Video-capsule Endoscopy in the etiological diagnosis of occult gastrointestinal bleeding

Abstract

Introduction: The advent of Video-capsule Endoscopy (VCE) has revolutionized the exploration of the small bowel, which was previously inaccessible to conventional endoscopic procedures, and the management of unexplained anemia without gastrointestinal bleeding (GIB). The aim of this work is to evaluate the contribution of VCE in the etiological diagnosis of unexplained iron deficiency anemia. **Materials and methods:** This is a monocentric, descriptive retrospective study from June 2018 to May 2024, including patients referred for unexplained anemia without exteriorized gastrointestinal bleeding and explored by VCE type PillCam® SB3 and Capsocam SV-1. **Results:** Out of 161 patients who underwent VCE, 48 (29.81%) were referred for evaluation of unexplained iron-deficiency anemia without exteriorized GIB, with a mean hemoglobin level of 6.9g/dl, the average age was 56.21 years, with a female predominance (sex ratio: 1.4). 43,75% of patients were hypertensive, 33,3% were diabetic, 20.8% were taking non-steroidal anti-inflammatory drugs, 4,16 % had celiac disease, 2,08% had Crohn's disease. 16.6% had capsule retention factor. VCE found vascular lesions in 58 % of cases, dominated by angiodysplasias (47.8%), followed by inflammatory and ulcerative lesions in 23% of cases, tumoral lesions in 12 % dominated by submucosal tumors. There was one case of a small bowel diverticulum with mucosal ulceration. The distribution of the lesions was jejunal in 51% of cases, ileal in 30% and duodenal in 19% of cases. Gastric angiodysplasia were diagnosed in 16% of cases and cecal angiodysplasia in 4,16% of cases. the diagnostic yield of VCE in the etiological diagnosis of occult gastrointestinal bleeding was 83%. **Conclusion:** Occult digestive bleeding with a normal endoscopic evaluation represents a formal indication for VCE. In our study, small bowel angiodysplasia was the most common cause, followed by inflammatory and ulcerative lesions, as well as tumoral lesions.

Keywords: occult gastro-intestinal bleeding, Video-capsule endoscopy, angiodysplasia

Introduction:

Iron deficiency anemia (IDA), occurs most often on chronic occult gastrointestinal bleeding, represents a major public health problem and is a common reason for consultation in gastroenterology clinics. IDA affects 5% of premenopausal women and 1-2% of men and postmenopausal women [1].

In most cases, the origin of bleeding can be identified using standard endoscopic procedures such as gastroscopy and colonoscopy. However, in 2-10% of cases, bleeding comes from lesions in the small bowel, making these standard endoscopic explorations negative. Video-capsule Endoscopy (VCE) of the small bowel is a non-invasive technique used to examine the small intestine. It is primarily recommended for diagnosing unexplained gastrointestinal bleeding or isolated anemia. The aim of

this study is to evaluate the diagnostic accuracy of the VCE in identifying abnormalities in the small bowel when upper and lower digestive endoscopies have yielded inconclusive results.

Materials and methods:

This is a monocentric, descriptive study from June 2018 to May 2024, including patients referred for unexplained iron deficiency anemia without externalized gastrointestinal bleeding and explored by VCE type PillCam® SB3 and Capsocam. All our patients underwent a clinico-biological examination, upper and lower endoscopy with biopsy. The preparation used was PEG (2 L the day before and 0.5 L after ingestion of the capsule) with clear broth the day before the examination and 10 days' discontinuation of oral iron if taken.

Results:

Total 161 patients who underwent VCE, 48 (29.81%) were referred for evaluation of unexplained iron-deficiency anemia without externalized gastro-intestinal bleeding. the average age was 56.21 years (extremes from 17 to 87 years), with a female predominance (sex ratio: 1.4).

