Endoscopy innovations

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Innovation everywhere for everybody—this is the way we can summarize the 2014 Digestive Disease Week, which was held in Chicago, Illinois, last May. Many sessions introduced new innovative materials and concepts. From the robot of the future to the simplest ideas, the congress was fertile and sometimes full of surprises. Abstracts representing significant progress and innovations in the field of digestive endoscopy are reviewed here.

DIAGNOSIS

Optical coherence tomography (OCT) is now under the spotlight. This new technique can be useful to achieve real-time, 10-μm-resolution, and cross-sectional images of the different digestive segments.[1] Barrett's esophagus and associated dysplasia are accurately determined using this approach, which could reduce the sampling error of the random biopsy protocol during disease surveillance. Despite several in vivo OCT studies in the human gastrointestinal tract, the high cost and a lack of standardized terminology and large prospective data have limited the diffusion of this technique.

An innovative, interesting, and simple application of OCT in the screening of Barrett's esophagus was presented by Gora et al.[2] The authors reported the first human experience using tethered capsule endomicroscopy in 53 patients. The device applied the OCT technology in a transparent capsule (11 × 25 mm) and was connected to a flexible tether (containing the optical fiber), which allowed its retrieval after swallowing. The entire esophagus could be explored first via the peristalsis and then through the progressive withdrawal of the capsule. Furthermore, a coupled cautery laser light could be used to mark the regions of interest during the examination, which then facilitated their identification for conventional biopsy during subsequent high-definition video endoscopy.

The capsule was successfully swallowed in 90% of cases, and the removal phase was the only uncomfortable step for patients. The marked Barrett's esophagus and squamous sites were easily identified during subsequent video endoscopy. The procedure appeared to be safe and well tolerated, with a mean procedure time of approximately 10 minutes when three sites were marked. Thus, this new device appears to be a promising and useful alternative to gastroscopy in the surveillance of Barrett's esophagus. Furthermore, it brings together several essential properties of a good screening test: simplicity, safety, tolerance, and diagnostic accuracy. A future validation study on 130 patients is currently underway by the same team prior to conducting a comparative and cost-effective analysis.

STENTING

Despite the effectiveness of self-expanding metallic stents (SEMS) for the recovery of digestive patency in patients with malignant gastrointestinal obstructions, migration and tumoral ingrowth and overgrowth lead to significant dysfunction and re-intervention. Covered SEMS failed to achieve the highest patency in recent meta-analyses regardless of the stent location.[3,4] Drug-eluting stents are already used in cardiovascular treatments, and this material could open new gates in digestive stenting thanks to the potential for antitumor action. Promising preliminary results of safety and feasibility of the paclitaxel-eluting stent for malignant biliary obstructions have been published recently.[5]

Zhang and Zhining[6] presented the first evaluation of paclitaxel-eluting covered metal stents in an animal model of obstructive esophageal squamous carcinoma. The authors used an interesting, previously developed, rabbit model of squamous cell carcinoma that induced a significant esophageal stricture by endoscopic implantation of VX2 fragments.[7] The 30 animals were randomly assigned to receive either a noncovered SEMS or a paclitaxel-eluting covered SEMS (at concentration 10%) to recover

Abbreviations: CCE, colon capsule endoscopy; CTC, circulating tumoral cell; EMR, endoscopic mucosal resection; ESD, endoscopic submucosal dissection; EUS, endoscopic ultrasound; FNA, fine-needle aspiration; NOTES, natural orifice transluminal endoscopic surgery; OCT, optical coherence tomography; POEM, peroral endoscopic myotomy; SEMS, self-expanding metallic stents; TTNB, through-the-needle biopsy.

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esophageal lumen patency. At sacrifice 2 weeks after stent placement, the paclitaxel-eluting SEMS group showed a significant reduction in both the mean tumor volume (0.94 vs. 7.0 cm^3) and the area of the esophageal wall defect (0.17 vs. 0.7 cm^2) compared with the noncovered SEMS. No difference in complications or adverse events was observed between the groups. The clinical outcomes (food intake, weight loss, and tumor metastasis) were similar, as would be expected for such a short follow-up.

