

## Original Research Article

# Utility of video capsule endoscopy in clinical practice, experience at King Faisal Specialist Hospital and Research Center, Riyadh

Feras A. Aljemeeli<sup>1\*</sup>, Ahmed A. Alzead<sup>2</sup>, Saad Al Shareef<sup>3</sup>, Aymen Almuhaidd<sup>2</sup>, Mohammed Q. Khan<sup>2</sup>, Abdullah AlQaraawi<sup>2</sup>, Hamad I. Al-Ashgar<sup>2</sup>, Khalid Al-Kahtani<sup>2</sup>, Mohammed Al Quaiz<sup>2</sup>, Fahad Alsohaibani<sup>2</sup>, Abdulrahman Alfadda<sup>2</sup>, Adnan Almahrouq<sup>2</sup>, Ayman A. Alharbi<sup>4</sup>, Ahmad A. Alkhdairi<sup>1</sup>

<sup>1</sup>Department of Medicine, Unayzah College of Medicine and Medical Sciences, Qassim University, Kingdom of Saudi Arabia

<sup>2</sup>Department of Medicine, Section of Gastroenterology, <sup>3</sup>Department of Medicine, Section of Allergy and Immunology, King Faisal Specialist Hospital and Research Center, Riyadh, Kingdom of Saudi Arabia

<sup>4</sup>Department of Medicine, College of Medicine, Qassim University, Buraydah, Kingdom of Saudi Arabia

**Received:** 16 February 2022

**Revised:** 28 February 2022

**Accepted:** 01 March 2022

### \*Correspondence:

Dr. Feras A Aljemeeli,

E-mail: [feras.aljemeeli@ucm.edu.sa](mailto:feras.aljemeeli@ucm.edu.sa)

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## ABSTRACT

**Background:** Video capsule endoscopy (VCE) is a valuable diagnostic tool for the evaluation of the small intestine. Evidence shows that it is effective in the diagnosis of occult bleeding and superficial lesions that are not radiographically observed. We evaluated the efficacy and safety of the capsule endoscopy in the diagnosis and management of the common gastrointestinal disorders.

**Methods:** A retrospective chart review of a total of 326 candidates who have met the inclusion criteria and who underwent VCE from the period from January 2006 till December 2018.

**Results:** The main indication for Video Capsule Endoscopy was small bowel overt gastrointestinal bleeding with 106 cases (32.6%) followed by iron deficiency anemia with 104 cases (32%). Capsule retention rate was observed in 11 cases (3.4%) 4 of which were crohn's disease patients (22.2%). Overall diagnostic yield was 36%, 64% for overt gastrointestinal bleeding and 41% for occult gastrointestinal bleeding. The most common reported positive finding was Angiodysplasia in 19.9% of cases, followed by ulcers in 13.8% of cases, followed by polyps in 8.3% of cases and erosions in 8% of cases.

**Conclusions:** Video capsule endoscopy proved to be an essential diagnostic tool in gastrointestinal bleeding. Advantages of VCE include; less labor, higher resolution examination of mucosa, relative safety, and noninvasiveness. On the other hand, it does not offer intervention capabilities when compared with enteroscopy and its interpretation was sometimes difficult and time consuming. Risk of capsule retention remains significant especially in patients suffering from crohn's disease.

**Keywords:** Video capsule endoscopy, Occult gastrointestinal bleeding, Obscure gastrointestinal bleeding, Small bowel bleeding, Angiodysplasia, Angioectasia, Small intestinal neoplasm

## INTRODUCTION

Video capsule endoscopy (VCE) is a valuable diagnostic tool especially for evaluating the small intestine. Evidence

shows that it is effective in the diagnosis gastrointestinal (GI) mucosal lesions that could be challenging to diagnose by imaging. VCE offers a noninvasive diagnostic option alternative to imaging for the evaluation of small intestine

which used to be out of reach by endoscopists until recent years. Evidence shows that it is effective in the diagnosis of occult bleeding and superficial lesions that are not radiographically observed.<sup>1,2</sup> Furthermore, passive movement of the capsule through gastrointestinal tract offers functional assessment capabilities.<sup>3</sup>

Proximal and distal GI tract mucosa was accessed by endoscopists during early endoscopic evolution.<sup>1</sup> Introduction of enteroscopy offered the ability to evaluate the proximal small intestine and more recently almost all the intestine.<sup>2</sup> Recent literature proposed that VCE is more accurate than radiographic studies in the diagnosis of mucosal pathologies such as angiodysplasia.<sup>3</sup> Furthermore, VCE have shown to be effective in the diagnoses of a broad list of indications.<sup>4</sup>

