Is capsule colonoscopy the solution for incomplete conventional colonoscopy?

The era of colon capsule endoscopy (CCE) started in 2007 (1). Few years later second-generation CCE (CCE-2) (Medtronic, Minneapolis, USA) was launched, featuring an improved optical system allowing for nearly 360° coverage via two 172° angle cameras, and adaptive frame rate function (ranging from 4 to 35 images per second depending on capsule motion).

At present the main clinical indications for CCE are: a) completion of incomplete colonoscopy; b) polyp detection; and c) investigation of inflammatory bowel disease (IBD).

Colon capsule endoscopy (CCE-2) was shown to be a reliable tool for the detection of colonic lesions such as polyps and tumors. The ability of CCE to identify colonic polyps and colorectal cancer (CCR) has been the goal of several studies, which were recently subjected to a meta-analysis pooling data from 14 studies (2). The accuracy of first-generation CCE (CCE-1) was tested in 7 studies involving 1,128 patients. CCE-2 was studied in 1,292 patients included in another series of 7 studies. This analysis showed that, while the sensitivity values for polyp detection achieved by CCE-1 studies were relatively low (58% and 54% for ≥ 6 mm and ≥ 10 mm polyps, respectively), those reported in CCE-2 studies were more acceptable (i.e., sensitivity of 86% and 87% for ≥ 6 mm and ≥ 10 mm polyps, respectively; specificity of 88.1% and 95.3% for ≥ 6 mm and 10 mm polyps, respectively). In addition, CCE-2 identified all 11 invasive cancers that were detected by colonoscopy. The authors concluded that high specificity values for polyp detection seem to be achievable by CCE-2 with a 10 mm cutoff in a screening setting.

Conventional colonoscopy is the gold-standard procedure for the screening of bowel cancer. While complete examination of the large bowel is essential to detect abnormalities, incomplete colonoscopies (ICs) do occur. Population-based studies have found that, in clinical practice, cecal intubation rates (CIR) are variable between centers within the range of 80-95% (3), far from the targets established by different national and international specialty associations (4,5).

The consequences of incomplete colonoscopy may be unfortunate. The term “post-colonoscopy colo-rectal cancer” (PCCRC) has been coined for interval cancers in patients having undergone colonoscopy. PCCRCs may represent a missed missed cancer, a cancer arising in a missed or incompletely treated adenoma, or a cancer that started to develop after colonoscopy. Missed cancers may result from several factors, including poor bowel preparation or reduced withdrawal time, but most important is incomplete colonoscopy. Higher post-colonoscopy colorectal cancer (PCCRC) rates are found for endoscopists with a lower CIR (6), and in cases of incomplete colonoscopy (7), with PCCRCs being more frequent in the right side of the colon.

These data make it clear that all patients with incomplete screening colonoscopy should be re-examined. Several alternatives may be used. Patients may undergo a successful repeat colonoscopy at a tertiary referral center with dedicated endoscopes –pediatric, variable-stiffness, balloon-assisted enteroscopes or colonoscopes, robotic colonoscopes (8)– and/or expert endoscopists using special insertion tricks (such as monitoring progression under the guidance of magnetic imaging or fluoroscopy, water immersion technique, carbon dioxide insufflation). The application of these techniques allows a complete colonoscopic examination in most patients (9-11).

Nevertheless, in case of initial incomplete colonoscopy, several alternative techniques to conventional colonoscopy are available, including computerized tomography colonography (CTC), which is done preferably the same or the next day (12,13). For this purpose, CCE may also be recommended (14).

To date, most of the evidence for CCE refers to patients with previous IC. Other indications of CCE for screening purposes include patients refusing to undergo conventional colonoscopy and patients with contraindications for conventional colonoscopy (15). Six cohort studies (16-21) have been published on the use of CCE to complete colonic examination for a total of over 450 patients, with completion rates of approximately 90% of cases. Significant findings were identified in more than one third of patients (22). One of these studies, conducted by Spada et al., addressed a comparison between CCE and CTC. Complete colonic evaluation by CCE was achieved in 98% of patients. Compared to CTC, CCE identified more polyps with size thresholds of 6 and 10 mm. The study also disclosed potential CTC limitations in identifying flat sessile lesions. Based on these findings, the authors concluded that both procedures are very effective for completing a previously incomplete conventional colonoscopy, but CCE seems to have a higher diagnostic yield (21).

