

WIRELESS CAPSULE ENDOSCOPY

Abstract:

The video capsule is specifically designed to view the inner lining of the **Esophagus**. The capsule is equipped with miniature cameras on both ends and is about the size of a multi-vitamin, which can be swallowed easily. Three sensor arrays are strategically placed on the patient's chest and connected to a data recorder, worn on a belt around the waist.

The patient swallows the capsule lying down, and is then raised in a series of inclinations over a total of 5 minutes. The Pill Cam™ ESO travels through the esophagus by normal peristaltic waves, flashing 14 times per second, each time capturing images of the inner lining of the esophagus.

As it continues down the esophagus, the images captured may identify potential abnormalities, such as Esophagitis – which is inflammation of the lining of the esophagus often caused by **Gastro esophageal** Reflux Disease or GERD. Severity of symptoms is measured by a Grading system, and in severe cases, esophageal ulcers can appear.

Images captured by the Pill Cam™ ESO may also identify symptoms of Barrett's Esophagus, which occurs as a result of abnormal cell growth in the lower esophagus. Columnar cells, typically found in the lining of the stomach, replace the squamous cells in the lining of the esophagus, which can lead to a cancerous condition.

During this five-minute procedure, the Pill Cam™ ESO captures images, which are transmitted to the sensor arrays. These images then travel from the sensors, along the wires to the Data Recorder™. At this point, the patient is permitted to get up and walk or remain seated for an additional 15 minutes to ensure the capsule has traveled the entire length of the esophagus. After dropping into the stomach, the pill is later excreted naturally.

Once all equipment is removed from the patient, the portable Data Recorder™ downloads the video images to a designated workstation, from which the physician views and assesses the results in order to recommend next steps in the patient's treatment.

Key Words: *Esophagus, multivitamin, sensor, data recorder, pill cam, gastro esophageal, peristaltic*

Conclusion

In clinical trials, the Given Imaging System seemed to be more effective than push enteroscopy or surgical techniques in detecting suspected physical abnormalities in the small intestines. To date, there have been no side effects associated with this procedure. Given Imaging believes their system will be cost effective and is planning to work with insurers to see that this procedure is included in reimbursement policies.

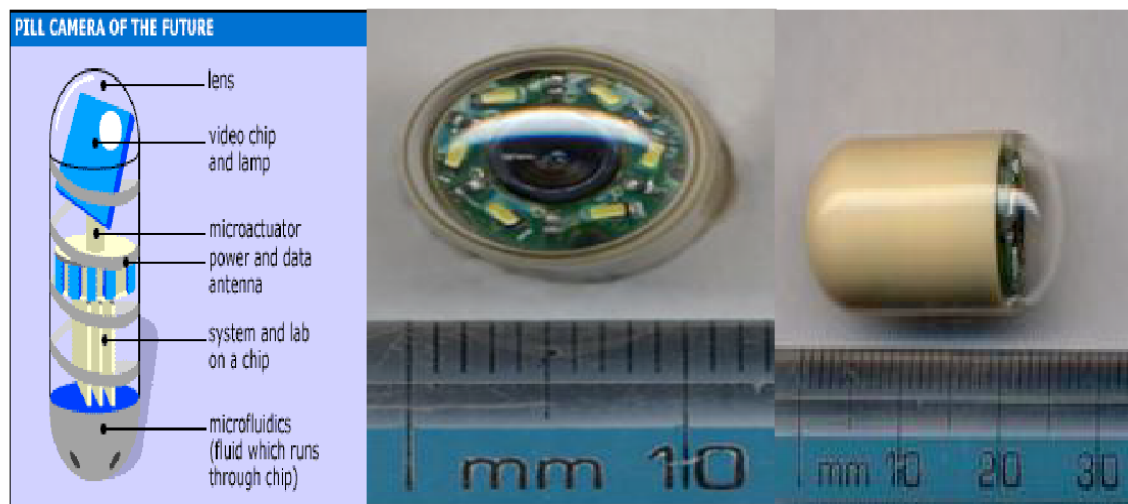
INTRODUCTION

An embedded system is some combination of computer hardware and software, either fixed in capability or programmable that is specifically designed for a particular kind of application device. Industrial machines, automobiles, medical equipment, cameras, as well as the more obvious cellular phone are among the myriad possible hosts of an embedded system. Embedded systems that are programmable are provided with a programming interface

In the past, doctors who needed to diagnose digestive problems would either use X-rays or endoscopy, which involves sedating a person and guiding a narrow tube with a camera attached down the throat and into the stomach and upper intestinal tract. Before endoscopy, doctors would have to perform surgery to assess some problems. Capsule endoscopy allows us to see places inside the small bowel where other methods cannot reach.

