

THE ROLE OF CAPSULE ENDOSCOPY IN THE DIAGNOSIS OF DIGESTIVE HAEMORRHAGE

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ABSTRACT

Gastrointestinal bleeding is a common cause of hospitalization, with a high hospital morbidity and mortality rate, but decreasing compared to previous years due to an important progress in therapeutic endoscopic techniques. It is estimated that 5-7% of gastrointestinal bleedings are of obscure origin, with a normal upper and lower gastrointestinal endoscopy. The capsule endoscopy is the state-of-the-art, non-invasive procedure, providing a fine diagnosis of intestinal lesions, especially those found in the small bowel, difficult to address by other methods. Many studies have been published during the past years regarding the sensibility and outcome of capsule endoscopy in patients with gastrointestinal bleeding, but few underline its definitive role in the diagnosis of digestive bleeding. This review looks at the role of capsule endoscopy in the evaluation of patients with gastrointestinal bleeding from the small bowel and the therapeutic options available.

Keywords: gastrointestinal bleeding, capsule endoscopy, therapeutic endoscopy.

RÉSUMÉ

La vidéocapsule endoscopique dans le diagnostic de l'hémorragie digestive

Les hémorragies digestives sont une cause fréquente d'hospitalisation, aux taux élevés de mortalité et morbidité, actuellement en baisse par rapport aux années précédentes, grâce à l'évolution des techniques endoscopiques. Environ 5-7% des hémorragies digestives sont d'origine obscure, avec une endoscopie oeso-gastroduodénale et une iléocoloscopie normales. La vidéocapsule endoscopique est une technique récente, non-invasive, permettant le diagnostic des lésions digestives, en particulier celles de l'intestin grêle, qui sont difficilement visualisées par d'autres méthodes. Au cours des dernières années, de nombreuses études concernant la sensibilité et les résultats de cette technique ont été publiées, mais sans souligner son rôle définitif dans les hémorragies digestives. Cette revue examine le rôle de la vidéocapsule endoscopique dans l'évaluation des hémorragies de l'intestin grêle et les options thérapeutiques disponibles.

Mots-clés: hémorragie digestive, vidéocapsule endoscopique, endoscopie thérapeutique.

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INTRODUCTION

Capsule endoscopy is a non-invasive procedure with negative predictive value and insignificant impact on the patient, which provides a fine diagnosis of intestinal lesions, especially those found in the small intestine, difficult to address by other imaging methods. Until its introduction in 2000, the small bowel was considered a “dark hole“ of the gastrointestinal tract, as there were no imaging methods that could accurately visualize the entire small bowel¹. Since then, capsule endoscopy became a valuable tool that could assess small bowel pathologies, with high diagnostic accuracy and higher sensibility rate compared with radiographic methods².

THE MANAGEMENT OF PATIENTS WITH DIGESTIVE HAEMORRHAGE

When facing a patient with acute digestive haemorrhage, we first need to know whether it is an upper or a lower gastrointestinal (GI) tract bleeding, or if it is an occult or overt GI bleeding. For this, the physicians must choose the method of exploration depending on the type of exteriorization. In a patient presenting hematemesis, an upper endoscopy is performed and in the presence of melena or hematochezia, a gastric lavage is first performed and, depending on the gastric content, we can choose between upper and lower digestive endoscopy; if both are normal, capsule endoscopy is recommended for the visualization of the small intestine³.

THE ENDOSCOPIC CAPSULES PRESENTLY AVAILABLE

There are several types of endoscopic capsules, all of them having wireless transmission, but differing regarding the field of view, the battery life span, frames per second recorded and number of cameras: with a single camera for the small bowel and with two cameras for the oesophagus and colon. The cameras can record from 2 to 35 frames per second that are played continuously, like a video. The capsules introduced so far are from Japan (EndoCapsule, Olympus, Tokyo, Japan), Israel (PillCam, Given Imaging, Yokneam, Israel), Korea (MiroCam, IntroMedic, Seoul, Korea), China (OMOM, Jinshan Science and Technology Company, Chongqing, China), and the USA (Capso CamPlus, Capso Vision Inc., Saratoga, CA, USA) (Figure 1).

