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Sequential capsule endoscopy of the small bowel for follow-up of patients with known Crohn's disease

Eva Niv[a,*], Sigal Fishman[a], Helena Kachman[a], Ruth Arnon[b], Iris Dotan[a]

[a] IBD Center, The Department of Gastroenterology and Liver Diseases, Tel-Aviv Sourasky Medical Center, Tel-Aviv, Israel[1]
[b] Department of Immunology, Weizmann Institute of Science, Tel-Aviv, Israel

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Video capsule

Abstract

Background and Aims: The aim of this study was to perform sequential small bowel (SB) capsule endoscopy (CE) studies in patients with known active Crohn's disease (CD) during different treatments, to characterize the changes in the SB mucosa over time, and to correlate the CE findings with clinical and laboratory parameters of inflammation.
Methods: Consecutive patients with known moderately active CD were prospectively recruited. After proven patency with Agile capsule, CE studies were performed at baseline and after 4, 12 and 24 weeks. CE parameters and a Lewis score were calculated. Clinical and laboratory parameters were correlated. A control group of 178 non-CD patients was used for comparisons.
Results: Thirty-one CD patients were recruited and 19 met the inclusion criteria. A total of 43 CE studies were performed over the time. There was no capsule retention despite a high rate of previous SB surgery. The mean baseline CDAI, IBDQ and Lewis scores were 306 ± 56, 135 ± 26.6 and 1730 ± 1780, respectively. There was no correlation at the baseline between clinical and laboratory parameters (CDAI, CRP, IBDQ) and mucosal disease (Lewis scores). CDAI and IBDQ changes over a period of 4 and 12 weeks did not correlate with the Lewis score. The cecum arrival rate of the CD patients was significantly lower ($p = 0.0047$) and the SB transit time was significantly longer ($p = 0.005$) compared to those of the controls.

Abbreviations: SE, sequential capsule endoscopy; CD, Crohn's disease; SB, small bowel; CDAI, Crohn's Disease Activity Index; IBDQ, Inflammatory Bowel Disease Questionnaire; SICUS, small intestinal contrast ultrasonography.

* Corresponding author at: The Department of Gastroenterology and Liver Diseases, Tel-Aviv Sourasky Medical Center, 6 Weizmann Street, Tel-Aviv 64239, Israel. Tel.: +972 3 6974807; fax: +972 3 6973191.
E-mail address: niv_em@netvision.net.il (E. Niv).
[1] Affiliated to the Sackler Faculty of Medicine, Tel-Aviv University.

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Conclusions: Sequential CE studies are feasible and safe in CD patients. In patients with complete CE studies, they provide reliable information on mucosal changes in CD and should be considered as an *independent* and *objective follow-up tool* in known CD patients.

1. Introduction

Capsule endoscopy (CE) is now commonly used for examining the small bowel (SB) mucosa, and the information it provided has added considerably to our knowledge on SB diseases.[1–5] One of the major indications for SB capsule is suspected Crohn's disease (CD).[6,7] Numerous studies have demonstrated that CE is a sensitive diagnostic tool for both early and advanced CD in the SB mucosa.[8–12] A less common application of CE is evaluation of disease activity and extent within the SB in patients with already known CD.[13,14] Increasing evidence recently demonstrated that mucosal healing (MH) is a predictor of better prognosis of CD.[15–20] The current gold standard for monitoring MH is ileocolonoscopy, but it is an invasive procedure and it shows only part of the terminal ileum, making its recurrent use challenging. Imaging modalities and biomarkers are being evaluated as surrogate markers for MH, each having significant disadvantages that potentially preclude its use, even if proven efficacious for reflecting MH status.

We hypothesized that SB CE may be an accurate, safe and feasible tool for the follow-up of disease activity and response to treatment in patients with known active CD. The aim of this study was to perform sequential SB CE in such patients during different active treatments, to follow the changes in SB mucosa over time and to correlate mucosal changes with clinical and laboratory parameters.

