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Colonic lesions in patients undergoing small bowel capsule endoscopy: incidence, diagnostic and therapeutic impact

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ABSTRACT

Background: Nowadays, capsule endoscopy is the first-line procedure to assess the small bowel. During small bowel procedures, other segments of the gastrointestinal tract may be visualized. The aim of the current study was to evaluate the incidence of colonic abnormalities in patients undergoing small bowel capsule and its impact on patient management.

Patients and methods: This study is a retrospective analysis of data from 526 consecutive capsule endoscopy procedures performed at a single tertiary-care centre between 2008 and 2011. Patients with incomplete procedures were excluded from the analysis. Patient baseline characteristics, colonic lesions, diagnosis and management before and after capsule endoscopy were recorded and a descriptive analysis was performed.

Results: Four hundred and sixty four patients were finally included in the analysis. Two hundred and ninety three patients were male (57.3%) and the mean age was 61.3 ±

20.03 years (18-86). Obscure gastrointestinal bleeding (59%) and inflammatory bowel disease (19%) were the main indications for the procedure. Colonic abnormalities were detected by capsule endoscopy in 47 (9%) of 464 patients. The most common types of missed lesions were vascular lesions (34%) and colonic ulcers (32%). This information had a clinical or diagnostic impact of 7.55% and a therapeutic impact of 6.03%.

Conclusion: All images of the colon should be evaluated during small bowel capsule endoscopy as they may provide relevant information that may result in changes in patient management.

Key words: Capsule endoscopy. Small bowel. Colon. Lesions.

INTRODUCTION

To date, small bowel capsule endoscopy (SBCE) is considered as the first-line procedure to assess the small intestine (1-3). It was approved by the FDA in 2001 for the study of obscure gastrointestinal bleeding (OGIB). However, over the last ten years it has been widely accepted in clinical practice due to its accuracy, excellent safety profile and non-invasive nature (4-7). Undiagnosed iron-deficiency anemia, suspected or known Crohn's disease, celiac disease, small bowel tumors and hereditary polyposis syndrome are currently other established indications (8,9). SBCE is typically used to examine the SB when no source of hemorrhage is identified after negative conventional endoscopies (gastroscopy and colonoscopy) (10,11). However, technological advances and unique features mean that this technique can be used to examine other areas of the GI tract, some of them within the reach of conventional endoscopy, such as the esophagus, stomach or colon (12,13). As a result, SBCE may detect lesions in proximal and distal segments of the GI tract that could have been overlooked by conventional endoscopy. In fact, it is well known that both upper and lower GI endoscopic procedures have false negatives (16-18). However, the incidence and impact of these lesions on patient management has not been well documented. Therefore, it is not clear whether all images of a video capsule procedure should be reviewed. The aim of the current study was to evaluate the incidence of colonic lesions (CL) in patients undergoing SBCE and its impact on patient management.

PATIENTS AND METHODS

This study is a retrospective analysis of data from 511 consecutive patients undergoing SBCE in a single tertiary-care center (Complejo Hospitalario de Navarra) between 2008 and 2011. All patients with incomplete procedures were excluded from the study. SBCE was considered as complete when the cecum was reached before battery-life expiration. The variables included in the analysis were: patient demographics, procedure indications, presence and type of colonic lesions during SBCE, performance of colonoscopy before and after SBCE, patient diagnosis and management before and after SBCE and patient outcome.

Definitions

- *Colonoscopy pre-SBCE:* only those colonoscopies performed two years before the SBCE procedure were considered.
- *Additional findings:* they refer to CL different from those detected by a previous colonoscopy.
- *New findings:* CL detected in patients with no previous findings in the colonoscopy (i.e., negative colonoscopy).
- *Clinical impact:* defined as the proportion of patients with changes in their pre-SBCE procedure diagnosis.
- *Therapeutic impact:* defined as the proportion of patients with changes in their pre-SBCE procedure treatment.

CE procedure

All SBCE examinations were performed using the PillCam®SB2 (Given Imaging, Yoqneam, Israel). Patients usually underwent SBCE in an outpatient setting without any bowel preparation or prokinetic and after fasting for eight hours. The PillCam®SB2 was then administered. A light breakfast after two hours and a light meal after five hours were permitted. At the end of the recording period, patients returned to the endoscopy unit where the data recorder was removed and images were downloaded. SBCE recordings were reviewed by experienced readers at 12 frames per second using

the Rapid® Reader software.