VCE have been used initially in the diagnosis of obscure GI bleeding, more recent evidence has shown that its useful in the evaluation of inflammatory bowel disease, celiac disease and small bowel neoplasia as well.<sup>5</sup> Obscure GI bleeding is defined as gastrointestinal bleeding after nonrevealing upper and lower endoscopies. Etiology of Obscure GI bleeding is likely related to pathology in small intestine, an area traditionally believed to be difficult to evaluate adequately.<sup>6</sup> Prior to the introduction of VCE the standard procedure included endoscopic evaluation with upper and lower endoscopy with push enteroscopy, enteroclysis, tagged red blood cell scan, angiography, and small bowel follow through studies.

VCE offers the ability to examine the entire mucosa of the small bowel by noninvasive means through high resolution images which makes it more effective for the evaluation of superficial lesions than imaging. It has been shown that VCE is safe and effective with relatively high diagnostic yield especially if the study is performed within one month of bleeding.<sup>7,8</sup>

Differentiating between crohn's disease and ulcerative colitis can be made by the exclusion of proximal GI involvement thus potentially improving treatment decisions.<sup>9</sup>

In most patients suffering from crohn's disease the small intestine is affected.<sup>10</sup> VCE enables clinicians to adequately assess small intestine without procedure or sedation related risks that accompany endoscopy or radiation risks that accompany computed tomography.<sup>2,4</sup> Furthermore, it has the ability to define the extent of the disease activity as well.<sup>11,14</sup>

Small intestine neoplasia occurs in the majority of patients with familial adenomatous polyposis (FAP) and Peutz-Jeghers syndrome (PJS).<sup>12</sup> In patients with FAP, no consensus have been made for the management of jejunal and ileal polyps likely related to the low incidence of adenocarcinoma in such locations, while in cases of PJS, management is more clearly defined as the risk is more evident and thus preemptive evaluation may deter

emergency surgery or cancer. VCE have shown to be more effective than barium study for the evaluation of small intestine polyps in patients known to have hereditary polyposis syndromes.<sup>13</sup> It can also localize large polyps thus making polypectomy by means of endoscopy more feasible.<sup>14</sup>

Small intestine neoplasia has been traditionally known to be challenging to diagnose, more recent evidence has shown VCE to be helpful in the diagnosis of such lesions. In a retrospective chart review of 562 patients undergoing VCE for different indications, 8.9% were diagnosed with small-bowel tumor from which 48% were malignant.<sup>15</sup> The option of noninvasive diagnostic test with high diagnostic yield will help in the early diagnosis of small bowel neoplasia and thus may affect clinical outcomes.

## METHODS

This is a retrospective chart review, which was designed to evaluate the efficacy and safety of the capsule endoscopy in the diagnosis and management of the common gastrointestinal disorders. The database was formed after gathering the appropriate information from eligible patients, in whom Video Capsule Endoscopy (VCE) was performed at King Faisal Specialist Hospital and Research Center. This proposed study was conducted at King Faisal Specialist Hospital and Research Center (KFSH & RC) for a proposed period from November 2014 to December 2018. Capsule endoscopy videos were analyzed by the investigators including revisions of opinions from the treating physicians. Aljemeeli, Feras Abdulrahman, Ahmed A. Alzead were responsible for study planning, contributing in data collection, and providing communication and the logistical support needed for the study as well as data analysis at the end of the study. Adnan Almahrouq is the endoscopy unit coordinator at KFSH and RC, who formulated our study database and assisted in the data collection process. Al Shareef, Almuhaideb, Khan, AlQaraawi, Al-Ashgar, Al-Kahtani, Al Quaiz, Alsohaibani, Alfadda, Alharbi, and Alkhdairi assisted in interpretation of VCE studies and contributed in the data collection process and data entry to electronic data collection sheet. Data analysis is performed using Statistical package for social sciences (SPSS) 26™.

