Small Bowel Tumors in Patients Undergoing Capsule Endoscopy: a Single Center Experience

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Abstract

Background and Aims: Small bowel tumors (SBTs) are rare, accounting for 1-3% of all gastrointestinal malignancies. Since the introduction of capsule endoscopy (CE), several studies have suggested that their frequency may be substantially higher. The present study is aimed at evaluating the prevalence, clinical presentation, laboratory parameters, endoscopic appearance, and diagnostic work-up of SBTs in patients undergoing CE in a single referral center.

Patients and Methods: During 2003 - 2009, 102 patients underwent CE. For each patient with lesions suggesting SBT at CE, with subsequent diagnostic/therapeutic work-up leading to histological confirmation, we registered: clinical presentation, hemoglobin level, small bowel follow-through, red blood cells scintigraphy, CT-enterography, enteroscopy, histological confirmation and management. Results: SBTs were detected in 5 patients (mean age 55.2 ± 15.8 years) of 102 undergoing CE (4.9%). The main indication for CE was obscure gastrointestinal bleeding, occult or overt. All patients had undergone, before CE, at least one procedure evaluating the small bowel after negative upper endoscopy and colonoscopy. All patients had iron-deficiency anemia, three had abdominal pain, two had episodes of nausea/vomiting and one had diarrhoea and abdominal distension. The main SBT type was gastrointestinal stromal tumor. After CE, 3 patients underwent single-balloon enteroscopy; surgery was performed in all patients. Mean follow-up time was 19 ± 17 (range 2-36) months; one patient died during follow-up. No retention of capsule occurred. Conclusions: CE could be used as first choice for diagnostic investigation in patients suspected to have SBTs.

Key words

Capsule endoscopy – small bowel tumors - endoscopy.

Introduction

Although the small bowel represents almost 75% of the gastrointestinal tract extension and nearly 90% of its mucosal surface, it is considered a rare location for tumors. Small bowel tumors (SBTs), either benign or malignant, account for 3-6% of all digestive neoplasms [1], although the accuracy of these estimates is uncertain because the traditional methodologies for examining small bowel have proved inadequate. Most of SBTs are malignant, but they represent only 1.1 – 2.4% of gastrointestinal malignancies [2]. Until a decade ago, most of the small bowel was out of the range of endoscopic examination, the only available technique being push enteroscopy which allowed visualization as far as the proximal jejunum only.

Capsule endoscopy (CE), introduced in practice in 2000, is a safe, painless and accurate endoscopic imaging method of the entire small bowel; since then, several studies have revealed its diagnostic superiority over other procedures aimed to evaluate the small bowel. As a result, CE has rapidly become standard practice in investigating diseases of the small bowel, and some studies have found a higher prevalence of SBTs than previously reported, ranging between 2% and 9% [3-7].

The aim of the present study was to evaluate retrospectively the prevalence, clinical presentation, laboratory parameters, endoscopic appearance, and diagnostic work-up related to SBTs in patients undergoing CE in a single referral center from north-eastern region of Romania.

Patients and methods

Between January 2003 and September 2009, 102 patients (61 males, 41 females; mean age 50.6±24.5 years, range 25-75 years) underwent CE at the Institute of Gastroenterology and Hepatology, Iasi, Romania. For each patient in whom CE showed one or more lesions suggesting SBTs, and a subsequent diagnostic/therapeutic procedure led to
histological confirmation, the following parameters were registered from their respective charts: clinical presentation, hemoglobin (Hb) level, small bowel evaluation (small bowel follow-through, angiography, red blood cell scintigraphy, CT-enterography) after negative upper gastrointestinal endoscopy and colonoscopy before CE.

