Capsule endoscopy and deep enteroscopy

Enrique Pérez-Cuadrado Martínez, MD, Enrique Pérez-Cuadrado Robles

Murcia, Spain

During the 2014 Digestive Disease Week in Chicago, many high-quality studies on small-bowel endoscopy were presented. The most relevant abstracts from around the world of two complementary procedures – capsule endoscopy and deep enteroscopy – which have seen rapid changes in recent years, have been selected for this review.

CAPSULE ENDOSCOPY

Preparation for capsule endoscopy

The major role of video capsule endoscopy (VCE) as a method of imaging the small bowel has been established. However, limitations have also been reported, including quality of the small-bowel images and incomplete assessment of the small bowel. There is no consensus on the best bowel preparation for VCE, and no evidence that preparation with different prokinetics (erythromycin, metoclopramide) or purgative agents,[1] or different timings of purgative administration[2] improves the image quality or diagnostic yield in the small bowel.

Lubiprostone is a new selective activator of type 2 chloride channels in the apical membrane of the gastrointestinal epithelium. Previous studies have reported net fluid secretion and acceleration of small-bowel and colonic transit times with lubiprostone,[3] although other studies have not confirmed the results.[4] A short, double-blind, placebo-controlled study from Japan[5] evaluated the usefulness of lubiprostone for both small-bowel preparation and as a propulsive agent to improve the transit of the capsule endoscope. The study volunteers received the drug and/or placebo at 60 and 30 minutes before VCE ingestion in three groups: a 24-μg lubiprostone tablet followed by placebo (L-P group); placebo followed by 24 μg lubiprostone (P-L group); and placebo followed by placebo (P-P group). The outcome measures were the gastric and small-bowel transit times, the adequacy of cleansing, and the amount of water in the small bowel (measured by median image quality score). The use of lubiprostone significantly decreased the small-bowel transit time (178.5, 110.5, and 122.5 minutes in the P-P, P-L, and L-P groups, respectively). In addition, lubiprostone was effective in inducing water secretion into the small bowel (1 ± 1.65, 4 ± 1.29, and 4 ± 1.64 in the P-P, P-L, and L-P groups, respectively; $P < 0.01$), and improved the visualization of the small bowel during VCE (3 ± 1.35, 4 ± 0.85, and 4 ± 0.56 in the P-P, P-L, and L-P groups, respectively; $P < 0.01$). Studies that include more patients are needed to determine whether or not the lubiprostone with or without various purgative prokinetics improves the diagnostic yield of VCE.

Crohn's disease

The evaluation of the small bowel is crucial in patients with Crohn's disease in order to differentiate the disease from other enteropathies and for making decisions about therapy and follow-up. VCE is the first diagnostic choice for small-bowel exploration. Its usefulness has been established for the diagnosis of Crohn's disease, the definition of extent and activity of the disease, and to confirm or to exclude complications such as tumors.

The main advantage of VCE is the ability to visualize the entire small bowel. However, its main drawback is the inability to perform biopsy and therapeutic procedures. The complementary procedure for selected patients who require biopsy or therapy is deep enteroscopy. The insertion route for deep enteroscopy (antegrade/oral or retrograde/anal approach) can be chosen according to VCE findings. In examinations for suspected Crohn's disease, a negative conventional endoscopy with ileoscopy may involve an unexplored area of the small bowel (jejunum and ileum) with disease involvement in approximately 15% of cases (i.e. false-negative cases). Deep enteroscopy is an invasive procedure, but offers a high diagnostic accuracy. The VCE is a noninvasive procedure with high sensitivity for detecting early superficial lesions and therefore has a special position in the diagnostic algorithm after ileocolonoscopy. However,

Abbreviations: CTE, computed tomography enterography; DBE, double-balloon enteroscopy; MRE, magnetic resonance enterography; OGIB, obscure gastrointestinal bleeding; VCE, video capsule endoscopy.

DISCLOSURE: *All authors disclosed no financial relationships relevant to this article.*

This report is published simultaneously in the journals *Gastrointestinal Endoscopy* and *Endoscopy*.

0016-5107/$36.00
http://dx.doi.org/10.1016/j.gie.2014.07.006

among patients with known Crohn's disease, the indication of VCE for the diagnosis of small-bowel lesions is unclear.

