



University of Dental Medicine, Yangon Bulletin

SINCE 1964

Vol. 1, No.5

www.udmyangon-edu.com

July, 2017

CONTENTS

“Lab-on-a-chip”: A New Diagnostic Tool for Early Detection of Oral Cancer 1

Evidence-based prevention of Periodontal Disease 3

As knowledge is an unique powerful tool for continuing medical education, the aim of circulation of this bulletin is to share the information to our colleagues what we are doing; what we can do and what will be done in near future for our profession. This bulletin is going to be published every two months and The Editorial Committee cordially invites academic contributions about research activities and findings in the field of dentistry.

Please address all your correspondence to:

Prof. Zaw Moe Thein

Professor/Head

Department of Oral Medicine

University of Dental Medicine, Yangon

Email: prof.zawmoethein@gmail.com

Phone: 0943134014

The Editorial Committee

Email: rectoroffice@udmyangon-edu.com

Phone: 01-571270, 01-570847, 01-571273

Fax: 01-571270, 01-571767

Address: No. 582, Than Thu Mar Road,

Thut Wine Gyi Ward, Thingangyun

Township, Yangon, Myanmar

Restricted for Internal Use Only

“Lab-on-a-chip”: A New Diagnostic Tool for Early Detection of Oral Cancer

The prognosis for patients with oral cancer, mainly squamous cell carcinoma, remains poor in spite of advances in therapy of many other malignancies. Early diagnosis and treatment remains the key to improved patient survival. There are two approaches in the early detection of oral dysplasia and cancer: (1) oral cancer screening programs that identify asymptomatic patients with suspicious lesions and (2) employing specific diagnostic tools to identify dysplasia and early oral cancers in asymptomatic patients with an oral abnormality. Because the scalpel biopsy for diagnosis is invasive and has potential morbidity, it is reserved for evaluating highly suspicious lesions and not for the majority of oral lesions which are clinically not suspicious. Furthermore, scalpel biopsy has significant interobserver and intraobserver variability in the histologic diagnosis of dysplasia.

Hence, there is an urgent need to devise critical diagnostic tools for early detection of oral dysplasia and malignancy that are practical, noninvasive and can be easily performed in an out-patient set-up. Diagnostic tests for early detection include brush biopsy, toluidine blue staining, autofluorescence, salivary proteomics, DNA analysis, biomarkers and spectroscopy. During recent years, microfluidics technology - also referred to as “**lab-on-a-chip**” or “**micro-total-analysis systems (TAS)**” is introduced in early detection of oral cancer via the adaptation, miniaturization, integration, and automation of analytical laboratory procedures into a single device or “chip.”

Since 2012, researchers from British University of Sheffield, and Rice University in Houston, Texas, are conducting a clinical trial on a revolutionary technique for diagnosing oral cancer more quickly and effectively. The “lab-on-a-chip” device could be used by a dentist to determine whether a patient has oral cancer or other abnormalities in less than 20 minutes.



Fig (1) For the examination, cells are removed with a brush and placed on a chip. An analyzer yields a result within minutes. (Photo courtesy of Martin Thornhill)

This microfluidics technology is initially introduced with a brush biopsy to collect cells from/inside the oral cavity. In other word, cells from the suspected lesion are brushed away, resuspend them in a special fluid, and introduce a drop of the mixture into the lab- on- a-chip for analysis. Then collected samples are conveyed into a small chamber on the chip and filtering out the fluid. In general, the process works as follows: after loading the drop of fluid into the device, the mixture passes along a tiny microfluidic channel and pools into the chamber. The chamber has a porous membrane floor that, like emptying boiled ravioli into a colander, drains out the fluid and leaves the larger cells behind and isolated on the floor of the chamber. At this point, a cocktail of antibodies is automatically pumped into the chamber through the holes in the floor. The antibodies are labeled with fluorescent dyes and this protein receptor tends to be over-expressed on many common types of oral cancer. Also there is a nice miniaturized platform with a digital camera interface. It allows the tumor cells to see the fluorescence on a computer screen and quantify the bound antibody on the cell surface. The chip essentially automates a process that is now done manually by a pathologist. Thus, it notes as “pathology-on-a-chip” just using fluorescent stains instead of the standard dyes that a pathologist employs. Moreover, once the cells are on the floor of the chamber, not only using antibodies, but also staining the nucleus of the cell and evaluate its DNA content. The approach is very flexible and scalable as well.

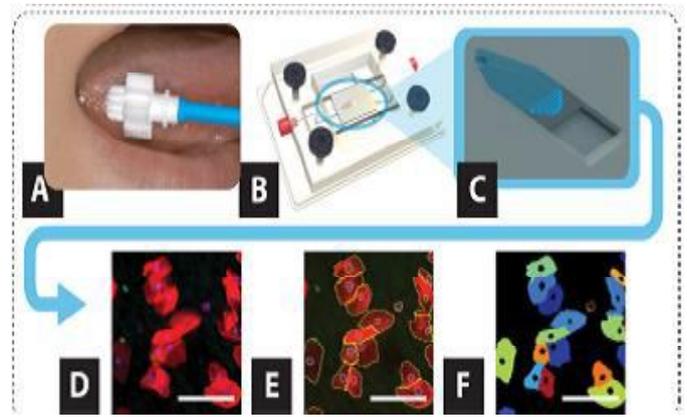


Fig (2) Diagram of “cytology-on-a-chip” sample processing in which a brush cytology sample is collected (A), processed in a suspension, and delivered through the microfluidic platform (B) to a cell-capture, nano-porous membrane (C). Multi-spectral fluorescence images are recorded (D) and analyzed with automated software to identify single cells (E) and extract these regions for measurement (F).

