



INDIA'S FIRST ON-THE-JOB TRAINING COURSE
FOR GI ENDOSCOPY TECHNICIANS.

Capsule endoscopy

Dr. Piramanayagam



Accredited by



Outline

- Principles
- Indications
- Preprocedure checklists
- How to carry out capsule endoscopy examination?

Development

Upper GI endoscopy- evaluation upto D2

Colonoscopy-evaluation upto terminal ileum

Small intestine- was considered “blind area”. Techniques used to explore small intestine

- Push enteroscopy
- Capsule endoscopy- introduced in 2001
- Balloon enteroscopy- single/ Double balloon

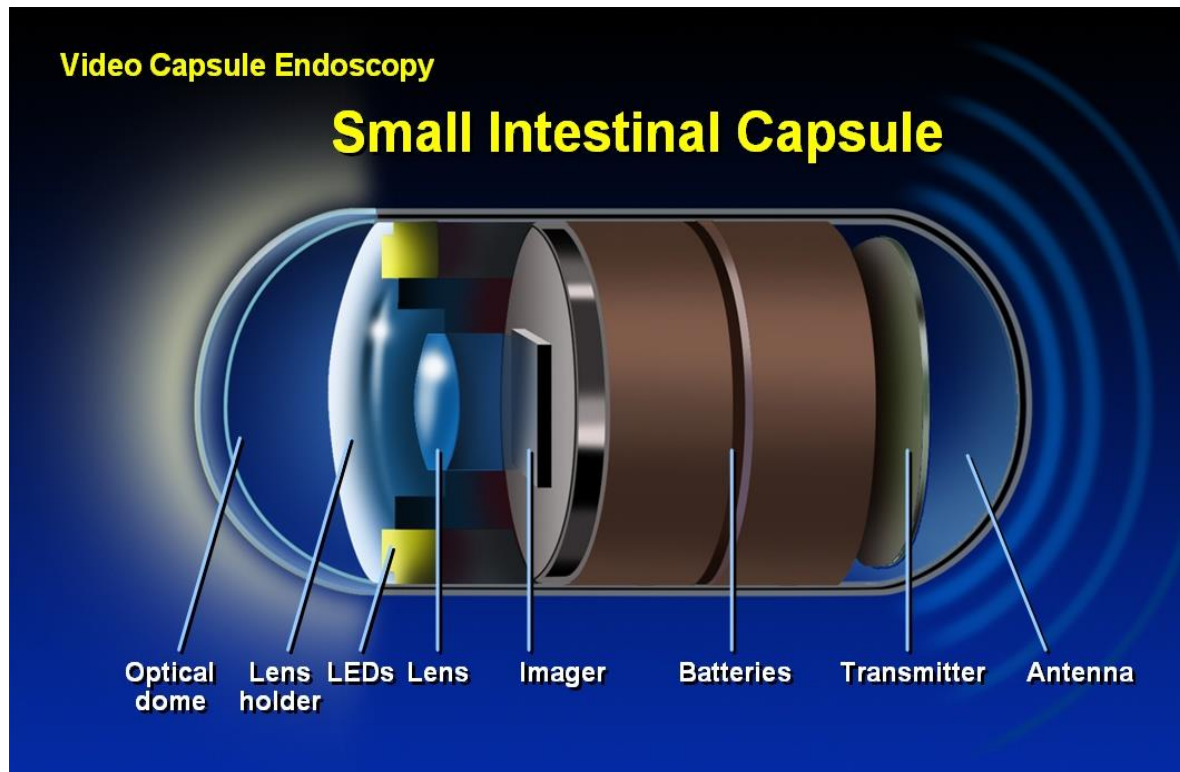
Principles

Capsule endoscopy



- Developed to evaluate small intestine mucosal problems
- Ingested like a “capsule”
- Has camera, light source and transmitting device inbuilt in capsule

