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CAPSULE ENDOSCOPY

Small-bowel video capsule endoscopy: a 4-year experience

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Background: Video capsule endoscopy (VCE) is an established non-invasive investigation of the small bowel. However, data describing its use and findings in sub-Saharan Africa remain limited. We evaluated the indications, findings, safety and factors associated with abnormal VCE examinations at a tertiary academic centre in South Africa.
Methods: We conducted a retrospective review of consecutive patients who underwent VCE at Groote Schuur Hospital between June 2021 and June 2025. Demographic characteristics, clinical indications, previous investigations, VCE findings, examination completion, complications and documented subsequent investigations or interventions were recorded. The primary outcome was the presence of an abnormal VCE finding. Secondary outcomes included small-bowel pathology, examination completion, safety and factors associated with an abnormal examination.
Results: Seventy patients underwent VCE, with a mean age of 59.8 ± 15.3 years; 39 (55.7%) were female. Iron-deficiency anaemia was the most common indication (53/70; 75.7%), followed by overt gastrointestinal bleeding (14/70; 20.0%). An abnormal VCE finding was identified in 49 patients (70.0%), while small-bowel pathology was identified in 39/70 (55.7%). Angiodysplasia was the most common small-bowel abnormality (28/70; 40.0%), followed by masses or polyps (8/70; 11.4%) and ileitis (3/70; 4.3%). Gastritis was identified in 11 patients (15.7%) and colonic polyps or masses in 2 (2.9%). Seven of 28 patients with angiodysplasia subsequently underwent double balloon enteroscopy and argon plasma coagulation. Complete examination was achieved in all patients, with no capsule retention or procedure-related complications. No significant associations were identified between abnormal VCE findings and age, sex, iron-deficiency anaemia, overt gastrointestinal bleeding or weight loss.
Conclusion: VCE identified abnormalities in 70% of patients in this South African tertiary-care cohort, with small-bowel pathology present in 55.7%. The procedure was safe and achieved complete examinations in all patients. Angiodysplasia was the predominant finding, and VCE directed subsequent therapeutic enteroscopy in a subset of patients. These findings support the role of VCE in appropriately selected patients and provide further regional data from sub-Saharan Africa, while highlighting the need for prospective studies assessing subsequent management and patient-centred outcomes.
Keywords: endoscopy, gastrointestinal, diagnostic yield, South Africa

Introduction

Video capsule endoscopy (VCE) was first described in 2000 and entered clinical practice in the early 2000s, subsequently becoming an established non-invasive modality for evaluating small-bowel pathology.[1] In patients with suspected small-bowel bleeding, VCE has demonstrated good diagnostic performance compared with conventional cross-sectional imaging, including computed tomography enterography.[2]

Its principal application remains the evaluation of suspected small-bowel bleeding following negative upper and lower gastrointestinal endoscopy.[3,4] However, its applications extend beyond bleeding to the detection of inflammatory, vascular and neoplastic small-bowel lesions and other mucosal abnormalities that may be difficult to identify by conventional imaging.[3,4] In selected patients, these findings may provide a direction for further investigation, including targeted enteroscopy or biopsy, and may occasionally reveal an unsuspected or uncommon diagnosis.

VCE is generally considered safe, with a low complication rate. Capsule retention remains the most clinically significant adverse event, occurring in approximately 1% of examinations, particularly in patients with stricturing disease or tumours.[5,6] Other limitations include incomplete examinations, delayed gastric transit and, less commonly, difficulty with capsule ingestion.[7]

Although the indications, diagnostic yield and safety profile of VCE are well described internationally, with substantial experience reported across a range of clinical indications and patient populations, data from sub-Saharan Africa remain limited.[8,9] Recent published experience includes a single-centre study from Kenya and a South African study from our own institution, both highlighting the limited regional evidence base.[10,11] Local data are important for informing patient selection, optimising resource utilisation and guiding clinical practice. This study aimed to evaluate the clinical indications, VCE findings, safety and predictors of abnormal findings at a tertiary academic centre in South Africa, providing real-world data from a resource-limited setting.

Methods

Study design

We conducted a retrospective review of the medical records of consecutive patients who underwent small-bowel VCE at

the Gastrointestinal Clinic, Groote Schuur Hospital, between June 2021 and June 2025. Data collected included patient demographics, clinical indications, prior investigations, VCE findings, examination completion, complications and documented subsequent management following VCE.

Data were collected and entered by a single investigator through systematic review of the medical records and captured in a secure Research Electronic Data Capture (REDCap) database.

The primary aim was to describe the clinical indications and findings of small-bowel VCE in this tertiary-care cohort. Secondary aims were to describe examination completion and safety, document subsequent investigations and interventions following VCE where these were recorded and assess whether demographic or clinical variables were associated with an abnormal VCE finding.

