submucosa tumor and palliative treatment of tumoral bilio-digestive obstruction. The possibility to resect sessile or flat polyps allows us to treat curatively well-differentiated carcinoma without infiltration of the muscularis mucosae, with the risk of invasion of lymph nodes being null in these cases. In case of invasion of muscularis mucosae, this risk is inferior to 1% for colorectal cancer when submucosal invasion does not exceed 1,000 microm, but this risk is between 6% and 22% in case of esophagogastric carcinoma invading the third part of the submucosa (5). The mortality of endoscopic resection was null in almost all published series. Morbidity was 15-20% for colorectal resection with 5-6% of severe complications and up to 23% after esophageal tumor ablation (5). Moreover, improvement of echoendoscope dedicated to therapeutic procedures allows from now to achieve non-anatomic pancreatic or biliary drainage through the gastric wall when the retrograde route is not suitable (whipple resection, duodenal stricture) or when drainage of the left hepatic lobe is difficult via the retrograde approach (6). A new technique was able to realize an anastomosis between the left hepatic duct and the stomach by the insertion of one or two stents. The efficacy and safety of this procedure were recently retrospectively evaluated with a technical success in 91% of the cases. Therapeutic endoscopy made many progress during the last years and development of new generation of endoscope and accessories would allow a real endoluminal surgical approach for superficial tumor, bilio-digestive anastomosis or gastro-enteroanastomosis. In addition the development of technologies based on light-tissue interactions [e.g., narrow band imaging (NBI)], computer aided diagnosis, injection pharmacotherapy (with particular reference to EUS-guided injection), photodynamic diagnosis and therapy have made endoscopy a keystone in modern gastroenterology.

New technology in the diagnosis of gastrointestinal (GI) cancers

Confocal laser endomicroscopy (CLE)

Since endoscopes can go everywhere but cannot see everything while microscopes can see everything but cannot reach every place, a new technology called CLE was introduced in 2004 (7). This is a novel endoscopic imaging technique that allows for instant *in vivo* histology during ongoing endoscopy. Two probe devices are actually approved, one is integrated into the distal tip of a high-resolution endoscope (iCLE; Pentax, Tokyo, Japan) and the other is a standalone probe, which is introduced through the instrument channel of standard endoscopes (pCLE; Cellvizio, Mauna Kea Technologies, Paris, France). Once the suspect area is seen, the operator put the probe in contact with the mucus thus performing an "optic biopsy". Thus, thanks to light property it could be not mandatory to take a sample for histology or cytology saving time and the risk of false negatives and seeding. The end-result images, in fact, are approximately a 1,000-fold magnification of *in vivo* tissue (8-10). One of the major limitations of CLE is that it only covers a limited field within the mucosa rendering a pan-endomicroscopy of the GI tract virtually impossible, so this technique is used more to perform targeted biopsy. CLE also allows us to choose the best treatment immediately, to correctly identify lesions margins, and to follow-up treatment response (8-10). Multiple high-quality studies evaluated the role of CLE; all these studies demonstrated that CLE was able to distinguish between normal tissue and regenerative or neoplastic tissue with very high accuracy (8-11). CLE is well established in most recent guidelines as an excellent choice for dysplasia surveillance in patients with UC instead of random biopsy with a considerable cost saving (12-15). However, the procedure tends to be time-consuming and the operational equipment is costly. Furthermore, it requires additional training and there is also a medical-legal issue in the endoscopists making a histological diagnosis without confirmation by a pathologist.

Narrow band imaging (NBI)

NBI utilizes green and blue light to enhance blood vessels and consequently tumour lesions that are more vascularized. NBI allows to correctly identifying lesions margins that cannot be seen so clearly by standards endoscopes. Recently a multicenter randomized controlled trial showed that NBI improves the detection of subtle gastric lesions (e.g., early gastric cancer or dysplastic lesions) and intestinal metaplasia compared with white light endoscopy WLE (16). This study suggested that NBI could open new screening for gastric cancer. Another challenge is the detection of flat dysplasia in Barrett's esophagus. Dysplasia is difficult to detect showing a similar appearance to nondysplastic mucosa on WLE, and therefore random biopsy sampling is currently recommended. A recent meta-analysis provided evidence for the use of advanced imaging in Barrett's esophagus surveillance (17) suggesting that newer imaging modalities could help target biopsies to evaluate for dysplasia.