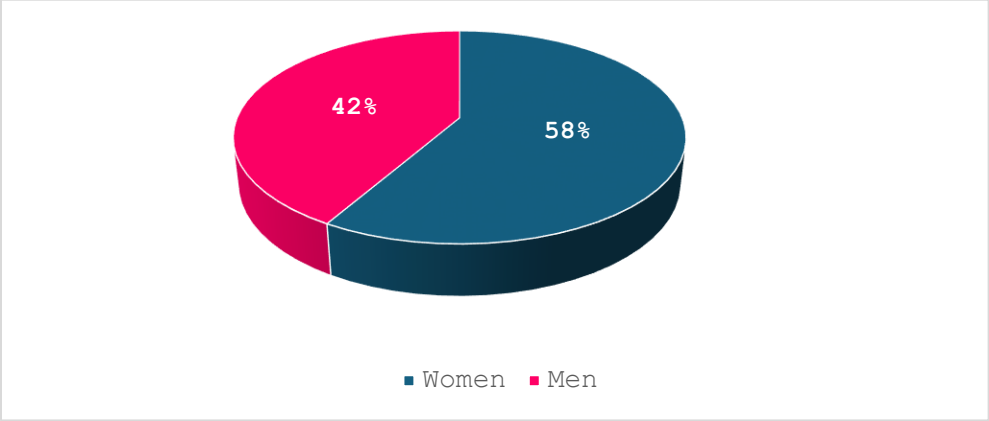

Figure1: Repartition of patients by gender

43,75% of patients were hypertensive, 33,3% were diabetic, 20.8% were taking non-steroidal anti-inflammatory drugs (NSAIDs),4,16 % had celiac disease, 2,08% had Crohn's disease and 2,08% had portal hypertension.16.6% had capsule retention factors: pelvic-abdominal surgery in 7 cases (14.58%) and Crohn's disease in one case (2.08%)

The mean hemoglobin level was 6.9 g/dl (range 3 – 10 g/dL). The mean ferritin level was 5,1 ng/dL (range 1.5 – 16 ng/dL).

VCE reveals lesions in 83% of cases and was normal in 17% of cases.

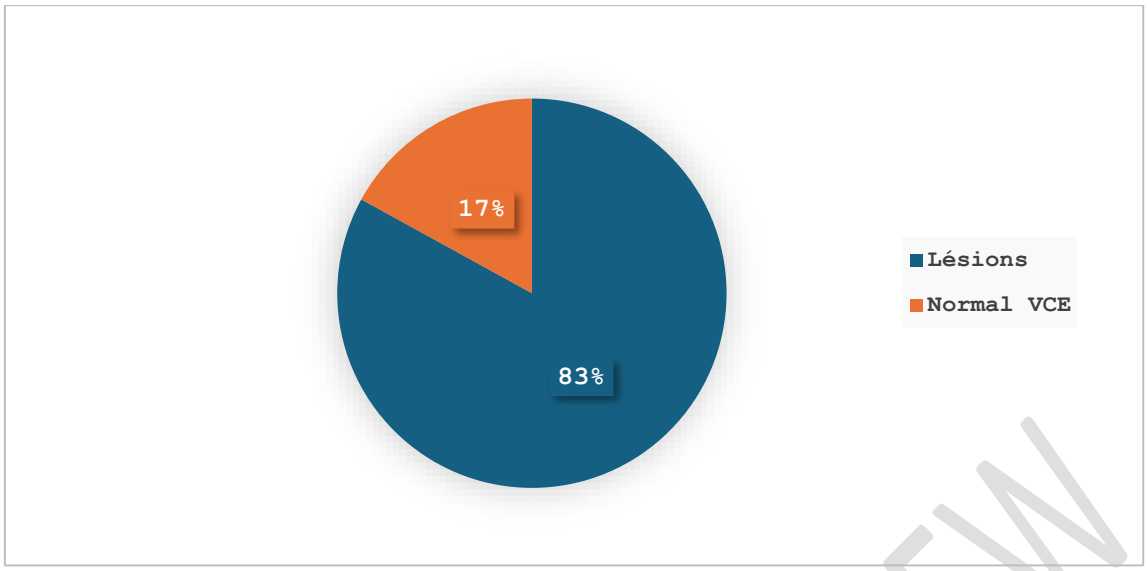

Figure 2: VCE results

VCE found vascular lesions of the small intestine in 58 % of cases, dominated by angiodysplasias in 47.8% of cases (Figure 5), red spots were noted in 4 cases (8.3%) and phlebectasis was noted in 3 cases (6.25%). Inflammatory and ulcerative lesions of the small intestine were observed in 23% of cases, including 3 cases of ulcerative lesions caused by NSAIDs (Figure 6) , 2 cases of Crohn's disease (Figure 7). In addition, non-typical inflammatory and ulcerative lesions were observed in 5 cases (10.41%). Tumoral lesions were noted in 12% of cases, of which 6.25% were submucosal tumors evocative of GIST (Figure 8). Polyps were identified in 4 cases (8.3%). There was one case of a small intestine diverticulum (Figure 9) with mucosal ulceration and one case of celiac disease (Figure 10).