The Olympus endocapsule for the small bowel (single camera) has a field of view of 160° and a depth of field from 0 to 20 mm, taking 2 frames per second, with a battery life of 12 hours, and the ability to

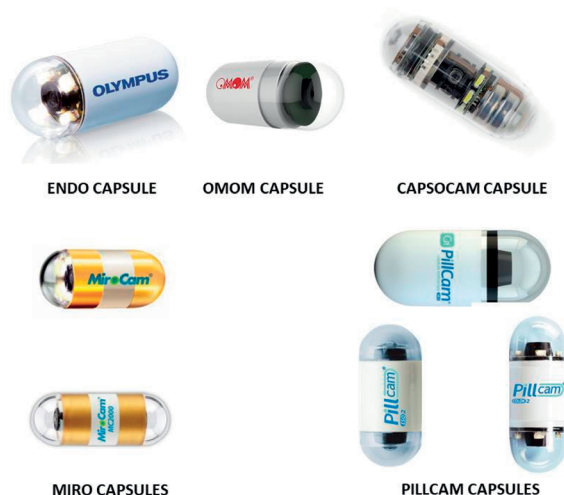


Figure 1. The capsule endoscopes presently available

photograph more than 100,000 images throughout the study. It is easy to swallow, weighting only 3.3g and 11 x 26 mm in dimensions⁴.

The Pillcam capsules are: SB3 for the small bowel (single camera) with a field of view of 156°, taking 2 frames per second, with a battery life of 8 hours, and the ability to photograph more than 70,000 images; ESO3 for the oesophagus (double camera), with a field of view of 172°, taking 35 frames per second, with a battery life of 30 minutes; COLON2 for the colon (double camera), with a field of view of 172°, taking 35 frames per second, with a battery life of 10 hours⁵.

The MiroCam capsules are: MC1600 single camera, taking 6 frames per second, and MC2000 double camera, taking 3 frames per second on each side, both with a field of view of 170°, perfectly suited for both small-bowel and colon visualization. The MiroCam capsules also have a magnetic controller called Navi Controller that can deliver an immobilized capsule safely from the oesophagus and stomach into the duodenum, controlling the movement of the capsule by viewing the images in real time⁶.

The CapsoCam Plus capsule (4 cameras) has a field of view of 360° and a depth of field from 0 to 18 mm, taking 5 frames per second per camera (20 frames per second overall), with a battery life of 15 hours⁷.

The Omom Capsule 2 (single camera) has a field of view of 140°, taking 2 frames per second, with a battery life of 12 hours⁸.

When evaluating the diagnostic efficiency between these capsules using a head-to-head comparison, similar efficacy was found^{9,10}.

PREPARATION

Prior to capsule endoscopy exploration, it is recommended that the patients follow a modified diet and ingest a purgative (2L of polyethylene glycol) for better visualization, but the optimal timing for taking purgatives is yet to be established¹¹.

INDICATIONS

Being one of the few possibilities to explore the small intestine, capsule endoscopy is indicated for patients with digestive haemorrhage whose cause could not be detected by classical endoscopic methods, patients with occult or overt anaemia, for the diagnosis and follow-up of patients with inflammatory bowel disease, to evaluate celiac disease and its complications (ulcerative jejunoileitis, intestinal lymphoma, refractory celiac disease), intestinal polyposis syndromes, small-bowel tumours, or patients who wish to confirm suspected lesions by other imaging methods (barium fluoroscopy, CT, MRI)¹¹⁻¹³.

CONTRAINDICATIONS

The absolute contraindications for capsule endoscopy remain intestinal obstruction and the presence of strictures or fistulas. After further review, pacemaker and cardiac defibrillator carriers have now relative contraindication as it has not been proven that the devices signal interferes, and can undergo the procedure without special precautions (low quality evidence)¹¹. In patients with dysphagia, we can opt for endoscope-assisted capsule ingestion.

ADVANTAGES AND DISADVANTAGES

The main advantage of the small bowel capsule lies in its diagnostic accuracy, superior to other diagnostic methods, with a sensitivity of 88% and a specificity of 64% for detection of fresh blood¹⁴. The ease of the technique is another important advantage, both for the small bowel and the colon capsule, compared to the usual endoscopic methods (upper, lower digestive endoscopy, enteroscopy).

The disadvantages are regarded more as limitations: the impossibility of being guided, lack of insufflation, lack of washing and aspiration, high costs involved, sometimes the lesion is not detected due to the presence of blood – which forces us to look for the lesion upstream. And last, but not least, we need to remember that capsule endoscopy is a method of investigation with negative predictive value, used only in diagnosis, without the possibility of therapeutic techniques.

COMPLICATIONS

Capsule endoscopy has two main complications – retention and aspiration. Retention may appear in benign strictures (post-operative or due to inflammatory bowel diseases) and malignant strictures (tumours of the small bowel). When capsule retention is radiologically confirmed, in asymptomatic patients radiological monitoring is recommended, until the obstacle is exceeded – 15 days. In case of symptomatic patients, it is recommended to first retrieve the capsule with the use of device-assisted enteroscopy, and only when the enteroscopy is unsuccessful, surgical intervention is indicated, to retrieve the capsule and to treat the underlying disease. The European Society of Gastrointestinal Endoscopy (ESGE) recommends the use of endoscopic capsule placement in patients with suspected or established non-obstructive swallowing disorder, in order to prevent capsule aspiration¹¹.

