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Cyted's Sponge On A String May Help Diagnose Esophageal Cancer

by Barnaby Pickering

Cyted is using Medtronic's cytosponge collection device combined with its own analysis platform to create a simple and cheap method to screen patients for early warning signs of esophageal cancer.

Pulling a sponge by a piece of string out from your stomach, and up through to your mouth certainly would not be described by anyone as a good time, but this is precisely the technique Cyted has developed to deliver clinical insights that could predict and diagnose esophageal cancer.

Esophageal cancer, which has just a 15% survival rate at five years, is difficult to diagnose. Initial symptoms, which include worsening heartburn, consistent coughing and slight weight loss are often brushed aside.

And once a potential patient is identified, the standard procedure to confirm diagnosis requires an upper endoscopy. In recent years the US Food and Drug Administration has found this procedure carries surprisingly high risks due to improper sterilization. A recent report cited a huge increase in adverse events related to endoscopy procedures, centered around the transmission of drug resistant bacteria. (Also see "*Study: FDA Data Shows Endoscope-Related Adverse Events Continue To Rise*" - Medtech Insight, 28 Apr, 2022.)

Marcel Gehrung, CEO and co-founder of Cyted spoke to *Medtech Insight* about these challenges, the company's tool for bypassing them, Cytosponge, and how Artificial Intelligence (AI) could be used to augment cancer diagnostics.

Cyted was founded as an amalgamation of three people's expertise and a device produced by *Medtronic*, he explained. Gehrung brought with him an extensive computer science background, thanks to his prior work running a German software consultancy firm.

When he was completing a PhD in the UK, he met Rebecca Fitzgerald, a professor specializing in the prevention of cancer at Cambridge University, and Maria O'Donovan, a pathologist who has spent much of her career researching the cause of upper gastrointestinal tract cancers.

Fitzgerald and O'Donovan spent many years championing a device developed by Medtronic called Cytosponge, which can be used as a tool to collect cellular material from the esophagus. Analysis of this material could be used to detect a condition in patients known as Barrett's esophagus – the thin pink lining covering the esophagus becomes damaged by acid reflux, thickening and turning red.

Gehrung realised that it was this step that needed to be improved, because the incidence of Barrett's esophagus is an effective predictor of esophageal cancer. Between *three and 13 people out of 100* with Barrett's esophagus in the UK will go on to develop esophageal cancer, compared to a general rate of roughly 1 out of 100 people.

However, Barrett's esophagus cannot be diagnosed with a simple yes/no answer finding. The condition is characterized by changes to the flat squamous cells lining the esophagus, and the severity of these changes, which cannot be easily observed via endoscopy, is linked to the likelihood of progression into cancer.

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Even though it is linked to a deadly cancer, Barrett's esophagus is not actively searched for because the cost and risk associated with endoscopy makes it unviable for population-based screening protocols.

According to Gehrung, this is where Cytosponge excels. To use the device, the patient swallows a pill the size of a multivitamin, waits a few minutes for the plant-based capsule to dissolve, and then pulls on a piece of string attached.

This mechanical process pulls a small sponge, about the size of the tip of a thumb, out from the stomach, through the esophagus and out the mouth as the sponge's matrix absorbs cellular material. The sponge is then collected, shipped to a central lab and then processed.

The simplicity of this process makes sample collection is fast and easy. Because cytosponge is disposable, made of cheap materials, and already has market approval in Europe and the US it is both practically and economically viable as a tool for population-based screening.

The processing stage is also relatively simple, explained Gehrung. Instead of spinning out the cells, or smearing them onto a slide, the sponge is fully washed and the loose cells are then clotted together, "making something which looks like a histology sample, but is actually a cytology sample."

A single slide of material gathered by cytosponge can provide much more information than a histology. A higher number of cells simply increases the odds of spotting any that show signs of a problem.

Cyted has also observed that as the sponge is pulled upwards, cells initially collected are forced deeper into the sponge. The depth of the cells in the sponge could eventually yield information regarding specific locations of concern in a patient's GI tract, Gehrung said.

Artificial intelligence – part of Gehrung's contribution to the operation – makes the analysis faster by highlighting cells of concern. He hopes to have "full automation" of sample analysis working in the next few years.

Moreover, the company is working on self-supervised biomarker discovery. This would have an artificial intelligence study clinical data and compare it to outcome data. After comparing enough samples, the AI would be able to spot signs beyond human perception that something is amiss.

Gehrung cautioned that the company does not have the "critical mass" of data to do this yet, but that the team's "vested interest" in the gastrointestinal tract meant that it was a research angle they are keen to pursue.

Another major advantage of the dragging motion is that the sample taken is continuous – it covers the whole GI tract. Typical biopsies taken via endoscopy are point-biased and may miss smaller areas of Barrett's esophagus. Cytosponge's unbiased approach prevents these misses and cytosponge can be used to spot fungal or bacterial infections.

The only obvious counterargument to the unbiased approach is that cytosponge cannot collect data regarding the "architecture" of the esophagus which appears as reddening on an endoscope. Because cytosponge is not an image modality, and the shape of squamous cells with Barret's is easy to detect – this architecture is of no concern, he said.