Available online at www.sciencedirect.com
ScienceDirect
Digestive and Liver Disease 39 (2007) 575–580
Digestive and Liver Disease
www.elsevier.com/locate/dld

Digestive Endoscopy

Video-capsule endoscopy gastric and small bowel transit time and completeness of the examination in patients with diabetes mellitus

K. Triantafyllou [a,*], C. Kalantzis [b], A.A. Papadopoulos [a], P. Apostolopoulos [b], T. Rokkas [c], N. Kalantzis [b], S.D. Ladas [a]

[a] *Hepato-Gastroenterology Unit, 2nd Department of Internal Medicine, Medical School, Athens University, "Attikon" University General Hospital, 1 Rimini Street, 124 62 Haidari, Athens, Greece*
[b] *Gastroenterology Department, NIMTS Hospital, 10, Monis Petraki Street, 11521 Athens, Greece*
[c] *Gastroenterology Clinic, "Henry Dunant" Hospital, 107 Messogeion Avenue, 11526 Athens, Greece*

Received 20 October 2006; accepted 30 January 2007
Available online 12 April 2007

Abstract

Background. Small intestine video-capsule endoscopy examination in patients with diabetes mellitus may be incomplete due to delayed gastric emptying.

Aim. To measure video-capsule endoscopy gastric and small bowel transit time and to assess the completeness of the examination in diabetes mellitus patients.

Methods. In this retrospective, case-control study, we examined capsule endoscopy videos from 29 consecutive diabetes mellitus patients. Fifty-eight matched for sex, type of preparation, age and reason for referral non-diabetic controls were selected from our video-capsule endoscopy database. Two independent experienced investigators measured transit times and assessed examinations' completeness.

Results. Video-capsule endoscopy gastric transit time was significantly longer in diabetes mellitus (87, 1–478 min) compared to non-diabetic patients (24, 4–108 min, $p < 0.001$). The caecum was visualized in 20/29 (69%) diabetes mellitus and 52/58 (89.6%) non-diabetic controls ($p = 0.02$). In 16 diabetes mellitus patients that video-capsule endoscopy reached the caecum, small bowel transit time was significantly shorter (261.2 ± 55.5 min) compared to their 32 non-diabetic matched controls (302 ± 62.7 min, $p = 0.03$).

Conclusions. Patients with type 2 diabetes mellitus have prolonged video-capsule endoscopy gastric transit time compared to non-diabetic patients. Prospective studies are required to complete our understanding of video-capsule endoscopy transit times in the setting of diabetes mellitus.

Keywords: Diabetes mellitus; Gastric transit time; Small bowel transit time; Video-capsule endoscopy

1. Introduction

Video-capsule endoscopy (VCE) is a widespread non-invasive modality to diagnose small intestinal diseases [1,2]. However, incomplete examination of the small intestine by capsule endoscopy occurs in about 15–20% of the patients [1–4]. A crucial factor for incomplete examinations is the long retention of the capsule in the stomach [5] and, therefore, inadequate time for the capsule to visualize the small intestine, because the life span of capsule battery is 8 h.

It is known that patients with diabetes mellitus (DM) have delayed gastric emptying and this may result in a higher percentage of incomplete VCE examinations. Studies using radionuclide techniques have shown that gastric emptying of both solid and liquid meals is abnormally slow in 30–50% patients with longstanding type 1 [6,7] or type 2 DM [6,8]. Therefore, long retention of the VCE in the stomach of DM patients undergoing investigation of the small bowel may limit the diagnostic yield of the examination.

* Corresponding author. Tel.: +30 210 5832552; fax: +30 210 5326422.
E-mail address: ktriant@med.uoa.gr (K. Triantafyllou).

1590-8658/$30
doi:10.1016/j.dld.2007.01.024

The aim of our study was to measure both gastric transit time (GTT) and small bowel transit time (SBTT) of the video-capsule and to assess the completeness of examination in DM patients.

2. Methods

This retrospective, case-controlled study included the videos of 29 consecutive DM outpatients who underwent capsule endoscopy examination of the small bowel in NIMTS, Attikon and Henry Dunant Hospitals in Athens, Greece, between June 2002 and April 2006. All cases had type 2 DM for 8 (5–12) years. Two of the patients used insulin, while the rest of them were treated with antidiabetic oral medications. No type 1 DM patient was detected in our database.

