

Research Article

Single Center Review of Wireless Capsule Endoscopy in Children

Atiye Nur Aktay^{1*} and Hassan Hamandi²¹Department of Pediatric Gastroenterology, Rainbow Babies and Children's Hospital, USA²Department of Pediatric Gastroenterology, Johns Hopkins University, USA

*Corresponding author

Atiye Nur Aktay, Department of Pediatric Gastroenterology and Nutrition, Rainbow Babies and Children's Hospital, Cleveland OH, USA, Tel: 216-386-7060; Email: Atiye.aktay@uhhospitals.org

Submitted: 11 January 2016

Accepted: 02 February 2016

Published: 03 February 2016

Copyright

© 2016 Aktay et al.

OPEN ACCESS

Keywords

- Wireless capsule endoscopy
- Small bowel crohn's disease
- Obscure gastrointestinal bleeding

Abstract

Objective: The data on wireless capsule endoscopy (WCE) in children is limited. The aim of this study is to describe the demographics, indications, findings, and complications of this novel non-invasive diagnostic tool in a pediatric population.

Methods: The study is an IRB approved retrospective chart review of patients <18 years of age who underwent WCE at a tertiary children's hospital over a seven-year period.

Results: 91 WCE were included, youngest patient was 4 years old; 15 patients were <10 years old. Active gastrointestinal bleeding was only observed in 2 patients. One patient demonstrated findings consistent with NSAID injury, and another patient endorsed parasites. In our study, the diagnostic yield of WCE was highest in patients with known CD, 10 of 17 CD and 2 of 10 IC patients were found to have active SBCD. Patients with IC had their disease reclassified as CD. The treatment modality had been changed in all of the patients with newly diagnosed SBCD patients and 92% of patients with known CD. 2 of 6 patients with gastrointestinal bleeding were found to have active bleeding in the small bowel; and none of the patients with suspected polyposis were found to have polypoid lesions. The complication rate was 7%.

Conclusion: Pediatric indications of WCE are more focused on Inflammatory Bowel Disease (IBD) versus gastrointestinal bleeding and polyps. Evaluation of established CD demonstrated the greatest ratio of abnormal findings. Complication rate is comparable to other published studies in children.

ABBREVIATIONS

WCE: Wireless Capsule Endoscopy; US: United States; CD: Crohn's Disease; IC: Indeterminant Colitis; OGIB: Obscure Gastrointestinal Bleeding; SSBCD: Suspected Small Bowel Crohn's Disease; FDA: Food and Drug Administration; SBCD: Small Bowel Crohn's Disease; IBD: Inflammatory Bowel Disease

INTRODUCTION

WCE is a novel non-invasive diagnostic tool in the evaluation of patients with suspected small bowel pathology including inflammatory bowel disease, polyps and obscure gastrointestinal bleeding. It has been shown to be safe and well tolerated in adults, but limited data is available on its utility in pediatric patients. The aim of this study was to retrospectively investigate the diagnostic value of WCE in children and to determine its safety and applicability.

MATERIALS AND METHODS

The study is an IRB approved retrospective chart review of

patients <18 years of age who underwent WCE at Rainbow Babies Children's Hospital, from January 2006 through December 2012. WCE is performed using the PillCam™, which is a disposable imaging capsule. The capsule measures 11 by 30 mm and contains video imaging, self-illumination, and image transmission modules as well as a battery supply that lasts up to 8 hours. Capsules were placed either by swallowing or endoscopically. To decrease the rate of capsule retention, all patients underwent either an upper gastrointestinal barium study or swallow a patency capsule to evaluate for possible strictures. In terms of preparation for the capsule endoscopy, the day before the test patients were on clear liquid diet from noon until 10 pm and stayed NPO until the test. The capsule was swallowed with a glass of water. Patients were NPO for 2 hours after the placement of the WCE; after that only sips of clear liquids for 4 hours and then light snack were allowed.

