Endoscopic Capsule Retention: Frequency, Causes and Risk Factors Analysis in 244 Consecutive Procedures

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Summary

Introduction. *Endoscopic capsule is central to the study of the small bowel. Retention is its main complication.* ***Objective.*** *To analyze the frequency and risk factors associated with capsule retention.* ***Methods.*** *244 consecutive examinations were analyzed. The event was defined as "definitive retention" if the capsule remained in the small bowel for 3 weeks after the procedure, and as "temporary retention" if the capsule remained in the small bowel at the end of the procedure but was eliminated spontaneously in the following days. Risk factors associated with retention were inflammatory small bowel strictures, tumours and large diverticula.* ***Result.*** *Of 244 procedures, lesions were found in 164 (67.2%), 130 of which were in the small bowel. There were 5 and 2 patients with definitive and temporary retention, respectively. Forty-four cases had risk factors. In 7 (15.9%) there was retention of the endoscopic capsule, with definitive retention in 5 cases. The 2 cases of temporary retention occurred in Meckel's diverticulum and in peptic ulcer scar. The 5 cases of definitive retention occurred in 2 patients with Crohn's disease, 2 patients with stenosis related with anti-inflammatory drugs use and 1 patient with actinic stenosis. None of the 11 cases of small bowel neoplasia had capsule retention.* ***Conclusions.*** *There was no endoscopic capsule retention in patients without risk factors. Definitive retention was observed in approximately one-tenth of all patients with small bowel risk factors. Recognition of risk factors and their identification prior to the procedure is of utmost importance, especially in patients with suspected inflammatory strictures.*

Keywords. *Endoscopic capsule, retention, small-bowel, endoscopy.*

Retención de cápsula endoscópica: frecuencia, causas y análisis de factores de riesgo en 244 procedimientos consecutivos

Resumen

Introducción. *La cápsula endoscópica es fundamental en la investigación del intestino delgado. La retención es su principal complicación.* ***Objetivo.*** *Analizar la frecuencia y los factores de riesgo relacionados con la retención de cápsula.* ***Métodos.*** *Fueron analizados 244 exámenes consecutivos. El evento fue definido como "retención definitiva" si la cápsula permanecía en el intestino delgado durante 3 semanas después del procedimiento y como "retención temporal" cuan-*

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do al finalizar el procedimiento la cápsula aún se mantenía dentro del intestino delgado, pero era eliminada en los próximos días de manera espontánea. Los factores de riesgo relacionados con la retención fueron estenosis inflamatorias de intestino delgado, tumores y divertículos de gran tamaño. ***Resultados.*** *De 244 exámenes, se encontraron lesiones en 164 (67,2%) y, de éstas, 130 en el intestino delgado. Presentaron retención definitiva y temporal 5 y 2 pacientes respectivamente. Tenían factores de riesgo 44 casos. En 7 (15,9%) de ellos, hubo retención de la cápsula endoscópica, siendo retenciones definitivas en 5 casos. Los 2 casos de retención temporal se presentaron en el divertículo de Meckel y en la cicatriz de una úlcera péptica. Las 5 retenciones definitivas ocurrieron en 2 pacientes con Enfermedad de Crohn, 2 pacientes con estenosis por uso de antiinflamatorios y 1 paciente con estenosis actínica. En ninguno de los 11 casos de neoplasia de intestino delgado hubo retención de la cápsula.* ***Conclusión.*** *No hubo retención de capsula endoscópica en pacientes sin factores de riesgo. Se observó retención definitiva en aproximadamente una décima parte de todos los pacientes con factores de riesgo en intestino delgado. El reconocimiento de los factores de riesgo y su identificación antes del procedimiento son de suma importancia, especialmente en pacientes con sospecha de estenosis inflamatoria.*

Palabras claves. *Cápsula endoscópica, retención, intestino delgado, endoscopía.*

Abreviaturas
EC: Endoscopic capsule.
SB: Small bowel.
OGIB: Obscure gastrointestinal bleeding.
RF: Risk factors.
NSAIDs: Non-steroidal anti-inflammatory drugs.
CD: Chron's disease.