The patients underwent bowel preparation with 2 to 4 L of polyethylene glycol solution and fasted overnight before the procedure. The Given M2A capsule (Pillcam SB, Given Imaging Ltd, Yoqueam, Israel) was swallowed with 200 ml water by the patients after a sensor array was applied to their abdomen and connected to the data recorder which they wore on a belt. Patients were allowed to drink clear liquids at 3 hours after swallowing the capsule. All equipment was disconnected after 8 hours, and the images were downloaded and reviewed by two experienced reviewers. The location of the lesions in the small-bowel was determined by the time ratio, which was calculated by the transit time from the pylorus to the lesion divided by the transit time from the pylorus to the caecum.

**Results**

All patients swallowed the capsule without difficulty, and the procedure was well tolerated without adverse events. SBTs were detected in 5 patients (3 males, 2 females; mean age 55.2±15.8 years) of the 102 patients (4.9%) submitted to CE. The main indication for CE was obscure gastrointestinal bleeding (OGIB) (78%). Clinically, all patients presented with OGIB which was obscure-occult in 3 (60%) and obscure-overt in 2 (40%). Patients with overt bleeding had melena and symptoms related to anemia, and no other complains. By contrast, patients with occult bleeding had abdominal pain (3) and repeated episodes of nausea / vomiting (2), diarrhoea and abdominal distension (1). Mean Hb level at presentation was 9.6 ± 2.1 g/dl. The characteristics of the patients are summarized in Table I.

![Fig 1.a.](image)

**Table I. Characteristics of the patients with small bowel tumors**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>Mean 55.2±15.8</td>
</tr>
<tr>
<td>Male/ female</td>
<td>3/2</td>
</tr>
<tr>
<td>Hemoglobin (g/dl)</td>
<td>Mean 9.6±2.1</td>
</tr>
<tr>
<td>Occult GI bleeding of obscure origin</td>
<td>3</td>
</tr>
<tr>
<td>Iron-deficiency anemia</td>
<td>3</td>
</tr>
<tr>
<td>Positive fecal occult blood test</td>
<td>3</td>
</tr>
<tr>
<td>Overt GI bleeding of obscure origin</td>
<td></td>
</tr>
<tr>
<td>Melena</td>
<td>2</td>
</tr>
</tbody>
</table>

All patients underwent CE after at least one negative upper gastrointestinal endoscopy and colonoscopy. Procedures aimed to evaluate the small bowel (small bowel follow-through, angiography, CT-enterography, red blood cells scintigraphy) had also been performed before CE (mean number of diagnostic procedures: 1.8/patient); in 4 out of 5 patients the results of these examinations were completely negative, while red blood cells scintigraphy suggested active bleeding in one patient.

The most frequent tumors were gastrointestinal stromal tumors (GISTs) (3 patients), all located in the jejunum (Figs. 1, 2). An adenocarcinoma and a carcinoid tumor (Fig. 3), both located in the ileum, were diagnosed in the remaining two
Small bowel tumors detected by capsule endoscopy

The lesions were single in 4 cases; in one patient there were two lesions (both proven to be carcinoids). The following endoscopic appearances of SBTs on CE were described: small polypoid lesion with central depression, polypoid ulcerated lesion, active bleeding, bluish protruding lesion.

The entire small bowel was examined by CE in 4 patients; in one case, CE visualized partially the ileum.

Further diagnostic (single-balloon enteroscopy with biopsies) and therapeutic procedures (surgically resected specimens) established the final histological diagnosis: GIST (3), adenocarcinoma (1), and carcinoid (1).

Surgery was performed in all patients. Mean follow-up time was 19 ± 17 (range 2-36) months, and one patient died during follow-up.

Discussion

The small bowel is the site of 1-3% of all gastrointestinal neoplasms [8, 9]. Traditionally, SBTs have been difficult to diagnose due to their nonspecific clinical symptoms, combined with inadequate methodologies for examining the small bowel. Since the introduction of CE into clinical practice, several studies have suggested that the prevalence of these tumors may be substantially higher than previously reported, ranging between 2% and 11% [3-7,10] (Table II).