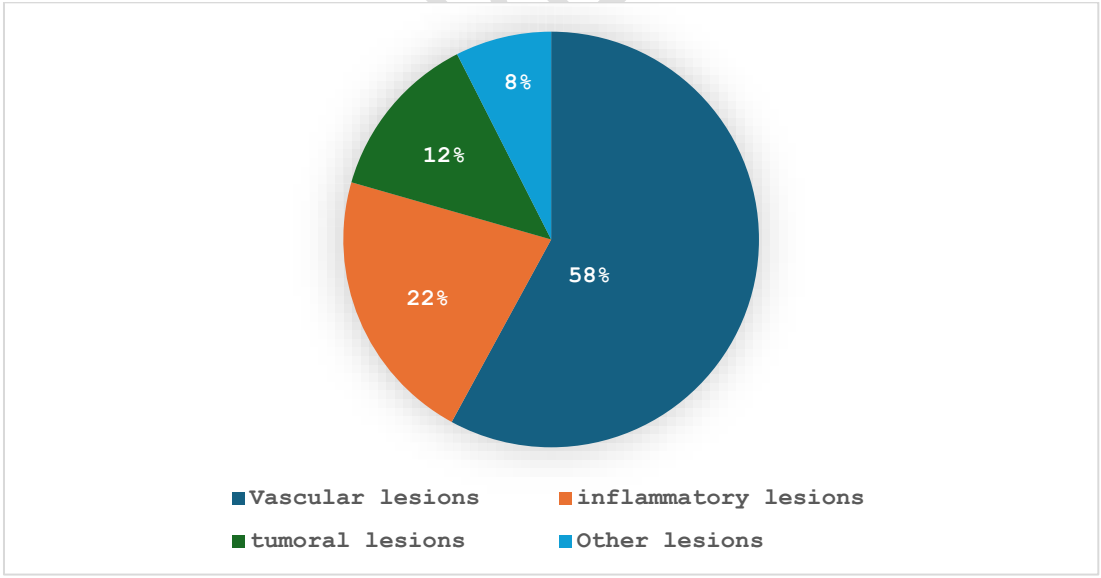

Figure 3: Repartition of small intestine lesions diagnosed by VCE

The distribution of the lesions was jejunal in 51 % of cases, ileal in 30 % and duodenal in 19 %.

