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### Feasibility of a Video-Mosaicking Approach to Extend the Field-of-View For Reflectance Confocal Microscopy in the Oral Cavity In Vivo.

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#### ABSTRACT

**BACKGROUND:** Reflectance confocal microscopy (RCM) is a developing approach for noninvasive detection of oral lesions with label-free contrast and cellular-level resolution. For access into the oral cavity, confocal microscopes are being configured with small-diameter telescopic probes and small objective lenses. However, a small probe and objective lens allows for a rather small field-of-view relative to the large areas of tissue that must be examined for diagnosis. To extend the field-of-view for intraoral RCM imaging, we are investigating a video-mosaicking approach. **METHODS:** A relay telescope and objective lens were adapted to an existing confocal microscope for access into the oral cavity. Imaging was performed using metal three-dimensional-printed objective lens front-end caps with coverslip windows to contact and stabilize the tissue and set depth. Four healthy volunteers (normal oral mucosa), one patient (with an amalgam tattoo) in a clinical setting, and 20 anesthetized patients (with oral squamous cell carcinoma [OSCC]) in a surgical setting were imaged. Instead of the usual still RCM images, videos were recorded and then processed into video-mosaics. Thirty video-mosaics were read and qualitatively assessed by an expert reader of RCM images of the oral mucosa. **RESULTS:** Whereas the objective lens' native field-of-view is  $0.75\text{mm} \times 0.75\text{mm}$ , the video-mosaics display larger areas, ranging from  $2\text{mm} \times 2\text{mm}$  to  $4\text{mm} \times 2\text{mm}$ , with resolution, morphologic detail, and image quality that is preserved relative to that observed in the original videos (individual images). Video-mosaics in healthy volunteers' and the patients' images showed cellular morphologic patterns in the lower epithelium and at the epithelial junction, and connective tissue along with capillary loops and blood flow in the deeper lamina propria. In OSCC, tumor nests could be observed along with normal looking mucosa in margin areas. **CONCLUSIONS:** Video-mosaicking is a reasonably quick and efficient approach for extending the field-of-view of RCM imaging, which can, to some extent, overcome the inherent limitation of an intraoral probe's small field-of-view. Reading video-mosaics can mimic the procedure for examining pathology: initial visualization of the spatial cellular and morphologic patterns of the tumor and the spread of tumor margins over larger areas of the lesion, followed by digitally zooming (magnifying) for closer inspection of suspicious areas. However, faster processing of videos into video-mosaics will be necessary, to allow examination of video-mosaics in real-time at the bedside. *Lasers Surg. Med.* © 2019 Wiley Periodicals, Inc. **KEYWORDS:** imaging; intraoral; oral mucosa; reflectance confocal microscopy; squamous cell carcinoma; video-mosaicking PMID:31067360 DOI:10.1002/lsm.23090