Another challenge is to improve the adenoma detection rate of the endoscopist in screening colonoscopy thus reducing the risk of interval cancer. With the discovery of the serrated adenoma pathway, it would be important that endoscopists would be able to adequately identify these precancerous polyps. Kumar *et al*. (18) found that sessile serrated adenomas were more likely to resemble adenomas on NBI features than were hyperplastic polyps (odds ratio 0.84 *vs*. 0.59) and concluded that NBI optical biopsy eliminate misclassification of these high risk polyps as hyperplastic polyps.

Low coherence-enhanced backscattering spectroscopy freestanding fiberoptic probe

Colonoscopy as a colorectal cancer screening technique is not efficient given the low prevalence of advanced adenomas. Recent findings could make colorectal screening program more cost-effective allowing the identification of patients who are at a high risk of adenomas. Microvascular blood content is increased in early carcinogenesis and is a robust marker of field carcinogenesis in humans. Rectal mucosal microvasculature endoscopic increased blood supply (EIBS) is altered in patients harboring advanced adenomas elsewhere in the colon (*Figure 1*) (19). The quantitative measurement of mucosal microvasculature is feasible *in vivo* by a 2 mm fiberoptic probe that can be used either as an endoscopically compatible device or a stand-alone device for detection of EIBS in rectal mucosa (19). Roy *et al*. (20) recently confirmed a robust performance of this minimally invasive test in the identification of patients with colon polyps allowing risk-stratification of patients for screening colonoscopy.

Full-spectrum view colonoscopies

The most important problem in colonoscopy is the adenoma detection rate because a lesion could lie behind folds. A new colonoscope was introduced this year to increase the adenoma detection rate thanks to its ability to see behind folds. It is called the PeerScope (PeerMedical Ltd, Caesarea, Israel) (21). It maintains the standard features of a colonoscope but has two viewing modes: a 160-degree forward-viewing mode and a 330-degree or greater full-spectrum view. Recent data suggest that it is functionally comparable to standard colonoscopes, but further studies are needed to assess the improvement of the adenoma detection rate.

Radio-controlled motor-driven capsule

The ability to screen the GI tract in a non-invasive way is another important challenge. To this purpose, a new capsule technology able to control both the direction and transit speed resulting in a more adequate visualization of the GI tract was introduced this year (radio-controlled motor-driven capsule) (22). The device was tested on dogs showing adequate maneuverability but some difficulties exist in maintaining its position with peristalsis and postural changes and a limited life battery and poor motor force. Nevertheless the evaluation of the stomach and colon was feasible. If refined the remote-control capsule system will increase the ability to screen the GI tract without invasion.

Endoscopic ultrasound (EUS)

With the advent of EUS, new frontiers in GI tumors diagnosis were gained. By combining endoscopy and ultrasound an accurate stadiation of GI cancer was possible and thanks to linear echoendoscope also tissue sampling was possible. Recently, the use of contrast enhanced imaging and elastography increased the diagnostic performance of EUS. At the same time the role of other techniques such as

