

Initial experience of video capsule endoscopy at a tertiary center in Saudi Arabia

Abdulrahman Alkhormi, Mohammed Y. Memon, Ahmad Elhafi, Mishal Aljohani, Abdullah Aljahdali, Adil Khatimi, Amer Rizvi, Khaled Shaban, Ghulam Yazdani, Mohammed Alnasser

Gastroenterology and Endoscopy Unit, King Abdulaziz Medical City, Riyadh, Saudi Arabia

Abstract

Background/Aim: No prior experience with video capsule endoscopy (VCE) has been published from Saudi Arabia. In this study, we aim to report the first Saudi experience with VCE.

Patients and Methods: A prospective study was conducted between March 2013 and September 2017 at King Abdulaziz Medical City, Riyadh, Saudi Arabia. Eligible patients underwent VCE and their data (age, sex, indication for VCE, type of obscure gastrointestinal bleeding [OGIB: overt vs occult], VCE findings, and complications) were recorded. Approval was obtained from the institutional ethics board before the study began and all patients provided verbal and signed consent for the procedure. The procedure was performed according to the established guidelines.

Results: During the study period, a total 103 VCE procedures were performed on 96 patients. Overall, 60 participants (62.5%) were male (mean age, 58.8 years; range, 25–97 years) and 36 (37.5%) were female (mean age, 52.8 years; range, 18–78 years). The most frequent indication for VCE was OGIB ($n = 91$, 88.35%; overt, $n = 46$, 50.55%; occult, $n = 45$, 49.45%). Other indications were suspected Crohn's disease ($n = 4$, 3.88%), suspected complicated celiac disease ($n = 4$, 3.88%), and unexplained chronic abdominal pain ($n = 4$, 3.88%). The VCE results were categorized as incomplete ($n = 2$, 1.94%), poor-quality ($n = 7$; 6.8%), normal ($n = 39$, 37.86%), and abnormal ($n = 55$, 53.4%). The completion rate was 98.06% ($n = 101$), and the overall diagnostic yield was 53.4%. Of the 55 patients with abnormal VCE results, 43 (78.2%) had small bowel (SB) abnormalities and 12 (21.8%) had abnormalities in the proximal or distal gut. The most frequent SB abnormalities were angiodysplasia ($n = 22$, 40.0%) and tumors ($n = 7$, 12.7%).

Conclusion: The diagnostic yield of VCE for Saudi patients with OGIB is comparable to that reported internationally; however, data for other VCE indications, including inflammatory bowel disease, are still lacking.

Keywords: Angiodysplasia, celiac disease, Crohn's disease, obscure gastrointestinal bleeding, video capsule endoscopy

Address for correspondence: Dr. Abdulrahman Alkhormi, Gastroenterology and Endoscopy Unit, King Abdulaziz Medical City, Riyadh - 11426, Saudi Arabia.
E-mail: Dr_abuturkey@hotmail.com

INTRODUCTION

Examination of the small bowel (SB) had posed a major challenge to gastroenterologists until the introduction of video capsule endoscopy (VCE) into clinical practice

in 2000.^[1] VCE visualizes the entire small intestine mucosa and allows more complete SB exploration. It has primarily been used as a diagnostic tool in obscure

Access this article online	
Quick Response Code:	Website: www.saudijgastro.com
	DOI: 10.4103/sjg.SJG_110_18

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How to cite this article: Alkhormi A, Memon MY, Elhafi A, Aljohani M, Aljahdali A, Khatimi A, *et al.* Initial experience of video capsule endoscopy at a tertiary center in Saudi Arabia. Saudi J Gastroenterol 2018;24:355-9.

gastrointestinal (GI) bleeding (OGIB), but it also aids the diagnosis of inflammatory bowel disease (IBD), celiac disease, and SB neoplasia.