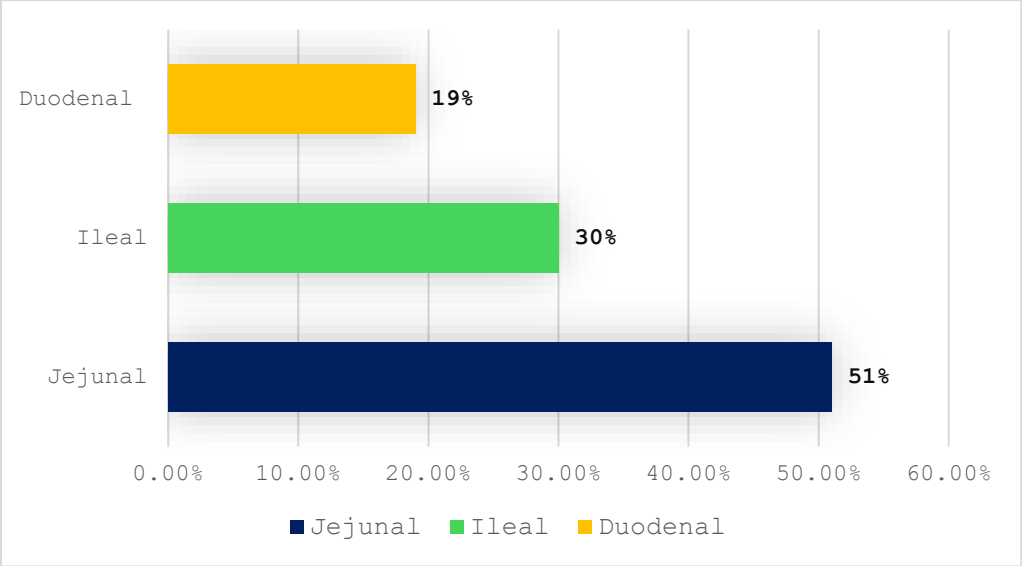

Figure 4: Distribution of small intestine lesions by site

VCE revealed gastro-bulbar lesions in 38 patients, or 79.16% of cases. These lesions were mainly dominated by inflammatory and ulcerative lesions in 28 cases (73.68%), followed by vascular lesions in 14 cases (36.8%), with a predominance of angiodysplasias in 8 cases, associated with angiodysplasias of the small bowel in 6 cases. cecal angiodysplasia were diagnosed in 4,16% of cases. Among these lesions, 27.08% explained the anemia in this group of patients.

Thus, the diagnostic yield of VCE in in the etiological diagnosis of occult gastrointestinal bleeding was 83%.

Figure 5 : Jejunal angiodysplasia

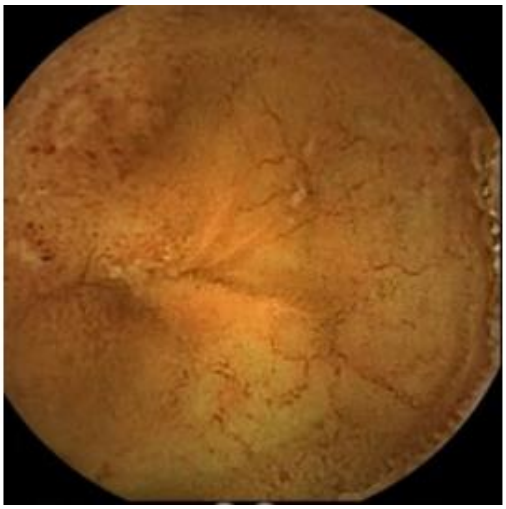

Figure 6: Ileal ulceration associated with NSAID use

Figure 7 : Terminal ileitis evocative of Crohn's disease

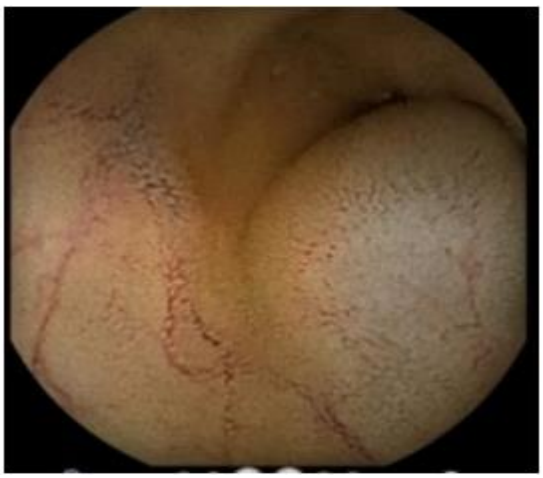

Figure 8: Submucosal tumor evocative of GIST

Figure 9: Small intestine diverticulum

Figure 10 : Cracked appearance of the jejunal mucosa (celiac disease).

Discussion:

iron-deficiency anemia is particularly common in women, especially of reproductive age, due to increased iron requirements [2]. In the USA, the incidence of iron deficiency in men is around 1% but is at least 11% and often higher in women [3,4].

A study by Holleran et al [5] also noted this dominance, with 54% of women anemic versus 46% of men, which is consistent with our study.

The prevalence of iron-deficiency anemia also depends on age, with an increased risk in the elderly, which is in line with our study (mean age 56.21 years) [1,6].

VCE has become an invaluable tool for detecting lesions in the mucosa of the small bowel [7]. It plays a crucial role in the diagnosis of occult digestive bleeding and iron-deficiency anemia when upper and lower gastrointestinal endoscopy are negative [8]. In our study , the diagnostic yield of VCE in the etiological diagnosis of occult gastrointestinal bleeding was 83%.