Introduction

Endoscopic capsule (EC) is an important tool for the study of the small bowel (SB). EC allows physiological and non-invasive visualization of the SB.[1-3] According to an ASGE guideline, "wireless capsule endoscopy has become the first-line test for visualization of the SB mucosa and its lesions, with an accuracy of 80%".[4-6] The main complication is capsule retention, which occurs in 2 to 3% of the procedures and usually indicates a clinical problem.[7] There are several indications for EC, including obscure gastrointestinal bleeding (OGIB),[3, 8-11] patients with suspected or established Crohn's disease,[12] abdominal pain and chronic diarrhea.[3, 13-19] Impaction in the cricopharynx,[20] Zenker's diverticulum[21] or Meckel's diverticulum[22] have been described and are very rare causes of EC retention.[4] In previous studies SB cancer and SB strictures were associated with EC retention and even considered a contraindication to the procedure.[4, 23-25] The goal of our study is to evaluate the frequency of EC retention as well as its risk factors in a consecutive series of 244 EC procedures.

Material and Methods

Between 2007 and 2016, we analyzed 244 consecutive SBECs (GIVEN/Medtronic, models M2A and PillCam SB, SB 2 and SB 3). All patients had previously undergone upper and lower endoscopy, with no clinically significant findings in these segments. Indications for the use of EC were OGIB, anemia, search for polyps in patients with polyposis syndromes, investigation of diarrhea or neoplasms, abdominal pain, evaluation in patients with celiac disease and suspected or known cases of Crohn's disease. Risk Factors (RF) were considered: Inflammatory narrowing of the small bowel (Crohn's disease, use of non-steroidal anti-inflammatory drugs (NSAIDs), previous small bowel radiation, ulcers or lesions in Meckel's diverticulum and other enteritis), SB tumors, scars (stenosis in treated Crohn's disease, in surgical anastomosis, scar retraction of duodenal ulcer), and diverticula. The EC was considered to be definitively retained if it was still in the SB at three weeks after the procedure as shown by radiographs or had been surgically removed. Temporary retention was considered if the CE was still in the SB at the end of the study, but passed spontaneously in the following days. The study was approved by the institutional review board of our center and conducted in accordance with the principles of the Helsinki Declaration, and written informed consent was obtained from all patients before capsule endoscopy.

Results

Of the 244 EC procedures, lesions were found in 164 (67.2%). In 130 of these 164 cases, the lesions were located in the SB (53% of the total cases or 79% of the cases with lesions). In 34 of the 244 cases (13.9%) or 34 of the 164 cases with lesions (20.7%), the lesions were found outside the SB (colon or stomach). And in 80 of the 244 cases (32.7%) no injurie or disease was found by the EC (Table 1).

Table 1. *Baseline characteristics*

Number of ECs 244	With injuries 164 (67.2%)	Without injuries 80 (32.8%)
Small bowel lesions	130/164 (79%)	
Stomach or colon lesions	34/164 (20.7%)	

Permanent capsule retention was observed in 5 cases (2.04%). Temporary or permanent retention occurred in 7 of the 130 cases with SB disease (5.3%). Of these 130 cases with SB lesions, 44 (33.8%) had lesions considered to be RF. The CE was retained in 7 of these 44 cases (15.9%), temporarily in 2 (4.5%) and definitively in 5 (11.4%). None of these patients presented with abdominal distension on physical examination (Table 2).

Causes of retention: The 2 cases of temporary retention occurred in a patient with Meckel's diverticulum and another with a duodenal bulb deformity (post-ulcer scar). None of these patients were symptomatic after the procedure. The 5 cases of definitive retention occurred in patients with Crohn's disease (n=2), NSAIDs related stricture (n=2) and 1 case of actinic enteritis. None of these patients presented with clinical signs and symptoms of small bowel obstruction. In the 11 cases of SB malignancy found in 130 patients with SB lesions there was no EC retention (Table 3).

Treatment of retention: The 5 patients with definitive EC retention underwent surgery to remove the device as well as treatment of the underlying lesion. In 2 of them, removal by enteroscopy has been attempted previously without success. All patients had a rapid and complete postoperative recovery.

Table 2. *Capsule retention*

Group	N	no.%	95% CI
Total cases	244	5 (2.05)	0.67 - 4.72
Cases with lesions	164	5 (3.05)	1.00 - 6.97
Cases with lesions in SB	130	5 (3.85)	1.26 - 8.75
Cases with lesions in SB with risk factors	44	5 (11.36)	3.79 - 24.56

Table 3. *Causes of capsule retention*

Retention	Causes	Number
Temporary	Meckel´s Diverticulum Stenosis	1
	- Cicatricial stenosis of the duodenal bulb	1
Definitive	- Radiotherapy related stricture	01
	- NSAID related stricture	02
	- CD related stricture	02

Discussion

EC retention rates range from 0% to 21% in different series.[12, 23, 26-33] Permanent capsule retention was observed in 5 cases (2.04%) of the total sample. Temporary or permanent retention occurred in 7 out of 130 cases with SB disease (5.3%). However, 44 (33.8%) of the 130 cases had lesions that were considered risk factors for retention. EC was retained in 7 of these 44 cases (15.9%), temporarily in 2 (4.5%) and definitively in 5 (11.4%), or 1 in 10 patients with RF retention had this complication. Definitive retention occurred exclusively in patients with SB strictures of benign etiology.