Approval for the study was granted from Research Ethical Committee in KFSH&RC. All patients who underwent Video Capsule Endoscopy in KFSH&RC were included in our study. Exclusion criteria were as follows; Patients aged below 14 years, poor bowel preparation during procedure, technical defects in VCE recording, lack of distal small bowel recordings due to long gastric transient time, prolonged small bowel transient time causing lack of distal small intestine recordings. Endoscopy indications were divided into eight main categories as following; overt gastrointestinal (GI) bleeding, obscure gastrointestinal (GI) bleeding, occult GI bleeding, undiagnosed chronic abdominal pain, iron deficiency anemia of unknown etiology, weight loss, diarrhea of unknown origin, and

abdominal mass detected in CT abdomen. The demographic characteristics (i.e., age, sex, height, weight, body mass index etc.), presentation, comorbidities, medication history, complications, capsule endoscopy findings and interventions following the diagnosis by the CE were evaluated. The VCE findings were classified into erosions, angiodysplasia, polyps, bleeding or non-bleeding ulcers, gastritis and/or duodenitis, scalloping of the mucosa, aphthous ulcers, adenocarcinoma, carcinoid tumor, gastrointestinal stromal tumor, lymphomas, lymphangioma, lymphangiectasia, hemangioma, hamartoma, tubular adenomas. Following interventions include discontinuation of medications, surgery, further diagnostic studies, increasing dose or adding medications. We are presenting summary statistics for continuous data as mean  $\pm$  SD (standard deviation) and for categorical data as percentages. We constructed 95 % confidence interval to summarize the uncertainties. In case we needed sub-graph analyses arises, a T-test, chi-square test.

In all analyses we shall set the type I error rate at 5%, with an adjustment for multiplicity if needed. Subjects involved in our proposed study already did Video Capsule Endoscopy as part of their routine evaluation and were not contacted for follow up data related to the study. Data was collected from the study subject's files, electronic charts as well as endoscopy software. Study subjects were identified serial numbers in this proposed study. All data already existed in medical records as a result of routine clinical practice and the included subjects were not contacted for any further investigation or follow up data related to this study.

## RESULTS

A total of 326 candidates met the inclusion criteria and entered the study. These included 178 males and 139 females: mean age 54 (range 13-90 years).

**Table 1: Demographic characteristics.**

Variable	Category	N	Percentage	Mean
Age	Less than 40 years	89	27.3	54 years
	40-less than 60 years	80	24.5	
	60-less than 70 years	74	22.7	
	70 years or above	81	24.8	
	Total	324	99.4	
Height (cm)	Less than 150 cm	29	8.9	162.45 cm
	150-less than 160 cm	91	27.9	
	160- less than 170 cm	102	31.3	
	170 cm or above	87	26.7	
	Total	309	94.8	
Weight (kg)	Less than 60 kg	76	23.3	70.7 kg
	60-less than 70 kg	79	24.2	
	70-less than 85 kg	80	24.5	
	85 kg or above	75	23.0	
	Total	310	95.1	
Gender	Male	178	54.6	
	Female	139	42.6	
	Total	317	97.2	

**Table 2: Indications.**

History	Category	N	Observed Prop. (%)
Mass in computed tomography for abdomen	No	318	97.8
	Yes	7	2.2
Occult gastrointestinal bleeding	No	213	65.3
	Yes	113	34.6
Weight loss	No	304	93.8
	Yes	20	6.2
Obscure gastrointestinal bleeding	No	219	67.4
	Yes	106	32.6
Abdominal pain of uncertain origin	No	270	83.1
	Yes	55	16.9
Diarrhea of Unknown origin	No	301	92.6
	Yes	24	7.4

The main indication for VCE was occult gastrointestinal bleeding with 113 cases (34.6% of total cases). Video capsule endoscopy was performed for small bowel gastrointestinal bleeding with 106 cases (32.6% of total cases).

**Table 3: Bowel preparation**

Bowel preparation	N	Percentage
<b>Good</b>	180	57.3
<b>Fair</b>	79	25.2
<b>Satisfactory</b>	35	11.1
<b>Poor</b>	20	6.4
<b>Total</b>	314	100.0

**Table 4: Complications.**

Complications	Category	N	Observed Prop. (%)
<b>Tech Difficult</b>	No	293	90.7
	Yes	30	9.3
<b>Capsule retention</b>	No	311	96.6
	Yes	11	3.4

55 candidates underwent video capsule endoscopy for further evaluation of undiagnosed abdominal pain (15.9% of total cases). 24 candidates underwent video capsule

endoscopy because of diarrhea of unknown origin (7.4 % of total cases), and another 20 candidates have taken the study because of unexplained weight loss (6.2% of total cases). 7 candidates underwent Video Capsule Endoscopy for further evaluation of an abdominal mass detected on computed tomography (2.2% of total cases). (Table 1, 2 and Figure 1)

