Capsule Endoscopy of Small Bowel – A Large Single Center Experience from India

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Abstract

Background and Aims: Capsule enteroscopy provides a non-invasive means of examining small bowel mucosa. This study evaluates the safety and efficacy of this technique in a large series of patients with suspected small bowel diseases.

Methods: Over a 6-year period, 178 patients with suspected small bowel diseases were investigated with capsule enteroscopy. Medical records were retrospectively reviewed for indications, capsule endoscopy findings and complications.

Results: The indications for capsule endoscopy were obscure GI bleeding in 133 (74.7%) patients, iron deficiency anemia in 32, abdominal pain in 6, malabsorption syndrome in 5, and assessment of ectopic varices in 2. The capsule endoscopy identified significant findings in 112 patients giving the overall diagnostic yield of 62.9%. The diagnostic yield for patients with obscure GI bleeding was significantly higher than in iron deficiency anemia (75.2% vs 34.4%; \( p < 0.001 \)) but yield between obscure-occult and overt- GI bleeding was similar (73.9% vs 76.6%, \( p = 0.7 \)). Angiodysplasia (35.4%) was the most common diagnosis followed by Crohn’s disease (19.1%). The small bowel examination was incomplete in 41 (23%) patients and 3 (1.7%) patients required surgical removal of capsule following small bowel obstruction. There was no mortality related to the procedure.

Conclusions: Capsule enteroscopy is a safe procedure with high diagnostic yield in evaluating small bowel disorders especially for patients with obscure GI bleeding and iron deficiency anemia. (J Dig Endosc 2010;1:3-7)

Keywords: Capsule enteroscopy, indications, complications, angiodysplasia, Crohn’s disease

Introduction

Visualisation of small bowel mucosa was the ‘black box’ of endoscopy until the introduction of enteroscopes. Sonde enteroscopy was abandoned due to its tedious nature and the push enteroscope has its limitation of incomplete small bowel assessment (1). Intraoperative enteroscopy allows complete examination of the small bowel but it has risk of adverse events due to its invasive nature. There was therefore a need to develop a safe, non-invasive and reliable technique to visualise the small intestinal mucosa. The landmark discovery of capsule enteroscope in 2001 met this need and revolutionised the approach to management of patients with small bowel disease (2-3).

Capsule enteroscopy (CE) has been successfully used in the evaluation of patients with obscure gastrointestinal bleed (OGIB) and detection of a host of other small bowel lesions including Crohn’s disease, celiac disease, small bowel tumours, NSAID enteropathy, etc. (4-7). Application of CE in suspected small bowel disease has played a major role in diagnosis and management decisions and avoided unnecessary surgeries (8). In this study, we assessed the efficacy and safety of CE for evaluation of small bowel disease in a large series of 178 patients at our center during the past six years.
Results

One hundred and seventy eight patients underwent CE during the study period. Their mean age was 45.6±16.4 years and 64% were males. Most of our patients were from east India (65.2%) and south India (26.4%). The remaining patients were from other parts of India (5%) or from other countries (3.4%, Nepal-2; Bangladesh-2; Bhutan-1; UK-1). Indications for performing CE are shown in Table 1. The commonest indication was obscure gastrointestinal bleeding (OGIB) (75%) followed by iron deficiency anemia with negative stool occult blood test (18%) and abdominal pain (3%). Small bowel examination was incomplete in 41 (23%) patients. A diagnosis could however be made in 35 of 41 (85.4%) patients with incomplete examination based on available CE findings. The reasons for incomplete examination were small bowel strictures (n=22), prolonged gastric

<table>
<thead>
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<td>Obscure GI bleed</td>
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<td>Iron deficiency anemia</td>
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<tr>
<td>Assessment of ectopic varices</td>
<td>2 (1.1%)</td>
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<tr>
<td>Total</td>
<td>178</td>
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</tbody>
</table>

Methods

All patients who underwent CE at the Christian Medical College, Vellore from January 2003 to March 2009 were included in this retrospective study. Written informed consent was obtained from all patients before the procedure. Bowel preparation was performed using polyethylene glycol (Pegelec*-137.15g in 2 litres of water on the previous evening and again in the morning before procedure). Capsule enteroscopes manufactured by Given Imaging Limited (Yoqneam, Israel) or Miro Cam (IntroMedic, Korea) was used in our patients. The capsule contains an imaging device, light emitting diode and a transmitter (1). The imager is activated by removal of the capsule from its magnetic holder; the capsule is swallowed by the patient and propelled by peristalsis through the bowel. Images of mucosa taken during study are transmitted to sensors attached to the abdominal wall. The abdominal sensors send data to a battery powered data recorder worn on a belt on the body. The capsule battery lasts for approximately eight hours (11 hours in Miro Cam) after which the data recorder is removed. The data from recorder is downloaded onto a computer workstation and video images are read (7). The capsule passes out spontaneously along with the stool. Imaging records and reports of all patients studied were retrieved for evaluation.