Endoscopy is the examination of the inside of the body using a lighted, flexible instrument called an endoscope. In general, an endoscope is placed into the body through a natural opening like the mouth or anus. The most common endoscopic procedures evaluate the esophagus (swallowing tube), stomach, and portions of the intestine, colon.

Capsule camera, endoscopic capsule or video pill is a camera with the size and shape of pill. The Imaging Capsule contains a miniature camera, battery, light, computer chip and wireless transmitter. The target destination for the device is the small bowel, where the miniature camera may help physicians detect sources of bleeding or diagnose disease.

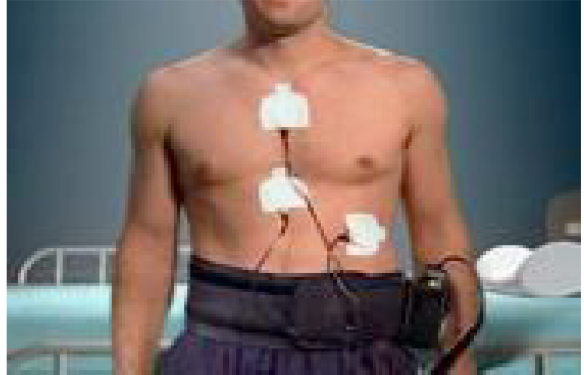


DESCRIPTION

The capsule itself is larger than an aspirin, about 11 mm x 26 mm in size and about 4grams in weight. Called the M2A, it is not a medication, but rather a single-use video color-imaging capsule. Besides the miniature color video camera, the capsule contains a light source, batteries, a transmitter, and an antenna.

Once swallowed this capsule/camera travels easily through the digestive tract and is naturally excreted. It is never absorbed in the body. The patient wears a wireless Given Data Recorder on a belt around his or her waist, much like a portable "Walkman." This device receives and records signals transmitted by the camera to an array of sensors placed on the patient's body. These signals can also track the physical course of the capsule's progress. During this procedure, users feel no pain or discomfort and are able to continue their regular activities as the camera works inside the body and the sensors and belt work outside. The entire process takes about eight hours.

The video images to a designated workstation, from which the physician views and assesses the results in order to recommend next steps in the patient's treatment. Once all equipment is removed from the patient, the portable Data Recorder™ downloads



A computer workstation using Given's Imaging propriety software processes the data and produces a video of the images together with additional relevant information from the digestive tract. Doctors can then view, edit, and save both individual images and the streaming video. The images produced are of an especially high quality.

PillCam™ ESO Capsule Images



Suspected Barret



General



Esophagitis



Varices

How it Works

- PillCam™ ESO is equipped with two miniature color video cameras (one on each end), battery and flashing light source
- Cameras transmit 14 color images per second as capsule moves through the esophagus
- Transmits about 2,600 images of the esophagus to a recording device worn by the patient
- Data is transferred from the recorder belt to the RAPID® Workstation (used for viewing, editing, archiving and e-mailing video images. Saves individual images and short video clips)

Procedure

- Patients fast for two hours before swallowing the PillCam™ ESO
- Smooth plastic capsule is easily swallowed with water while patient lies on his/her back
- After swallowing PillCam™ ESO, patients are raised by 30 degree angles every two minutes over a six minute ingestion period until they are sitting upright
- PillCam™ ESO makes its way through the esophagus in about three minutes
- Transmits images to recorder belt worn around the patient's waist
- Total procedure takes approximately 20 minutes in the doctor's office, hospital or clinic
- Natural digestive contractions help propel the disposable PillCam™ ESO through the gastrointestinal (GI) tract, and is passed naturally and painlessly from the body, usually within 24 hours

Benefits over Traditional Endoscopy

- Little discomfort
- Does not require sedation
 - Eliminates potential sedation related cardiopulmonary complications
- Offers a simple, safe and less invasive alternative
- Patient satisfaction
 - Ease of ingestion
 - Comfort during procedure
 - Convenience
- Immediate recovery
- Preferred by patient over traditional endoscopy