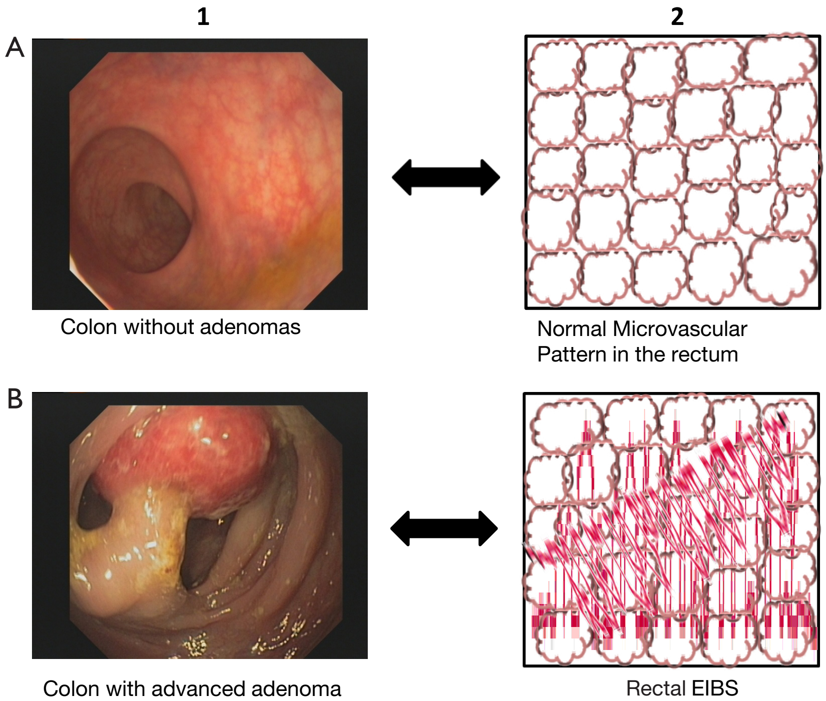

Figure 1 Increased nanoscale disorder of rectal histologically normal colonocytes is a marker of adenomas located elsewhere in the colon and could help colon cancer screening eliminating the need for total colonoscopy. Field carcinogenesis has manifestations at a number of levels of tissue physiology and morphology that are not detectable by means of either standard endoscopy (A1) or histopathology. These manifestations include alterations in mucosal microvasculature (e.g., EIBS, B2) detectable with a fiberoptic polarization-gated spectroscopy probe. Fracta dimension of rectal mucosal microarchitecture is altered in patients harboring advanced adenomas elsewhere in the colon (B2). Patients with adenomas removed on a prior colonoscopy but with no concurrent adenomas have insignificantly elevated EIBS marker compared with patients with no prior history and no concurrent adenomas, whereas patients with both prior history and concurrent adenomas had significantly elevated EIBS marker. A fiberoptic probe for quantitative measurement of mucosal microvasculature (e.g., EIBS) is about 2 mm in diameter and can be used either as an endoscopically compatible device or a stand-alone device for detection of EIBS in rectal mucosa enabling colon cancer screening.

the radiologic approaches and even endoscopic retrograde cholangiopancreatography (ERCP) progressively declined. EUS has been established as a valuable diagnostic modality in detecting and staging malignancies. In addition EUS-guided fine needle aspiration (EUS-FNA) is routinely used for the evaluation of pancreatic masses. Recently Wani *et al*. (23) showed that EUS-FNA diagnostic yield of pancreatic masses is improved by the presence of an on-site cytopathologist. EUS is also employed for the evaluation of pancreatic cystic lesions that have a poorly understood natural history and a controversial management. Regarding this latter in 2012 the International Association of Pancreatology published modified consensus guidelines (e.g., modified Sendai guidelines), for the management of intraductal papillary mucinous neoplasms and mucinous cystic neoplasms. Two studies attempting to validate the Sendai guidelines performing EUS produced conflicting conclusions. The first by Palta *et al*. (24) concluded that the EUS findings of Sendai guidelines lack sensitivity for the detection of malignancy in pancreatic cystic neoplasms. The second study (25) concluded that the patients with "high-risk" features as defined by the Sendai guidelines (jaundice, pancreatic duct ≥5 mm in diameter, cyst ≥30 mm in size, and the presence of a mural nodule), have a high rate of the development of pancreatic cancer. These two studies produced conflicting conclusions and new data are needed.

Single-incision needle-knife (SINK) biopsy

The diagnostic ability of EUS-FNA is often limited by insufficient tissue for immunohistochemistry. Additional experiences with established endoscopic techniques to obtain tissue in submucosal tumors of the stomach were recently reported. De la Serna *et al*. (26) evaluated the role of SINK biopsy for histopathological examination of gastric subepithelial tumors. The lesions first underwent EUS for evaluation of size and morphological characteristics. A pulsed Doppler scan was performed to scan for blood vessels in the area of the tumor. A 6- to 12- mm linear incision was made on the highest protrusion of the subepithelial tumor using a needle-knife. A regular biopsy forceps was introduced through this incision to obtain 3 to 5 biopsy bites for histopathological evaluation. Prophylactic clips were placed over the incision only in the first patients. SINK biopsy was diagnostic in 93% while FNA was diagnostic in only 12.5% of the patients, the authors concluded that SINK biopsy is easy and safe, has a high histological yield and may represent a reliable alternative to EUS-FNA in smaller subepithelial lesions.

