

The indications for the wireless capsule endoscopy

Silviu IOBAGIU, MD, PhD,
Dana Maria PASCA, MD, PhD,
Oliviu PASCU, MD, PhD
3rd Medical Clinic

University of Medicine and Pharmacy
"Iuliu Hatieganu" Cluj-Napoca, Romania

ABSTRACT

The wireless capsule endoscopy is a new device permitting the visualization of the small bowel, the most difficult segment of the digestive tract to explore. There are important valuable advantages and moderate downsides, some of them generated by the actual technical limits. The indications are continuously to be defined. The main benefit of the wireless capsule endoscopy is in occult and obscure intestinal bleeding. It brings also valuable data in Crohn's disease, celiac disease, intestinal tumors, polyposis. To avoid the problems generated by a possible impact of the capsule in the digestive tract, the exam is not performed in patients with suspected stenosis.

Key words: wireless capsule endoscopy, obscure intestinal bleeding

INTRODUCTION

The 3rd millennium brings in the non-invasive medical investigations field the small bowel exploration with the wireless capsule endoscopy system (1). The advantages are multiple: the examination is easily accepted by the patient, the preparation for the examination is not difficult, there is no significant discomode during the 8 hours of the exploration, the images have a "high-fidelity" character in conditions of a "physiologic endoscopy", the possibility to investigate accurately a long segment of the digestive tract: the small bowel, an organ very difficult to be examined through other methods (radiology

or classical endoscopy performed through oral or anal way). There are disadvantages too: the impossibility to perform biopsies or therapeutic activities, there is no air insufflation to distend the bowel for a mucosal visualization enhancement, sometimes the capsule does not traverse the whole small bowel tract during the 8 hours of the battery-life, so the investigation remains incomplete, there are risks correlated with the possible presence of a stenosis or a diverticulum where the capsule could impact itself, the difficulty in specifying the exact anatomic location of a visualized lesion, a relatively high cost of the examination. □

METHOD

The investigation needs the ingestion of a M2A video capsule endoscope, in fact a wireless capsule with small dimensions (11/27 mm) and weight (3.7 g), easy to be ingested while it has a slippery coating. Its ovoid shape prevents the adhesion of intestinal contents.

The normal peristalsis of the digestive tract moves the capsule from mouth to the lower levels. The capsule has a 7-8 hours-life battery and, while it progresses through the digestive tract, 2 images per second are transmitted to an outside recorder, worn by the patient on the belt. The images are downloaded into a computer and could be interpreted using an

informatics program. The lesions could be localized with an accuracy of 2-3 cm, while there are 8 sensors on the abdominal wall and the first gastric image, the first duodenal image, the last ileal image and the first cecal one are captured.

Before the wireless capsule endoscopy is performed, it is safe for the patients to have undergone other explorations, like the small bowel radiological examination. This is particularly emphasized for patients with possible strictures, for example in suspected Crohn's disease, where there is a risk for the capsule to be impacted, to cause bowel obstruction and to necessitate laparotomy. □

INDICATIONS

In this period, of the first years in using the wireless capsule endoscopy in the clinical practice (2), there is a big interest in defining the knowledge of the right indications of this new method in the investigation process of the digestive tract.

The initial device was invented to bring new and more valuable data concerning the

small bowel pathology. The medical experience reached to define the main indications for this investigation (Table 1). The initial device was used in diagnosis of small bowel disease in adults. The recent interest of the pediatricians shows also growing experience in children over the age of 10 (3).

The main indication of this investigation method is to find the source of an occult or obscure gastrointestinal bleeding in adult patients where the upper digestive endoscopy, the colonoscopy or the radiological examination of the digestive tract did not find the real point of blood loss. The patients included here could have recurrent overt bleeding or chronic gastrointestinal blood loss. The main help is the diagnosis of angiodysplasias of the gastrointestinal tract, lesions which are not found through radiological methods.

Obscure gastrointestinal bleeding defines a recurrent or persistent digestive bleeding despite the absence of clear findings at upper and lower endoscopy (4).