Angiodysplasia is a major cause of 50-60% of cases of occult gastrointestinal bleeding [9]. In a study of 120 cases by Olano and colleagues [1], angiodysplasia was diagnosed in 45% of patients, which is similar to what we found in our series: 47.9% of patients had angiodysplasia.

They are more frequent in the jejunum than in the ileum, and 60% of patients have angiodysplasia in more than one location [10]. In our series, the jejunal location was the most frequent.

The prevalence of angiodysplasia increases with age [11]. It may be associated with certain conditions such as chronic renal failure, cirrhosis of the liver, Von Willebrand disease and aortic stenosis (Heyde syndrome).

The most common causes of small bowel ulceration include Crohn's disease, celiac disease, use of non-steroidal anti-inflammatory drugs (NSAIDs), ischemic enteritis, Behçet's disease, tuberculosis and small bowel tumors [12].

For the diagnosis of ileal Crohn's disease, VCE has been shown to have a sensitivity of 93% and a specificity of 84%, with a high negative predictive value [13]. in our study we noticed 2 cases of Crohn's disease.

A meta-analysis of 6 studies involving 166 patients with celiac disease [14] evaluated the efficacy of VCE for the diagnosis of this disease. The results showed a high sensitivity of 89% and a remarkable specificity of 95% for the detection of celiac disease by VCE.

Tumours of the small bowel are rare [15], accounting for just 2% of all primary gastrointestinal tumours. The most common sites in the small intestine are the ileum, followed by the duodenum and jejunum.

Studies [16] have reported a tumor detection rate of 6% to 12% in patients with occult GI bleeding, with a predominance of adenocarcinoma and gastrointestinal stromal tumors. In our study, 6.25% of cases had submucosal tumors, in line with the literature.

ESGE [17,18] suggests that when VCE detects a submucosal mass, it is advisable to confirm the diagnosis with assisted enteroscopy and/or cross-sectional imaging, considering local availability and expertise.

Video-capsule endoscopy (VCE) is a valuable diagnostic tool for evaluating the small intestine, but it has inherent limitations. While offering a non-invasive approach, VCE is primarily diagnostic and does not permit therapeutic interventions. Image quality can be affected by bowel preparation, capsule transit time, and patient factors, potentially leading to missed lesions. The extensive video data requires specialized interpretation, which can be time-consuming and costly. Furthermore, the risk of capsule retention, especially in patients with underlying conditions, necessitates careful patient selection. Although generally safe, complications may arise requiring additional imaging or interventions. Patient factors, such as difficulty swallowing the capsule or non-

adherence to bowel preparation, can impact the procedure's success. Despite these limitations, VCE remains a crucial component of the diagnostic workup for small bowel diseases when used judiciously in conjunction with other modalities[19].

Conclusion:

VCE is now considered the method of choice for diagnosing pathologies of the small bowel, thanks to its high diagnostic yield, accuracy and safety profile. VCE is particularly useful for exploring occult gastrointestinal bleeding and unexplained iron-deficiency anemia.

In our study, the main cause of occult digestive bleeding was angiodysplasia, followed by inflammatory and ulcerative lesions and sub-mucosal tumours of the small bowel.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

Option 2:

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc have been used during writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

Details of the AI usage are given below:

1.

2.

3.

References:

[1] Olano C, Pazos X, Avendaño K, Calleri A, Ketzoian C. Diagnostic yield and predictive factors of findings in small-bowel capsule endoscopy in the setting of iron-deficiency anemia. Endosc Int Open. 2018 Jun;6(6):E688-E693. doi: 10.1055/a-0593-5915. Epub 2018 May 25. PMID: 29868633; PMCID: PMC5979215

[2] Rossi RE, Zullo A, Ferretti S, Migliorisi G, Gatta L, De Francesco V, Del Forno A, Marcozzi G, Masoni B, Franchellucci G, Hassan C, Repici A. Diagnostic Yield of Small Bowel Videocapsule Endoscopy in Patients with Iron Deficiency Anemia. A Systematic Review and meta-analysis. J Clin Gastroenterol. 2024 Jan 17. 103(1):1-4.

