INTRODUCTION
Capsule endoscopy has revolutionized the art of diagnostic endoscopy by its ease of administration, noninvasiveness and of course, achieving a screen of the small bowel whose depths remain unfathomable by other means. It came into existence in 1997, given to this world by Gabriel Idan and Paul Swain. The year 1999 witnessed the first human ingestion by Paul Swain. In the first ever controlled study comparing it with push enteroscopy in occult gastrointestinal (GI) bleed, capsule endoscopy won by a margin of 2:1. Since then it has grown in leaps and bounds.

INDICATIONS OF CAPSULE ENDOSCOPY
- Obscure GI bleed
- Unexplained iron deficiency anemia
- Chronic diarrhea
- Recurrent abdominal pain (after ruling out small bowel obstruction)
- To spot the primary tumor in a symptomatic metastatic carcinoid
- In suspected metastasis
- Lymphoma and carcinoma
- To evaluate the soft findings identified in radiological imaging of the small bowel
- In suspected celiac disease where small bowel biopsy is not diagnostic but serological markers are positive.

DISCUSSION
The small bowel capsule is 11 mm × 26 mm and has a camera with imaging capability of 2 frames per second and a depth of field 0–30 mm. The newer PillCam™ SB2 sports better optics with advanced automatic light control and a wider angle of 156°. Rapid 7 viewing screen has a progress indicator and an image adjustment with automatic light control and a wider angle of 156°. Rapid 7 viewing has a frame rate of 3 frames per second per camera. CapsoCam SV-1 employs four cameras facing the sides of the capsule that together image a full 360° about the capsule’s circumference and capture high-resolution images of the mucosa including surfaces hidden behind folds. The CapsoCam captures 20 frames per second for the first 2 hours at a rate of 5 frames per second per camera and thereafter 12 frames per second at the rate of 3 frames per second per camera. CapsoCam SV-1 captures a stable video with faster review time because the cameras are located in the center of the capsule facing the sides. With the side view, the motion of the mucosa is constrained to a minimum diameter by the capsule so there is less mucosal movement. The image is more stable due to less motion of the cameras and also less mucosal movement. The CapsoCam SV-1 stores the captured images on-board. Capsule endoscopes are powered by tiny on-board batteries. The CapsoCam SV-1 design assists patients in retrieving the capsule after the procedure for data access and proper disposition by the clinician. This an initial imaging of 3 minutes, the capsule enters a sleep mode of 2 hours. After the sleep mode, it spontaneously wakes up and begins transmission of images.

In a study at author’s center, they utilized the colon capsule to achieve panendoscopy in 18 patients, in which the entire gut was visualized. This study was one of the first of its kind. The patient swallows the colon capsule after the sleep mode is over and hence the entire gut is visualized. Colonoscopy was the standard against which capsule endoscopy was compared. Intermittent checks were made using a real-time viewer. A four point grading scale was used as a standard to grade colon cleanliness.

Panendoscopy could be achieved in 17 out of 18 (94.44%) patients. In one patient (5.55%), capsule passed up to splenic flexure before the end of the life of the capsule’s battery.

Positive finding of polyps on colon capsule with no polyps seen on conventional colonoscopy was noted in two patients. More important in the present case series is that pan-endoscopy could be achieved using PillCam™ colon capsule by augmentation of intestinal motility using a prokinetic agent.

PillCam™ colon 2 introduces a whole new perspective with intelligent functionality. The most significant feature is the adaptive frame rate. In this feature, the image capture rate varies ranging from a minimum of 4 per second to a maximum of 35 per second depending on the capsule movement. It also boasts of an adaptive video displaying most clinically relevant images and also can estimate polyp size. A 172 field of view on each side offers a near 360° visualization of the colon. It has 89% sensitivity for colorectal polyps greater than or equal to 6 mm with a negative predictive value of 96%.

CapsoVision new capsule CapsoCam system (31 mm × 11.3 mm) has a frame rate of up to 20 per second and has four cameras giving it a panoramic view of 360°. The CapsoCam SV-1 employs four cameras facing the sides of the capsule that together image a full 360° about the capsule’s circumference and capture high-resolution images of the mucosa including surfaces hidden behind folds. The CapsoCam captures 20 frames per second for the first 2 hours at a rate of 5 frames per second per camera and thereafter 12 frames per second at the rate of 3 frames per second per camera. CapsoCam SV-1 produces a stable video with faster review time because the cameras are located in the center of the capsule facing the sides. With the side view, the motion of the mucosa is constrained to a minimum diameter by the capsule so there is less mucosal movement. The image is more stable due to less motion of the cameras and also less mucosal movement. The CapsoCam SV-1 stores the captured images on-board. Capsule endoscopes are powered by tiny on-board batteries. The CapsoCam SV-1 design assists patients in retrieving the capsule after the procedure for data access and proper disposition by the clinician.
keeps the capsule from getting into the sewer system and waterways that could cause possible water pollution. The proprietary design of CapsoCam SV-1 makes it the only capsule endoscope to offer a complete 360° view of the small bowel. The panoramic view provides a better viewing experience to the physician than the conventional capsule endoscopes out there. The 360° panoramic view is delivered by four ultracompact wide angle cameras capturing the small bowel images about the full 360° circumference of the capsule.

Some images of CapsoVision capsule endoscopy are given in Figures 1A and B.

**CAPSOCAM SV1 IN A PATIENT WITH CROHN’S DISEASE**

**RECENT ADVANCES**

**Drug Delivery Capsule**
- InteliSite® (Innovative Devices, USA)
- Eternion (Phaeton Research, UK)
- Can be used for targeted drug delivery and collecting absorption data in GI tract.

**Microbiopsy Capsule**
- Mucosal biopsies using a spring-loaded Crosby capsule-type device guided by real-time imaging capability
- Radiofrequency-controlled remote manipulation or a rotational microbiopsy device consisting of a trigger with a paraffin block and a rotational tissue-cutting razor
- Designed to operate sequentially so that tissue sampling, sealing, and fixing are achieved in single operation.

**Magnetically Guided Capsule Endoscope**

The prototype of the magnetically guided capsule endoscope system was jointly developed by Siemens and Olympus and consists of an innovative guidance magnet, an image processing and guidance information system as well as the capsule endoscope. The patient swallows the capsule together with water. The patient is positioned in the system so that his stomach including the capsule is located in the center of an artificially generated magnetic field. The magnet generates varying magnetic fields in real time to navigate the capsule. The magnetic field enables the physician to control the capsule with a joystick. The cameras at both ends of the capsule transmit images from inside the stomach to the image processing system where the doctor can view the images. The capsule endoscope is approximately 31 mm long and measuring 11 mm in diameter (Figures 2A to I).
Figures 2A to I: Magnetically guided capsule endoscopic images