Tumor suck ligate unroof biopsy

Another technique to diagnose and treat small subepithelial lesions was described in 16 patients by Binmoeller *et al*. (27). This approach involves the suction of the lesion into a cap, ligation below the tumor, unroofing of the mucosa overlying the subepithelial tumor with a needle-knife, and biopsies from exposed tumor suck ligate unroof biopsy. One patient suffered of abdominal pain. No other adverse events were noted. This pilot study shows that this new technique may be safe and effective in obtaining sufficient tissue for immunohistochemistry.

New technology in therapy of GI cancers

Natural orifice transluminal endoscopic surgery technique (NOTES)

Pure NOTES has attracted great interest from both surgeons and gastroenterologists. For this reason, in 2005 the American Society for Gastrointestinal Endoscopy (ASGE) and the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) came together in the Natural Orifice Surgery Consortium for Assessment and Research (NOSCAR). This minimally invasive surgery can be performed with an endoscope passed through a natural orifice (e.g., mouth, anus) then through an internal incision in the stomach, vagina, bladder or colon, thus completely eliminating the need for skin incision. Potential main advantages of NOTES include lower anaesthesia requirements, faster recovery and shorter hospital stays, avoidance of the potential complications of transabdominal wound infections, better postoperative pulmonary and diaphragmatic function. Critics challenge the safety and advantages of this technique in the face of effective minimally invasive surgical options such as laparoscopic surgery. NOTES was originally performed in animals by researchers at Johns Hopkins University and was recently used for transgastric appendectomy in humans (28). In 2007 Swanstrom and colleagues reported the first human transgastric cholecystectomy (29). In the last years, NOTES has ranged from diagnostic explorations of the peritoneal cavity to complex organ resections including pancreatectomy, splenectomy, cholecystectomy and nephrectomy. Technologies growing from the concept of NOTES may resolve an array of challenges currently associated with endoscopic surgery and flexible endoscopy. The feasibility of endoscopic transgastric gastrojejunostomy (30) and pure NOTES rectosigmoidectomy using transgastric endoscopic inferior mesenteric artery (IMA) dissection and transanal rectal mobilization were showed feasible in animal models (31). To improve NOTES a critical need is the ability to triangulate. This year the Endomina system (MEDI-LINE SA, Liege, Belgium), a new universal triangulation platform adaptable to a flexible endoscope was created to allow an easier endoscopic submucosal dissection (ESD) by lift and cut and oppose and suture tissue (32). The system has been tested in animal models, and recently in humans. In addition, a wireless tissue palpation system for tactile and kinaesthetic feedback created a mechanical link between the external platform and the target region (33). Finally an endoscopic suturing device, capable of performing interrupted or continuous sutures by using a double-channel endoscope (Overstitch, Apollo Endosurgery, Austin, TX, USA), has been tested in humans to close large mucosal defects after ESD eliminating the need for hospital admission with encouraging results (34).

Submucosal tunneling

The development of peroral endoscopic myotomy (POEM) has opened up a new discipline of submucosal endoscopic surgery. With this approach, there is feasibility of removing submucosal tumors arising from the muscularis propria by using the submucosal tunneling technique. Several studies suggest that by using the submucosal tunneling technique it's feasible to remove submucosal tumors arising from the muscularis propria such as tumors at the esophagogastric (EG) junction. A preliminary study (35) has shown a 100% successful en bloc resection of the EG junction for leiomyomas or GI stromal tumors with the submucosal tunneling technique (negative lateral and deep tumor-free margins in all cases). The technique was showed safe (the only complication was pneumothorax in two patients treated by chest tubes) and there was no local recurrence or distant metastases during 12 months follow-up. These results were confirmed by another study described tunneling to resect submucosal tumors in 151 consecutive patients with GI stromal tumors and leiomyomas, mostly located in the esophagus or EG junction (36). The en bloc resection rate was 86% with complete R0 resection in 83% and an adverse event rate of 35.5% (pneumothorax subcutaneous/mediastinal air and pneumoperitoneum). The mean procedure time was one hour. This technique offers a less invasive technique compared with surgery but needs to be further investigated.

