Use and Misuse of Small Bowel Video Capsule Endoscopy in Clinical Practice

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Video capsule endoscopy (VCE) was introduced into the United States in 2000 and has significantly advanced the ability to visualize the small intestinal mucosa by using noninvasive technology. Compared with traditional imaging with small bowel barium imaging, the use of VCE has demonstrated the ability to enhance diagnostic yield in patients with suspected small bowel pathology by approximately 25%–50% in patients with suspected small bowel disorders.[1–3] Although the use of VCE has been recommended as the next step in patients with obscure gastrointestinal hemorrhage after a negative upper and/or lower endoscopic examination,[4] its use in other clinical scenarios such as small bowel inflammatory disorders may not be associated with similar diagnostic yields.

The major complication associated with the use of VCE remains small bowel retention. Although the risk of this event is virtually nil in patients with obscure bleeding, it can approach 10% in patients with known inflammatory bowel disease (IBD).[5] A critical appraisement of appropriate use of this technology may help physicians and third-party payers to determine which subset of patients with suspected or known small bowel disorders would benefit the most from undergoing a VCE procedure.

To critically examine the use of VCE in clinical practice, an evidence-based approach was performed by using the GRADE system,[6,7] and a critical review of the literature on capsule endoscopy was performed by using PubMed, SCOPUS, and the Cochrane Database from 2000–2012. The quality of evidence could range from high (implying that further research was unlikely to change the authors' confidence in the estimate of the effect) to moderate (further research would be likely to have an impact on the confidence in the estimate of effect) or low (further research would be expected to have an important impact on the confidence in the estimate of the effect and would be likely to change the estimate). The strength of a recommendation was graded as strong when the desirable effects of an intervention clearly outweigh the undesirable effects and as conditional when there was uncertainty about the tradeoffs. The evidence-based statements generated from this review are shown in Table 1. Studies including more than 20 patients were included for each topic to increase data quality when meta-analyses or randomized controlled trials were not available.

Appropriate Use of Capsule Endoscopy

Obscure Overt Gastrointestinal Hemorrhage

The use of VCE has been demonstrated to be superior compared with use of small bowel radiography, push enteroscopy (PE), or computed or magnetic enterography for visualization of small bowel sources of overt hemorrhage or iron deficiency anemia (IDA).

Bleeding from a small bowel source remains uncommon, accounting for approximately 5% of sources in patients presenting with overt or occult gastrointestinal hemorrhage.[4] In patients with suspected small intestinal disorders, the yield of capsule endoscopy has been estimated to be approximately 60%. Capsule endoscopy is preferred as the initial test compared to deep enteroscopy because of its ability to visualize the entire small bowel, a decreased potential for complications, and decreased use of endoscopic resources.[8]

On the basis of this information, use of VCE has been recommended as the next step in the evaluation of patients with gastrointestinal hemorrhage after a normal upper and lower endoscopic examination.[9] The caveat of this recommendation is that approximately 20%–30% of patients will have sources of bleeding detected within reach of a standard endoscope or colonoscope on repeat examination that were not detected on initial examination. This finding has been demonstrated in patients undergoing both capsule endoscopy[10] and deep enteroscopy.[11]

Use of VCE has been demonstrated to be clearly superior to other imaging modalities for the small bowel in patients with obscure bleeding. Based on the prior literature, VCE offers an increased diagnostic yield of 25%–50% compared to the yield demonstrated by using traditional small bowel radiography[1,2] (yield, 3%–20%), PE (yield, 3%–30%),[12–14] and/or elective angiography (5%–15%).[15,16] In patients with a negative capsule endoscopy, the use of multidetector computed tomographic enterography (CTE) or magnetic resonance enterography (MRE) has been shown to detect pathology in some patients, particularly if bleeding is related to an underlying neoplasm.[17]

Timing of the VCE examination has been demonstrated to be associated with diagnostic yield in patients with overt obscure hemorrhage. In a landmark study published by Pennazio et al[14] in 2004, the diagnostic yield in 100 patients undergoing VCE was 92% in patients with ongoing overt hemorrhage, 13% in patients with bleeding that had stopped (intervals ranging between 10 days and 1 year), and 44% in the IDA cohort. Subsequent studies defined higher diagnostic yields when VCE was performed within 2 weeks of an overt bleeding episode (detection rate, 91%) compared with 34% when the VCE occurred more than 2 weeks later.[18] Similarly higher diagnostic

Abbreviations used in this paper: CTE, computed tomographic enterography; FAP, familial adenomatous polyposis; FC, fecal calprotectin; IBD, inflammatory bowel disease; IC, ileocolonoscopy; IDA, iron deficiency anemia; MRE, magnetic resonance enterography; PE, push enteroscopy; PJS, Peutz–Jeghers syndrome; SBFT, small bowel follow-through; VCE, video capsule endoscopy.