Statistical analysis

The statistical analysis was performed using the 15.0 version of the SPSS software (IBM Corporation, New York, USA). For normally distributed quantitative data, all results are presented as mean, standard deviation (SD) and range, shown as mean (SD, range) within the given values. For non-normally distributed quantitative data, all results are presented as a median with the corresponding interquartile range. Qualitative variables are presented as simple proportions. The Chi-squared test was used for the qualitative data comparison and p values under 0.05 were considered as statistically significant.

Ethics

The Institutional Review Board from our Institution approved the study and the use of the data for the present study. Informed consent form was obtained from all patients before the SBCE procedure.

RESULTS

Patient demographics

During the study period, 526 SBCE procedures were performed in 511 patients.

Four capsule explorations were excluded from the analysis due to technical problems. In addition, the cecum was not reached within the recording time in 58 cases (11.2%). Therefore, 464 procedures were included in the analysis. Two hundred and ninety-three patients were male (57.3%) and the mean age was 61.3 ± 20.03 years (18-86). Patients were referred for SBCE due to: OGIB in 310 cases (59%), known or suspected Crohn's disease in 100 cases (19%), abdominal pain in 37 cases (7%), chronic diarrhea in 37 cases (7%) and other indications in 42 cases (8%). SBCE was normal in 152 patients (29.8%) and SB abnormalities were noted in 359 patients (70.2%). These SB findings were: erosions/ulcers, 39.4% (n = 141); angiodysplasias, 36.4% (n = 131); inflammatory bowel mucosa, 15.1% (n = 54); polyps, 6.1% (n = 22); and active bleeding, 3.0% (n = 11).

Colonic findings

SBCE detected colonic abnormalities in 47 patients (9%). These CL were: 34% vascular lesions (n = 16), 32% colonic ulcers (n = 15), 23.3% polyps (n = 11), 6.4% diverticula (n = 3) and 4.3% carcinoma (n = 2). SB lesions were also identified in 33 of 47 patients (70.2%) and they were: 39.4% erosions/ulcers (n = 13), 36.4% angiodysplasias (n = 12), 15.1% inflammatory bowel mucosa (n = 5), 6.1% polyps (n = 2) and 3.0% active bleeding (n = 1). In addition, 14 patients had only CL. Up to 42 patients (89.4%) had a previous colonoscopy. The mean number of colonoscopies was 1.21 ± 0.63 (1-3) while the mean waiting-time between colonoscopy and SBCE was 303.5 ± 492.33 days (1-2,319). Taking into account only those patients with a colonoscopy in the two years before SBCE (n = 36, 85.7%), a CL detected during SBCE had been overlooked during colonoscopy in 24 patients (66.6%). There were additional findings different from those detected by the previous colonoscopy in 13 patients (54%), and there were new findings (i.e., negative colonoscopy) in eleven patients (46%). These colonic findings were: 41.8% vascular lesions (n = 10), 20.8% colonic ulcers (n = 5), 33.3% polyps (n = 8) and 4.1% carcinoma (n = 1). Colonic findings were identified by both procedures in 12 patients (33.3%) and the same proportion of vascular lesions (n = 3), colonic ulcers (n = 3), polyps (n = 3) and diverticula (n = 3) were found. Colonic lesions were also found in eleven patients (24.4%) with no previous colonoscopy, these were: 27.3% vascular lesions (n = 3), 63.7% colonic ulcers (n = 7) and 9% carcinoma (n = 1). The types of lesions detected in the colon during SBCE are shown in figure 1.

Clinical and therapeutic impact

CL led to a diagnostic change in 35 of 47 patients (74.5%), resulting in an overall clinical impact of 7.55%. The frequency of diagnostic changes was significantly higher among those patients who had not undergone a previous colonoscopy (100% *versus* 66.6%, $p < 0.01$). Although, 36 of these patients (76.6%) had undergone a previous colonoscopy, a second colonoscopy was required in 28 patients (59.6%). The initial therapeutic strategy was changed in twenty-eight patients (59.6%) due to the presence of colonic findings during SBCE, resulting in an overall therapeutic impact of 6.03%. The

frequency of therapeutic changes was significantly greater among those patients who had not undergone a previous colonoscopy (72.7% *versus* 55.5%, p < 0.01). Pharmacological therapy was the treatment of choice in 16 patients (57.2%), followed by therapeutic endoscopy in ten patients (35.6%) and surgery in two patients suffering from colon cancer (7.2%). The most common treatment changes after SBCE performance were iron supplements (n = 10) in the pharmacological group and argon beam (n = 6) for vascular lesions (angiodysplasia) in the endoscopic group. The study results are summarized in figure 2.