In Crohn's disease (CD), EC has become an important tool for the evaluation of SB,[1, 2, 19] both in patients with suspected or with already established disease.[17] It has become the procedure of choice due to its safety and high diagnostic capacity, especially when ileocolonoscopy is negative.[1, 3, 19] However, the safety of EC in patients with Crohn's disease remains a concern, as the stenosis typically seen in CD may promote EC retention.[17] Known SB strictures are considered a contraindication to EC examination.[17] If a stenosis is suspected, further imaging studies should be performed prior EC,[17, 34-35] such as CT scan (multislice enterotomography) or MR. A previous study showed that in 14 cases of stricture-associated retention, in 11 of them the contrast radiologic examination of the SB did not show stenosis in any of them,[4] as was the case in our experience, demonstrating that SB series should no longer be used prior to EC.[36]

Patients with a diagnosis of Crohn's disease have a much higher retention rate than patients with suspected Crohn's disease. In three studies the mean retention was 4%, 6% and 7%, despite normal radiologic studies prior to EC.[29, 30, 32] Another study[17] reviewed the records of 983 EC tests and selected 102 cases in which the test was performed with suspected Crohn's disease (64 cases) or already diagnosed Crohn's disease (38 cases). In one of the 64 cases with suspected Crohn's disease, EC retention occurred (1.6%), compared with 5 (13%) patients with known CD.[17] In 1291 patients who underwent EC, retention occurred in 32 (2.5%). Crohn's disease and malignancy were the 2 most common causes of retention.[2] Many studies have focused on retention as a complication of EC itself. On the other hand, some authors have even questioned whether retention is a complication or a step towards resolution of the clinical situation.[8-9, 13-14, 24-25, 41-43, 46] In one study, the authors found that in 4 of the 5 cases in which the EC was retained, there was a clear clinical benefit from the information provided by the EC or the surgical procedure, resulting from the diagnosis of the stenosis highlighted by the EC retention.[46] Retention may indicate definitive surgical treatment of the underlying disease. If the stenosis is not less than 2/3 of the diameter of the EC, the EC may eventually pass.[2] Elective surgical removal of a retained EC and the stenosis causing its retention, may resolve the clinical picture itself.[17,23,26,30,45]

An accurate medical history to identify symptoms suggestive of SB strictures and prior radiologic imaging of the SB by CT are indicated before CE, in order to reduce the retention rate. Pseudocapsules or patency capsules could also be used.

Another fact related to technical problems with EC is a possible delay in its passage through the stomach, delaying its arrival at the SB and often preventing a complete SB study. In patients with suspected delayed gastric emptying, such as diabetic gastroparesis, some authors recommend the use of prokinetics before the patient ingests the EC.[44]

In the case of EC retention, several measures could be taken. In a study analyzing 14 retentions cases, the EC was removed surgically in 11 of 13 cases, by enteroscopy in 1 case and by colonoscopy in another case. One patient refused to have the device removed and was followed for 3 years without developing any clinical picture related to SB obstruction.[4] Other authors reported retention in 5 of 245 cases (2%), with 2 cases of Crohn's disease, 1 SB adenocarcinoma, 1 idiopathic stenosis and 1 case of adhesions.[46] In 2 of these cases, the EC was removed by endoscopy and in the other 3, surgical resection was performed.[46] In cases of retention, other measures besides endoscopy and surgery could be undertaken. The capsule could be left in place and in case of symptoms of obstruction, surgical or medical treatment should be performed. In patients with Crohn's disease, steroids and/or biological agents could be used in cases of non-fibrotic strictures. Endoscopic intervention by enteroscopy or surgery with simultaneous removal of the capsule and the stenotic area are the most commonly used therapeutic maneuvers.

In conclusion, retention of EC, although a major complication, is relatively rare (2.04%) in a general population of EC patients. Recognition of risk factors and detailed examination of the small bowel by entero-CT or MR prior to EC are of paramount importance, as CE retention occurs almost exclusively in patients with SB strictures. Small bowel series should no longer be used prior to EC.

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