1542-3565/$36.00

http://dx.doi.org/10.1016/j.cgh.2013.03.010

Table 1. Evidence-based Recommendations for Use of VCE

Recommendations for use of VCE
Obscure gastrointestinal hemorrhage
VCE should be performed for evaluation of obscure bleeding as the next diagnostic test after normal upper and lower endoscopic examinations. (Strong recommendation, high level of evidence)
For patients with obscure overt bleeding, VCE should be administered as soon as feasible to increase the diagnostic yield. (Strong recommendation, high level of evidence)
In patients with IDA, VCE should be performed for further evaluation after negative upper endoscopic and colonoscopic examinations. (Strong recommendation, high level of evidence)
IBD
VCE is recommended in patients with suspected or known Crohn's disease after negative ileoscopy in patients without signs or symptoms of obstruction. (Strong recommendation, high level of evidence)
In patients with suspected obstruction, patency VCE or enterography examination should occur as the next diagnostic test. (Conditional recommendation, moderate level of evidence)
VCE should not be routinely performed after a normal IC and MRE/CTE examination because of the low diagnostic yield for Crohn's disease. (Conditional recommendation, moderate level of evidence)
Celiac disease
VCE can be considered as an alternative test to histology for the diagnosis of celiac disease. (Conditional recommendation, moderate level of evidence)
VCE should be performed in patients with nonresponsive celiac disease to assess for disease-associated complications. (Conditional recommendation, moderate level of evidence)
Hereditary polyposis
In patients with PJS, small bowel surveillance with VCE should occur starting at the age of 8 years and continuing every 3 years. (Conditional recommendation, low level of evidence)
Screening for distal polyps by VCE can be considered in patients with FAP who have evidence of duodenal polyps on side-viewing endoscopic examination. (Conditional recommendation, low level evidence)
Potential misuse of capsule endoscopy
Chronic abdominal pain or isolated diarrhea
VCE is not recommended in patients with isolated abdominal pain or diarrhea without the presence of inflammatory markers. (Conditional recommendation, moderate level of evidence)
VCE should not be performed to evaluate isolated weight loss. (Conditional recommendation, low level of evidence)
Scenarios with high risk of retention
VCE should be avoided in clinical scenarios with increased risks of capsule retention including known IBD and radiation enteritis. (Conditional recommendation, moderate level of evidence)

rates have been demonstrated when deep enteroscopy is performed within 2 weeks of an overt bleeding episode.[19]

For inpatients, the yield of VCE has been shown to exceed 90% when administered within 48 hours of hospital admission.[20] However, although associated with higher diagnostic yields, use of VCE in the inpatient setting carries increased rates of gastric retention and incomplete examinations to the cecum.[10] In patients at higher risk of incomplete examinations, endoscopic placement into the duodenum and/or administration of prokinetic therapy should be considered.

Use of Video Capsule Endoscopy in Patients With Obscure Occult Bleeding

In patients presenting with chronic IDA, performance of VCE is also recommended as the next diagnostic test after a negative upper and lower endoscopic examination.[4] A recent meta-analysis published in 2012 examined the utility of VCE in 1960 patients from 24 studies with IDA.[21] Although the diagnostic yield overall was 47% (95% confidence interval, 42%–52%), there was significant heterogeneity among studies that influenced the results. When only patients with confirmed IDA by established thresholds for hemoglobin and ferritin values were included, the diagnostic yield increased to 67% (95% confidence interval, 61%–72%). Angioectasias accounted for approximately 45% of the positive findings on VCE examinations.

The risk of rebleeding after VCE depends on the type of lesion detected and the associated patient comorbidities. Patients with normal VCE examinations have a very low risk (<5%) of rebleeding during the course of the subsequent year.[22] Rebleeding rates can be expected to be highest (>50%) in patients with fresh blood on VCE examination or angiodysplastic lesions. In many patients with small bowel arteriovenous malformations, however, bleeding can subside over time without endoscopic or other therapy.[3,23] Patients with comorbid conditions including cardiovascular, renal, and pulmonary disorders are most likely to demonstrate rebleeding from new or existing vascular lesions.[24]

Clinical Impact of Video Capsule Endoscopy

Several studies have assessed further change in management after VCE studies performed for obscure gastrointestinal bleeding. In the original 2004 study published by Pennazio et al,[14] all of the 23 patients with overt bleeding were treated (including medical therapy in 9 patients, endoscopic treatment in 11, and surgery in 3 patients), resulting in a cessation rate of 87% during the follow-up period ranging from 12–25 months. Of the 39 patients with obscure-occult bleeding, 25 patients underwent further examinations after VCE. The diagnosis remained unknown in 17 patients, 18 were treated medically, 5 underwent endoscopic therapy, 6 had surgery, and 10 patients were not treated. Complete resolution in this cohort was 69% during the follow-up period.

In a subsequent 2007 study published in the Netherlands by van Tuyl et al,[25] questionnaires were sent to the treating phy-