EUS-guided therapies

Interventional EUS is a very promising technique with many potential applications. Since the introduction of EUS-FNA in 1992 (37), numerous novel EUS-based interventions and techniques have emerged. Currently, established interventional EUS techniques include celiac plexus block and neurolysis, drainage of pancreatic pseudocysts and pelvic fluid collections. Emerging EUS-guided experimental techniques include antitumor injection, ablation of tumors, and vascular access. The use of EUS to guide novel therapies is gaining momentum. There have been multiple trials investigating EUS-guided injection therapy (fine-needle injection) primarily in pancreatic cancer, but all have failed to show benefit in survival. Recently new encouraging data have been shown, but we must wait for results from an ongoing phase 2 study (38). New results in EUS-guided intravascular therapy have been shown for the treatment of liver metastases secondary to colorectal cancer (39) by the injection of 5-flurouracil or 5-fluorodeoxymidina into the hepatic artery under EUS guidance. The future holds promise for substantial progress in EUS-guided therapeutic interventions and their applications in clinical gastroenterology.

Endobiliary radiofrequency ablation (RFA)

Until recently, endoscopic palliation of malignant biliary obstruction included placement of plastic stents or self-expandable metal stents (SEMSs). Endobiliary RFA is a recent therapeutic modality that can be used as primary therapy in unresectable biliary malignancies or to treat occluded uncovered biliary SEMSs because of tumor ingrowth. Kahaleh *et al*. (40) suggest that endobiliary RFA has a defined role in the palliation of malignant biliary strictures, although further long-term trials are needed. They performed endobiliary RFA with the Habib EndoHPB catheter (EMcision, London, UK) in 40 patients with malignant biliary obstruction. After RFA plastic stents or SEMSs were placed on the strictures. RFA appeared to be efficacious and safe (the major postprocedural complications were pancreatitis/cholecystitis).

Although endobiliary RFA appears efficacious and safe, it is unknown whether this provides any survival benefit for patients. A recent study by Kallis *et al*. (41) suggests that endobiliary RFA may have a potential early survival benefit in patients with biliary obstruction secondary to unresectable pancreatic cancer. The addition of endobiliary RFA to the therapeutic armamentarium for treatment of malignant biliary strictures would certainly be very important since the photodynamic therapy (PDT) for hilar cholangiocarcinoma showed some advantages but also important limitations such as costs and availability, photosensitivity, and repeated treatment sessions. A retrospective small size study by Strand *et al*. (42) suggested that there is no survival benefit in patients with unresectable cholangiocarcinoma who undergo ERCP-directed RFA compared with similar patients who undergo ERCP-directed PDT but a follow-up randomized, controlled trial to validate these results is needed. The chosen therapeutic intervention for unresectable cholangiocarcinoma, either PDT or RFA, may ultimately be institution or physician dependent; however, these preliminary results suggest that survival is similar.

A recent pilot study (43) successfully demonstrates the safety and efficacy of EUS-guided RFA of pancreatic cysts in a small set of patients with pancreatic cystic neoplasms and neuroendocrine tumors. Using a 19- or 22-gauge needle performed EUS-FNA, and then a novel RFA probe was passed through the needle and then used to treat with varying wattages in different patients. The study showed a decrease in cyst size (38.8 *vs*. 20 mm) after RFA and a change in vascularity or an area of necrosis in the neuroendocrine tumors. The only complication was abdominal pain that resolved in 3 days.

RFA of esophageal tumors

RFA was recently advocated as treatment for early squamous cell cancer (SCC) of the esophagus but the results are not conclusive. RFA as a single treatment seems to be insufficient for SCC/squamous cell dysplasia and should only be performed after endoscopic resection of the suspicious lesion. SCC in fact is a very aggressive disease, and endoscopic resection of SCC or squamous cell dysplasia is important for staging purposes. Additional RFA might reduce the risk of recurrence or metachronous neoplasia.