Components of the small bowel capsule



Small bowel capsule characteristics

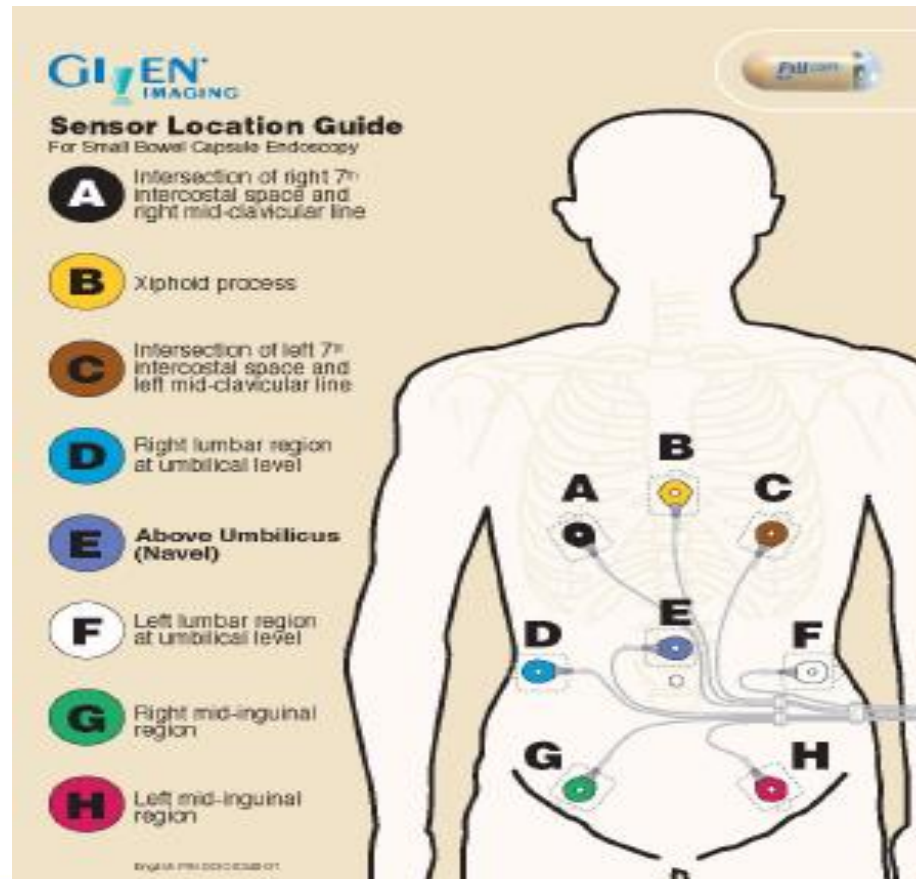
- Two images per second
- 55,000 images over eight hours.
- Magnification 1:8
- Review of the video, generation of a report: 30 to 90 minutes.
- Viewing: 1-25 frames per second (standard video speed).

Components of capsule endoscopy workstation

- Capsule
- Data recorder
- Workstation with software



Lead placements for the small bowel capsule



RAPID[®] 5 Viewing Screen

The screenshot shows the RAPID 5 Viewing Screen interface. At the top center is a large video window displaying an endoscopic view of the colon. Below this is a control panel with various buttons and a timeline. At the bottom, there is a localization map and a row of five captured thumbnails.

Video Controls: Includes play, pause, and stop buttons in the top left of the video window.

Run Mode Controls: Includes a play button and a 'Run' button in the bottom left of the control panel.

Play Speed: A slider control in the bottom left of the control panel.

Viewing Mode Controls: Includes a 'View' button and a 'Run' button in the bottom left of the control panel.

Localization: A small anatomical map in the bottom left showing the location of the current frame.

Passage Times (Gastric & Small Bowel): A table showing passage times for Gastric (0h 20m) and SB (2h 57m).

Marker Indicating Location in Study: A small icon in the top right of the video window.

Landmark Labeling of Current Image: A small icon in the bottom right of the video window.

Report Composition Mode: A small icon in the bottom right of the control panel.