Each diabetic patient was matched with two non-diabetic (ND) outpatient controls. Therefore, 58 matched controls in order for sex, type of preparation, age and reason for referral were selected from the VCE examinations of our institutions, performed at the same period. Matching has been performed by a blinded to the aim of the study person.

Before the VCE study, each patient received bowel preparation according to the preference of the participating department: either only clear liquids diet (CL) the day before the examination (Henry Dunant Hospital) or CL plus a purge with 2 L of polyethelene glycol (PEG) solution (NIMTS Hospital) or CL plus a purge with 45 mL of sodium phosphate (PS) (Attikon University General Hospital).

Neither case nor control had dyspeptic symptoms or known gastroparesis and none of them had suspected obstruction or any other reason for prolonged capsule transit times. All patients had at least once a negative upper and lower gastrointestinal endoscopy before referred for VCE examination.

2.1. Study design

Eligible for evaluation studies were coded and submitted to two independent experienced viewers, for video review. Both had an experience of at least 50 capsule endoscopy studies. All videos reviewed with the PillCam SB® capsule endoscopy system (Given Imaging Ltd., Israel). Images viewed by the Rapid Reader (version 3.1) using dual view mode at maximal speed (40 frames/s). Reviewers were blinded to the patient's status (case vs. control), preparation, indication and the diagnosis of each VCE study.

Each viewer assessed VCE GTT, VCE SBTT and the overall quality of preparation independently. VCE GTT was defined as the time taken from the first gastric image to the first duodenal image. VCE SBTT was defined as the time taken from the first duodenal image to the first caecal image for cases in which the capsule reached the caecum. The overall quality of preparation for each study case was determined using a three-step scale: 1 = good: excellent visibility of the mucosa; 2 = moderate: small to moderate volume of residual fluid which did not impair visualization of the small intestinal mucosa; 3 = poor: large volume of residual fluids or food residues, which disturbed visualization and interpretation [9].

2.2. Statistical analysis

In our series, mean VCE GTT in ND patients is 30 min without normal distribution [10]. We estimated that group sample sizes of 25 diabetics and 50 controls achieve 80% power to detect a difference of 60 min between the null hypothesis (both group VCE GTT means are 30 min) and the alternative hypothesis (the mean of VCE GTT of DM patients is 90 min) with unknown and unequal group standard deviations and with a significance level (alpha) of 0.05, using a two-sided two-sample *t*-test.

Results in the text and in the tables are presented as absolute and value percent for qualitative data. Qualitative data were assessed by non-parametric tests, as appropriate. Agreement between categorical measurements was assessed by Kappa statistics. Distribution of quantitative data was assessed by Kolmogorov-Smirnov test. Normally distributed quantitative data are presented as mean value (± standard deviation) and were assessed by Student's two-sided *t*-test. Non-normally distributed quantitative data are presented as median value with ranges and were assessed by non-parametric test. Correlations were assessed by regression analysis. A p-value of <0.05 indicated statistical significance.

Comparison data in figures are presented as box-and-whisker plots. The box includes 50% of the results falling between 25th and 75th percentile, the median value is represented as a horizontal line inside the box and outliers are shown as open circles and extreme values as asterisks.

3. Results

Demographic characteristics, indication for VCE study and type of bowel preparation in DM patients and ND controls are shown in Table 1. There was perfect matching regarding sex and bowel preparation, while there were no significant differences between cases and controls concerning mean age ($p = 0.79$) and indications for VCE imaging ($X^2 = 5$, d.f. = 4, $p = 0.28$). The commonest indication for both groups was iron deficiency anaemia (41.4% for DM and 46.5% for ND patients, respectively). There was no difference in the two groups regarding the diagnostic yield of the VCE ($X^2 = 6.8$, d.f. = 5, $p = 0.24$) (Table 2).

3.1. Quality of bowel preparation and interobserver agreement

Interobserver agreement of the quality of bowel preparation was excellent ($\kappa = 0.84$, $p < 0.001$) (Table 2) and agreement of caecum visualization was 100%. There was also excellent correlation between the two investigators for both VCE GTT ($r = 1$, $p < 0.001$) and SBTT ($r = 0.98$,