Clinical and investigation data were collected by a standardized review of medical records including detailed enteroscopy report. The indications for the procedure, diagnostic findings, quality of mucosal visualisation, proportion of patients with complete small bowel assessment and complications were analysed.

Definitions

1. Incomplete examination: Failure of capsule to reach cecum before its battery exhausted was considered as an incomplete examination.
2. Angiodysplasia: It was diagnosed in presence of multiple red spots in small bowel mucosa in patients with anemia and absence of NSAID intake.
3. Crohn’s disease was diagnosed using a variable combination of clinical, endoscopic, radiological and histological features (9).
4. Tuberculosis was diagnosed if granuloma/acid-fast bacilli was detected on tissue or lymph node and patient responded to anti-tuberculous therapy.
5. Small intestinal tumours and lymphangiectasia were diagnosed based on histology of surgical specimen.

Data analysis was done using SPSS for Windows. For comparison between two groups chi square test was done for categorical variables and t test for continuous variables. A p value of <0.05 was considered significant.

Table 1: Indications for capsule enteroscopy

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Table 2: Diagnostic yield of capsule enteroscopy in relation to indications (n=178)

<table>
<thead>
<tr>
<th>Diagnosis</th>
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<tbody>
<tr>
<td></td>
<td>Obscure occult GI bleed</td>
</tr>
<tr>
<td>Angiodysplasia jejunum</td>
<td>21</td>
</tr>
<tr>
<td>Crohn’s Disease jejunum</td>
<td>20</td>
</tr>
<tr>
<td>NSAID enteropathy</td>
<td>2</td>
</tr>
<tr>
<td>Helminth</td>
<td>2</td>
</tr>
<tr>
<td>Jejunal polyp</td>
<td>1</td>
</tr>
<tr>
<td>Adenocarcinoma jejunum</td>
<td>1</td>
</tr>
<tr>
<td>Gastrointestinal stromal tumour</td>
<td>1</td>
</tr>
<tr>
<td>Leiomyoma jejunum</td>
<td>1</td>
</tr>
<tr>
<td>Liposarcoma jejunum</td>
<td>-</td>
</tr>
<tr>
<td>Ileal tuberculosis</td>
<td>1</td>
</tr>
<tr>
<td>Intestinal lymphangiectasia</td>
<td>-</td>
</tr>
<tr>
<td>Ileocecal Intussusception</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
</tr>
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(73.9%) (76.6%) (34.4%) (7.7%) (62.9%)
transit (n=5), small bowel tumour (n=1) and jejunal diverticula with impacted capsule (n=1). In the remaining 12 patients, no cause could be ascertained. Among the 22 patients with strictures and incomplete examination, imaging studies done on 9 patients (barium meal follow through, 6; CT abdomen, 3) prior to CE failed to show small bowel strictures. Three patients had a complete examination despite having small bowel strictures. Visualisation of small bowel mucosa was suboptimal in 5 patients – 3 had poor preparation while luminal blood obscured view in the other 2. Three patients (1.7%) required surgical removal of capsule. There was no mortality related to the procedure.

Table 2 shows the diagnostic yield of CE in the patients studied according to the indications. The CE identified significant findings in 112 patients giving overall diagnostic yield of CE as 62.9%. Angiodysplasia and Crohn’s disease of small intestine accounted for 87% of the diagnosed cases. In the subgroup of 133 patients with OGIB, the diagnostic yield was 75.2%. The diagnostic yield in patients with obscure-occult GI bleeding (73.9%) was not significantly different with patients of obscure-overt GI bleeding (76.6%) (p = 0.68). In the 32 patients with iron deficiency anemia, small bowel angiodysplasia was detected in 11 (34.4%) and rest had normal study. The diagnostic yield for patients with obscure GI bleeding was significantly higher than in iron deficiency anemia (75.2% vs 34.4%; p < 0.001). Eight patients had jejunal mass/polypoid lesions. Sixty-six (37%) patients had normal small bowel mucosal study. Figures 1-6 show few of the diagnostic findings on CE in different patients. The age, sex and regional distribution of patients with normal and abnormal CE were not significantly different.

Discussion

In this study we have demonstrated the diagnostic usefulness of CE along with its low rate of complications. Similar to other published studies, our study showed that OGIB was the commonest indication for CE (75%) (4,10). In a report of CE on 191 patients from Austria, 79% had OGIB while 13% had suspicion of IBD (4). Other conditions where CE was found useful include assessment of small bowel in Crohn’s disease, NSAID enteropathy, iron deficiency anemia in absence of occult blood positivity, unexplained abdominal pain, celiac disease and detection of small bowel polyps in familial polyposis syndromes (6,10).