Clinical indications and definitions

Indications for VCE were categorised as iron-deficiency anaemia (IDA), overt gastrointestinal bleeding, diarrhoea and weight loss. Patients with more than one documented indication were included in all relevant categories.

Overt gastrointestinal bleeding was defined as documented haematochezia, melena or haematemesis, including coffee-ground vomiting. IDA was defined according to the documented clinical diagnosis in the medical record. Although IDA may prompt investigation for gastrointestinal blood loss, it was not considered synonymous with occult gastrointestinal bleeding, as iron deficiency may have non-gastrointestinal causes.

Diarrhoea was recorded when symptoms persisted despite prior evaluation without an identified cause. Weight loss was defined as documented unintentional reduction in body weight recorded in the clinical record.

Prior investigations

Previous investigations were recorded, including upper gastrointestinal endoscopy, colonoscopy, cross-sectional imaging and angiography when performed before VCE. The extent of prior investigation was documented to describe the clinical context in which VCE was undertaken.

VCE procedure

VCE was performed using the PillCam™ SB3 system (Medtronic, USA), comprising an ingestible capsule, external sensors, a portable data recorder and dedicated analysis software. All patients underwent bowel preparation with three sachets of Pico-Prep approximately 8 hours before the procedure and fasted overnight. Capsule progression was monitored using the data recorder at 2, 4 and 6 hours after ingestion. At the 2-hour assessment if the capsule was retained in the stomach oral metoclopramide was administered to facilitate passage of the VCE into the small bowel. Patients were permitted to resume normal activity and oral intake four hours after capsule ingestion.

Recorded data were downloaded and analysed using PillCam™ RAPID version 8.0 software. Interpretation was carried out by the gastroenterology fellow under supervision by a consultant gastroenterologist experienced in interpreting VCE. VCE findings were categorised as angiodysplasia, mass or polyp, gastropathy, duodenitis, ileitis or ulceration. Additional abnormalities identified during examination were recorded where present.

Suboptimal mucosal visualisation was defined as inadequate visualisation documented by the interpreting clinician because of residual luminal contents or inadequate bowel preparation that limited assessment of the small-bowel mucosa.

A complete examination was defined as passage of the capsule to the caecum within the recording period. Capsule retention was defined as persistence of the capsule within the gastrointestinal tract beyond 72 hours, confirmed radiologically or requiring intervention for retrieval.

Outcome definitions

An abnormal VCE finding was defined as any abnormality identified during capsule examination, irrespective of whether the finding explained the presenting indication or resulted in a change in management. The overall abnormal-finding rate was defined as the proportion of patients with any abnormal finding identified on VCE.

Small-bowel pathology was defined as a pathological abnormality identified within the small bowel, including angiodysplasia, masses or polyps, and ileitis. Findings outside the small bowel, including gastropathy and colonic lesions, were recorded separately and were not automatically considered explanations for the presenting indication.

Documented subsequent clinical impact was defined as a subsequent investigation, therapeutic intervention or other management change attributable to a VCE finding. Because subsequent management was not systematically recorded for the entire cohort, this was analysed descriptively rather than as a formal measure of clinical outcome.

Evidence of active bleeding or stigmata of recent haemorrhage was recorded as a bleeding-related VCE finding.

Subsequent investigation and management

Where documented in the medical record, subsequent investigations and interventions following VCE were recorded. These included DBE, endoscopic biopsy, histological assessment and therapeutic intervention.

Double balloon enteroscopy (DBE) was used as the standard term throughout the manuscript for subsequent enteroscopic procedures.

Statistical analysis

Data were analysed using the Statistical Package for the Social Sciences (SPSS), version 25. Descriptive statistics were used to summarise baseline characteristics, clinical indications, VCE findings, examination completion, complications and documented subsequent management.

Associations between clinical variables and the presence of an abnormal VCE finding were assessed using t-test for continuous variables and the chi-square test or Fisher's exact test for categorical variables, as appropriate. A two-sided p-value < 0.05 was considered statistically significant.

Results

A total of 70 patients underwent small-bowel video capsule endoscopy (VCE) at the Gastrointestinal Clinic, Groote Schuur Hospital, between June 2021 and June 2025. The mean age was 59.8 ± 15.3 years (range 16–86), and 39 patients (55.7%) were female. Iron-deficiency anaemia (IDA) was the most common indication for VCE, occurring

in 53 patients (75.7%), followed by overt gastrointestinal bleeding in 14 (20.0%). Diarrhoea was recorded in 3 patients (4.3%) and weight loss in 3 (4.3%).

