Image enhanced endoscopy: Optical diagnosis or optical illusion?

The American Society for Gastrointestinal Endoscopy (ASGE) defined performance thresholds to be met by technologies for real-time *in vivo* diagnosis of diminutive polyps to allow for resect-and-discard all adenomas <5 mm in size and diagnose-and-leave hyperplastic polyps <5 mm in size in the rectosigmoid region.[1] Experts in optical diagnosis have clearly demonstrated that ASGE Preservation and Incorporation of Valuable Endoscopic Innovations (PIVI) standards can be achieved for diminutive polyps using image-enhanced technologies. Attempts have been made to extend these strategies beyond diminutive polyps. The DISCOUNT study group explored optical diagnosis in real-time and implications of extending it from diminutive to small polyps. The findings suggested that the PIVI criterion could be met for diminutive and small polyps (6–9 mm) resulting in substantial cost savings.[2] However, previous large, multicenter studies[3] have shown that community gastroenterologists without a specialist interest in colonic neoplasia struggle to meet the ASGE PIVI standards.

Alharbi *et al.* have published the results of an image-based optical diagnosis study in a select group of endoscopists practising in the Kingdom of Saudi Arabia (KSA).[4] The results make for very interesting reading. One of the strengths of the study is that they managed to get 71 endoscopists to take part in this exercise. The results demonstrate a big gap in optical diagnosis skills/knowledge of the participants. They performed a little bit better on image enhancement when compared with white light but were nowhere close to the acceptable levels. However, they all showed interest and keenness to learn. Another important finding is that the degree of confidence made no difference to the diagnostic accuracy. This is unconscious incompetence, where the practitioners are simply unaware of their limitations. This is a potentially dangerous situation and is undeniably a major barrier to the implementation of the resect-and-discard model. Yet, it is undeniable that the potential cost savings from such a policy cannot be easily dismissed.[3,5,6] There are several limitations of this study. First, the definition of the scopes used to collect the images is not mentioned, but we know that high definition scopes perform better during optical diagnosis. Second, there is an issue regarding the size of polyps as the work is not restricted to diminutive polyps. We are aware that

it is easier to make an optical diagnosis on larger polyps when compared with smaller ones. Third, all three different platforms were used and that can have a substantial impact on performance. The histological distribution within each image-enhanced endoscopy modality is not clear. Finally, participant selection bias cannot be ruled out and that can question the generalizability of the findings. Despite all this, the lack of optical diagnostic ability in study participants is undeniable.

The question therefore, that needs to be answered is, how to move optical diagnosis from being an academic tool to mainstream practice. One of the limitations is that training in colonoscopy has traditionally concentrated on practical, scope handling skills and the ability to get to caecum and resect a polyp, with a lack of emphasis on describing and characterizing lesions. This culture needs to change within endoscopy training, where we have to introduce lesion characterization very early in the training. Training of existing faculty members is a challenge but can be achieved if the workforce is motivated enough.

There is a range of competing proprietary technologies for making an *in vivo* diagnosis from the various endoscope manufacturers. NBI (Olympus), FICE (Fujifilm), and i-scan (Pentax). It is important to note that NBI is a filter technology, whereas FICE and i-scan are postprocessing digital technologies, so the images produced by them are all different, which poses a challenge to the endoscopist attempting to train in the techniques. The situation has become a bit better recently with the introduction of BLI from Fujifilm and OE scan from Pentax, as these images are very much similar to NBI images, paving the way for a unified classification and generalizability of the optical diagnosis skills across all platforms.