Previous studies showed that RFA of high-grade dysplasia and intramucosal cancer in people with Barrett's esophagus is safe and effective. However, the durability of RFA therapy has not been well understood. The risk of esophageal adenocarcinoma (EAC) in this set of patients is about 0.5 percent per year (44). Typically, before EAC develops, precancerous cells [low grade dysplasia (LGD) or high grade dysplasia (HGD)] appear in the Barrett's tissue. Although endoscopic eradication therapy has become the standard of care for patients with HGD and intramucosal cancer, endoscopic therapy of all patients with low-grade dysplasia LGD remains controversial. Recent guidelines suggest that the option to endoscopically treat patients with LGD should be a shared decision between the patient and the physician after thoroughly weighing the risks and benefits of the procedure. A multicenter, randomized, controlled trial by Phoa *et al*. compared surveillance with RFA in the management of patients with confirmed LGD (45). The RFA group underwent treatment every two to three months with a maximum of five sessions with subsequent post ablation yearly endoscopic surveillance for three years. The authors conclude that RFA is effective in reducing progression to HGD/EAC.

Endoscopic full-thickness resection (EFTR) of colonic submucosal tumors originating from the muscularis propria

Endoscopic mucosal resection (EMR) and ESD are widely used techniques for en bloc resection of superficial GI carcinomas and premalignant lesions from, respectively, the mucosal and submucosal layers (46). However, these techniques are suboptimal for resecting subepithelial tumors originating from the muscularis propria. Colonic ESD is considered technically even more difficult than gastric ESD because of the thin walls, narrow lumen and acute angulations in the colon (46). The muscularis propria in the colon is thin, and colonic submucosal tumors (SMTs) are usually adherent to the serosa with an increased risk of perforation and failure to achieve R0 resection margins. EFTR is a novel method enabling resection of SMTs, which traditionally are managed by colonic resection. This new technique consists in resecting the tumor without interrupting the tumor capsule and with active perforation. At the end the defect will close with a nylon loop allowing the endoscopic closure of colonic wall mucosal defect. A prospective pilot study has shown the feasibility and safety of EFTR of colonic SMTs combined with standard metallic clips (47). Newly developed endoscopic clipping and sewing devices such as the over-the-scope clip and the OverStitch suturing device should increase the safety of the colonic EFTR procedure but needs to be investigated. EFTR could have a great impact in the management of intestinal GISTs that are more aggressive than gastric GISTs of same size and have a benign to malignant ratio of 1 to 2 (48). Recent guidelines by the National Comprehensive Cancer Network, in fact, recommend that all GISTs larger than 2 cm should be resected while the treatment options for incidental tumors smaller than 2 cm are resection or surveillance (49). Surveillance, however, may result in delayed diagnosis of malignancy. EFTR in these patients could offer an alternative option to traditional surgical management.

Magnetic compression anastomosis for minimally invasive colorectal surgery (MAGNAMOSIS)

MAGNAMOSIS system has proven to be effective in full-thickness porcine small-bowel anastomoses (50). MAGNAMOSIS forms a compression anastomosis using self-assembling magnetic rings that can be delivered via flexible endoscopy. The system allowed a hybrid endoscopic colorectal anastomosis (NOTES) with three abdominal trocars instead of conventional stapled anastomoses. It has the advantage over circular staplers of precise endoscopic delivery throughout the entire colon. The device is still undergoing design optimization but is a promising technology that enables both minimally invasive and NOTES approaches to colorectal surgery.

Conclusions

Endoscopy is a keystone in modern gastroenterology and thanks to its progress diagnosis and therapy of GI cancers completely changed in the last years. Endoscopy development is linked to different field such as technology, advances in knowledge of digestive diseases, evolution of disciplines such as radiology and oncology, and last but not least laws and costs. Since technology brings with it obsolescence in few times endoscopic technology becomes outmoded as well as the fibreoptic endoscope. Technology, especially if costly, improves outcomes but requires further and better data with statistical power. Evolution of technology in endoscopy will progressively eliminate the traditional boundaries between medicine and surgery. Endoscopy rooms will resemble operating rooms, the complexity of endoscopic procedures will progressively increase and the distinction between specialist and generalist endoscopist will become more definite.

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