Towards the early detection of oral cancers

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New technology offers a way to visually examine the mouth for cancer, without the need for a surgical biopsy.

When Australians notice a new dark spot on their shoulder or changes in an old mole, they generally know to get it checked out. But, would they know if they had cancer in their mouth?

As the population ages, the diagnosis of oral cancer is increasing.[1] Globally, this devastating cancer affects 750,000 people, and it has a five-year mortality rate of approximately 50 per cent if not detected and treated early.

The insidious nature of oral cancer means it is often detected at a later stage; up to half of people who are diagnosed with oral cancer[2] already have large tumours, as oral cancer is often painless and unseen.

A further challenge is the limited tools to detect and monitor potential oral cancers and skin lesions over time. This forces clinicians to remove suspicious lesions by scalpel biopsy and assess pathology.

The Melbourne University Dental School has partnered with Victorian company OptiScan Imaging Ltd to improve screening and early diagnosis of oral cancer. A new research project, which commenced in September, aims to identify individuals who are likely to develop oral cancer, without invasive biopsies.

The project will use Optiscan's state-of-the-art confocal laser endomicroscope, known as InVivage™, that enables real-time 'in vivo' imaging of human tissue at a cellular level, providing instant, 'virtual' biopsies for cancer screening, diagnoses and treatment.

With the tip of a hand-held instrument, tissue can be viewed with 1000-times better resolution than an MRI scan. This allows clinicians and surgeons to diagnose cancerous tissue in real time, reducing or eliminating the need to have one or more biopsies taken and sent to a laboratory for analysis.

The technology of cancer detection

Oral cancer can have a devastating impact on a person's life – removing a cancer from the mouth and tongue can impact on a person's speech, their ability to swallow and eat, and ultimately, their self-esteem.

The project, which has been enabled by a grant to OptiScan by the Australian Government through the Medical Research Future Fund's BioMedTech Horizons Program, seeks to ascertain how OptiScan's technology can be used to microscopically see tumour cells in the clinic, helping clinicians to assess the tissue and determine if a biopsy or surgery is required there and then.

The earlier the diagnosis can be made, and the least tissue removed – the better for the patient.

Although 95 per cent of the lesions are not cancerous, without a biopsy (which can be painful and invasive), it's very difficult to determine which lesions are cancerous or not.

Oral cancers are often preceded by changes in the appearance, such as the colour and thickness of the skin of the mouth. These changes are considered to have the potential to grow an oral cancer and affect as many as one in 20 people. However, only around three to five per cent of people with these changes will develop an oral cancer.

Once a biopsy sample is taken, it is assessed by a pathologist to see if there is any cancer present.

Sometimes there are changes in the way the skin is growing, called dysplasia, which indicates there may be an increased risk of cancer developing in the future. Still, this assessment is a limited predictor and can only be made on the small piece of skin that has been sampled.

Mapping the mouth

With OptiScan's hand-held confocal laser endomicroscope, tissue can be viewed in 3D with 1000-times magnification. This could allow clinicians and surgeons to diagnose cancerous tissue in real time, reducing or eliminating the need to have one or more biopsies taken, and sent to a laboratory for analysis.

Alongside trialling the technology, the project also aims to develop software to comprehensively record an annotated 'map' of the patient's mouth, which would enable a comparison against a patient's 'mouth map' the next time they come in to assess any changes.

Special dyes can also be used that show all the cells in the skin surface or another that only binds to molecules that are found more commonly in cancer, identifying potential 'hot spots' of skin growth.

The Mouthmap™ project, in partnership with OptiScan and Molemap, has the potential to establish a new standard of diagnosis which will allow advancement of both human and computer algorithm-based learning.

The next steps

This clinical study aims to provide a solid foundation to advance towards clinical trials and recommendations to changes in standard of care.

Participants will be recruited by invitation

from Victoria's main oral pre-cancer referral centre, networked with regional community centres where individuals on healthcare card and pension card holders are eligible for treatment. This is important because lower socioeconomic status, as well as older age, are known risk factors for oral cancer. Other recruitment sites include collaboration with head and neck teams at Royal Melbourne Hospital and the Peter MacCallum Cancer Centre. A second research site at the Australian Centre for Oral Oncology Research and Education, in Perth, Western Australia, will be led by Professor Camile Farah.

Melbourne Dental School and OptiScan's goal is that this technology will help to reduce the need for scalpel biopsy in the future, allowing for more comprehensive assessment of changes in the mouth and earlier detection of oral cancer.

Sources

1. Cancer Council, *Types of cancer: Mouth cancer, www. cancer.org.au/cancer-information/types-of-cancer/mouth-cancer*.

2. Nature Research, *Validation of the use of a fluorescent PARP1 inhibitor for the detection of oral, oropharyngeal and oesophageal epithelial cancers, www.nature.com/articles/ s41551-020-0526-9*.

About OptiScan Imaging Ltd

OptiScan Imaging Ltd (ASX:OIL) is a global leader in the development of microscopic imaging and related technologies for surgery and medical research. Based in Victoria, Australia, OptiScan was established in 1994, and listed on the ASX in 1997. OptiScan has developed and patented endomicroscopic technology which enables real-time, 3D, 'in vivo' imaging of human tissue at the cellular level – instant virtual biopsies for cancer screening, diagnoses, and treatment. OptiScan's technology allows clinicians and surgeons to diagnose cancerous tissue in real time, improving patient welfare, saving time, reducing hospital costs, improving accuracy, and reducing or eliminating the need for multiple procedures. The technology is approved for use in brain cancer, and is part of a number of oral cancer and breast cancer studies and trials. OptiScan's technology is used by leading research institutions and hospitals across North America, Europe, Asia and Australia.

Pictured: Dr Tami Yap of the Melbourne Dental School leads the MouthMap™ project using Optiscan's confocal laser endomicroscope to assess oral skin changes.