When the real source of the gastrointestinal bleeding is identified, one could initiate the

A). suspected occult hemorrhage from a supposed small bowel lesion
B). the initial diagnosis in:
1) suspected Crohn's disease: unselected patients or selected patients without any sign of disease on the diagnostic tests and upper and lower endoscopy
2) suspected celiac disease
3) suspected irritable bowel syndrome
4) suspected neoplasm or intestinal polyposis syndrome possibly located in the small bowel
C). in specifying the extension of supposed or known disease:
1) ileitis
2) regional enteritis of the small bowel
3) vascular insufficiency of the bowel
4) gastroenteritis and colitis due to radiation
5) toxic gastroenteritis and colitis
6) diverticulosis and diverticulitis of the small bowel
7) angiodysplasia in digestive mucosa
D). follow-up evaluation in:
1) patients with known Crohn's disease
2) patients with known celiac disease
3) patients with known small bowel neoplasm or intestinal polyposis syndrome

TABLE 1. The indications for the wireless capsule endoscopy examination (modified after 2)

treatment. Depending on the diagnosed lesion type, the treatment choices include angiographic treatment, endoscopic therapy, pharmacological or surgical methods.

The wireless capsule endoscopy seems to be useful also in selecting patients with obscure gastrointestinal bleeding for intra-operative enteroscopy (5), especially in situations where a clear lesion is not seen, even if fresh blood is present on a segment of the small bowel.

The benefit of using the wireless capsule endoscopy in specifying the source of a bleeding is completed with the data brought in the extension, the localization and the type of lesions in Crohn's disease. If a significant stenosis is not suspected, the examination should be performed to investigate the small bowel segment, where small or moderate lesions could not be detected through classical methods like endoscopy or radiology. A negative small bowel radiological examination in a patient suspected of Crohn's disease cannot be considered as evidence that the patient does not have the disease (6). In such a patient, the wireless capsule endoscopy should be performed. The same examination is useful

in patients with known Corhn’s disease of the colon to determine small bowel involvement, or in patients with undetermined colitis to have a more defined diagnosis (6).

The wireless capsule endoscopy could specify the presence, the position and the characters of the gastrointestinal tumors, even there is no real possibility till now to perform biopsies. Maybe the next years will complete the capsule possibilities with a biopsy device or an aspiration system for obtaining intestinal cells or juice, their study offering valuable data for the digestive disease diagnosis.

One could see hemangiosarcoma or carcinoid tumors, different appearances of lymphomas like “infiltrated areas”, “polypoid lesions”, “irregular ulcers” or “ulcerated lesions on thickened folds” (7).

In patients with celiac disease, the wireless capsule endoscopy can specify the type and the extension of the lesions in small bowel. There are necessary dedicated studies with the wireless capsule endoscopy for description of typical markers of celiac disease and for the real value

of the method in recognizing villous atrophy. The wireless capsule endoscopy could evaluate the complications of celiac disease, like enteropathy-associated T-cell lymphoma, small bowel adenocarcinoma, ulcerative enteritis (8)

There is a possibility to describe through the wireless capsule endoscopy the NSAID-induced small bowel damage.

The surveillance of polyposis syndromes could also be performed through the wireless capsule endoscopy. The small bowel examination in patients with hereditary polyposis syndromes is difficult in usually conditions. The wireless capsule endoscopy is very useful in patients with Peutz-Jeghers syndrome and familial juvenile polyposis. The screening intervals have to be defined (9).

There are also some evolving indications for the wireless capsule endoscopy, their current use is not yet precisely established in the literature: chronic diarrhea, malabsorption, unspecified inflammatory diseases of the gastrointestinal tract. □

CONTRAINDICATIONS

The wireless capsule endoscopy is very helpful in finding lesions of the small bowel tract. There are contraindications in its using too: pregnancy, suspected stricture or a specified one through a radiological examination of the small bowel, presence of cardiac pacemakers, implanted defibrillators or other electromechanical devices, presence of a Zenker’s diverticulum, intestinal pseudo-obstruction or other severe motility disorders who can provoke a blocking of the capsule somewhere on the digestive tract (Table 3). □

POSSIBLE FUTURE ADVANCE

In the future, when the using of the wireless capsule could be largely extended, its indications could extend themselves a lot. We could use the capsule in monitoring the small bowel lesions induced by drugs and chemicals (beginning with the common or the rarely used NSAID), in verifying the mucosal healing after various treatments, new or old ones (in Crohn’s disease, for example), in specifying the extent of lesions (celiac disease, Crohn’s disease), in