These results suggest a clear antitumor effect of the drug-eluting device with a potential improvement of stent patency. However, the stent occlusion rate did not differ when these devices were used in malignant biliary obstruction in the first human comparative studies.[5] The concentration of paclitaxel and the adjuvant therapy (e.g. Pluronic F-127) contained in the membrane of the stent could explain the different results, because of variations in drug release.[8] Large randomized and controlled clinical trials using various concentrations of coating agents are required in both the esophagus and other locations.

SUTURING DEVICES

New therapeutic challenges in digestive endoscopy, such as natural orifice transluminal endoscopic surgery (NOTES), postsurgical leak and fistula, bariatric surgery, and complications of mucosal resection (endoscopic submucosal dissection [ESD] and endoscopic mucosal resection [EMR]), have led to the development of new suturing devices and techniques. However, the entire endoscopy field is still waiting for an easy, realistic, and suitable suturing tool. The Apollo OverStitch endoscopic suturing device (Apollo Endosurgery, Austin, Texas, United States) is definitely a good candidate judging by the large number of oral or poster communications on this topic during DDW. Recently, Kantsevoy et al[9] reported the largest experience using the OverStitch in 12 consecutive patients, where large post-ESD defects were successfully closed within a short mean procedure time.

At DDW, the first intermediate results of the US Nationwide Endoscopic Suturing Registry, in which the OverStitch full-thickness endoscopic suturing device was used, were presented.[10] The system enables sutures to be placed through a flexible endoscope, without removing the endoscope for reloading and with a simple single-handed operation. This prospective observational multicenter study aimed to evaluate the feasibility and safety of the technique. To date, data from 284 procedures in 8 centers were collected. The operators were gastroenterologists and surgeons. Despite a patchwork of various indications (mainly transoral outlet reduction procedures n = 181; leak and fistula n = 42; and stent anchors n = 37), the feasibility was confirmed and described as homogeneous, with only two unsuccessful procedures. The mean number of sutures was relatively low, varying from 1.5 to 4.2 depending on the etiology.

Safety could be an issue, as the device achieves a full-thickness suture in the absence of sufficient access in some locations. However, the results of this study are clearly promising, with only three significant complications reported, none of which required surgery (two esophageal tears and one bleeding needing transfusion). Furthermore, the large majority of the procedures were performed in an outpatient setting. In conclusion, the OverStitch suture appears to be safe and technically feasible. However, further clinical, randomized studies need to focus on efficacy and cost efficiency compared with other devices (e.g. over-the-scope clips), other indications (e.g. complications after bariatric surgery), and other strategies used for the treatment of perforation or fistula. Finally, more data are awaited on longer follow-up as well as the persistence of the closure and suture over time.

VIDEO CAPSULE ENDOSCOPY

Bowel preparation remains a major factor of patient compliance in colorectal cancer screening. Less invasive and painless procedures such as colon capsule endoscopy (CCE) have not solved the problem because rigorous colon cleanliness and a booster to promote capsule transit are still required in order to achieve complete examination of the colon with better diagnostic accuracy before the end of the battery life.[11] You dreamed about it, Moshkowitz and Arber[12] made it! This team reported the first results of a novel prep-free colonic imaging capsule (Check Cap; Check Cap Ltd., Mount Carmel, Israel) in volunteers. The device is the same size as other optical capsule systems (11.5 × 34 mm) and delivers an ultra-low dose of roentgen rays, equivalent to a chest radiograph. After swallowing the capsule and a small amount of contrast agent, the patient continues their daily routine. The roentgen rays are generated at 360° around the device throughout the whole colon, and lesions are detected regardless of mucosal folds, stool, or a difficult location. The data are transmitted to a recorder, which provides three-dimensional reconstruction of the colon images at the end of the procedure.

Ten volunteers were enrolled to confirm the feasibility and safety of the technology in humans. The roentgen ray exposure was calculated and confirmed to be minimal (0.03 mSv). The average elimination time was 68 hours without any adverse event, and data were safely exported from the recorder. Laboratory synthetic and cow colon phantoms with or without polyps were also tested and showed reconstruction accuracy close to 2 mm in measurement. Thus, a high diagnostic accuracy for polyp screening is expected. This technology promises to be a simple, safe, efficient, and patient-friendly way of screening for colon cancer. A prospective multicenter study is ongoing to determine the efficacy in polyp detection, and results are eagerly awaited.