(Photo courtesy of Timothy J Abram)

Martin Thornhill, Professor of Oral Medicine at the University of Sheffield and Honorary Consultant in Oral Medicine at Sheffield Teaching Hospitals NHS Foundation Trust, said: **“This new technology is an exciting development in the search for quicker and more effective diagnosis of oral cancer. The current procedure we have for making a diagnosis - taking a biopsy - can take a week or more to produce results and can involve extra visits from patients. With this technology, a brush can be used to remove a few cells painlessly and a result could be produced in minutes.”** This offers a number of benefits, including reduced waiting times and patient visits. Patients are currently being tested with the new device, which is being compared to the standard biopsy procedure to test its accuracy and reliability.

If the trial demonstrates that the new technology is as effective as carrying out a biopsy then it could become standard procedure at dental- surgeries in the future.

Zaw Moe Thein &

House Officer (1/2017) Group-7

Sources: <http://oralcancernews.org/wp/lab-on-a-chip-technique-may-be-able-to-detect-oral-cancer/>
<https://www.nidcr.nih.gov/Research/ResearchResults/InterviewsOHR/TIS082007.htm>
<https://headandneckoncology.biomedcentral.com/articles/10.1186/1758-3284-3-33>
<http://dx.doi.org/10.1016/j.oraloncology.2016.07.002>

Evidence-based prevention of Periodontal Disease

<p>All adults and children</p>	<p><u>Advice to be given</u></p> <p><i>Self-care plaque removal</i></p> <ul style="list-style-type: none"> • Remove plaque effectively using methods shown by the dental team • This will prevent gingivitis (gum bleeding / redness) and reduces the risk of periodontal disease • Daily effective plaque removal is more important to periodontal health than tooth scaling and polishing by the dental team <p><i>Tooth brushing and toothpaste</i></p> <ul style="list-style-type: none"> • Brush gum line and each tooth twice daily (before bed and at least on one other occasion) • Use either <ul style="list-style-type: none"> - Manual or powered toothbrush (Figure 1 and 2) - Small toothbrush head, medium texture <p><u>Professional intervention</u></p> <ul style="list-style-type: none"> • Advise best methods of plaque removal to prevent gingivitis, achieve lowest risk of periodontitis and tooth loss • Use behavior change methods with oral hygiene instruction • Correct factors which impede effective plaque control including; supra- and sub-gingival calculus, open margins and restoration overhangs and contours which prevent effective plaque removal • For patients with extensive inflammation, start with tooth brushing advice, followed by interdental plaque control • Assess patient's / parent's / carer's preferences for plaque control and advise on appropriate type and method of plaque control
<p>All adults and ages (12-17 years old)</p>	<p><u>Advice to be given</u></p> <p><i>Interdental plaque control</i></p> <ul style="list-style-type: none"> • Clean daily between the teeth to below the gum line before tooth brushing, <ul style="list-style-type: none"> - For small spaces between teeth: use dental floss or tape (Figure 3) - For larger spaces: use interdental or single-tufted brushes (Figure 4 and 5) - Around orthodontic appliances and bridges: use kit suggested by the dental professional (Figure 6)



Figure 1. Manual toothbrush with small head



Figure 2. Powered toothbrush



Figure 3. Dental floss and tape



Figure 4. Interdental brush



Figure 5. Single-tufted brush



Figure 6. Toothbrush used for those with orthodontic appliance

Risk factor control

Tobacco (all adults and adolescents)	<p><u>Advice to be given</u></p> <ul style="list-style-type: none"> • Do not smoke • Smoking increases the risk of periodontal disease, reduces benefits of treatment and increases the chance of losing teeth <p><u>Professional intervention</u></p> <ul style="list-style-type: none"> • Ask, Advise, Act: take a history of tobacco use, give brief advice to users to quit and if possible, refer to local stop smoking service
Diabetes	<p><u>Advice to be given</u></p> <ul style="list-style-type: none"> • Patients with diabetes should try to maintain good diabetes control as they are <ul style="list-style-type: none"> - at greater risk of developing serious periodontal disease - less likely to benefit from periodontal treatment if the diabetes is not well controlled <p><u>Professional intervention</u></p> <ul style="list-style-type: none"> • For patients with diabetes <ul style="list-style-type: none"> - Explain risk related to diabetes
Medications	<p><u>Advice to be given</u></p> <ul style="list-style-type: none"> • Some medications can affect gingival health <p><u>Professional intervention</u></p> <ul style="list-style-type: none"> • For patients who use medications that cause dry mouth or gingival enlargement <ul style="list-style-type: none"> - Explain oral health findings and risk related to medication

Prevention of peri-implant disease

All adults with dental implants	<p><u>Advice to be given</u></p> <ul style="list-style-type: none"> • Dental implants require the same level of oral hygiene and maintenance as natural teeth • Clean both between and around implants carefully with interdental kit and toothbrushes (Figure 7 and 8) • Attend for regular checks of the health of gum and bone around implants <p><u>Professional intervention</u></p> <ul style="list-style-type: none"> • Advise best methods for self-care plaque control, both tooth brushing and interdental cleaning
---------------------------------	---



Figure 7. Implant care kit



Figure 8. Toothbrush to clean implant

ON