All patients had undergone previous upper gastrointestinal endoscopy and 68 (97.1%) had undergone colonoscopy before VCE. Cross-sectional imaging with CT or MRI had been performed in 26 patients (37.1%), while 5 (7.1%) had undergone angiography for acute gastrointestinal bleeding before VCE.

An abnormal VCE finding was identified in 49 of 70 patients (70.0%). Small-bowel pathology was identified in 39 patients (55.7%). Angiodysplasia was the most common small-bowel abnormality, identified in 28 patients (40.0% of the total cohort), followed by masses or polyps in 8 (11.4%) and ileitis in 3 (4.3%). Non-small-bowel findings included gastropathy in 11 patients (15.7%) and colonic polyps or masses in 2 (2.9%) (Table I). Three patients had concomitant angiodysplasia and gastropathy; consequently, individual findings were not mutually exclusive.

Among the 21 patients with no abnormal VCE finding, IDA was the predominant indication (n = 16), followed by overt gastrointestinal bleeding (n = 2) and diarrhoea (n = 3). Suboptimal mucosal visualisation due to inadequate bowel preparation was documented in five cases and may have contributed to the absence of an abnormal finding.

All patients completed bowel preparation, and a complete small-bowel examination was achieved in all cases, with the capsule reaching the caecum within the recording period. Prokinetic agents were used in 2 patients (2.9%). No capsule retention or procedure-related complications were observed.

Where documented, subsequent investigations included DBE, endoscopic biopsy and histological assessment. Histological evaluation of 4 lesions identified on VCE confirmed a single patient with each of the subsequent pathologies: adenocarcinoma, gastrointestinal stromal tumour, benign capillary haemangioma and duodenal tubular adenomas. Among the 28 patients with angiodysplasia, 7 subsequently underwent DBE and argon plasma coagulation. These documented interventions represent subsequent management in a subset of patients; clinical outcomes were not systematically recorded for the entire cohort.

Associations between clinical variables and the presence of an abnormal VCE finding are shown in Table II. No significant associations were identified for age, sex, IDA, overt gastrointestinal bleeding, weight loss. Diarrhoea was associated with an absence of an abnormal VCE finding (p = 0.024); however, this finding was based on only three patients with diarrhoea, all of whom had normal examinations, and should therefore be interpreted cautiously.

Table I: Findings identified on video capsule endoscopy

Finding	*n*	% of total cohort (*n* = 70)
Overall findings		
No abnormal finding	21	30.0
Any abnormal finding	49	70.0
Small-bowel pathology		
Angiodysplasia	28	40.0
Masses/polyps	8	11.4
Ileitis	3	4.3
Non-small-bowel findings		
Gastropathy	11	15.7
Colonic polyps/masses	2	2.9

Individual findings are not mutually exclusive. Three patients had concomitant angiodysplasia and gastropathy. Percentages therefore do not sum to 70%.

Discussion

In this retrospective single-centre cohort, VCE identified an abnormal finding in 70% of patients, while small-bowel pathology was identified in 55.7%. Angiodysplasia was the predominant small-bowel abnormality, followed by masses or polyps and ileitis. Most patients were referred for IDA or overt gastrointestinal bleeding, reflecting the principal clinical applications of VCE. Complete examinations were achieved in all patients, with no capsule retention or procedure-related complications.

The mean age of 59.8 years is broadly consistent with international VCE experience and reflects the increasing frequency of vascular and neoplastic small-bowel pathology

Table II: Factors associated with an abnormal VCE finding

Variable	No abnormal finding (*n* = 21)		Abnormal finding (*n* = 49)		*p*-value
Age, years, mean ± SD	57.2 ± 17.2		61.0 ± 14.5		0.347[t]
Sex	*n*	%	*n*	%	
Male	10	47.6	21	42.9	0.713[c]
Female	11	52.4	28	57.1	
Diarrhoea					
No	18	85.7	49	100	0.024[f]
Yes	3	14.3	0	0.0	
Iron-deficiency anaemia					
No	5	23.8	12	24.5	0.951[c]
Yes	16	76.2	37	75.5	
Overt gastrointestinal bleeding					
No	19	90.5	37	75.5	0.202[f]
Yes	2	9.5	12	24.5	
Weight loss					
No	19	90.5	48	98.0	0.513[f]
Yes	2	9.5	1	2.0	

[t] t-test, [c] chi-square test, [f] Fisher's exact test

with advancing age.[5,6,9] The predominance of IDA and overt gastrointestinal bleeding also reflects the established role of VCE following negative conventional endoscopic assessment.[3,4] Selective referral in a resource-constrained setting may have contributed to the relatively high frequency of small-bowel abnormalities.