Bowel preparation was good in 180 cases (57.3%), fair in 79 cases (25.2%), satisfactory in 35 cases (11.1%) and poor in 20 cases (6.4%). The study was deemed as technically difficult in 30 cases (9.3%). Overall diagnostic yield was 36%, diagnostic yield was 64% and 41% for overt and occult gastrointestinal bleeding respectively. Capsule retention rate was observed in 11 cases (3.4%). Capsule retention was observed in 4 out of 18 (22.2%) patients diagnosed with crohn’s disease. (Table 3, 4)

The most common reported finding was angiodysplasia in 65 cases (19.9%), followed by ulcers in 45 cases (13.8%), followed by polyps in 27 cases (8.3%), followed by erosions in 26 cases (8%), followed by unidentified bleeding site in 22 cases (6.7%), followed by unspecified erythema in 16 cases (4.9%), followed by gastritis and/or duodenitis in 12 cases (3.7%), followed by diverticulae in 8 cases (2.5%), followed by aphthous ulcers in 10 cases (3.1 %), followed by scalloping of the mucosa in 4 cases (1.2%).

**Table 5: Findings.**

Findings	Category	N	Observed Prop. (%)	Exact Sig. (2-tailed)
<b>No abnormality</b>	No	208	63.8	<0.05
	Yes	118	36.2	
<b>Erosions</b>	No	300	92.0	<0.05
	Yes	26	8.0	
<b>Angiodyspalsia</b>	No	261	80.1	<0.05
	Yes	65	19.9	
<b>Polyps</b>	No	299	91.7	<0.05
	Yes	27	8.3	
<b>Non-Bleeding Ulcer</b>	No	292	89.6	<0.05
	Yes	34	10.4	
<b>Bleeding Ulcer</b>	No	315	96.6	<0.05
	Yes	11	3.4	
<b>Gastritis/ duodenitias</b>	No	314	96.3	<0.05
	Yes	12	3.7	
<b>Scalloping of the mucosa</b>	No	322	98.8	<0.05
	Yes	4	1.2	
<b>Apthus Ulcers</b>	No	316	96.9	<0.05
	Yes	10	3.1	
<b>Adeno Ca</b>	No	326	100.0	<0.05
	Yes	0	0.0	
<b>Carcinoid</b>	No	324	99.4	<0.05
	Yes	2	0.6	
<b>GI stomal tumors</b>	No	323	99.1	<0.05
	Yes	3	0.9	
<b>Lymphoma</b>	No	326	100.0	<0.05
	Yes	0	0.0	

Continued.

Findings	Category	N	Observed Prop. (%)	Exact Sig. (2-tailed)
Lymphangioma	No	326	100.0	<0.05
	Yes	0	0.0	
Lymphangiactasia	No	322	98.8	<0.05
	Yes	4	1.2	
Hemangioma	No	325	99.7	<0.05
	Yes	1	0.3	
lymphoid nodules	No	326	100.0	<0.05
	Yes	0	0.0	
Short Transit Time	No	324	99.4	<0.05
	Yes	2	0.6	
Hemartomas	No	326	100.0	<0.05
	Yes	0	0.0	
Diverticula	No	318	97.5	<0.05
	Yes	8	2.5	
Unidentified Bleeding site	No	304	93.3	<0.05
	Yes	22	6.7	
Unspecified Erythema	No	309	95.1	<0.05
	Yes	16	4.9	

Table 6: Diagnostic yield for the indications of occult GI bleeding and overt GI bleeding.

Finding	Below 30 years old		30-50 years old		Above 50 years old	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
No abnormality	21	42.0	27	33.8	70	35.7
Erosions	7	14.0	8	10.0	11	5.6
Angiodyspalsia	0	0.0	8	10.0	57	29.1
Polyps	3	6.0	5	6.3	19	9.7
Non-bleeding ulcer	3	6.0	15	18.8	16	8.2
Bleeding ulcer	3	6.0	1	1.3	7	3.6
Gastritis/ duodenitias	4	8.0	2	2.5	6	3.1
Scalloping of the mucosa	1	2.0	1	1.3	2	1.0
Apthus Ulcers	3	6.0	5	6.3	2	1.0
Adeno Ca	0	0.0	0	0.0	0	0.0
Carcinoid	0	0.0	0	0.0	2	1.0
GI stomal tumors	0	0.0	1	1.3	2	1.0
Lymphoma	0	0.0	0	0.0	0	0.0
Lymphangioma	0	0.0	0	0.0	0	0.0
Lymphangiactasia	1	2.0	1	1.3	2	1.0
Hemangioma	0	0.0	1	1.3	0	0.0
Lymphoid nodules	0	0.0	0	0.0	0	0.0
Shrt transit time	1	2.0	0	0.0	1	0.5
Hemartomas	0	0.0	0	0.0	0	0.0
Tubular adenoma	1	2.0	0	0.0	0	0.0
Diverticulae	1	2.0	0	0.0	0	0.0
Unidentified Bleeding site	2	4.0	5	6.3	15	7.7
Unspecified erythema	2	4.0	4	5.0	10	5.1