Lewis Score: A small icon in the bottom right of the control panel.

Captured Thumbnails: A row of five small video frames at the bottom, each with a timestamp (01:02:39, 01:02:40, 01:02:54, 01:05:32, 01:06:59).

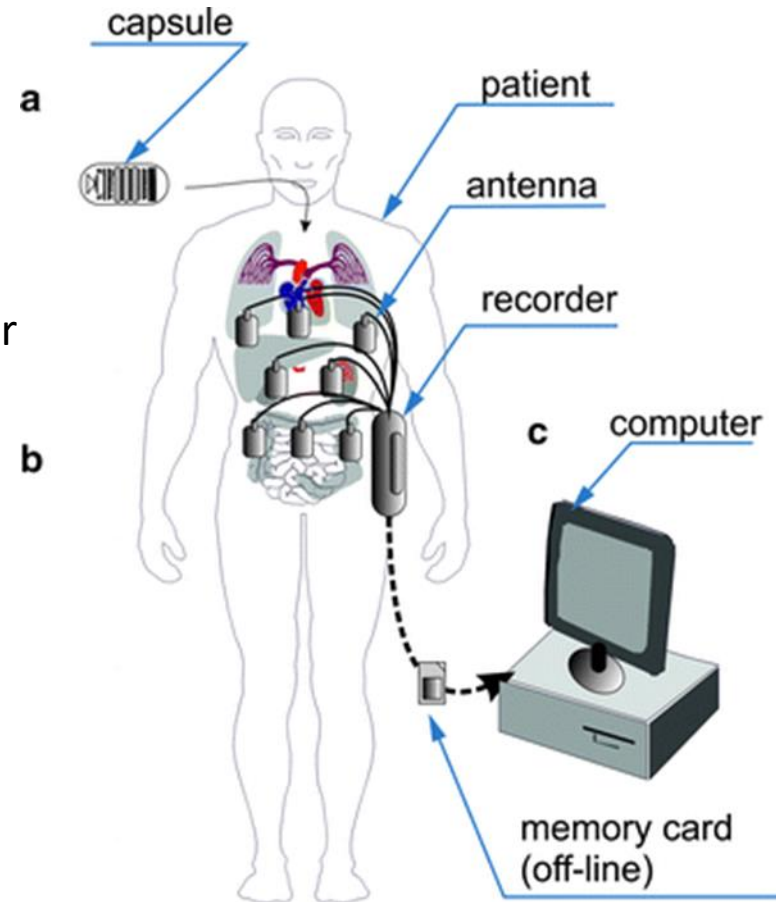
Summary of events

Patient prepared, swallows capsule

Data acquisition by capsule and transmitted to recorder

Images transferred to workstation and processed

Generation of report



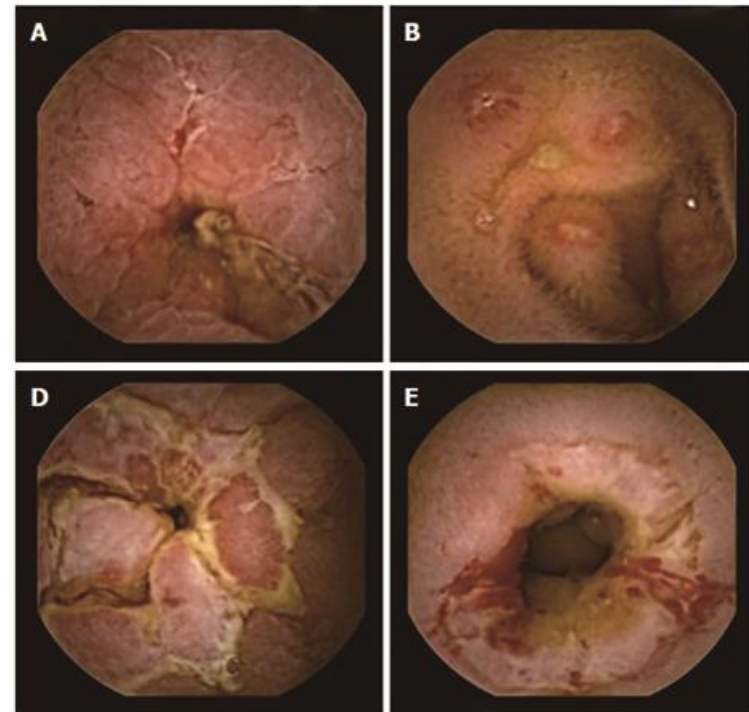
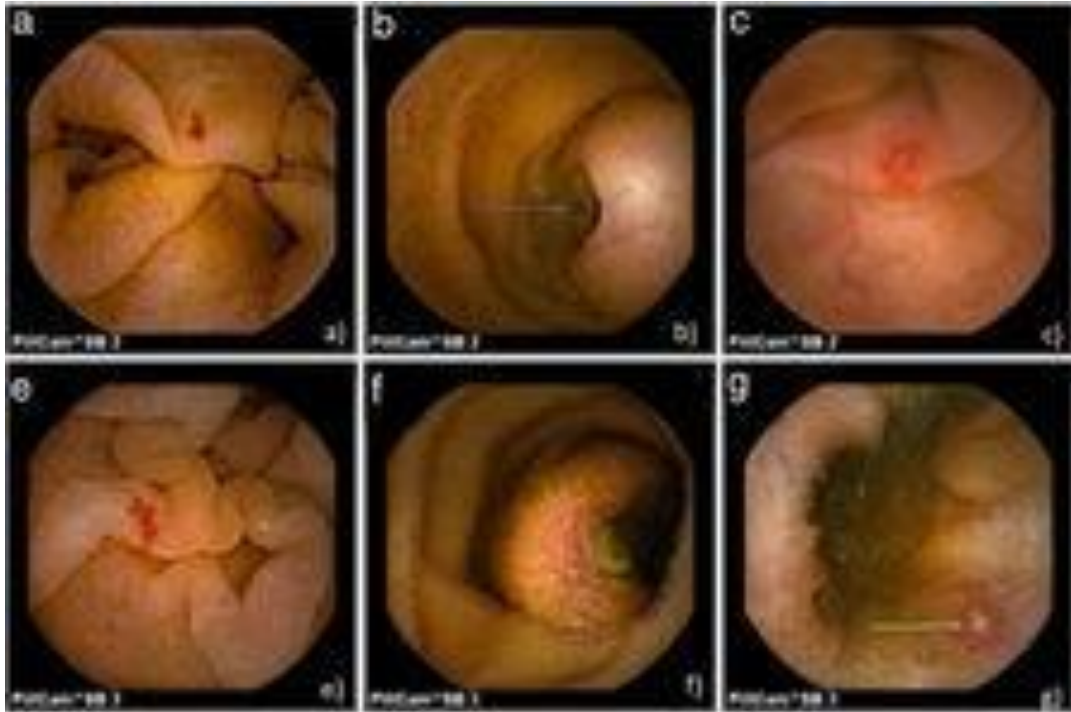
Available devices

| | Pillcam SB3 | EndoCapsule | MiroCam | OMOM capsule | CapsoCam SV1 |
|----------------------------|---------------------|---------------------|----------------------------------|----------------------|-------------------------------|
| Length, mm | 26 | 26 | 24 | 25.4 | 31 |
| Diameter, mm | 11 | 11 | 11 | 11 | 11 |
| Weight, g | 3.4 | 3.3 | 3.4 | 4.5 | |
| Frame rate, frames/second | 2–6 | 2 | 3 | 2–4 | 3–5 per camera (4 cameras) |
| Viewing direction | Front | Front | Front | Front | Lateral |
| Image sensor | CMOS | CCD | CMOS | CMOS | |
| Field of view | 156° | 160° | 170° | 157° | 360° |
| Illumination | 4 white LEDS | 6 white LEDS | 6 white LEDS | 6 white LEDS | 16 white LEDs |
| Automatic light adjustment | Yes | Yes | Yes | – | Yes |
| Antennas (body leads), n | 8 (or sensor belt) | 8 | 9 | 4 (jacket) | N.A. |
| Data transmission | Radiofrequency | Radiofrequency | E-field propagation ¹ | Radiofrequency | None |
| Data storage | External hard drive | External hard drive | External hard drive | External hard drive | On-board EPROM flash memory |
| Real-time viewing | Real-time viewer | VE-1 viewer | Miro-Viewer | Real-time monitoring | N.A. |

