

# New Developments in Capsule Endoscopy

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## **Introduction to Hardware and Software**

There are two capsule endoscopes that are currently available, the Endocapsule and the Pillcam SB. Both of these capsules are very similar in size, they are 26 x 11 mm. They image at two frames per second and have a battery life of about eight hours. Both devices transmit at radiofrequency and have an 8 lead sensor, which in turn is connected to a small hard drive that is worn on the belt allowing complete patient mobility during the study. The differences are that the Endocapsule has a CCD chip and the PillcamSB has a CMOS chip. Once a recording is completed, the hard drives are connected to a workstation, the data is downloaded and a video is created. These videos can be viewed at varying speeds; a report can be created, printed and distributed. Each workstation is also capable of creating CDs for storage of the videos and transferring images to other media. At the present time, reading a capsule study takes between 30 minutes and one hour.

## **Normal Variants**

During the training phase of reading videos from a video capsule study, the biggest problem is to sort out the normal from the abnormal. For trainees the ASGE recommends reading a minimum of 25 videos during training, and for those already trained as endoscopists, they should read 10 videos with a mentor. The key to reading a video is to have a system. It is helpful to first identify the first gastric image, followed by the first duodenal image, followed by the first cecal image. This allows for a rough assessment of the time taken to read the study. The rapid scanning process may also allow for the detection of obvious pathology. Once those points are established, then the small bowel images should be carefully scrutinized. Any abnormalities should be thumbnailed. Once this is done, a decision has to be made as to whether the lesions found are clinically

significant. A report can then be assembled that reports the findings, selects relevant images and makes appropriate clinical recommendations.

### **Preps, Prokinetics and Placement**

The need to use a preparation or not remains controversial. The simplest preparation consists of keeping a patient NPO for 12 hours. The ASGE recommends using two liters of a PEG solution the evening before the study. However data supporting this contention is still very scanty. A poor preparation can make reading difficult, but it may also be a tip that there is a underlying stricture that is causing a backup of luminal contents. Simethicone has been reported as helpful, but this has not been confirmed

The use of prokinetics is controversial. Metoclopramide and erythromycin have been used to accelerate the passage of a capsule out of the stomach, again, without clear benefit. Since tegaserod has been taken of the market there is no effective small bowel prokinetic. The argument is that more rapid transit reduces the chance of finding an abnormality.

If there is any evidence of gastroparesis, or if in a previous study a capsule has been retained in the stomach, then the video capsule should be placed endoscopically using either a Roth net or an endoscopy placement device. In either case, the video capsule should be placed in at least the first portion of the duodenum. It should be noted that the sedation associated with endoscopic placement may reduce intestinal motility and lead to incomplete small bowel studies.

### **Obscure G.I. Bleeding**

The most frequent indication for capsule endoscopy is obscure bleeding. This might be either occult or overt. For this indication, it is assumed that and upper endoscopy and colonoscopy have performed, and neither revealed a source of bleeding. The most common cause of bleeding from the small intestine is angioectasia. Secondly blood may be seen without obvious source. Thirdly, bleeding may be coming from ulceration due to

inflammatory bowel disease, NSAIDs or tumors. Much more rarely bleeding may originate from a small bowel enteropathy or varices due to portal hypertension. Occasionally the bleeding may originate from the stomach or colon, and have been missed endoscopically.

### **Celiac Disease**

Celiac disease is a relatively new indication for video capsule endoscopy. It has a sensitivity and specificity comparable to endoscopy and can be very useful, if a patient is reluctant to undergo conventional upper endoscopy. Celiac disease may also be found incidentally, in patients who are being worked up for iron deficiency anemia. Video capsule endoscopy may also be very helpful in assessing whether or not there is coexistent jejuno-ileitis, Crohn's disease or underlying lymphoma.

### **Inflammatory Bowel Disease**

Indications for capsule endoscopy related to inflammatory bowel disease include suspected Crohn's disease, determination of whether a patient has a true flareup of Crohn's disease or whether they have a super imposed irritable bowel syndrome, and detection of small bowel abnormalities in patients with an indeterminate colitis. The major concern about using capsule endoscopy in patients with Crohn's disease relates to capsule retention. If this is a concern then a patency capsule can be used as a prelude to the video capsule study. The retention rate in patients with suspected Crohn's disease is about 1% and in patients with established Crohn's disease may be as high as 13%.

### **Case Management**

As time permits, we will discuss several difficult management cases with a variety of indications for capsule endoscopy. These will illustrate how capsule endoscopy can change the usual paradigms of management with considerable benefit the patient.