The overall diagnostic yield of CE has varied from 40 to 50% (4,10). The combined yield in our study was higher (63%). In articles reporting only OGIB cases, positive findings have ranged from 50% to 70% (11-13). In an Indian study on 154 patients with OGIB, yield was 52% while a German multicenter study of 285 patients reported a better yield of around 60% (11-12). NSAID enteropathy was the commonest cause in the Indian study and angiodysplasia in the German report. Among our 133 patients with OGIB, a positive diagnosis was made after CE in 100 patients (75%), 52 of whom had angiodysplasia. The diagnostic yield in overt (77%) and occult (74%) obscure gastrointestinal bleed were similar and higher than yield in iron deficiency anemia (34%). Yield in iron deficiency anemia has been reported to be lower in other studies as well (10). CE helped avoid surgery (intraoperative enteroscopy) in the 63 patients with angiodysplasia who were managed medically. CE detects lesions in 30 to 50% of patients with suspected small bowel Crohn’s (4,14). None of our patients with established Crohn’s disease underwent CE for small bowel assessment as the policy in our institution is to perform CT abdomen or small bowel barium examination for this purpose. However, 34 new cases of Crohn’s disease were diagnosed following CE for OGIB or other indications. The small bowel tumour detection rate on CE has varied from 1.6 to 2.4% (15). Six
(3.4%) of our patients had small bowel tumour. Apart from mucosal lesions, luminal pathogens like parasites can cause blood loss and anaemia especially in tropical countries which may be seen on CE (16,17). We detected two patients with helminths. Apart from the positive diagnosis made in above conditions, a negative result on CE also has important implications. Macdonald et al have shown that among patients with OGIB and negative CE, rebleed rate is only 11% at around 1.5 years compared to 42% in the rest of the patients ($p<0.01$) (18).

Introduction of any new diagnostic technique warrants its comparison with older as well as contemporary techniques to establish its efficacy. CE has been the subject of numerous studies and meta-analysis where it has been compared with push enteroscopy, small bowel radiology and double balloon enteroscopy (DBE) (19-23). Two meta-analysis have firmly established the superiority of CE over push enteroscopy and small bowel radiology (19-20). Marmo et al in their meta-analysis showed that CE detects 41% more lesion than push enteroscopy and/or small bowel radiology (19). DBE has been shown to have similar yield as CE (56% vs 61%) in a meta-analysis of 8 prospective studies (24). A Canadian study on 57 patients showed that DBE detected 21 lesions missed by CE and CE detected 31 lesions missed by DBE (25). However, their overall yield was similar. This suggests that CE and DBE should be complementary rather than interchangeable techniques. Same message was echoed in a meta-analysis of CE vs DBE by Pasha and colleagues in 2008 (23). While CE is less invasive, DBE enables one to take biopsies and perform therapy. It is suggested that CE, being less invasive, may be the initial procedure in OGIB following which the need and the route for DBE as well as the choice of sedation may be determined (26).

In approximately 20% patients, the study is incomplete as capsule does not reach cecum before the battery burns out (4,27). Apart from obvious reasons like strictures, mass lesion and diverticulum of small bowel which physically hinder capsule passage, prolonged gastric transit has also been shown to be a cause of incomplete study (27-28). A retrospective study of 291 CE showed that poor bowel preparation, prolonged gastric transit time, prior small bowel surgery and hospitalisation were independent predictors of incomplete study (27). Stricture of small bowel and prolonged gastric transit time were the main reasons for incomplete study in our patients. To improve transit of capsule, manoeuvres like chewing gum during procedure, keeping patient in right lateral position and use of prokinetics have been suggested (28-30). A small controlled study showed that keeping patients in right lateral position results in complete examination in 96% patients vs 73% in the rest ($p=0.03$) (30). Despite the limitation of incomplete examination in 23% of our patients, a diagnosis was made based on available CE findings in 85% of them.

The most important complication of CE is capsule retention. Three (1.7%) of our patients who had capsule retention required surgical removal of capsule. In a large retrospective study from USA, capsule retention occurred in 1.4% of the 1000 patients (31). Patients with suspected bowel strictures and mass lesions are at increased risk (31). Use of patency or agile capsules, which dissolve spontaneously if retained for long time, have been shown to predict retention (32-34). They help select the patients in whom CE should be avoided. Small bowel barium examination has not been useful in predicting retention (32). In our study, nine patients with multiple small bowel strictures on CE had normal barium examination or abdominal CT prior to CE. The period of waiting before spontaneous passage of capsule is unsettled (35). An observation period of two weeks has been proposed in asymptomatic patients (36). Other limitations of this procedure, especially in developing countries, include the high cost and limited availability.

In conclusion, this study shows that CE is a safe procedure with high diagnostic yield in evaluating small bowel disorders. Wider availability of the technique as well as development of cheaper or reusable capsules are challenges for the future in developing countries.

References
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