2. Methods

2.1. Study design

This prospective study was conducted in the IBD Center of the Department of Gastroenterology and Liver Diseases, Tel-Aviv Sourasky Medical Center, a tertiary referral center for IBD patients in Israel. This was a sub-study of a prospective, randomized, double blind placebo-controlled study to assess the safety, tolerability and efficacy of glatiramer acetate (GA, Copaxone®)[21] in inducing remission in patients with moderately active CD (manuscript in preparation). The study protocol was approved by the local Helsinki committee (Helsinki number 0037-08, date of approval 02/06/2008). Consecutive suitable patients aged 18–70 years with known moderately active CD (a Crohn's Disease Activity Index [CDAI] score 220–450) were referred for screening after signing an informed consent form. Their diagnosis of CD needed to be confirmed by colonoscopy, radiology or surgery more than 3 months before enrollment. The permitted medications were stable doses of 5ASA, prednisone up to 20 mg/day, budesonide up to 6 mg/day and stable doses of thiopurines during the 3 months prior to enrollment. Patients with recent bowel surgeries (fewer than 3 months before enrolment), colostomy, ileostomy or short bowel syndrome, obstructive symptoms or radiologic evidence of intestinal strictures were excluded. Pregnancy, lactation, swallowing problems, cardiac pacemaker, and defibrillator were exclusion criteria as well. Eligible patients were followed-up at weeks 0, 4, 8 and 12.

Demographic data, the duration of CD, previous bowel surgeries, results of previous abdominal computerized tomographic (CT) scans, results of ileocolonoscopy and biopsies from the terminal ileum (preferably within one year before the CE study) were retrieved from their medical records. CDAI scores were evaluated at weeks 0, 4 and 12. Quality of life was assessed by the Inflammatory Bowel Disease Questionnaire (IBDQ) at weeks 0 and 12,[22] and relevant laboratory tests, including C-reactive protein (CRP), were carried out at weeks 0, 4 and 12.

During their screening, the patients underwent an Agile patency capsule study (Given® Diagnostic Imaging System, Given Imaging Ltd, Yokneam, Israel) after an overnight fast. They were examined by a scanner and/or an abdominal X-ray within 30 h of swallowing the Agile capsule in order to determine whether or not it had passed the SB. Patients who had a proven SB patency underwent a standard Video CE study as follows. After a 12-hour overnight fast, each patient ingested a PillCam™ SB 2 wireless video capsule (Given®, Israel). No preparation with purgatives and no prokinetics were used. A sensor belt and recorder were attached to the patient for 8 h. The recorded digital information was downloaded, and the images were analyzed using RAPID® software (Given®, Israel). Each study patient underwent a CE study at baseline and at weeks 4 and 12. Patients with normal SB CE results at baseline skipped a CE study at week 4 and underwent a repeat study at week 12. Several patients who had responded to medical therapy by week 12 and entered the extension arm of the GA study underwent further CE evaluations beyond week 12. The CE videos of every patient were evaluated by the same gastroenterologist with CE expertise in order to avoid inter-observer variability and to achieve better homogeneity in the follow-up of changes that had occurred between the films.

The following data were collected from the CE studies: gastric transit time (defined as time from the first view of the gastric mucosa to the first image of the duodenum, expressed in minutes) and SB transit time (defined from the first view of the duodenum up to the first cecal image, expressed in minutes). In cases of an incomplete study, SB transit time was calculated as 480 min (8 h) minus gastric transit time. A CE study was defined as being complete if the capsule reached the cecum. An abdominal X-ray was performed to exclude capsule retention in cases of non-arrival. Cleanliness in the distal part of the SB scored from 1 to 3 (1 = free of stool and debris, 2 = some stool and debris, and 3 = full of stool and debris).

The Lewis score was applied to evaluate the degree of inflammation and stenosis in the SB.[23] Briefly, villous appearance, presence of aphthae and ulcers and the presence of stenosis were detected and scored using a specific formula: a score of <135 is compatible with normal or clinically insignificant mucosal changes, 135–790 defines mild mucosal

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