DISCUSSION

SBCE has been developed to examine the SB in a simple and non-invasive way (4-7). Its ability to visualize SB lesions has been demonstrated in a number of studies (1-3). OGIB, undiagnosed iron-deficiency anemia, suspected or known Crohn's disease or hereditary polyposis syndrome are some of the indications accepted worldwide (8,9). SBCE is usually performed when SB pathology is suspected after negative conventional endoscopic examinations. However, studies during the last few years have reported the ability of SBCE to detect lesions outside the small intestine that in some cases are within reach by conventional endoscopy (12-15).

In a recent study by Spiller and Parkins of patients with OGIB, the source of bleeding was identified outside the small intestine in 29% and 6% of second-look upper and lower endoscopies, respectively (19). Very similar data was observed in the study of Rana et al. when conventional endoscopy was repeated (20). Similarly, Zaman et al. identified esophagogastric lesions in approximately 50% of push enteroscopy procedures (21). These results confirm that lesions may be missed with both upper and lower endoscopy procedures.

The objective of the present study was to determine whether readers of the test should review the images captured in the colon when SBCE has been performed. Even though the majority of SBCE procedures are complete, i.e., the capsule enters the cecum, little is known about the ability of SBCE to simultaneously detect CL. Colon images may not be examined on the capsule examination due to a poor colonic cleansing or the availability of previous colonoscopy examination data. The first study

to report non-small bowel lesions in the colon during capsule exploration was by Kitiyakara et al. in 2005. In fact, the source of bleeding was found to be in the colon in 3.6% of patients after a negative colonoscopy (22). Lipilieur et al. showed very similar data (23). Along the same lines, we found that a significant proportion of our patients undergoing SBCE with no oral preparation also had CL (9%). In some cases, their identification may seem like a coincidence rather than a frequent clinical scenario. However, our results suggest that all images of the colon obtained during SBCE should be read regardless of the cleansing level and the use of prokinetics (24,25) as they may provide relevant information that impact upon patient management.

One explanation for this observation could be the higher rate of complete explorations achieved in this study (88.8% *versus* 80% in other studies), which consequently allowed more colon explorations during SBCE (26-28). On the other hand, the improvement of the battery-life in the PillCam-SB3® could also play an important role. The reason why these lesions were missed during conventional endoscopy is not clear. Some reported hypotheses relate to the variation of the appearance of vascular lesions associated with the drugs used during endoscopic procedures and air insufflations. Other theories relate to the procedure itself, in terms of the quality of colon preparation, complete examination rates or endoscopists experience (29). In this clinical scenario, the usual recommendation is to repeat the endoscopic procedure, especially if signs or symptoms persist, if there is a suspicion of missed lesions or poor colon cleansing, or when the cecum is not reached (9,29-31).

It has not been demonstrated that a second-look colonoscopy enhances the diagnostic yield and thus SB exploration should be performed (9,29-31). It is important to ensure that SBCE examines the entire SB. Moreover, if colon images are captured during the SBCE procedure, these images should be read, as this may influence the diagnosis in 7.5% of cases and lead to an alternate therapeutic approach in 6.0% of cases. Patient symptoms and CL should be taken into account when evaluating these findings as an angiectasia or an ulcer in the context of OGIB or Crohn's disease is not the same. We decided to use the first option (diagnostic and therapeutic impact) as we believe that this provides more concrete information regarding the real impact of these findings. Angiodysplasias and ulcers were the most frequent lesions found in our study, similar

to those reported by Kitiyakara and Rana (20,22).

We faced certain limitations in the current study:

1. A retrospective study design.
2. A prospective long term follow-up is mandatory for confirming that potentially significant lesions are not actually incidental findings.
3. Heterogeneity of SBCE indications makes a previous colonoscopy unnecessary in some cases. Unlike OGIB, where conventional endoscopy should always precede capsule exploration, an initial colonoscopy is not essential in some cases such as Crohn's disease, in which only evaluation of the SB mucosa is needed to assess treatment response (32). It is likely in these cases that CL would have been identified if an initial lower endoscopy had been performed. As demonstrated in this study of colorectal cancer patients, the cause of the symptoms could originate in the colon in some cases. In one patient, colonoscopy was not performed because symptoms were indicative of an upper GI tract bleed (melena). In the second case, prior colonoscopy did not detect colorectal cancer due to poor cecum cleansing.
4. There is a lack of information regarding the maximum period of time between conventional endoscopic procedures and SBCE. We chose two years as an arbitrary cut-off, although it is well established that endoscopic procedures should be repeated if a prior endoscopy was unreliable. Otherwise, SBCE should be performed as soon as possible after a negative colonoscopy (8,9).