RESULTS

98 WCE were reviewed; the placement technique, small bowel transit time, capsule findings, prior imaging studies,

complications, indications were recorded. The median age was 14.3 y (range, 4.8 - 17.11), youngest patient was 4.8 years old; 15 patients were <10 years; 55% were female. Prior to undergoing WCE, the most commonly reported symptoms were abdominal pain (52%), diarrhea (13%), hematochezia and melena (9%), vomiting (8%), and weight loss (5%). The indications for WCE were: SSBCD established CD unresponsive to therapy, indeterminate colitis, evaluation of unexplained gastrointestinal bleeding, and evaluation of suspected polyps (polyposis syndrome) (Figure 1). Of the 98 WCE, 91 completed, 7 were incomplete studies (31%). All patients except 1 (parents preferred WCE prior to endoscopy) underwent upper endoscopy and ileocolonoscopy prior to WCE. Patients either had small bowel imaging or patency capsule prior to proceeding to WCE.

29 WCEs had abnormal findings. The primary abnormal findings were aphthous ulcers and erosions in the small bowel; these findings were evident in 25 patients (86% of all abnormal findings) (Figure 2). Abnormal findings per indication were as follows: 13 of 56 patients with SSBCD had ulcer and erosions in the small bowel, were newly diagnosed with SBCD; 10 of 17 patients with established CD were found to have active small bowel ulcerations; 2 of 10 patients with IC had their disease reclassified as SBCD; 2 of 6 patients with gastrointestinal bleeding were found to have active bleeding in the small bowel (Figure 3) and none of the patients with suspected polyposis were found to have polypoid lesions. 1 patient on high dose NSAID had mucosal erosion, and 1 patient had hookworms. WCE findings altered the management of the patients in 25/98 patients. 2 patients with active bleeding underwent push enteroscopy, 1 patient with hookworm infection was treated with mebendazole. The treatment modality was changed in all patients with newly diagnosed SBCD and 92% of patients with known CD.

Mean small bowel transit time of capsule was 236±94 minutes (range 75-480 min), excluding retained capsules. The complication rate was 7%: 3 capsules showed poor visibility due

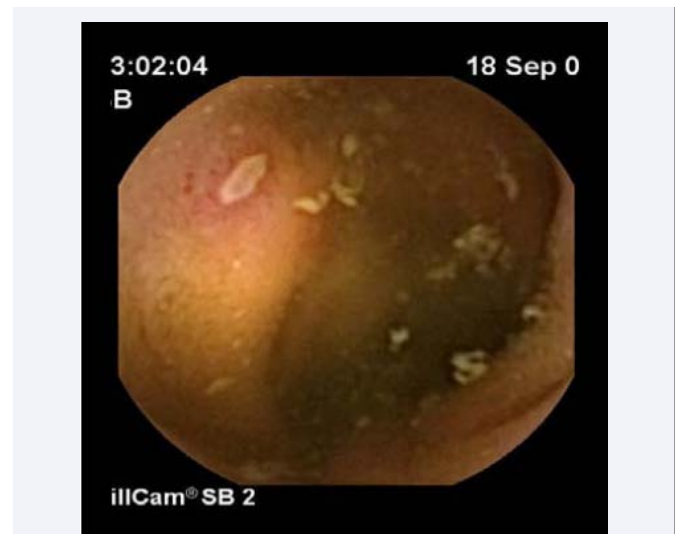


Figure 2 Ulcers in small bowel.

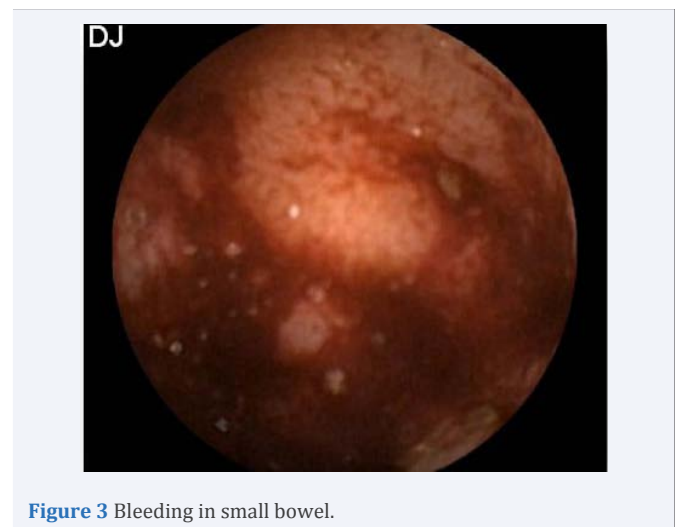


Figure 3 Bleeding in small bowel.

