'Next Generation' Endoscopy

Changing the paradigm of cancer screening

by Dr Jarrod Lee

About 1,400 Singaporeans die each year from digestive tract cancers. The latest report from the Singapore Cancer Registry, 2008 to 2013, mentions that digestive tract cancers account for three out of the top six cancer deaths in both males and females. Although these cancers have high death rates, many can be cured if detected early.

Conventional Endoscopy

Gastrointestinal endoscopy has been available in Singapore for over 20 years. It allows digestive tract cancers to be detected at an early stage, even before symptoms develop. An increasing number of Singaporeans undergo endoscopy for early cancer detection. Despite this, the proportion of early digestive cancers diagnosed has not increased significantly over the last 10 years. It is increasingly recognised that routine endoscopy misses a significant number of cancerous and pre-cancerous growths. For example, colonoscopy has been shown to miss 20% to 30% of pre-cancerous polyps and 5% of colorectal cancers, while gastroscopy has been shown to miss up to a staggering 19% of early stomach cancers. The limitations of today's endoscopy have drawn attention to new advanced imaging technology to improve diagnostic accuracy for tomorrow's endoscopy.

Image Enhanced Endoscopy

Image Enhanced Endoscopy (IEE) encompasses various techniques that allow the endoscopist to better differentiate normal from abnormal tissue. Broadly, there are two types of IEE: dye based and equipment based. Dye based IEE is also known as Chromoendoscopy. It entails the application of various dyes to better identify dysplastic tissue. The type of dye used depends on the type of cell that the endoscopist is looking for.

Chromoendoscopy has been proven in multiple studies to provide superior detection of dysplastic tissue compared to conventional endoscopy, particularly in groups at high risk of cancer. Equipment based IEE is also known as Digital Chromoendoscopy. These are

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push button technologies where advanced imaging is incorporated into the endoscopy systems using either special light filters or computer algorithms to enhance surface features or micro-vascular characteristics. Perhaps the best established equipment based IEE is called Narrow Band Imaging (NBI). NBI illuminates tissues at a specific wavelength that enhances underlying vasculature for contrast between vessels and surrounding mucosa. This allows the margins of abnormal growths to be better visualised as well as identifying best areas for biopsy. IEE techniques allows detection of early cancers and pre-cancerous areas that routine endoscopy would miss altogether **[Figure 1 and 2].** IEE can be incorporated into routine endoscopy to provide a more thorough and detailed endoscopic examination. This facilitates cancer risk assessment and prevention for every patient undergoing endoscopy.

Endoscopic Ultrasound

Endoscopic Ultrasound (EUS) enables detailed examination of the digestive tract beneath its surface, and is ideal for assessing any growth seen in the digestive tract. It can assess the depth of growth and the relationship to surrounding structures. It is considered the most accurate screening modality for organs adjacent to the digestive tract, such as the pancreas and biliary system. Undergoing diagnostic EUS is just like undergoing a regular gastroscopy, and it can be done as an outpatient with a simple overnight fast. The big difference is that while the gastroscopy examines the inside of the upper gastrointestinal tract, the EUS examines its wall and surrounding structures. This allows submucosal growths to be evaluated with remarkable accuracy, so that doctors can counsel patients objectively on the need for resection or surveillance. It also helps to look for lesions in adjacent organs, and to evaluate them with the highest accuracy possible in medicine today.

Going a step further, EUS can be used to obtain samples from lesions outside the intestinal tract by precisely guiding a needle into the lesion under real time, thus avoiding blood vessels and other vital structures. EUS can obtain samples both cytology and histology, and is akin to taking biopsies during general endoscopy. This is invaluable in diagnostic cancers such as pancreatic cancers, which previously needed surgery to obtain a biopsy for diagnosis. In cancer patients, EUS can also be used for accurate local staging to assess suitability for surgery, and for applying analgesia to the local nerve plexus for good pain relief.

The advent of advanced imaging may herald a fundamental change in the way endoscopy will be done in future. With an unprecedented level of diagnostic accuracy, earlier detection of cancers and pre-cancerous growths will be possible.

This 'next generation' endoscopic technology has been available in Singapore for a few years. Doctors performing such advanced endoscopy need to undergo an additional year of specialised training in order to perform them with high accuracy. The advent of advanced imaging may herald a fundamental change in the way endoscopy will be done in future. With an unprecedented level of diagnostic accuracy, earlier detection of cancers and pre-cancerous growths will be possible.

Conclusion

Advanced imaging has only recently reached a mature enough stage for widespread use in Singapore. The biggest limitation currently is the small number of suitably trained doctors and limited number of facilities with suitable equipment. However, the near future will see an increased availability of 'next generation' endoscopy systems and doctors trained in advanced imaging. When that happens, more digestive tract cancers can be detected at an early curative stage or even pre-cancerous stage, and then these cancers will no longer be the top killers in Singapore. At the moment, endoscopy with advanced imaging should certainly be considered for patients with indeterminate findings on routine endoscopy or radiology scans, and in patients with high cancer risk. MD

***Figure 1.* Conventional endoscopy easily misses an early oesophageal cancer.** *Picture Source Olympus*

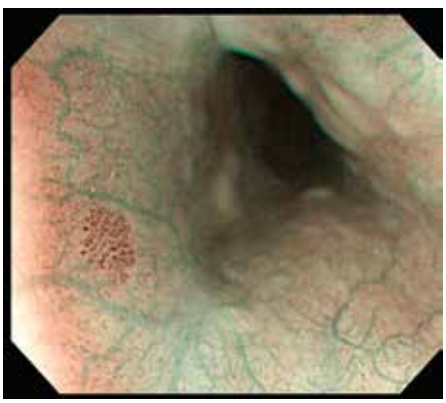

***Figure 2.* The early cancer can be seen clearly using advanced imaging. Narrow band imaging technology is used in this instance.** *Picture Source Olympus*