



VIDEOCAPSULE

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WHAT IS IT?

Video capsule endoscopy (VCE) is a novel non invasive technology, designed primarily to provide diagnostic imaging of the small intestine, an anatomic site that has proved peculiarly difficult to visualize. Limited views of the oesophagus, stomach, and cecum may also be acquired.

The capsule is ingested by the patient with a drink of water and progresses pushed by peristalsis. During transit illuminates the intestinal tract, capturing images for 8 hours (time that usually allows the transit from the esophagus to the blind). This capsule contains two micro-video-cameras enabling to movie the overall small bowel. Each camera takes pictures at a rate of 7 frames per second or 14 frames per second when combined, allowing to both movie all the internal bowel lumen that it covers and to verify the situation of the organ. An average of 50,000 images are obtained during the 8-hr. passage of the pill. The available images are of excellent resolution and have a 1:8 magnification, which is higher than that of conventional endoscopes. This magnification allows visualization of individual villi.

HOW IS IT COMPOUNDED?

The VCE, which is about the size of a large vitamin pill, measures 11 mm x 26 mm and weighs 3.7 grams. The outside surface of the capsule is made of a specially sealed biocompatible material that is resistant to the gastrointestinal tract's digestive fluids. Inwards, it contains: light emitting diodes (LEDs), two lenses, two colo-camera chips, two silver-oxide batteries, a radio-frequency transmitter and a radio-antenna. The chips, named as complementary-metal oxide semiconductor (CMOS), require less current power, than present charged coupled device (CCD) chips, usually found on video-endoscopes and digital camera. Moreover, they can operate at very low levels of lighting.



HOW DOES THE PROCEDURE WORK ?

First it is a premise on the preparation that must be implemented before starting the investigation. There is no unanimous agreement on the modalities for the examination with capsule. The recommended preparation in our Center is that of colonoscopy (4 litres of polyethylene glycol solution). How to prepare alternatives may be recommended in each case. It is useful to stop taking drugs that slow gastric emptying and discontinue drugs that contain iron from at least two days before the exam to avoid false images. In the case of mandatory medications the patient must take them 3 hours before or 2 hours after ingestion of the capsule. Sublingual medications can be taken at any time. Men hair removal is required of the abdomen, 15 cm above and below the navel. It is recommended to wear comfortable clothes, eg. gym clothes, both for men and for women, so as to easily accommodate the belt with the recorder.

During the examination, the patient wears a belt with suspenders, where will be placed a recorder (data recorder) powered by a battery and electrodes attached with patches on the abdomen, which will form an antenna capable of receiving the signal from the capsule and send it to the recorder. This equipment will be removed at the end of the examination and the recorder will be downloaded in a work-station that will process the data and will constitute a real tube around the small intestine (duodenum-jejunum-ileum).

The procedure can be performed in ambulatory or hospitalised patients.

It is generally agreed that patients should fast at least overnight (12 hours). Whether additional patient preparation is needed is controversial and consensus has not yet been achieved.

Once they ingest the capsule with a small amount of water, they are free to go about their usual activities. Subjects are allowed to drink water 2 hr. after ingesting the capsule and eating a light meal after 4 hr. Seven to eight hours later, the recorder is disconnected and the sensors are removed. The capsule is retrieved from the feces of a regular bowel movement by each subject using a special net. The recorded digital information is downloaded from the recorder into the computer and images from the stomach and the small bowel are analyzed by the proprietary software. The videos produced from the data are recorded



and reviewed by experienced gastroenterologists. The recording system expires until eight hours but usually such a time is enough to across the whole bowel.

WHY IT'S IS USED?

It's worth remembering that since 2000 the use of original VCE (Given Imaging, Ltd, Yoqneam, Israel) has been approved by the Food and Drug Administration in USA.

The main indications are as follows: occult gastrointestinal bleeding (both negative Esophagogastroduodenoscopy and colonoscopy), Crohn's disease, injury from anti-inflammatory (NSAIDs and steroidal), small intestinal Polyposis, neoplastic, chronic diarrhea of unknown origin.

WHAT ARE THE LIMITS ?

First, patients with a previous diagnosis of bowel occlusion are excluded from the procedure, so, the extent of eligible patients results limited as a whole.

It is also appropriate to provide for a series of precautions when the investigation began:

- After swallowing the capsule does not take food or drink for 2 hours.
- After 4 hours is allowed a small snack (some crackers or biscuits or cookies); However, fasting or taking only sugared tea.
- Avoid tiring physical activity.
- Avoid to remain long in bed or sitting; is shown wandering stimulate peristalsis and then transit the capsule.
- Avoid frequenting places where there are magnetic fields (input from banks or department stores).
- Limit the use of mobile phones.
- Check every 15 min, the light on the data-recorder comes on about 2 times per second, indicating the proper functioning of that the most frequent cause of failure is the exhaustion of the battery.

One of the drawbacks of the system is the length of its battery life for some patients: the 8 hr. currently available does provide ample time for the swallowed capsule to reach the cecum in most cases, but not at all. The next-generation capsule seem to have improved battery life and solved part of the problem.

A further speech deserves the possibility of complications as a result of this exam. On the basis of an international consensus it was established to define retention of the capsule, when it is not excreted in the feces within two weeks after ingestion. In reality the time capsule ejection is varied, from a few hours to a few days and usually depends more on the transit time in the colon, as well as in the small intestine. There are also conditions recognized in enticed patients that can slow the expulsion. In such a circumstances physicians can decide to supply prokinetics before administration of the capsule, or where suspicion still of slow transit. The capsule is not toxic and are documented cases of patients who retained it in the gut for several months without any symptoms. Some authors define capsule retention only if it is necessary to put in place a medical therapy (SELG, prokinetics, cortisone if inflammatory stenosis), endoscopic or surgical or to allow the expulsion. In truth, the real complication can occur when the capsule coming out of a stenosis does not allow transit of bowel contents, thus leading to a framework of bowel obstruction, requiring emergency surgery. Since the presence of intestinal stenosis can lead to this complication, conditions that can cause gastrointestinal tract stenosis (Crohn's disease, the presence of adhesions following previous surgeries) are contraindications for the use of at least capsule. This has limited the use of the capsule in Crohn's disease (which also has a useful diagnostic role), in which some authors recommended a small bowel barium enema before the examination of the small intestine with capsule video to exclude stenotic lesions. However, since x-ray images cannot highlight very short stenosis or describe a deformability strictured, they do not allow to provide the ability to consistently capsule transit.



Finally, it may happen that the capsule does not store in a great movie or you could lose your images.

Bibliografia

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