Hence, is the widespread adoption of *in vivo* diagnosis and a resect-and-discard policy an unrealistic proposition? It is important not to be too hasty in dismissing this; over the years, we have seen the adoption of many new technologies and it often takes time for a methodology to move from academic tertiary care to mainstream practice. However, there is the possibility that *in vivo* diagnostic skills may soon become less important with the arrival of computer-aided

diagnosis.[7] While this may sound far-fetched, there are several devices currently in development,[8] and with the pace of technology moving rapidly, it is not unreasonable to expect that it will not be long until commercially available software is available to work with modern endoscopes, which in turn will make an *in vivo* diagnosis with a negative predictive value of more than 90%. Even if tools that work in real-time take time to become available, work is continuing on point-of-test devices where freshly resected tissue can be processed at the bedside to yield an immediate diagnosis.[9]

The study by Alharbi *et al.* should serve as an eye opener, and a concerted effort should be made at the national level to embark on an organized training program for optical diagnosis. This will require a lot of knowledge and that can be dissipated by an electronic platform along with a big atlas of images, but the key to success will be the engagement and acceptance of the endoscopists in the concept of optical diagnosis. This will require a big cultural shift from a biopsy-based culture to an *in vivo* optical diagnosis-based culture. This cultural shift will require substantial support from industry, national societies, and some enthusiastic and passionate experts in the field of optical diagnosis. The concept has been proven well beyond doubt in expert centers and now is the time to take it to the community before the introduction of an organized national bowel cancer screening program in KSA. If mastered, optical diagnosis can completely change our colonoscopy practise by facilitating the introduction of diagnose-and-leave diminutive hyperplastic polyps in rectosigmoid, resect-and-discard all diminutive adenomas, and potentially "identify and refer" all cancers for *en bloc* excision in the future. What seems like an optical illusion can be made into real-time optical diagnosis with a concerted effort before the artificial intelligence of computers takes over from the real intelligence of the endoscopists.

Gaius Loncroft-Wheaton, Pradeep Bhandari

Department of Gastroenterology, Queen Alexandra Hospital, Portsmouth, UK

Address for correspondence: Prof. Pradeep Bhandari, Queen Alexandra Hospital, Portsmouth, UK. E-mail: deep3570@yahoo.co.uk

REFERENCES

1. Rex DK, Kahi C, O'Brien M, Levin TR, Pohl H, Rastogi A, *et al.* The American Society for Gastrointestinal Endoscopy PIVI (Preservation and Incorporation of Valuable Endoscopic Innovations) on real-time endoscopic assessment of the histology of diminutive colorectal polyps. Gastrointest Endosc 2011;73:419-22.
2. Vleugels JLA, Hazewinkel Y, Dijkgraa MGW. Optical diagnosis expanded to small polyps: Post-hoc analysis of diagnostic performance in a prospective multicenter study. Endoscopy 2019;51:244-52.
3. Ladabaum U, Fioritto A, Mitani A, Desai M, Kim JP, Rex DK, *et al.* Real-time optical biopsy of colon polyps with narrow band imaging in community practice does not yet meet key thresholds for clinical decisions. Gastroenterology 2013;144:81-91.
4. Alharbi OR, Alballa NS, AlRajeh AS, Alturki LS, Alfuraih IM, Jamalaldeen MR, *et al.* Use of image-enhanced endoscopy in the characterization of colorectal polyps: Still some ways to go. Saudi J Gastroenterol 2019;25:89-96.
5. Hassan C, Pickhardt PJ, Rex DK. A resect and discard strategy would improve cost-effectiveness of colorectal cancer screening. Clin Gastroenterol Hepatol 2010;8:865-9.
6. Kessler WR, Imperiale TF, Klein RW, Wielage RC, Rex DK. A quantitative assessment of the risks and cost savings of forgoing histologic examination of diminutive polyps. Endoscopy 2011;43:683-91.
7. Gupta N, Bansal A, Rao D, Early DS, Jonnalagadda S, Edmundowicz SA, *et al.* Accuracy of *in vivo* optical diagnosis of colon polyp histology by narrow-band imaging in predicting colonoscopy surveillance intervals. Gastrointest Endosc 2012;75:494-502.
8. Alagappan M, Brown JRG, Mori Y, Berzin TM. Artificial intelligence in gastrointestinal endoscopy: The future is almost here. World J Gastrointest Endosc 2018;10:239-49.
9. Renner J, Phlipsen H, Haller B, Navarro-Avila F, Saint-Hill-Febles Y, Mateus D, *et al.* Optical classification of neoplastic colorectal polyps – A computer-assisted approach (the COACH study). Scand J Gastroenterol 2018;53:1100-16.