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Capsule endoscopy – accurate diagnosis method for detection of obscure digestive bleedings and secondary chronic anemia

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ABSTRACT:

Background. Capsule endoscopy is a revolutionary new diagnostic method for the detection of digestive diseases, especially localized at the level of small bowel and colorectal tract. This method is the only technique that allows endoscopic examination of the digestive tract without sedation. Obscure gastrointestinal bleeding is the most common indication for capsule endoscopy, which commonly diagnoses arteriovenous malformations, small bowel tumors, ulcers or tumors missed at standard endoscopy or other imaging examinations [1]. **Aim.** Our study aimed to detect the accuracy of endoscopic videocapsule in detecting the cause of microscopic anemia in patients with supposed digestive pathologies. **Material and method.** We used PillCam 2 Platform provided by Given Imaging, a system consisting of PillCam 2 videocapsules, a data recorder, a set of sensors and the Rapid 7 Access computer soft capable to receive and transform pictures into films, in order to visualize the entire digestive gastrointestinal tract. We examined 25 patients with chronic anemia, all of them without any known hematologic, renal or digestive disease, investigated by standard imagistic and lab techniques. **Results.** From the total of 25 investigated patients, 18 (72%) of them presented sources of bleeding discovered with videocapsule endoscopy. The source of bleeding was the small bowel in 10 cases (55%) and the colorectal tract in 8 cases (45%). The accuracy of videocapsule was very good for detecting the digestive tract obscure sources of bleeding (Sn=74%, Sp=87%). **Conclusions.** The videocapsule endoscopy is an accurate imagistic option to detect digestive sources of bleeding and to identify the cause of many chronic anemia.

Key words: videocapsule endoscopy, obscure digestive bleeding, chronic anemia

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Introduction

Over 50% of gastrointestinal bleedings and secondary chronic anemia remain undiagnosed because are occult or intermittent [2]. The causes are multiple and varied: from the primary complications of gastrointestinal diseases to iatrogenic causes. More than 80% of cases are caused by vascular malformations and lesions (angiodysplasia, hemangiomas, etc). Small bowel tumors are involved in 10% of gastrointestinal bleedings and represent 5% of digestive tract tumors. Other causes, such as ulcerations, inflammatory bowel diseases, long treatments with NSAID's or anticoagulants can be causes for anemia due to chronic obscure bleeding [3]. Capsule endoscopy is a revolutionary new diagnostic method for the detection of digestive diseases, especially localized at the level of small bowel and colorectal tract. This method is the only technique that allows noninvasive endoscopic examination of the digestive tract without sedation and to detect obscure bleedings as causes of a chronic anemia. We aimed to study the accuracy of endoscopic videocapsule in detecting the source of bleeding as a cause of chronic microscopic anemia in patients with other unknown pathologies.

Material and method

Material.

We used PillCam 2 Platform provided by Given Imaging.

The Pillcam 2 Platform consists in 4 components developed and constantly improved to reach the currently highest technology. The basic structure of the capsule endoscopy systems is as follows:

1. Workstation consisting of a computer running a specialized software compilation, processing and interpreting registration and proving results reporting;
2. The set of sensors - which take information from the capsule and transmit them to data recorder (fig 1)

*Figure 1. The sensor location
(Image provided by Given Imaging)*

3. The data recorder - for recording and storing images during the procedure (fig 2);

4. Endoscopic capsules – miniature devices used to take snapshots of the gastrointestinal tract. It contains two video camera, a light source (four white light-emitting diodes), a radio transmitter and batteries. (fig 3)

*Figure 2 Data recorder
(Image provided by Given Imaging)*

*Figure 3. The capsule
(Image provided by Given Imaging)*

The new applications of software RAPID 7 Access of PillCam 2 Platform provides us a series of

advantages compared with the old version:

1) FICE application of virtual chromoendoscopy who opened the way to improve the noninvasive diagnosis of digestive tract pathology;

2) Viewing as a mosaic a series of 18-25 successive images/minute allowing the observation in progression of pathological changes in the digestive lining;

3) Progress indicator which enables to detect the linear distance traveled by the capsule in the digestive tract to the lesion found;

4) Function of automatic measurement for polyps.

Method.

1. To make capsule endoscopy we followed all steps indicated by the producer;
2. Patient preparation according to diet restrictions in the day prior to investigation;
3. Data recorder and sensors attachment;
4. Identification of capsule by the computer soft;
5. PillCam video capsule administration;
6. Recovery of data recorder device after finishing the procedure;
7. Create a video;
8. Report of result.

