Capsule endoscopy (CE) has been used in clinical practice for the evaluation of small bowel disease since 2001. CE has most commonly been used in cases of obscure GI bleeding. There are now several small bowel capsules (PillCam, Olympus EndoCapsule, MiroCam, OMOM, CapsoCam) in the world. CapsoCam has a 360° field of view, records at 165 frames per second, and has a 15-hour battery life.

Esophageal CE was developed for the diagnosis of esophageal varices, Barrett’s esophagus and esophagitis. Colon CE has been developed for the detection of colon polyps and colorectal cancer. Magnetically guided CE was developed in Japan for visualization of the stomach.

CE still has several major limitations. First, inflation of the GI lumen is impossible, and only passive images can be attained while the capsule passes the GI tract. It is therefore possible to miss lesions in CE. In addition, ampulla of the vater or Ileocecal valve may often pass undetected in small bowel CE. And the process of performing CE and interpreting capsule images takes a long time. Moreover, CE often results in vague images due to bile, mucus, etc. The external real time image viewer is coupled with additional action (eg, administration of water, or intravenous metoclopramide) to enhance the complete examinations for CE. CE is sometimes used to differentiate true lesions (eg, submucosal tumors) from false lesions (eg, bulges, extrinsic compression). Three dimensional reconstructions of CE images are made from two dimensional images using software algorithms (shape from shading). The use of this software leads to improvement in the visualization of lesions. Though Fuji Intelligent Color Enhancement (FICE) software has been incorporated into the PillCam, the use of FICE did not result in an improvement in diagnostic yield despite the enhanced visualization. Second, CE cannot take a biopsy, nor does it have therapeutic capabilities. Magnetically maneuvered capsules can release a nitinol clip to control bleeding or mark a lesion in pig models. Capsule that can perform mucosal tagging, biopsies, or therapeutic interventions are under development in animal models.

Future research should explore the possibilities of performing biopsies, executing therapeutic maneuvers, and expanding motion control.

References