So, while the core of evidence opens a door for CCE in patients with incomplete colonoscopy, larger multicenter, randomized studies are needed.

In this issue of the Spanish Journal of Gastroenterology (Revista Española de Enfermedades Digestivas) a Spanish multicenter study is reported on the therapeutic impact of colon capsule endoscopy with PillCam™ COLON 2 after incomplete standard colo-
This prospective, multicenter study involved ten Spanish hospitals enrolling 96 patients, all aged ≥ 18 years, with previous incomplete colonoscopy; the latter was due to inability to move past a loop using standard maneuvers in 78% of cases, patient intolerance in 12 (12.5%), and other causes in nine (9.4%). CCE-2 was used. Preparation was similar to the most widely used regimen in previously reported studies: low-residue diet two days before capsule ingestion, clear liquid diet the day before the procedure, and a 4-L polyethylene glycol (PEG) split regimen with sodium phosphate (NaP) as a booster, given on one or two doses depending on capsule excretion during the study. Preparation was assisted by metoclopramide or bisacodyl, according to the documentation of delays in capsule progression by real-time visual monitoring. Results, according to the study’s primary and secondary endpoint, included the following: a) frequency of complete CCE (the primary endpoint): 71.9%; b) diagnostic yield of CCE-2 for detecting colonic lesions in unexplored segments: 60.4% (polyps were the most frequent finding; 2 colon cancers were diagnosed); c) diagnostic yield of CCE-2 for detecting lesions in parts of the colon already visualized in the previous IC: no differences; d) impact of CCE-2 on therapy: in 44.8% of all patients, the new lesions observed led to therapy modifications, which included a new colonoscopy for polyp resection or surgery in patients with colonic neoplasm; e) level of colon cleanliness: adequate in 75% of patients, poor in fewer than 10% of patients; and f) safety of the CCE procedure: one severe event, namely, the sudden death of a 79-year-old male with undiagnosed severe dilated myocardiopathy evaluated for anemia.

This study confirms the utility of CCE in cases of IC as an adequate alternative to complete colonic examination, increasing the detection of significant colonic lesions. The results are in line with the statement found in the 2012 ESGE Guidelines on capsule colon endoscopy: “… in patients for whom colonoscopy is inappropriate or not possible, the use of CCE could be discussed with the patient (Evidence level 4, Recommendation grade D). CCE is a feasible and safe tool for the visualization of the colonic mucosa in patients with incomplete colonoscopy and without stenosis (Evidence level 3, Recommendation grade D)” (15).

One of the drawbacks observed in the results of this Spanish multicenter study refers to the issues related to preparation and capsule propulsion, since complete visualization of the colon with CCE was only possible in 71.9% of individuals. However, in 20 of the 27 patients in whom CCE-2 did not reach the hemorrhoidal plexus, the capsule passed the colonic segment already explored in the previous colonoscopy; therefore, CCE plus colonoscopy enabled a complete visualization of the colonic mucosa in 92.7% of patients. These results do not differ significantly from the outcomes obtained in similar studies. Safety was also a problem, raising the need for avoidance of NaP as booster, due to potential severe adverse events such as acute phosphate nephropathy, acute renal failure, hypertension, or mineral imbalance.

New preparation and propulsion protocols may probably overcome these drawbacks. Gastrographin (water-soluble iodinated radiopaque oral contrast medium) was first used as CCE regimen in the study by Spada comparing CCE versus CCT (21), because this contrast is generally used as part of the CT colonography regimen for “fecal tagging”. In a Japanese study, gastrographin appears to be useful and safe as a booster (24). Prokinetics have failed to show any additional benefit (25). PEG 2 liters + ascorbic acid preparation seems better than PEG 4 liter (26), and may also be used as a booster (27). Further studies to optimize the bowel preparation regimen will likely help to both standardize and expand the use of CCE.

In summary, there is growing evidence that CCE may be a viable alternative for completing the visualization of the colonic mucosa in cases of IC. In addition, CCE offers an opportunity of pan-enteric visualization (28). The administration of CCE immediately after IC, without need for a second preparation, may be a good approach to be tested in future studies.

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REFERENCES


