Retention associated with video capsule endoscopy: systematic review and meta-analysis CME

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Background and Aims: Video capsule endoscopy (VCE) has become a major diagnostic tool for small-bowel evaluation. However, retention of the video capsule endoscope remains a major concern.

Methods: We performed a systematic review of VCE retention rates by using Pubmed and SCOPUS (1995-2015). We included studies that enrolled at least 10 patients, included VCE retention rates, and separated retention rates by indication. We used Comprehensive Meta-Analysis (Version 3.0) to calculate pooled prevalence rates with 95% confidence intervals (CIs) and assessed heterogeneity by using the Cochran Q statistic.

Results: We included 25 studies (N = 5876) for patients undergoing VCE for evaluation of potential small-bowel bleeding, 9 studies (N = 968) for patients with suspected inflammatory bowel disease (IBD), 11 studies (N = 558) for patients with established IBD, and 8 studies for patients (N = 111) undergoing VCE for evaluation of abdominal pain and/or diarrhea. We used a random effects model and found that the pooled retention rate was 2.1% for patients with suspected small-bowel bleeding (95% CI, 1.5%-2.8%). Retention rates were 3.6% (95% CI, 1.7%-8.6%) for suspected IBD, 8.2% (95% CI, 6.0%-11.0%) for established IBD, and 2.2% (95% CI, 0.9%-5.0%) for abdominal pain and/or diarrhea. Based on subgroup analysis, subsequent VCE completion rates after performance of a patency capsule or CT enterography in patients with IBD to exclude retentions due to strictures was 2.7% (95% CI, 1.1%-6.4%). Reasons for retention were provided in 60 (77%) studies. The most common reasons for retention were small-bowel strictures, although etiology was not provided in all studies.

Conclusion: VCE retention occurs in approximately 2% of patients undergoing evaluation for small-bowel bleeding and is most likely due to small-bowel strictures. Retention rates in patients with suspected or known IBD were approximately 4% and 8%, based on our meta-analysis. These rates decreased by half in those studies that used either a patency capsule or CT enterography to assess patency before performing VCE. (Gastrointest Endosc 2017;85:1157-68.)

Abbreviations: IBD, inflammatory bowel disease; MR, magnetic resonance; NSAID, nonsteroidal anti-inflammatory drug; VCE, video capsule endoscopy.

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BACKGROUND

Video capsule endoscopy (VCE) has become a major diagnostic tool for the evaluation of small bowel disorders since its introduction to the scientific community via *Nature* in 2000.[1] This is in part due to the fact that other techniques for evaluation of the small bowel, including radiography, scintigraphy, operative enteroscopy, push enteroscopy, and double-balloon enteroscopy, are either insensitive, time-consuming, invasive and/or not widespread.[2]

Advantages associated with usage of VCE have included its ability to visualize the entire small bowel mucosa, up to 800 cm in most humans, and identify pathologic findings in a non-invasive fashion. An infrequent but potentially serious complication of VCE can include retention, which can occur in approximately 1-2% of patients undergoing VCE for evaluation of potential small-bowel bleeding sources.[3] In addition, capsule retention has been reported to

be as high as 13% in patients with inflammatory bowel disease (IBD), mostly due to the presence of associated underlying inflammatory strictures.[3] Published rates of VCE retention, particularly in patients with IBD, have been variable, and dependent upon the underlying small bowel pathologic process. We performed a systematic review and meta-analysis in order to more accurately determine the incidence of VCE retention depending upon the reason for the VCE examination. In addition, we investigated the causes of VCE retention and associated clinical outcomes including medical and/or surgical therapy.

MATERIALS AND METHODS

Literature search

By using key search terms of capsule endoscopy and retention (Appendix 1, available online at www.giejournal.org), we performed a comprehensive literature search from 1995 to 2015 by using Pubmed (N = 243) and SCOPUS (N = 314). We included cohort studies (both retrospective and prospective) that enrolled at least 10 patients undergoing video capsule endoscopy (VCE) for any indication including suspected small-bowel bleeding, suspected or known inflammatory bowel disease (IBD), suspected small-bowel polyps and/or neoplasms, or evaluation of symptoms including diarrhea, potential malabsorption, weight loss, and other symptoms suggestive of small-bowel disease and included retention rates associated with the VCE examinations.

Inclusion and exclusion criteria

Initially, we excluded studies that performed an initial patency capsule or CT or magnetic resonance (MR) enterography to exclude potential small-bowel obstruction before VCE. However, in those studies that listed numbers of patients with VCE retention, we calculated retention rates in a subsequent subanalysis.

We excluded publications that did not evaluate potential VCE retention. Studies that included mixed populations of patients (both suspected small-bowel bleeding and suspected IBD, for example) without listing reasons for retention by indication also were excluded, but an overall analysis of retention based on these studies was performed in a subanalysis. In addition, we excluded studies that reported delayed gastric retention and small-intestine transit times. Studies in a foreign language and those with only the abstract available also were excluded.

VCE retention was defined as a video capsule endoscope remaining in the digestive tract for a minimum of 2 weeks and with retention confirmed with an abdominal radiograph when endoscopic or surgical interventions were required to remove the device. One study used a minimum of 72 hours to define VCE retention and was included. Crohn's disease was often defined by preexisting diagnosis based on prior endoscopic, histologic, and imaging results. Suspected Crohn's disease included patients referred for symptoms compatible with small-bowel Crohn's disease, including elevated inflammatory marker results and prior unremarkable small-bowel series, EGD, and/or colonoscopy. One of the Japanese studies included patients with suspected Crohn's disease who did not fit the Japanese criteria for Crohn's disease. Overt GI bleeding was defined as the presence of hematochezia, melena, and/or hematemesis. Occult GI bleeding was defined as guaiac-positive stools in the absence of overt GI bleeding or iron-deficiency anemia. Chronic abdominal pain was defined as generalized abdominal pain for a specified duration that did not meet diagnostic criteria for other GI disorders. Small-bowel tumors often were suspected either by previous imaging or clinically by signs suggestive of malignancy, including weight loss. Patients undergoing VCE under the miscellaneous category included any patient who did not meet the indications in the other categories.

In some publications, patients with suspected strictures, particularly those with suspected or known IBD, were allowed study entry if they underwent a patency capsule study, MR enterography, or CT enterography before the VCE study. Patients with strictures demonstrated on MR enterography and/or CT enterography or retention of the patency VCE were excluded from the analysis. In the case of normal results on patency or enterography examinations, patients were enrolled in the analysis, and retention rates were calculated. Patients were not required to undergo both patency and/or enterography examinations because prior studies have demonstrated equivalent efficacy of both modalities to detect strictures in addition to the ability to miss structuring disease.[4]

Data extraction

For all of the selected articles based on the literature search, we extracted data regarding the total number of VCE studies, indications for procedures, numbers of VCE retentions, causes for retention if available, presence of obstructive symptoms, and subsequent therapy, which could include conservative management, medical therapy, endoscopic removal and therapy with deep enteroscopy, and/or surgical management.

Statistical analysis

Comprehensive Meta-Analysis (Version 3.0, Biostat Inc, Englewood, NJ) was performed to calculate pooled prevalence rates by using random effects models with 95% confidence intervals (CIs). Statistical heterogeneity was assessed by using Cochran's Q statistic, with a P value < .05 used as statistical significance for heterogeneity. When more than 10 studies were present, we assessed constructed funnel plots and assessed for publication bias by using testing by Begg and Mazumder[5] and Egger et al[6] with a P value < .05 considered to be significant.