We examined 25 patients diagnosed with chronic anemia in Internal Medicine Clinic of Emergency Hospital of Constanta County during 12 months, from January 2012 to January 2013, all of them investigated for causes of anemia by standard imagistic and lab techniques. None patient enrolled in our study had a known cause of anemia after thoroughly lab and imagistic investigations. All patients underwent a endoscopic videocapsule, supposing that, in concordance with many study results, the cause of anemia could be an occult bleeding of the digestive tract [1, 2].

Accuracy was calculated with a 95% confidence interval. Sensitivity was calculated as the percentage of patients who had positive findings on capsule endoscopy among those patients who had positive findings on other type of investigation. The false negative rate is equal to 1-sensitivity and indicates the percentage of lesions missed by capsule endoscopy. Specificity was calculated as the percentage of patients who had negative findings on

capsule endoscopy among patients with negative findings on colonoscopy/MRI enteroscopy. This corresponds to 1-the false positive rate. P value ≤ 0.05 was considered to indicate statistical significance. Statistical analyses were performed with Graph Pad InState and Graph Pad StateMate.

Results.

At the level of small bowel we discovered 5 cases with angiodysplasia, 2 cases with small bowel tumors, one benign and one malignant, 2 cases with Crohn's Disease localized in the ileum and 1 case with indeterminate ileitis.

Regarding the colorectal pathologies we discovered 3 cases with angiodysplasia localized in colorectal tract, 2 cases of diverticulitis, 2 cases with colonic polyps and one with ulcer localized at the level of D2 (table 1).

Table I. Causes of bleeding in the digestive tract detected by endoscopic videocapsule.

Causes of bleeding in the digestive tract	No./%	Localization – no./%				
		Superior digestive tract	Jejunum	Ileum	Colon	Rectum
Angiodysplasia	8[32]	0[0]	1[4]	4[16]	1[4]	2[8]
IBD	2[8]	0[0]	0[0]	2[8]	0[0]	0[0]
Indeterminate ileitis	1[4]	0[0]	0[0]	1[4]	0[0]	0[0]
Tumors	2[8]	0[0]	1[4]	1[4]	0[0]	0[0]
Polyps	2[8]	0[0]	0[0]	0[0]	2[8]	0[0]
Diverticulitis	2[8]	0[0]	0[0]	0[0]	2[8]	0[0]
Ulcers	1[4]	1[4]	0[0]	0[0]	0[0]	0[0]

Accuracy in detection of lesions.

The sensitivity and specificity of capsule endoscopy for detecting any kind of digestive source of bleeding was 74% (95% CI, 59 to 82) respectively 87% (95% CI, 83 to 95).

The sensitivity and specificity of videocapsule were higher in small bowel lesions and smaller in

colonic and rectal ones (88% vs. 69%, respectively 91% vs.79%).

Adverse events.

In 3 (12%) of 25 patients, adverse events were related to the bowel preparation and included abdominal discomfort, nausea or vomiting.

None of adverse events were related to capsule passage.

There were no cases of capsule retention.

All symptoms were considered to be mild.

Lesions detected at capsule endoscopy.

Arteriovenous malformations, also referred to as angiodysplastic lesions, telangiectasias, or angioectasias, are the most common abnormality accounting for obscure gastrointestinal bleeding and are seen in 21%–53% of patients who undergo capsule endoscopy [4-8]. (Figure 4)

Figure 4. Angiodysplastic lesion localized in the sigmoid segment

Polyps are also injuries that cause chronic bleeding and secondary anemia. They are found most commonly in the colon and are easy to detect and measure at capsule endoscopy. (Figure 5)

Figure 5. Colonic polyps

Diverticular disease. Diverticular disease consists of three conditions that involve the development of small sacs or pockets in the wall of the colon, including diverticulosis, diverticular bleeding, and diverticulitis. Diverticular bleeding occurs with chronic injury to the small blood vessels that are next to the diverticula. Videocapsule endoscopy can detect diverticula, but a previous diagnosis of diverticular disease could be a contraindication for this procedure due to the risk of capsule retention [9]. (Figure 6)

Figure 6. Diverticular disease

IBD. Small bowel ulcers are another common abnormality detected at capsule endoscopy. Although the majority of small bowel ulcers detected at capsule endoscopy are due to Crohn disease or NSAIDs, other causes include infection, ischemia, trauma, or vasculitis [10, 11]. (Figure 7)

Figure 7. Ileum superficial ulceration in Crohn's Disease

Conclusions.

The videocapsule endoscopy showed a good accuracy for detection of obscure sources of bleeding and is a good option to identify the cause of many chronic anemia.

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