Similar incidence was documented with lymphangiectasia in 4 cases (1.2%). Short transient time of capsule passage was documented in 2 cases (0.6%). Carcinoid tumor was documented in 2 cases (0.8%). Only a single case (0.3%) was documented for hemangioma (Table 5, Figure 2).

In patients referred with gastrointestinal bleeding, the most common finding was angiodysplasia in 33 cases (22%),

followed by ulcers with 22 cases (14%), followed by unidentified bleeding site with 17 cases (11%), followed by polyps with 13 cases (9%), and erosions with 13 cases (9%), followed by gastritis and/or duodenitis with 6 cases (4%), followed by unspecified erythema with 5 cases (3%), and Diverticulae 3 cases (2%). When subcategorized for patients younger than 30 years-old, the most common finding was erosions 14% followed by ulcers 12%

followed by gastritis and or duodenitis in 8%. Ulcers was the most common finding in patients aged between 30-50 years-old 20.1%, followed by erosions and angiodysplasia with both having 10% frequency. The most common

finding in patients aged more than 50 years was angiodysplasia in 29.1, followed by ulcers in 11.8%, followed by polyps in 9.7% (Table 6).

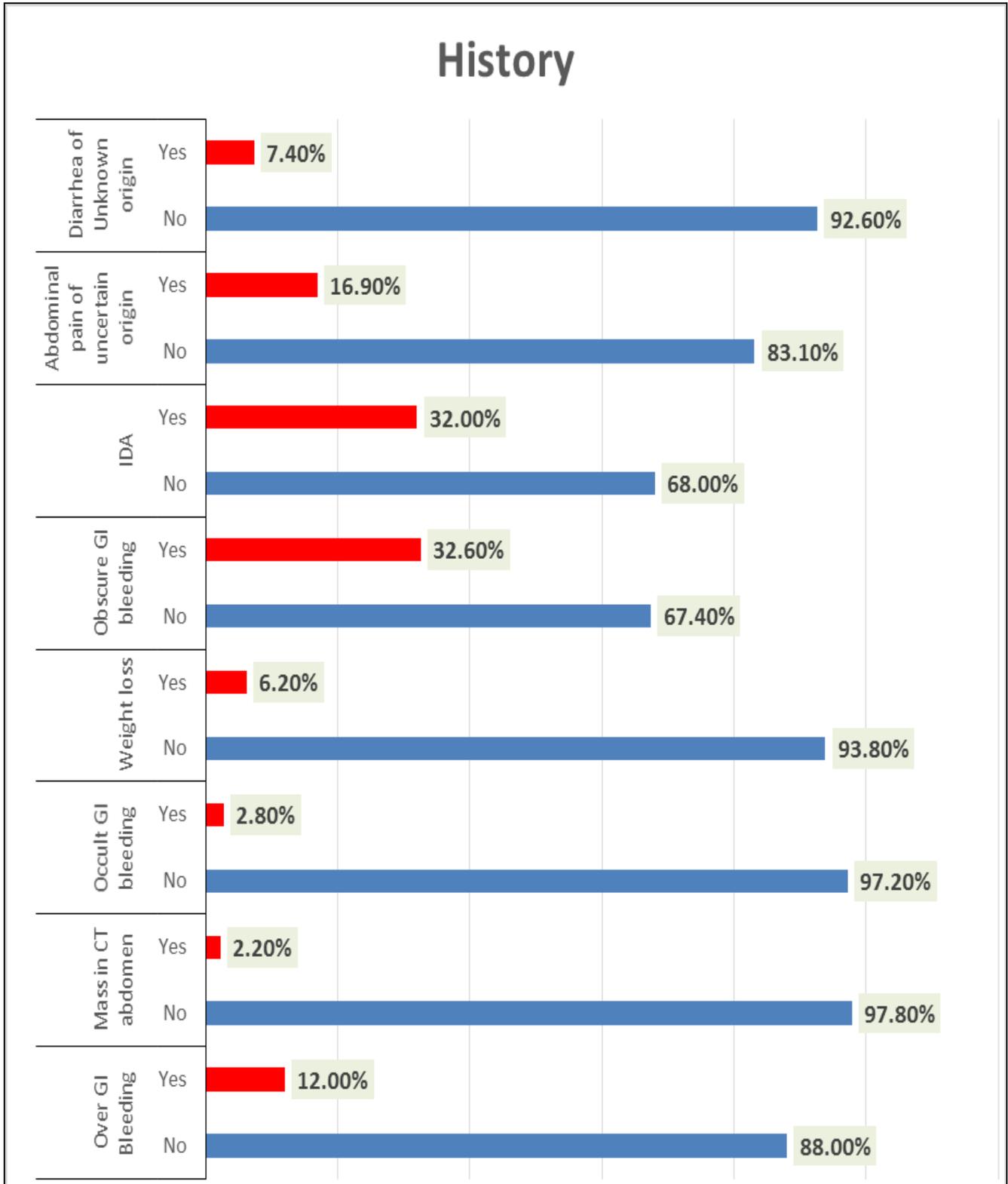


Figure 1: Indications for video capsule endoscopy.

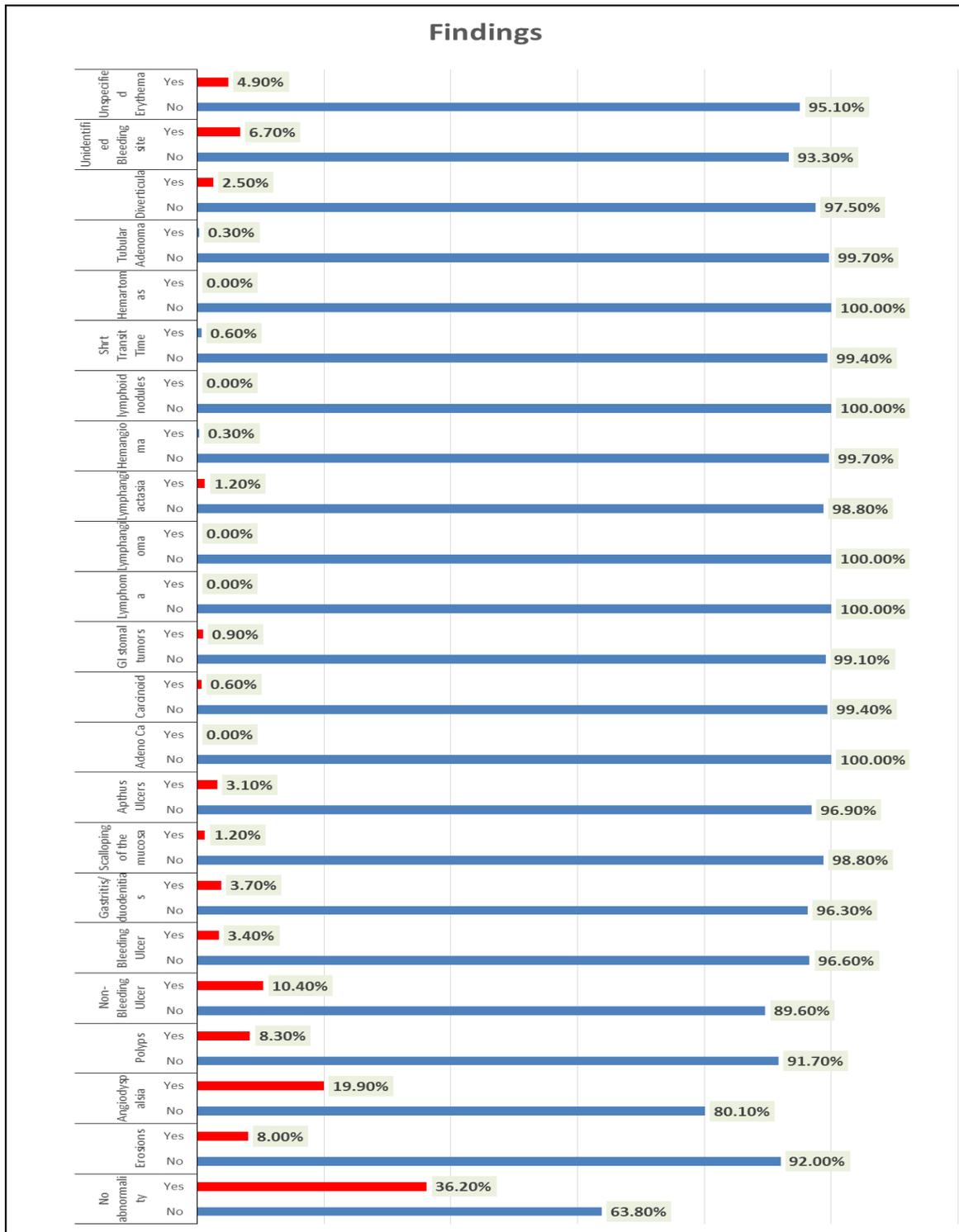


Figure 2: Findings observed in video capsule endoscopy.