Until 10 years ago, most of the small bowel was out of sight from the endoscopic examination. The advent of CE and double-balloon enteroscopy (DBE) is a major breakthrough for the endoscopic diagnosis of small bowel diseases [11].

Capsule endoscopy allows painless endoscopic imaging of the entire small bowel and several studies revealed its diagnostic superiority over other modalities such as push enteroscopy [12, 13], abdominal CT [13, 14] small bowel follow-through [14, 15], angiography [15], red blood cells scintigraphy, and magnetic resonance imaging [16], in detecting small bowel lesions. Recently, Fukumoto et al [17] reported that CE and DBE are nearly equal in their ability to detect small bowel lesions if the entire small bowel is examined. Similar results were reported by Arakawa et al [18] and by Pasha et al [19]. Nevertheless, CE lacks the ability to obtain biopsy specimens and perform therapeutic procedures (polypectomy, electrocauterisation), and therefore the role of CE in the diagnosis of SBTs is still debated, in spite of several papers published in this field [3-7, 20].

In our study, the prevalence of SBTs was 4.9% in 102 patients who underwent CE, which is in the range of 2% to 11%.
of other studies (Table II). There are several differences among the published series, the most important being the number of CE examinations performed, which may explain the significant differences of reported prevalence. Thus, Rondonotti et al [21] examined the relationship between the frequency of tumors detected and the number of CEs performed and found an inverse correlation, suggesting that the high number of CEs carried out might be related to the low prevalence of tumors detected. In the largest database published so far of SBTs detected by CE (124 tumors with 5,129 capsule procedures performed), Rondonotti et al [21] reported a 2.4% prevalence of SBTs, and Pasha et al [19], in a study including 1,000 CE examinations, reported a 1.6% prevalence of SBTs. On the other hand, in studies including lower number of SBTs examinations (Cobrin, Almeida, Delvaux) the prevalence of SBTs detected was significantly higher, ranging from 8.9% to 11.7%. There is no clear explanation for these significant differences in the prevalence of SBTs between studies with high and low number of CE examinations performed; it has been suggested that studies with fewer CEs carried out adopted stricter criteria for patient selection [21]. Other issues are also important, i.e. the lack of histological ascertainment in some studies, the different indication to CE, and the lack of distinction between malignant and benign tumors.

As reported in the literature, the patients in our study were predominantly males, the main indication for CE was OGIB, and the most frequent tumors detected were GIST, located in the jejunum. The mean number of examinations (excluding upper endoscopy and colonoscopy) performed before CE (1.8/patient) is comparable with those reported in other studies [3-5, 7, 16, 20].

The endoscopic appearance of SBTs on CE is seldom described in details in the published papers, probably due to the absence of universally accepted terminology, the terms usually being “tumor”, “tumor mass”, “polypoid mass”, “a bleeding polypoid mass”, “ulcerated mass lesion”, “thickened folds”, and “irregular ulcer”. In our study, the CE findings were described as an ulcerated polypoid mass, a white polypoid mass with linear erosions, active bleeding. We should emphasize that CE findings were of uncertain significance, and the final histological diagnosis was established by further diagnostic/therapeutic procedures (single-balloon enteroscopy, surgery) after CE.

We did not calculate the sensitivity, specificity, or predictive value of CE for detecting SBTs because we did not have a gold standard with which to compare the results. Recently published studies reported that CE and DBE have an equal ability to detect small bowel lesions [17, 18].

As far as we know, our study is the first one in Romania regarding the frequency, clinical characteristics, laboratory findings and endoscopic appearance of SBT detected in patients undergoing CE.

**Conclusion**

The prevalence of SBTs found by CE in our study is 4.9% and is similar to those studies which included a population with the same clinical characteristics. Capsule endoscopy could be used as the first choice for diagnostic investigation in patients suspected to have SBTs and, if necessary, followed by double or single-balloon enteroscopy for histopathological confirmation of the diagnosis and endoscopic therapy.

**Conflicts of interest**

None to declare.

**References**