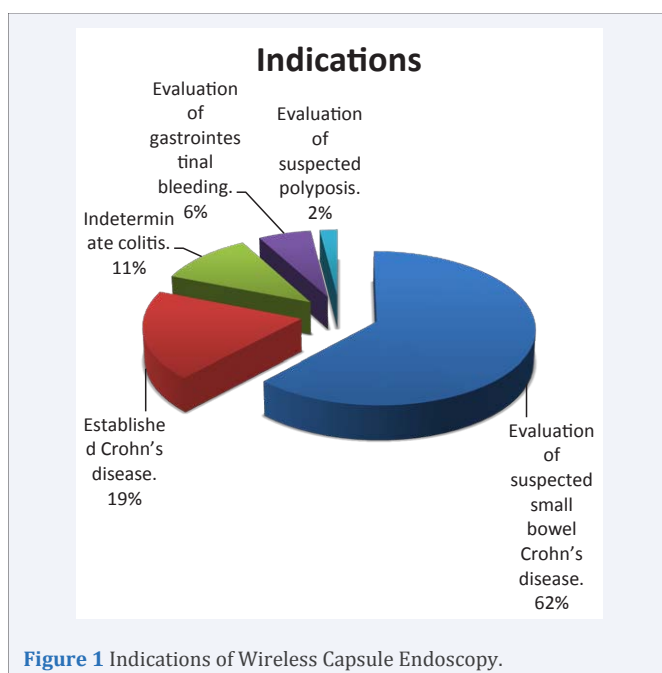


Figure 1 Indications of Wireless Capsule Endoscopy.

to food particles in the small bowel, 3 capsules were retained in the stomach in non-surgical patients during the 8 hour of recording but eventually passed, and 1 did not enter colon before the end of the video but eventually expelled naturally. In patients <10 years old, 40% of capsules were placed endoscopically in the second portion of the duodenum without any complication. None of the patients that were <10 years old retained a capsule.

Body mass index was not associated with the method of placement in this subset of patients. None of the capsules were retained in the small bowel.

DISCUSSION

Capsule endoscopy is an effective and appealing tool to diagnose and monitor small bowel luminal disorders in children. In 2001, US Food and Drug Administration (FDA) approved the use of WCE in adults [1]. A year after, Seidman et al first described the diagnostic role of WCE in children. In 2004, FDA approved it for pediatric patients 10 years and older and later expanded its use in children 2 years and older in 2009. In the last

decade handful of studies have been conducted in children but the data and research is limited and there is a need to document its feasibility, safety and utility especially.

It has been shown through multiple studies that the indications of WCE in children are significantly different in comparison to adults. In adults, major indication is obscure gastrointestinal bleeding (OGIB) whereas in children, it is mostly SSBCD. In a pediatric study by Atay et al 83 % of WCE have been for evaluation of new and existing SBCD, 15% for OGIB, and 1% for polyps [2]. A Meta analysis in 864 WCE completed in children showed that CD was the most prevalent diagnostic outcome [3]. Rondonotti et al. has shown that 66% of WCE in adults have been for OGIB, 11% for abdominal pain or diarrhea, 10% for SSBCD and remaining 10% [4]. This was also observed in our study, the main indication was SSBCD 61% (56/93 patients), established CD, IC, evaluation of unexplained GI bleeding and evaluation of suspected small bowel polyposis.

WCE has been instrumental in facilitating the diagnosis of CD and reclassifying patients diagnosed with IC and documenting mucosal healing in response to treatment. In our study, the diagnostic yield of WCE was highest in patients with known CD, 10 of 17 CD and 2 of 10 IC patients were found to have active SBCD. Patients with IC had their disease reclassified as CD. The treatment modality had been changed in all of the patients with newly diagnosed SBCD patients and 92% of patients with known CD.