**DISCUSSION**

VCE proved to be an essential diagnostic tool especially in the evaluation of GI bleeding. It offers less labor, higher resolution, safety, and noninvasiveness. On the other hand, it did not offer intervention capabilities as in double balloon enteroscopy and sometimes its interpretation was difficult and time consuming. A meta-analysis comparing

the two modalities has shown that the diagnostic yields were similar.<sup>5,16</sup> Moreover, it has been estimated that for every seventeen VCE, there is one double balloon enteroscopy referral.<sup>17</sup>

Diagnostic yield in cases referred with gastrointestinal bleeding was 53% including occult gastrointestinal bleeding and 56% excluding occult gastrointestinal

bleeding. Lepileur et al performed a similar retrospective chart review on 911 patients with negative upper and lower endoscopy from 2004 to 2010 and found that the diagnostic yield of VCE was 56%. Systemic review by Liao et al found that success rate of VCE was 60% with angiodysplasia being the most common finding. Findings indicate that VCE is effective in the diagnosis of GI bleeding.

Bowel preparation was good in 180 cases (57.3%), fair in 79 cases (25.2%), satisfactory in 35 cases (11.1%) and poor in 20 cases (6.4%). The study was deemed as technically difficult in 30 cases (9.3%). Two recent meta-analyses showed an improved diagnostic yield after a purgative preparation.<sup>18,19</sup> However, more recent meta-analysis found that the use of bowel preparation improves mucosal visualization but it did not affect the diagnostic yield or completion of the study.<sup>21</sup>

Often VCE was reported to be negative in our study. Our study was limited by its design to assess the negative predictive value of VCE. Based on previous literature, normal results on capsule endoscopy were reassuring. Based on two studies, 95.5% of patients with negative study results have no pathology on follow-up evaluation.<sup>20,21</sup> However, Curdia did a study on 68 patients and found rebleeding was documented in 16 (23.5%) patients.<sup>22</sup>

The most common reported positive finding was Angiodysplasia in 65 cases (19.9%), followed by non-bleeding ulcers in 34 cases (10.4%), erosions in 26 cases (8%) and polyps in 27 cases (8.3%), followed by unidentified bleeding site in 22 cases (6.7%). These findings go with concordance with other similar studies.<sup>26</sup> Otherwise, there were no major differences noticed among referrals with different indications.

The study design was appropriate in evaluating indications, diagnostic yield and complications of VCE. Limitations of our study included potential selection bias as a result of the study being conducted in single referral center. Our study will likely assist in recommendations related the VCE in our region.

## CONCLUSION

Video capsule endoscopy proved to be an essential diagnostic tool in gastrointestinal bleeding. It gained a lot of popularity among gastroenterologist because of its less labor, higher resolution, relative safety, and noninvasiveness. On the other hand, it does not offer intervention capabilities when compared with enteroscopy and its interpretation was often difficult and time consuming. Risk of capsule retention remains significant especially in patients suffering from crohn's disease.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