A) Definite or probable source of bleeding
1. active bleeding defined mucosal lesions: angiodysplasia, tumor, varices, Dieulafoy’s lesion, diverticulum
2. ulcer: ulcerated mucosa or tumor
3. others
B) Suspected source of bleeding (non-bleeding mucosal lesions as angiodysplasia, varices, tumor without ulcer)
C) Fresh blood localization without definite lesion identified
D) Capsule regional transit abnormality

TABLE 2. Diagnostic findings on capsule endoscopy in obscure gastrointestinal bleeding (modified after 5)

known or suspected stenosis of the digestive tract
pregnancy
Zenker’s diverticulum
intestinal pseudoobstruction
severe motility disorders of the digestive tract
cardiac pacemakers
implanted defibrillators
implanted electromechanical devices

Table 3. Contraindications for the wireless capsule endoscopy (modified after 2)

monitoring some upper or lower gastrointestinal lesions like esophagitis, Barrett's esophagus, various polyps. For the Barrett's esophagus or any other esophageal disease, as an example, there is a specially built capsule, with two video heads, and 14 images obtained per second, instead of 2 per second, as the capsule for the small bowel examination transmits. □

COMPARISON WITH OTHER ACTUAL DIAGNOSTIC METHODS

Some recent articles (10, 11, 12) compare the diagnostic detection rate of small bowel lesions using the wireless capsule video endoscopy with invasive methods like push-enteroscopy or double-balloon enteroscopy in patients with obscure gastrointestinal bleeding.

These methods are complementary (13): when the video capsule endoscopy finds a lesion, other methods continue the diagnostic process and may offer therapeutic possibilities: double-balloon enteroscopy, angiography or exploring laparotomy.

Capsule video endoscopy is a very sensitive method and superior than barium examination, usual endoscopy or enteroCT in specifying the diagnosis of many small bowel diseases (14).

It is useful in the diagnosis of patients with occult digestive bleeding (15), iron deficiency anemia or suspected Crohn's disease (16, 17). It permits a sensitive description of the small bowel tumors and polyps, in different polyposis syndromes.

The capsule endoscopy role in exploring patients with celiac disease or known Crohn's disease is extending (2). Some authors consider that the utility of the capsule video endoscopy in suspected irritable bowel syndrome or in suspected celiac disease (18, 19) is limited by the cost-efficiency ratio.

Actually, the indications for capsule endoscopy continue to be defined. Its specificity and positive predictive value remain to be established. □

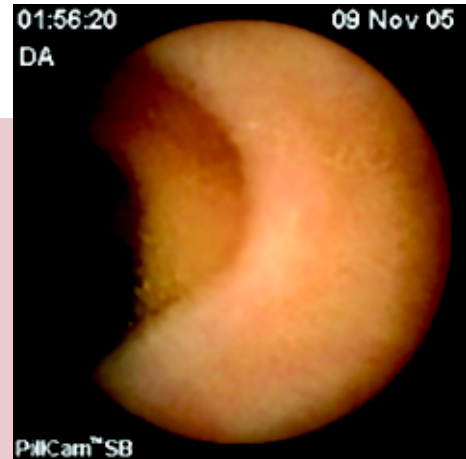


FIGURE 1. Normal mucosa in small bowel. The 3rd Medical Clinic Cluj-Napoca picture collection.

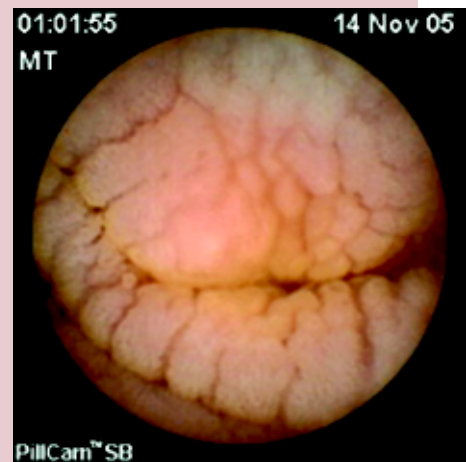


FIGURE 2. Scalloping of the small bowel folds and micronodularity in celiac disease. The 3rd Medical Clinic Cluj-Napoca picture collection.