In this study mean small bowel transit time of the capsule was 236 minutes, which is similar to mean transit time (266 minute) reported by Mohr et al. [5]. Capsule retention which is the most significant complication of WCE is defined as having a capsule remain in the digestive system for minimum of 2 weeks. The reported capsule retention rate in a study of 900 adult patients was 0.7 % [6]. Tokuhara et al reported the average capsule retention rate as 3.7 % in children [7]. Capsule retention is mostly observed in patients with history of GI surgeries or CD. No capsule retention was observed in our patients, this might be due to preceding small bowel imaging study or patency capsule. Patency capsule has been developed by Given imaging to assess bowel patency and degree of stenosis. We highly recommend obtaining either patency capsule or small bowel imaging study prior to WCE in children.

If the capsule does not reach cecum during the recording time but is eventually expelled within two weeks, the study would be considered as incomplete. WCE completion rates are similar in children and adults at around 80% [8]. Incomplete study was reported in 20 % of the adult patients (gastric retention was

found in 14%). This was observed in only 4 of 98 patients in our study (3 was retained in the stomach, 1 did not enter the colon). These patients didn't have any risk factors such as younger age or CD. Poor visibility in the small bowel is a limitation of WCE, this was observed in only 3 patients, and all of these patients were excluded from the study.

Capsule was placed endoscopically in the third portion of the duodenum under general anesthesia in our youngest patient (4.8 yr) All the endoscopic placement of capsules were performed under general anesthesia to prevent complications. In 40% of patients <10 years of age, capsule was placed endoscopically without any problem. 60% were able to swallow the capsule without any difficulty. In terms of OGIB, capsule endoscopy has impacted the management of two patients with overt GI bleeding; both of these patients underwent push enteroscopy.

In summary, WCE is a safe and valuable tool to diagnose small bowel disease especially in children with IBD. WCE facilitates the classification of IBD which is critical for better management with targeted therapies and to prevent complications of undiagnosed SBCD such as strictures and abscesses.

REFERENCES

1. Seidman EG. Wireless capsule video-endoscopy: an odyssey beyond the end of scope. *J Pediatr Gastroenterol Nutr.* 2002; 34: 333-334.
2. Atay O, Mahajan L, Kay M, Mohr F, Kaplan B, Wyllie R. Risk of capsule endoscope retention in pediatric patients: a large single-center experience and review of the literature. *J Pediatr Gastroenterol Nutr.* 2009; 49: 196-201.
3. Oliva S, Cohen SA, Di Nardo G, Gualdi G, Cucchiara S, Casciani E. Capsule endoscopy in pediatrics: a 10-years journey. *World J Gastroenterol.* 2014; 20: 16603-16608.
4. Rondonotti E, Soncini M, Girelli C, Ballardini G, Bianchi G, Brunati S, et al. Small bowel capsule endoscopy in clinical practice: a multicenter 7-year survey. *Eur J Gastroenterol Hepatol.* 2010; 2: 1380-1386.
5. Atay O, Mahajan L, Kay M, Mohr F, Kaplan B, Wyllie R. Risk of capsule endoscope retention in pediatric patients: a large single-center experience and review of the literature. *J Pediatr Gastroenterol Nutr.* 2009; 49: 196-201.
6. Barkin JS, Friedman S. Wireless capsule endoscopy requiring surgical intervention. The world's experience. *Am J Gastroenterol.* 2002; 97: 298.
7. Tokuhara D. Wireless Capsule Endoscopy in Pediatric Gastrointestinal Diseases. *New Techniques in Gastrointestinal Endoscopy.* Prof. Oliviu Pascu (Editor). 2011.
8. Zevit N, Shamir R. Wireless capsule endoscopy of the small intestine in children. *J Pediatr Gastroenterol Nutr.* 2015; 60: 696-701.

Cite this article

Aktay AN, Hamandi H (2016) Single Center Review of Wireless Capsule Endoscopy in Children. *JSM Gastroenterol Hepatol* 4(1): 1053.