[3] Zullo A, De Francesco V, Gatta L, Scaccianoce G, Colombo M, Bringiotti R, Azzarone A, Rago A, Corti F, Repici A, Hassan C, Rossi RE. Small bowel lesions in patients with iron

deficiency anaemia without overt bleeding: a multicentre study. Ann Hematol. 2024 Jan;103(1):1-4

[4] Romeo S, Neri B, Mossa M et al. Diagnostic yield of small bowel capsule endoscopy in obscure gastrointestinal bleeding: a real-world prospective study. Intern Emerg Med (2022) 17:349–358.

[5] Holleran GE, Barry S a, Thornton OJ, Dobson MJ, McNamara D a. The use of small bowel capsule endoscopy in iron deficiency anaemia: low impact on outcome in the medium term despite high diagnostic yield. Eur J Gastroenterol Hepatol. 2013;25(3):327–32.)

[6]Cotter J, Baldaia C, Ferreira M, Macedo G, Pedroto I. Diagnosis and treatment of iron-deficiency anemia in gastrointestinal bleeding: A systematic review. World J Gastroenterol. 2020 Dec 7;26(45):7242-7257.

[7]Chetcuti Zammit S, Sidhu R. Capsule endoscopy – Recent developments and future directions. Expert Rev Gastroenterol Hepatol. 1 févr 2021;15(2):127-37

[8] Snook J, et al. British Society of Gastroenterology guidelines for the management of iron deficiency anaemia in adultsGut 2021;70:2030–2051. doi:10.1136/gutjnl-2021-325210

[9] Saurin JC, Jacob P, Pioche M. Treatment of digestive angiectasia: time for prospective, randomized, therapeutic studies. Endosc Int Open. Déc 2019;7(12):E1778-9.

[10] Laine L. Management of Bleeding Due to Small-Intestinal Angiodysplasias. N Engl J Med. 2023 Nov 2;389(18):1718-1720.

[11] Maryam Aghighi; Mehran Taherian; Ashish Sharma. Angiodysplasia. StatPearls Publishing; 2021 Aug 29.

[12] Wu RM, Fisher LR. Role of Video Capsule in Small Bowel Bleeding. Gastrointest Endosc Clin N Am. avr 2021;31(2):277-306.

[13] McCain JD, Pasha SF, Leighton JA. Role of Capsule Endoscopy in Inflammatory Bowel Disease. Gastrointest Endosc Clin N Am. avr 2021;31(2):345-61.

[14]Lewis SK, Semrad CE. Capsule Endoscopy and Enteroscopy in Celiac Disease. Gastroenterol Clin North Am. mars 2019;48(1):73-84.

[15]Han JW, Hong SN, Jang HJ, Jeon SR, Cha JM, Park SJ, et al. Clinical Efficacy of Various Diagnostic Tests for Small Bowel Tumors and Clinical Features of Tumors Missed by Capsule Endoscopy. Gastroenterol Res Pract. 2015;2015:1-6.

[16] Cheung DY, Kim JS, Shim KN, Choi MG, Korean Gut Image Study Group. The Usefulness of Capsule Endoscopy for Small Bowel Tumors. Clin Endosc. Janv 2016;49(1):21-5.

[17] Rondonotti E, Spada C, Adler S, May A, Despott EJ, Koulaouzidis A, et al. Small-bowel capsule endoscopy and device-assisted enteroscopy for diagnosis and treatment of small-bowel disorders: European Society of Gastrointestinal Endoscopy (ESGE) Technical Review. Endoscopy. avr 2018;50(4):423-46)

[18] Pennazio M, Rondonotti E, Despott EJ, Dray X, Keuchel M, Moreels T, et al.Small-bowel capsule endoscopy and device-assisted enteroscopy for diagnosis and treatment of small-bowel disorders: European Society of Gastrointestinal Endoscopy (ESGE) Guideline – Update 2022. Endoscopy. janv 2023;55(01):58-95.

[19] Rosa B, Dray X, Koulaouzidis A. Retention of small bowel capsule endoscopy. Curr Opin Gastroenterol. 2023 May 1;39(3):227-233.