In conclusion, this study demonstrates that once SBCE is indicated, a careful review of the images obtained of the colon should be performed as some lesions may have been overlooked during conventional colonoscopy, resulting in an alternate diagnosis and impact on patient management. Oral preparation should be included in future studies in order to assess if it increases the rate of CL.

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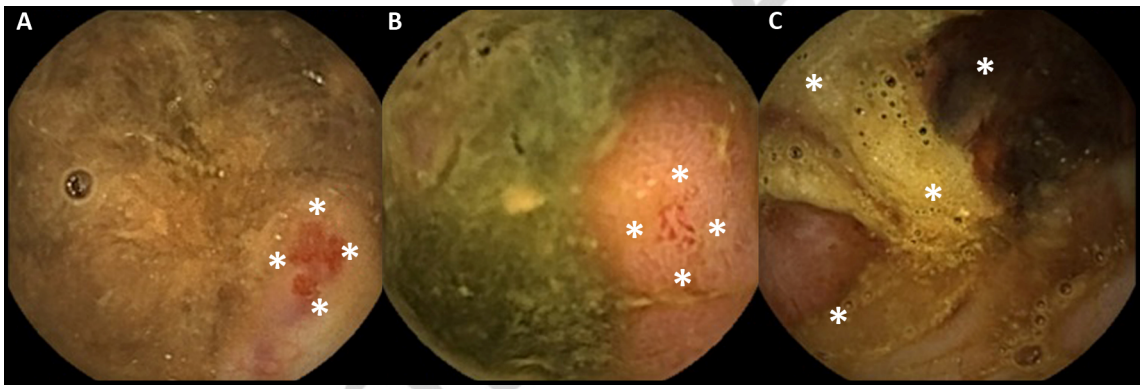

Fig. 1. Colonic findings during small bowel capsule endoscopy. A. Vascular lesion. B. Ulcer. C. Carcinoma.

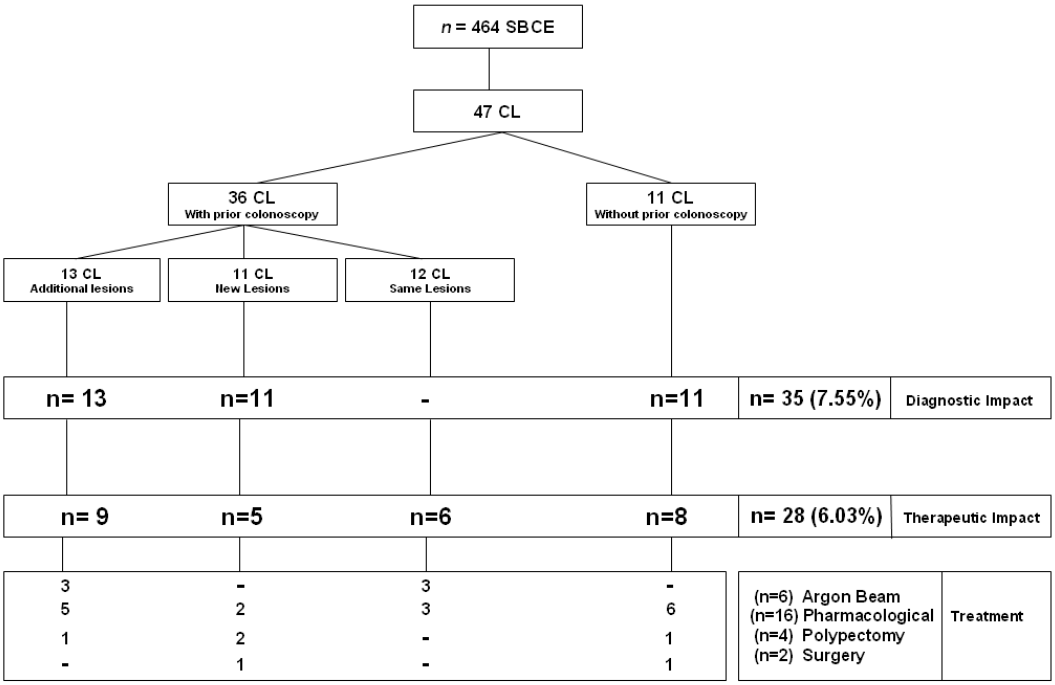

Fig. 2. Summary of the results from the study: clinical and therapeutic impact and type of treatment received. CL: Colonic lesions; SBCE: Small bowel capsule endoscopy; (-): No treatment.