Indications

Indications of capsule endoscopy

- Obscure GI bleed
- Unexplained iron deficiency anemia
- Chronic diarrhea
- Recurrent abdominal pain (after ruling out small bowel obstruction)
- 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.
- To spot the primary tumor in a symptomatic metastatic carcinoid
- Small bowel polyps- surveillance of patients with hereditary polyposis syndromes.
- Rejection in small bowel transplantation





Preparation for procedure

Pertinent history

A complete clinical history before capsule administration is highly recommended; special attention should be paid to

- Prior bowel surgery-small bowel resection
- Pelvic radiation
- Chronic NSAID use
- History suggestive of small bowel obstruction
- potential swallowing dysfunction in elderly patients
- Patients at risk of delayed gastric emptying- diabetic neuropathy, CKD, patients on psychotropic medications or severe hypothyroidism

Preparation

- Low fibre diet on day prior to procedure
- 2 litres of polyethylene glycol (PEG) preparation prior to procedure- optimal timing not clear- usually evening prior to procedure
- Fasting on day of procedure
- Routine use of prokinetics not recommended- only in patients with delayed gastric emptying noted on real time viewing
- Antifoaming agents- simethicone -80-200mg recommended before procedure

Small-bowel capsule endoscopy and device-assisted enteroscopy for diagnosis and treatment of small-bowel disorders: ESGE Technical review *Endoscopy* 2018; 50: 423–446

Setting

- Ideally capsule endoscopy should be performed on outpatient basis
- Incomplete studies-[Capsule did not reach cecum]- higher in ICU setting (54%) Vs in patient (26%) Vs outpatient (9.5%)
- Lack of physical activity, concurrent medications, critical illnesses may contribute to these finding

Small-bowel capsule endoscopy and device-assisted enteroscopy for diagnosis and treatment of small-bowel disorders: ESGE Technical review *Endoscopy* 2018; 50: 423–446

Interference with electromechanical devices

- ESGE recommends that patients with a pacemaker can safely undergo SBCE without special precautions.
- ESGE suggests that SBCE can also be safely performed in patients with implantable cardioverter defibrillators (ICDs) and left ventricular assist devices (LVADs).
- Cellphone use does not interfere with data recording
- Wireless telemetric cardiac monitoring not advised during procedure-If cardiac monitoring required during capsule endoscopy, wired devices to be used
- Contraindicated in pregnancy, as current data insufficient to make recommendation



Periprocedural instructions

Periprocedural instructions

- Patients should
- fast for at least 2 hours after capsule ingestion
- allowed to drink clear liquids 2 hours after capsule ingestion
- to eat solid food 4 hours after capsule ingestion.

Real time viewer- Recommendations

- Used to monitor passage of capsule beyond stomach
- Useful for patients at risk of delayed gastric emptying:
 - inpatients
 - patients with diabetic neuropathy
 - severe hypothyroidism
 - renal insufficiency
 - those using psychotropic or narcotic medications
- 10 mg of metoclopramide, followed by 500 mL of PEG was given if the capsule had failed to pass through the stomach at 60 minutes post-ingestion.
- Also gives real time view of pathology in small intestine and passage of capsule into colon



Post procedure instructions

Post procedure instructions

- Patients advised to
 - Look for egestion of capsule in stools for 2 weeks after study
 - Report if any symptoms of capsule retention (crampy abdominal pain or vomiting with abdominal distension) occurs
- Capsule retention arbitrarily defined as presence of capsule in abdomen radiograph imaging >14 days after ingestion
- ESGE recommends that a plain abdominal X-ray should be performed in patients with an incomplete capsule study (capsule not reaching the colon or stoma bag) if they do not notice capsule egestion after 15 days.