OGIB is the most frequently studied indication for VCE. A systematic review published in 2010 that included 227 studies (equivalent to 22,840 VCE procedures)^[2] reported a pooled diagnostic yield of approximately 60% for OGIB. The most common etiology for OGIB was angiodysplasia (50%), whereas inflammatory lesions or ulcerations and SB tumors, accounted for 26.8% and 8.8%, respectively, of all cases.^[2] For the indication of OGIB, VCE has higher diagnostic yield compared to SB barium study, computerized tomography (CT) enteroclysis, SB magnetic resonance imaging (MRI), and push enteroscopy; and similar diagnostic yield to mesenteric angiography and intraoperative enteroscopy.^[3]

The role of VCE in IBD is growing rapidly. It might be helpful for diagnosing Crohn's disease among patients with clinical suspicion of this condition but with negative ileocolonoscopy and abdominal imaging results by detecting early mucosal lesions in the SB.^[4] In established cases of Crohn's disease, VCE can potentially modify the treatment and clinical outcome when it is used to assess mucosal healing.^[5,6]

In celiac disease, VCE has been used successfully for defining the extent, severity, and complications of the disease.^[7,8]

Despite the potential benefits of VCE, this procedure is not without risk. The most common complication associated with VCE is capsule retention. The rate of capsule retention depends on the clinical indication. A systematic review and meta-analysis published in 2017^[9] reported a capsule retention rate of 2% for OGIB, 3.6% for suspected Crohn's disease, and 8.2% for established Crohn's disease. The most frequent cause of capsule retention was Crohn's disease stricture (46%), followed by SB neoplasms (17%).^[9]

Although VCE has been used widely in most tertiary centers in Saudi Arabia, experience with VCE has never been reported from this country. In the present study, we report the initial experience with VCE at a tertiary center in Saudi Arabia. Our objective is to see its growing scope locally and to compare with international published data.

PATIENTS AND METHODS

The primary objectives of the study were to determine the findings and diagnostic yield of VCE in Saudi patients. The

secondary objectives included procedure completion rate and complications in Saudi patients.

A prospective study was conducted between March 2013 and September 2017 at King Abdulaziz Medical City (KAMC), Riyadh, SA. Eligible patients underwent VCE and their data (age, sex, indication for VCE, type of OGIB [overt vs occult], VCE findings, complications) were recorded. Approval was obtained from the institutional ethics board before the study began and all patients provided verbal and signed consent for the procedure.

All adult patients (age >14 years) with OGIB, defined by the American Gastroenterological Association (AGA) as recurrent or persistent GI bleeding and negative esophagogastroduodenoscopy (EGD) and colonoscopy,^[10] were included. Patients suspected of Crohn's disease based on a combination of clinical features, elevated inflammatory markers, and negative results by EGD, colonoscopy, and CT enterography were also eligible for the study. Patients with celiac disease who were unresponsive to a gluten-free diet even after counselling and dietary consultation were marked as "probably complicated celiac disease" and were included as well. Patients with abdominal pain not explained by medical history, physical examination, abdominal imaging, and endoscopy were also included. Patients with suspected or confirmed SB obstruction were excluded from the study. The presence of relative contraindication to VCE, such as an implanted cardiac device or pregnancy, did not preclude patients from inclusion if VCE was indicated.

VCE system

At the KAMC endoscopy unit, we use the MiroCam capsule system (IntroMedic, Republic of Korea). The capsule measures 24.5 mm × 10.8 mm and has a 170° field of view. It has 12-h operation time and captures three images per second. The capsule depends on the human body as a conductor to transmit data from its antenna to the sensors and does not depend on radiofrequency transmission, eliminating potential interference between the capsule and implanted cardiac devices. The signals emitted by the capsule also enable the approximation of its position in the abdominal cavity.

Study protocol

All participants were instructed to cease iron therapy 3–5 days before undergoing VCE and to avoid any medications that can affect gut motility, including narcotic and anticholinergic medications, if possible. The day before the procedure, the patients were instructed to consume only liquid diet and to take at least 1 L polyethylene glycol-based bowel preparation (Moviprep; Norgine Limited, the

Netherlands) in the afternoon. The patients then fasted for 8 h before ingesting the capsule. On the day of the procedure and after the sensors had been attached to their body, the patients swallowed the capsule with water mixed with 5 ml simethicone (Salinal, Julphar Gulf Pharmaceutical Industries, Diqdaqah, Ras Al Khaimah, UAE). At the time of hospital discharge, the patients were given written instructions in both English and Arabic to follow over the next 12 h [Table 1]. All VCE images were reviewed by at least two expert gastroenterologists and any questionable findings were discussed.