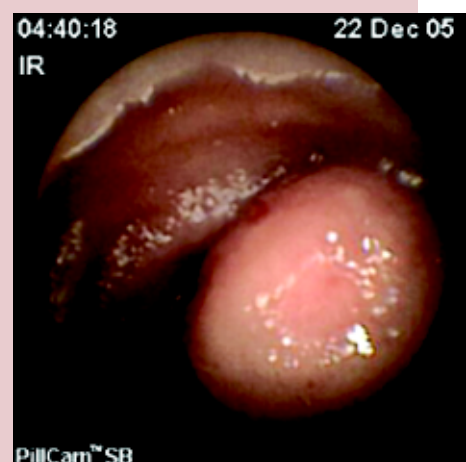


FIGURE 3. Tumor of the small bowel. The 3rd Medical Clinic Cluj-Napoca picture collection.

REFERENCES

1. **Iddan G, Meron G, Glukhovsky A, et al** – Wireless capsule endoscopy. *Nature* 2000; 405:417
2. **Eliakim R** – Wireless capsule video endoscopy: Three years of experience. *World J Gastroenterol* 2004; 10:1238-1239
3. **de Araujo Sant'Anna AM, Dirks M** – Potential applications of wireless capsule endoscopy in the pediatric age group. *Gastrointest Endoscopy Clin N Am* 2004; 14:207-217
4. **Zuckerman GR, Prakash C, Askin MP, et al** – American Gastroenterological Association technical review on the evaluation and management *Gastroenterology* 2000; 118:201-221
5. **Tang S, Haber GB** – Capsule endoscopy in obscure gastrointestinal bleeding. *Gastrointest Endoscopy Clin N Am* 2004; 14:87-100
6. **Eliakim R, Adler S** – Capsule video endoscopy in Crohn's disease – the European experience. *Gastrointest Endoscopy Clin N Am* 2004; 14:129-137
7. **de Franchis R, Rondonotti E, Abbiati C, et al** – Small bowel malignancy. *Gastrointest Endoscopy Clin N Am* 2004; 14:139-148
8. **Petroniene R, Dubcenco E, Baker J, et al** – Given capsule endoscopy in celiac disease. *Gastrointest Endoscopy Clin N Am* 2004; 14:115-127
9. **Schulmann K, Schmiegel W** – Capsule endoscopy for small bowel surveillance in hereditary intestinal polyposis and non-polyposis syndromes. *Gastrointest Endoscopy Clin N Am* 2004; 14:149-158
10. **Hadithi M, Heine GD, Jacobs M, et al** – A prospective study comparing video capsule endoscopy with double-balloon enteroscopy in patients with obscure GI bleeding. *Am J Gastroenterol* 2005; 100:1-6
11. **Cave DR** – Obscure gastrointestinal bleeding: the role of the tagged red blood cell scan, enteroscopy, and capsule endoscopy. *Clinical Gastro & Hepatol* 2005; 3:359-363
12. **Redondo-Cerezo E, Sanchez-Manjavacas N, Gomez-Ruiz CJ** – Capsule endoscopy vs push enteroscopy: which one should we perform first? *Gastroenterol* 2005; 129:1358-1365
13. **Triester SL, Leighton JA, Leontiadis GI, et al** – A meta-analysis of the yield of capsule endoscopy compared to other diagnostic modalities in patients with obscure GI bleeding. *Am J Gastroenterol* 2005; 100:2407-2418
14. **Costamagna G, Shah SK, Riccioni ME, et al** – A prospective trial comparing small bowel radiographs and video capsule endoscopy for suspected small bowel disease. *Gastroenterology* 2002; 123:999-1005
15. **Lewis BS, Swain P** – Capsule endoscopy in the evaluation of patients with suspected small intestinal bleeding: results of a pilot study. *Gastrointest Endosc* 2002; 56: 349-353
16. **Dubcenco E, Jeejeebhoy KN, Petroniene R, et al** – Capsule endoscopy findings in patients with established and suspected small bowel Crohn's disease: correlation with radiologic, endoscopic and histologic findings. *Gastrointest Endosc* 2005; 62:538-44
17. **Papadakis KA, Lo SK, Fireman Z, et al** – Wireless capsule endoscopy in the evaluation of patients with suspected or known Crohn's disease. *Endoscopy* 2005; 37:1018-1022
18. **Kesari A, Bobba RK, Arsura EL** – Video capsule endoscopy and celiac disease. *Gastrointest Endosc* 2005; 62: 796-797
19. **Green PHR, Rubin M** – Capsule endoscopy in celiac disease. *Gastrointest Endosc* 2005; 62:797-799