A multicenter study from Portugal[6] analyzed the clinicobiological features and endoscopic findings associated with lesions in the proximal small bowel in patients with known Crohn's disease who underwent VCE. Most of the 158 patients were diagnosed between the ages of 17 and 40 years (Montreal classification A2, 74%), with ileal location (L1, 42%), and nonstricturing, nonpenetrating phenotype (B1, 74%). Inflammatory activity was detected in the proximal two-thirds of the small bowel in 34% of patients. In the univariate analysis, predictive factors with statistical significance for proximal small-bowel involvement were stricturing behavior, high C-reactive protein levels, high platelet count, and significant weight loss. Older age (>40 years), and low albumin and protein levels were protective for inflammatory activity at VCE in this location. These basic clinical data could help to select the best candidates with Crohn's disease to undergo VCE for diagnosis of proximal small-bowel lesions. It would be interesting to know the influence of these factors in patients with a more aggressive phenotype than those included in this study.

The diagnostic yield of VCE in Crohn's disease is generally higher than classical radiologic imaging techniques, but for magnetic resonance enterography (MRE) the data are scarce and inconclusive. No previous studies have compared VCE with MRE. The advantage of MRE is the capability to evaluate transmural involvement in Crohn's disease. VCE and MRE are considered to be complementary techniques. A comparative trial from Spain[7] included 55 patients with established (n = 43) or suspected (n = 9) Crohn's disease and 3 patients with indeterminate colitis. All patients initially underwent MRE to rule out strictures, followed by VCE. A patency capsule was administered in the seven patients with suspected strictures on MRE, and this was retrieved with no modifications in 100% of cases. Small-bowel lesions were found in 46 patients by VCE and in 22 patients by MRE (83.6% vs. 45.5%; $P < 0.05$). Concordance between presence or absence of lesions was 58% (32/55 patients). VCE detected lesions in the proximal and mid small bowel in 16 patients who had negative MRE explorations. Lesions in the terminal ileum were diagnosed by VCE in 46 patients and by MRE in 24 patients (83.6% vs. 43.6%; $P = 0.03$). The authors concluded that VCE is superior to MRE for detection of lesions in the proximal and mid small bowel in Crohn's disease.

DEEP ENTEROSCOPY

Current recommendations issued by scientific societies for the study of the small bowel are based on the high degree of accumulated evidence on flexible endoscopy and VCE exploration.[8]

Total enteroscopy

Double-balloon enteroscopy (DBE), which was introduced 13 years ago,[9] replaced intraoperative and push enteroscopy (with or without overtube) as the reference standard examination in the small bowel, allowing examination of the whole small bowel either via the antegrade route or by a combined antegrade and retrograde approach. In contrast to push enteroscopy, in which the force is only transmitted through pushing, DBE incorporates the concept of pushing and pulling, with simultaneous traction on the overtube and enteroscope with inflated balloons, which rectify and fold the small-bowel loops while the enteroscope advances. A method has been proposed by the Wiesbaden group for determining the DBE distance reached,[10] and this has been validated recently by other groups.[11] The most commonly used practice for complete small-bowel exploration by DBE is a combined route, tattooing the distal end reached with the first approach, which is then identified during the examination by the second route.[8]

Although the VCE travels along the entire digestive tract, allowing the whole small bowel to be viewed during a single examination, detected lesions cannot always be located accurately. As a general rule, if the point to be reached is observed during the first 60% of the small-bowel examination time, subsequent DBE access should be via the antegrade route; if the target is observed during the last 40% then the retrograde route is used.

The degree of concordance between VCE and DBE in obscure gastrointestinal bleeding (OGIB) is high for vascular and inflammatory lesions but only moderate for neoplastic lesions and polyps in previous multicenter studies.[12] DBE with total small-bowel exploration as the gold standard should be used to validate VCE findings. A study from the United States[13] defined the diagnostic values of VCE and small-bowel radiographic imaging in small-bowel diseases such as Crohn's disease, OGIB, and submucosal masses, using total enteroscopy with DBE as the gold standard. Of 1840 patients, 239 underwent total DBE small-bowel exploration, 46 of which were performed in one direction (antegrade approach) (**Fig. 1**). A total DBE was performed in 34 patients with known or suspected Crohn's disease. Five cases were newly diagnosed with Crohn's disease after DBE. The sensitivity of VCE for Crohn's disease was high (80%) compared with radiographic imaging (46%), but specificity was low at 37%. Among the 119 patients with OGIB, the sensitivity of VCE was 80% for OGIB-occult and 70% for OGIB-overt, whereas for radiographic imaging the sensitivity was much lower (17% and 38%, respectively). This higher sensitivity of VCE could be due to easy identification of angiectasia, which is the most common lesion in OGIB. Additionally, for OGIB-occult the combination of VCE