An abnormal VCE result was defined as any detected abnormality that could be related to the patient's presenting problem. The presence of blood alone was also considered a positive finding, as blood usually helps to localize the lesion and supports the use of invasive procedures such as balloon-assisted enteroscopy (BAE) or surgery. Diagnostic yield was defined as the percentage of cases with abnormal VCE results. A poor-quality study was arbitrarily defined if less than 50% of mucosa could be observed. A normal study indicated that no abnormal findings could be detected in a good-quality study. Complete study was defined as the capsule passing through the ileocecal valve or into the colon on imaging, whereas incomplete study meant that the capsule had expired in the stomach or could not pass through the ileocecal valve during its working time and that further radiology was required to confirm its excretion.^[2] Capsule retention was defined as nonpassage of the capsule into the cecum within 2 weeks of capsule ingestion.^[9] The data were analyzed using SPSS version 20.0 (IBM, Armonk, NY, USA).

RESULTS

A total of 103 procedures were conducted on 96 patients during the study period. The participants comprised 60 men (62.5%) and 36 women (37.5%). The mean age for men was 58.8 years (range, 25–97 years) and for women was 52.8 years (range, 18–78 years). Overall, two patients had pacemakers and one was a pregnant woman in her second trimester.

The most common indication for VCE was OGIB ($n = 91$, 88.35%; overt, $n = 46$, 50.5%; occult, $n = 45$, 49.5%) [Table 2]. Other indications were suspected Crohn's disease ($n = 4$, 3.88%), suspected complicated celiac disease ($n = 4$, 3.88%), and unexplained chronic abdominal pain ($n = 4$, 3.88%). The VCE results were categorized as incomplete ($n = 2$, 1.94%), poor quality ($n = 7$, 6.80%), normal ($n = 39$, 37.86%), and abnormal ($n = 55$, 53.4%). The two incomplete studies were due to gastroparesis.

The overall completion rate for the 103 VCE procedures was 98.0% ($n = 101$) and the overall diagnostic yield was 53.4% ($n = 55$).

The abnormal VCE findings are summarized in Table 3. SB abnormalities were found among 43 patients (78.2%) and non-SB abnormalities were found in the proximal or distal gut among 12 patients (21.8%). The most frequent SB abnormalities were angiodysplasia ($n = 22$, 40.0%) and tumors ($n = 7$, 12.7%). The overall diagnostic yield of VCE in OGIB was 56%; however, the diagnostic yield was significantly higher for overt OGIB (73.9%) than for occult OGIB (37.8%) ($P = 0.00052$) [Table 4].

During the study period, seven patients (12.7%) were diagnosed with SB tumors: two (1.94%) with adenocarcinoma,

Table 1. Post procedure patient instructions

During the day long procedure, you may return home, work and do regular activities.
 You can drink water 2 hours after capsule ingestion
 You can take very light meal and your usual medications 4 hours after capsule ingestion but you must avoid red - colored fluids and food.
 You should exercise care with the sensor array when changing clothes or in the bathroom. It is advised to avoid strenuous exercise or other activities which may dislodge the leads.
 You should avoid other patients undergoing capsule endoscopy as this may result in interference with your study.
 After 12 hours of capsule ingestion, the procedure is considered to be finished and you can eat and drink normally.
 You will need to come back to endoscopy unit next day to remove the sensors and the data recorder.
 You should avoid MRI scanners until capsule passage is confirmed.

Table 2. Indications for Video Capsule endoscopy (VCE)

Indications	(Number = n, %)
Overt GI bleeding	(n=46, 47.38%)
Occult GI bleeding	(n=45, 46.35%)
Suspected Crohn's disease	(n=4, 4.12%)
Suspected complicated Celiac disease	(n=4, 4.12%)
Unexplained chronic abdominal pain	(n=4, 4.12%)
Total	(n=103, 100%)

Table 3. Video Capsule endoscopy (VCE) abnormal findings

Small bowel abnormalities N=43 (78.2 %)		Non-small bowel abnormalities N=12 (21.8 %)	
Angiodysplasia	22(40%)	Gastric Antral Vascular Ectasia (GAVE)	4 (7.3%)
Tumor	7(12.7%)	Portal Gastropathy	2 (3.6%)
Ulcerative ileojejunitis in Celiac	3 (5.5%)	Blood in the colon	6 (10.9%)
Crohn's disease	2 (3.6%)		
NSAIDs - enteropathy	1 (1.8%)		
Small bowel varix	1 (1.8%)		
Inflammatory polyp	1 (1.8%)		
Dieulafoy's lesion	1 (1.8%)		
Nonspecific ulcerations	4 (7.3%)		
Blood in the Terminal ileum	1 (1.8%)		