Report generation

Capsule reading protocols

- Recordings should be read at a maximum speed of 10 frames/s in a single-view mode. Double- and multiple-view modes, if available, at a maximum speed of 20 frames/s are also viable alternatives

Contents of report

- Procedure-related data (some of which is provided by the relevant proprietary software, i. e., gastric transit time, small-bowel transit time, and overall recording time)
- Bowel preparation used, if any
- Quality of bowel preparation (possibly evaluated using a published grading scale)
- Completion/extent of examination
- Findings and
- Advice

Contents of report

Report should include (when applicable):

- estimated lesion size and estimated location
- objective reporting of any visualized inflammatory changes, by means of the Lewis score or Capsule Endoscopy Crohn's Disease Activity Index (CECDAI) as appropriate
- an accurate description by means of the Smooth, Protruding lesion Index on Capsule Endoscopy (SPICE) score, and/or the Shyung score (for protruding lesions which may either represent neoplasms or innocuous mucosal bulges)



Complications

Capsule retention

- Capsule retention rates : 2-3% (in established IBD- 8%)
- Asymptomatic capsule retention can be followed up; only 2% of retained capsules caused symptomatic small bowel obstruction
- Targeted treatment (steroids for IBD) may help egress the capsule in 20-30% of asymptomatic patients
- In cases where capsule retrieval is indicated, ESGE recommends the use of device-assisted enteroscopy (DAE) as the method of choice. When clinically indicated or when DAE is unsuccessful, surgical intervention is indicated to retrieve the capsule and/or to treat the underlying disease (malignancy/ stricture)

Capsule aspiration

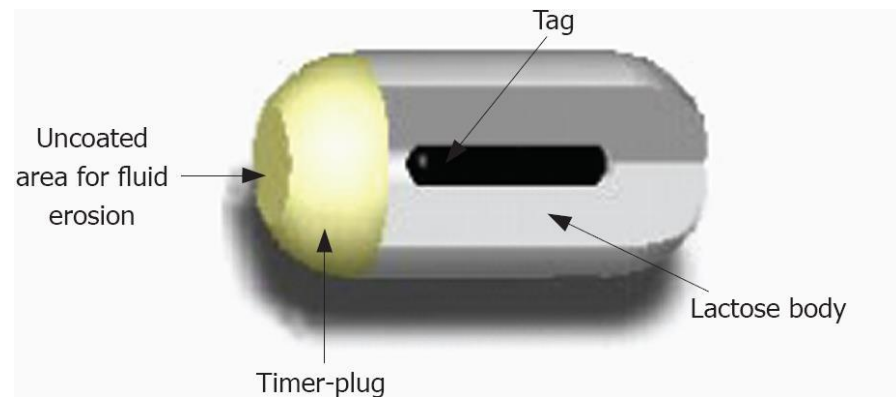
- Capsule aspiration rate <0.1%
- ESGE recommends the use of endoscopic capsule placement in patients with a suspected or established non-obstructive swallowing disorder, in order to prevent capsule aspiration.

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Patency capsule

Patency (Dummy) capsule

- “Test run”
- To establish that real capsule endoscopy pill can pass across the small intestine without getting retained
- Essentially rules out significant narrowing of small intestine
- If patency capsule gets stuck, it disintegrates and passes off



Role for patency capsule

- ESGE does not recommend offering a patency capsule procedure indiscriminately to all patients undergoing capsule endoscopy.
- ESGE recommends that a patency capsule procedure should be offered to patients at increased risk of capsule retention.
- Presence of a combination of symptoms of abdominal pain, abdominal distension, and nausea/vomiting before capsule endoscopy has been shown to be associated with a significantly higher rate of capsule retention



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