THE ROLE OF CAPSULE ENDOSCOPY IN GI BLEEDING

When facing a patient with acute GI bleeding, with normal upper and lower GI endoscopy, in whom we want to investigate the small bowel, two important questions arise: When is the best time to do the exploration? How does capsule endoscopy influence the therapeutic conduct?

The answer to the first question is as soon as possible to the onset of bleeding, the better the diagnosis is achieved. In most studies was reported a higher diagnostic yield of capsule endoscopy in patients with acute GI bleeding or ongoing obscure-overt bleeding compared with patients with obscure-occult bleeding or distant overt bleeding^{12,15}.

Regarding the second question, the answer is: endoscopic capsule, performed within the first 24-48 hours of patients' admission, can guide us both in choosing an additional diagnostic method for certainty and in choosing the therapeutic method appropriate to the type of lesion visualized. In a study performed on 55 patients with severe GI bleeding, who underwent an emergency capsule endoscopy examination within 48 hours of admission, 75% presented fresh blood without a visible lesion and 67% had relevant lesions recorded¹⁶. Additional diagnostic and therapeutic techniques were undertaken in 78% of cases (endoscopic, surgical and radiological) with lesion confirmation and treatment^{16,17}. Most of the patients presented multiple small bowel angiodysplasia, arteriovenous malformations, ulcers and nonsteroidal anti-inflammatory drug-induced enteropathy. Only in a few cases, small bowel tumors were visualized and surgical treatment was necessary¹⁸⁻²⁰.

In comparison with other imaging studies for the small bowel, capsule endoscopy has higher diagnostic yield than barium radiography^{21,22}, is more effective than enteroclysis²³ and could be more helpful than computed tomography²⁴.

Regarding computed tomography enterography (CTE), most studies show that a higher diagnostic yield can be achieved when using CTE as a complementary examination to capsule endoscopy, rather than using one or the other²⁵⁻²⁸.

In most studies, capsule endoscopy and single or double balloon enteroscopy have proven similar results regarding the visualization of lesions in the small bowel in GI bleeding. Nevertheless, the possibility of therapeutic techniques and better manoeuvrability of enteroscopy make it superior even if it is more stressful for the patient²⁹⁻³⁰. It is recommended to perform capsule endoscopy prior to enteroscopy, thus being more cost-effective and the enteroscopy can be significantly enhanced when guided by a previously positive capsule study³⁰⁻³³.

After the cause and the site of the GI bleeding are established using capsule endoscopy, the therapeutic options available for the type of lesions recorded must be taken into account. Thus, for angiodysplasias, ulcers, arteriovenous malformations and polyps, single or double balloon enteroscopy is recommended to certify the diagnosis, to take biopsies (if needed) and apply local treatment to stop the bleeding (if active) or treat the underlying disorder, to prevent recurrent bleeding. In case of tumours of the small bowel, we must choose between enteroscopy, to first biopsy the tumour, and later surgical treatment or surgical treatment from the beginning, depending on the extent of the tumour and whether it presents with complications (narrowing of the small bowel lumen, capsule retention, active bleeding)³³⁻³⁷.

In some cases, the cause of GI bleeding is not visible nor for capsule endoscopy or enteroscopy, due to massive bleeding. In this case, transcatheter angiography can be performed to establish the site of bleeding and to treat the underlying cause in the same endovascular session^{38,39}.

CONCLUSIONS

The above studies show that capsule endoscopy is a feasible, easy-to-use, non-invasive procedure, with insignificant impact on the patient, that can detect lesions up to 0.1 mm and has a high sensitivity and specificity for detecting fresh blood, proving itself as an irreplaceable tool in the initial diagnosis of small bowel bleeding.

The capsule endoscopy has shown to be more effective than other imaging studies for the small bowel (barium radiography, enteroclysis, computed tomography) and a worthy complementary examination to computed tomography enterography/angiography, single and double balloon enteroscopy and transcatheter angiography in determining the cause in patients with acute and obscure GI bleeding.

Although it is not as permissive as classic endoscopy, being only a diagnostic procedure, without the ability to treat the underlying cause of bleeding, it can guide us in establishing the appropriate therapeutic response, depending on the site and type of lesions recorded.

Compliance with Ethics Requirements:

„The authors declare no conflict of interest regarding this article“

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