Table 4. Video Capsule Endoscopy (VCE) results in obscure gastrointestinal bleeding (OGIB)

	OVERT	OCCULT	Total OGIB
Incomplete study	1	1	2
Poor quality study	3	3	6
Normal study	8	24	32
Abnormal study	34	17	51
Total	46	45	91 Procedures
Yield	73.9%	37.8%	56%

two (1.94%) with GI stromal tumors (GIST), one (0.97%) with multiple neuroendocrine tumors (NET), one (0.97%) with Burkett's lymphoma, and one (0.97%) with SB metastasis from colonic adenocarcinoma, where the patient had previously undergone colonic tumor resection. One of the four patients with suspected Crohn's disease had SB ulcerations; repeated ileocolonoscopy and biopsy confirmed the diagnosis of Crohn's disease. Three of the four patients with suspected complicated celiac disease had ulcerative ileojejunitis. By contrast, none of the four patients with unexplained chronic abdominal pain had abnormal VCE findings.

The capsule was retained in three patients (2.9%), where there was one case each of SB adenocarcinoma, SB diverticulum, and multiple SB strictures related to the use of non-steroidal anti-inflammatory drugs (NSAIDs). However, none of these patients developed SB obstruction or perforation. Capsule retention was symptomatic in one patient who presented with severe abdominal pain without signs of bowel obstruction or perforation 7 h after capsule ingestion. This patient required emergency laparoscopy to push the capsule out of a distal SB diverticulum to the cecum. Double-balloon enteroscopy (DBE) was used to retrieve the retained capsule from the patient with SB adenocarcinoma; however, this approach was unsuccessful in the patient with multiple NSAIDs-related SB strictures, who required surgery for capsule retrieval.

DISCUSSION

In this study of VCE in Saudi patients, both the overall diagnostic yield (53.4%) and the diagnostic yield for OGIB (56.0%) were within the ranges reported worldwide.^[2] The diagnostic yield was significantly ($P = 0.00052$) higher for overt OGIB (73.9%) compared to occult OGIB (37.8%). These data are comparable with that of previous studies.^[11-13]

Although we included only four patients with unexplained abdominal pain, the diagnostic yield of VCE was zero for this indication. This suggests that VCE is less helpful for unexplained abdominal pain than for other indications. In fact, a systematic review of 21 studies that evaluated the diagnostic yield of VCE among patients with chronic

unexplained abdominal pain found a pooled diagnostic yield of only 20.9%.^[14]

The completion rate in this study was high (98.0%) even though the study protocol did not include the administration of prokinetic medications to enhance procedure completion. This reduces the importance of such intervention. However, it has been previously shown that prokinetic medications increase the completion rate without improving the diagnostic yield.^[15,16]

Approximately 22% of the abnormalities detected by VCE in the present study were in the stomach or colon. This suggests that lesions were missed by the initial upper and lower endoscopies. All the missed lesions were vascular in nature. In fact, missing nonbleeding vascular lesions during upper and lower endoscopies is not uncommon; air insufflation and the required sedation are potential reasons for missing such lesions.^[17,18] One valuable aspect of VCE is its physiological nature, as it does not require air insufflation or sedation, which increases the sensitivity for detecting vascular lesions.

In the present study, three patients experienced capsule retention despite two of them having had normal abdominal CT results before undergoing VCE. Several studies have suggested that SB barium study and regular abdominal CT are inaccurate tools for ensuring SB patency, whereas CT/MR enterography and the agile patency capsule (Given Imaging, Yokneam, Israel) are considered the best options for this purpose.^[19-21]

This study has several limitations. Although we confirmed the positive VCE findings by DBE and/or surgery, not all of the negative VCE results were verified by the gold standard. Thus, we could not calculate the accuracy, sensitivity, specificity, negative predictive value (NPV), and positive predictive value (PPV) of VCE. Instead, we used crude measures, such as positive findings and diagnostic yield. In addition, the number of patients in the study was small for non-OGIB indications. Consequently, no firm conclusions could be drawn for these indications.

The strengths of this study include the prospective design and it being the first study on this topic to be conducted in our population. We anticipate that our results will encourage other national centers to share their data and help develop national guidelines on the use of VCE.

CONCLUSION

The diagnostic yield of VCE for Saudi patients with OGIB is comparable to that reported internationally; however,

data for other VCE indications, including IBD, are still lacking.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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