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IMAGING

Advancing dysplasia and neoplasia detection in Barrett oesophagus

Real-time imaging of dysplasia and neoplasia in patients with Barrett oesophagus is possible during endoscopy, can improve diagnosis, reduce the number of biopsy samples taken and change patient care.

Barrett oesophagus is a well-accepted precursor of oesophageal adenocarcinoma, the incidence of which has risen substantially in the past four decades. Distinguishing dysplasia and early neoplasia in Barrett oesophagus from benign tissue is not possible with conventional endoscopy, making it necessary to take numerous biopsy samples. As Huang and co-workers explain, "...the need for new advanced endoscopic modalities has never been greater".

Huang and colleagues evaluated whether rapid fibre-optic confocal Raman spectroscopy could be used during endoscopy to accurately detect dysplasia at the molecular level. Raman spectroscopy can make *in vitro* histopathological diagnoses, so the team wanted to tackle its *in vivo* application. "[We] developed a novel beveled fiber-optic confocal Raman probe coupled with a ball lens capable of enhancing *in vivo* epithelial tissue Raman measurements at endoscopy."

The team generated a reference library of >12,000 *in vivo* Raman spectra measured from 373 patients who had histologically confirmed columnar-lined epithelium, non-dysplastic Barrett oesophagus or high-grade dysplasia. They applied their new technique prospectively in 77 patients during endoscopy and the results were compared with histopathological findings in a blinded fashion. Combined with partial least-squares discriminant analysis, confocal Raman spectroscopy diagnosed dysplasia with a sensitivity and specificity of 87.0% and 84.7%, respectively.

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In their study, Canto *et al.* focused on diagnosis of neoplasia in Barrett oesophagus. They prospectively assessed the diagnostic yield and accuracy of high-definition white light endoscopy (HDWLE) plus real-time fluorescein-aided endoscope-based confocal laser endomicroscopy (eCLE) plus targeted biopsy compared with HDWLE plus random biopsy.

192 patients undergoing outpatient endoscopy were studied; 46 already had suspected or confirmed neoplasia. The reference standard was blinded diagnosis of biopsy samples by expert pathologists.

The diagnostic accuracy of both approaches was comparable, but HDWLE plus eCLE and targeted biopsy reduced the biopsy number and increased the diagnostic yield for neoplasia compared with HDWLE plus random biopsy (34% vs 7%; $P<0.0001$). eCLE increased the sensitivity for neoplasia detection from 40% to 96% ($P<0.0001$) without specificity being significantly reduced. The treatment of 36% of patients was changed by adding eCLE. "The real advance was the impact of *in vivo* microscopic imaging on real-time decision-making," concludes Canto.

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Original articles Bergholt, M. S. *et al.* Fiber-optic Raman spectroscopy for real-time *in vivo* diagnosis of dysplasia in Barrett's esophagus. *Gastroenterology* doi:10.1053/j.gastro.2013.11.002 | Canto, M. I. *et al.* *In vivo* endomicroscopy improves detection of Barrett's esophagus-related neoplasia: a multicenter international randomized controlled trial (with video). *Gastrointest. Endosc.* doi:10.1016/j.gie.2013.09.020