The 70% abnormal-finding rate should be interpreted in the context of our definitions. Of the 49 patients with an abnormal examination, 39 (55.7% of the total cohort) had small-bowel pathology, while the remainder had findings such as gastropathy or colonic lesions. Detection of an abnormality does not necessarily explain the presenting indication; in particular, isolated gastropathy should not automatically be regarded as an explanation for suspected small-bowel bleeding. The findings therefore describe the spectrum of abnormalities detected rather than assuming that every abnormality represents a clinically explanatory diagnosis.

The frequency of small-bowel pathology is comparable with that reported in international VCE series.[5,9,12,13] Differences may reflect variation in patient selection, indications, timing of examination and referral pathways. In resource-constrained settings, selective referral may increase the pretest probability of pathology because VCE is generally reserved for patients in whom conventional investigations have not established a diagnosis.

Angiodysplasia was the most common small-bowel abnormality, identified in 28 patients (40.0%), consistent with its recognised importance in suspected small-bowel bleeding, particularly in older patients.[7,9,12] Seven of these patients subsequently underwent therapeutic enteroscopy. Although this demonstrates documented subsequent intervention, it cannot be regarded as a measure of overall clinical impact because subsequent management was not systematically captured. It nevertheless illustrates how VCE findings can direct targeted enteroscopic investigation and treatment.

Our previous institutional study similarly demonstrated that detection of a lesion did not necessarily translate into measurable improvement in iron or haemoglobin support.[11] The present study extends this local experience by describing a broader VCE population and distinguishing abnormal findings from small-bowel pathology and documented intervention. The value of VCE should therefore not be judged solely by the number of abnormalities detected, but also by whether findings can subsequently be investigated or treated.

Masses and polyps were identified in 8 patients (11.4%). Histological assessment of 4 lesions resulted in a diagnosis. Although numbers were small, these findings illustrate the potential role of VCE in identifying otherwise undiagnosed lesions and directing subsequent enteroscopy and biopsy. No inference regarding the prevalence of small-bowel neoplasia in the wider South African or sub-Saharan African population can be drawn from this selected cohort.

Non-small bowel findings included gastropathy and colonic lesions. These abnormalities highlight the broader range of findings that may be encountered during VCE but require appropriate clinical interpretation and should not automatically be considered explanations for the presenting indication.[14]

Only three patients underwent VCE for diarrhoea, and all three examinations were normal. The association between diarrhoea and an absence of an abnormal finding should therefore be interpreted cautiously and does not provide evidence that VCE has limited value for this indication. No significant associations were identified for age, sex, iron-deficiency anaemia, overt gastrointestinal bleeding, and weight loss. Given the sample size, the absence of significant associations should not be interpreted as evidence that these factors have no influence on VCE findings.

The absence of NSAID-related small-bowel ulceration is noteworthy, as NSAID enteropathy is a recognised contributor to small-bowel pathology.[15] In our cohort, this may reflect differences in medication exposure, prescribing patterns, referral characteristics or the small sample size. It should not be interpreted as evidence of a regional difference in NSAID-related small-bowel disease.

The findings should also be considered in the context of the limited published experience from sub-Saharan Africa. A recent Kenyan study and our previous South African experience represent some of the available regional data but remain small compared with the international literature.[10,11] The present study adds further South African data describing the indications, spectrum of findings and safety of VCE in routine tertiary-care practice.

VCE was safe in this cohort, with complete examinations achieved in all patients and no capsule retention or procedure-related complications. This is consistent with the established favourable safety profile of the technique.[7,8]

Advances in capsule technology, including artificial intelligence-assisted image analysis, may further improve detection of subtle vascular and mucosal abnormalities.[16] However, increased detection does not necessarily equate to improved clinical outcomes, particularly when detected lesions are incidental or subsequent therapeutic enteroscopy is unavailable. Future evaluation of AI-assisted VCE should therefore consider clinically meaningful outcomes in addition to lesion detection.

This study is limited by its retrospective design, relatively small sample size and single-centre setting, which restrict the power to detect associations and generalisability. The diarrhoea association was based on only three patients and should therefore be interpreted cautiously. Subsequent management and patient-centred outcomes were not systematically recorded, limiting assessment of longer-term clinical impact.

Conclusion

VCE identified abnormal findings in 70% of patients in this South African tertiary-care cohort, with small-bowel pathology identified in 55.7%. Angiodysplasia was the predominant finding and documented therapeutic enteroscopy followed in a subset of patients. VCE was safe, with complete examinations achieved in all patients. These findings support the use of VCE in appropriately selected patients while highlighting the need for prospective studies assessing subsequent management and patient-centred outcomes.

Conflict of interest

The authors declare no conflict of interest.

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Ethical approval

The study was approved by the University of Cape Town Health Sciences Human Research Ethics Committee (HREC) (HREC Ref: 821/2025).

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