1. Pennazio M. Small-bowel endoscopy. *Endoscopy.* 2004;36:32-41.
2. Barkin JS, Friedman S. Wireless capsule endoscopy requiring surgical intervention: The world's experience. *Am J Gastroenterol.* 2002;97:S298.
3. Li F, Gurudu SR, De Petris G, Sharma VK, Shiff AD, Heigh RI et al. Retention of the capsule endoscope: a single-center experience of 1000 capsule endoscopy procedures. *Gastrointest Endosc.* 2008;68(1):174-80.
4. Galter S. Usefulness of the capsule endoscopy in the study of inflammatory bowel disease: preliminary results (Abstract). *ICCE: The International Conference on Capsule Endoscopy.* 2006;17.
5. Rondonotti E, Herrerias J, Pennazio M, Caunedo A, Mascarenhas-Saraiva M, de Franchis R. Complications, limitations, and failure of capsule endoscopy: a review of 733 cases. *Gastrointest Endosc.* 2005;62:712-6.
6. Gralnek I, Barkun A, Bardou M. Management of acute bleeding from a peptic ulcer. *N Engl J Med.* 2008;359:928-37.
7. Loperfido S, Baldo V, Piovesana E, Bellina L, Rossi K, Groppo M et al. Changing trends in acute upper-GI bleeding: a population-based study. *Gastrointest Endosc.* 2009;70:212-24.
8. Katz LB. The role of surgery in occult gastrointestinal bleeding. *Semin Gastrointest Dis.* 1999;10:78-81.
9. Lai LH, Wong GL, Chow DK, Lau JY, Sung JJ, Leung WK. Long-term follow-up of patients with obscure gastrointestinal bleeding after negative capsule endoscopy. *Am J Gastroenterol.* 2006;101:1224-28.
10. Gonçalves CT, Dias de Castro F, Moreira MJ, Rosa B, Cotter J. Small bowel capsule endoscopy in obscure gastrointestinal bleeding: normalcy is not reassuring. *Eur J Gastroenterol Hepatol.* 2014;26:927-32.
11. Buchman AL, Miller FH, Wallin A, Chowdhry AA, Ahn C. Videocapsule endoscopy versus barium contrast studies for the diagnosis of Crohn's disease recurrence involving the small intestine. *Am J Gastroenterol.* 2004;99(11):2171-7.
12. Burke CA, Santisi J, Church J, Levinthal G. The utility of capsule endoscopy small bowel surveillance in patients with polyposis. *Am J Gastroenterol.* 2005;100(7):1498-502.
13. Hartmann D, Schmidt H, Bolz G. A prospective two-center study comparing wireless capsule endoscopy with intraoperative enteroscopy in patients with obscure GI bleeding. *Gastrointest Endosc.* 2005;61(7):826-32.
14. Mozer M. Capsule endoscopy findings in 20 consecutive patients with Peutz-Jeghers syndrome

- (Abstract). ICCE: The International Conference on Capsule Endoscopy, Europe. 2006;117.
15. Cobrin GM, Pittman RH, Lewis BS. Increased diagnostic yield of small bowel tumors with capsule endoscopy. *Cancer.* 1 2006;107(1):22-7.
  16. Liangpunsakul S, Chadalawada V, Rex DK, Maglinte D, Lappas J. Wireless capsule endoscopy detects small bowel ulcers in patients with normal results from state of the art enteroclysis. *Am J Gastroenterol.* 2003;98(6):1295-8.
  17. Marmo R, Rotondano G, Piscopo R, Bianco MA, Cipolletta L. Meta-analysis: capsule enteroscopy vs. conventional modalities in diagnosis of small bowel diseases. *Aliment Pharmacol Ther.* 2005;22(7):595-604.
  18. Viazis N, Papaxoinis K, Theodoropoulos I, Sgouros S, Vlachogiannakos J, Pipis P et al. Impact of capsule endoscopy in obscure small-bowel bleeding: defining strict diagnostic criteria for a favorable outcome. *Gastrointest Endosc.* 2005;62(5):717-22.
  19. Appleyard M, Walsh A. Capsule endoscopy for obscure GI bleeding: A report of 100 consecutive cases to investigate long term outcomes (Abstract). The 5th International Conference on Capsule Endoscopy Program and Abstracts. 2006;42.
  20. Delvaux M, Fassler I, Gay G. Clinical usefulness of the endoscopic video capsule as the initial intestinal investigation in patients with obscure digestive bleeding: validation of a diagnostic strategy based on the patient outcome after 12 months. *Endoscopy.* 2004;36(12):1067-73.
  21. Min YW, Kim JS, Jeon SW, Jeon YT, Im JP, Cheung DY, et al. Long-term outcome of capsule endoscopy in obscure gastrointestinal bleeding: a nationwide analysis. *Endoscopy.* 2003;19.
  22. Barkin JS, O'Loughlin C. Capsule endoscopy contraindications: complications and how to avoid their occurrence. *Gastrointest Endosc Clin N Am.* 2004;14(1):61-5.

**Cite this article as:** Aljemeeli FA, Alzead AA, Al Shareef S, Almuhaideb A, Khan MQ, AlQaraawi A et al. Utility of video capsule endoscopy in clinical practice, experience at King Faisal Specialist Hospital and Research Center, Riyadh. *Int J Adv Med* 2022;9:384-92.