



# COVID-19: impetus to the adoption of capsule endoscopy as a primary diagnostic tool?

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The freeze on endoscopy activity during the first wave of the COVID-19 pandemic was followed by radical pathway redesign to minimise risks of viral transmission. However, most endoscopy lists are running at reduced capacity due to the need for extra safety measures, staff absences and there is a concern about a post-COVID surge in demand as symptomatic patients emerge from isolation. 'Desperate times call for desperate measures': to mitigate pressures on endoscopy services the British Society of Gastroenterology Endoscopy committee set up a COVID-19 Research Group to consider potential roles for novel alternative diagnostic technologies and National Health Service (NHS) England has provided £6 million to deliver colon capsule endoscopy services over the next year. Could this terrible pandemic be the impetus needed for capsule endoscopy to replace conventional endoscopy as the primary diagnostic tool? 'In the midst of every crisis lies great opportunity.'

Most clinicians remain hesitant about embracing capsule endoscopy of the colon or upper gastrointestinal (GI) tract, although small bowel examination is widely accepted. Colonoscopy is performed in 1.5% of the population per annum, demand is increasing, it is undignified and uncomfortable and often necessitates the use of sedatives and analgesia. About 90% of procedures reveal no clear cause for symptoms although incidental polyps are found in 20%.<sup>1</sup> It is hoped that biomarker assays such as the faecal immunochemical test (FIT) for haemoglobin and calprotectin may help select appropriate patients who need colonoscopy for biopsy or polypectomy. However, in setting FIT and calprotectin referral thresholds there is a trade-off between reducing referral rate and increasing pathology miss rate which puts patients and clinicians in a dilemma. Not all equate 'low risk' with 'no risk' and, therefore, it seems likely that colonic imaging will continue to be in demand.

On what evidence have the Scottish government and NHS England based their decisions to fund colon capsule endoscopy as a primary diagnostic tool?

Meta-analyses show that the sensitivity of colon capsule endoscopy in the detection of polyps of 10 mm or greater is 87% compared with colonoscopy.<sup>2</sup> Of interest is that several studies reported that false-positive capsule diagnoses were subsequently (outside the context of the trial) found to be lesions missed by colonoscopy and sensitivity seems to be better still in those with complete (as opposed to incomplete) colon capsule examinations.<sup>2</sup> To further put this in context, meta-analysis of tandem colonoscopy studies (in which a second colonoscopy using an auxiliary technique is performed) reveals a 9% miss rate for adenomas of at least 10 mm and 31% for adenomas of all sizes.<sup>3</sup>

As yet, however, there are no published data describing the use of colon capsule endoscopy in an unselected symptomatic population. This is important as we do not know if the quality of bowel preparation in routine practice is as good as that obtained in a trial setting. Obviously the same applies to all forms of colonic imaging, but the advantage of colonoscopy over capsule endoscopy is that it allows active intervention (washing, suction and patient position change) to improve views. Increased battery life will improve completion rate, but for the present time, capsule endoscopy may be more suitable for patients who are able to comply with a reasonably complex bowel preparation regimen and who do not have risk factors for a poor response.

What about capsule endoscopy of the upper GI tract? Like colonoscopy, gastroscopy is often poorly tolerated, associated with small risks of intubation-related and sedation-related injury and postprocedural infection and mostly identifies no, minor or irrelevant pathology. Capsule endoscopy is preferred by patients.<sup>4</sup> Meta-analyses showed an 80% sensitivity in detection of Barrett's oesophagus (and other oesophageal pathology) using the ESO3 capsule (Medtronic, Dublin, Ireland), which captures 18 frames per second from cameras at both ends.<sup>4</sup> No study assessed interobserver variability of grading of oesophageal pathology by gastroscopy, which was the gold standard in all cases. As the new UGI capsule (Medtronic) captures 35 frames per second, it may be that the two modalities have similar

diagnostic sensitivity. It is possible to use this device to examine the water-filled stomach but the video reading is time consuming and tedious. However, live image transmission allows the NaviCam capsule (Ankon, Shanghai, China) to be steered around the stomach using two joysticks to alter the polarity and vertical distance of an external, free-standing magnet suspended above the supine patient. A Chinese multicentre study of 350 patients showed that MAgnet controlled Capsule Endoscopy (MACE) had a diagnostic sensitivity of 90% in the detection of focal gastric lesions compared with gastroscopy, irrespective of site or size.<sup>5</sup> Although a fine detachable tether can be used to slow oesophageal transit to allow careful inspection before the capsule is released, it is hoped that a dual camera system with high frame capture rate will allow a completely non-invasive upper GI examination.

A small bowel capsule endoscopy training and accreditation programme was recently approved by the Joint Advisory Group (JAG) on Endoscopy Training. Accreditation requires attendance at a hands-on training course, completion of an e-learning package and local supervision (direct observed procedures), assessments being recorded on the JAG Endoscopy Training System e-portfolio. Most components of training use archived, anonymised videos specifically selected for their educational purpose which can be accessed flexibly, without the need to have trainee, trainer and patient colocated in time and place. This is illustrated in the novel Capsule Endoscopy Training Network developed by Conley and colleagues and described in this issue.<sup>6</sup> Their programme provides a training platform for 'hands-on' video reading which allows discussion and feedback in a 'COVID-compliant' manner using videoconferencing software. At a time when training has taken a back seat to safe service delivery, this is a model which enables trainees to acquire experience and build expertise quickly, an innovation which could be adopted nationally. Colon capsule endoscopy training programmes using a similar approach are available, but a JAG-approved programme is awaited.

However, elements of training may in time become redundant: deep convoluted neural networks, a form of machine learning,

appear to be highly sensitive in the detection of mucosal lesions and prospective clinical trials are underway. MACE, however, is a technical as well as an interpretative skill, for which training programmes are being developed. It may be an easier skill to acquire by a generation familiar with game consoles. Furthermore, practice in human subjects is likely to be much more acceptable than with intubational endoscopy. In time, artificial intelligence will control the magnet to steer the capsule over the entire surface area, identify images showing pathology, provide diagnoses and bypass the endoscopist entirely.

Costs allowing, in an era when high-quality, remote examination of the entire GI tract is possible, it may be that capsule endoscopy becomes the diagnostic test of choice, conventional endoscopy reserved for those needing intervention. This may address the concern (predating, but exacerbated by, COVID-19) expressed by Conley and colleagues about trainees qualifying without colonoscopy accreditation or lacking in confidence. Whisper it, but colonoscopy may become a superspecialist option rather than a core curriculum subject. A few words of reassurance to trainees: as long as you can explain to patients what they do have, and not just what they do not have, you are halfway to becoming a decent doctor!

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