



ORAL PRESENTATION

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Endoscopic ICG perfusion imaging for flap transplants: technical development

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From 2nd Scientific Meeting of the Head and Neck Optical Diagnostics Society
San Francisco, CA, USA. 23-24 January 2010

Objective

Endoscopic detection of fluorescence of indocyanine green (ICG) requires excitation in the NIR wavelength range <800nm and detection at >800nm. Commercial 3-chip endocameras can be made sensitive for the fluorescence emission in the blue channel by removing infrared blocking filters. It was the objective of the development to combine white light imaging (using the green and red channels only) and fluorescence imaging (using the blue channel) on a single 3-chip camera head. In addition, reliable pharmacokinetics of ICG perfusion images should be established.

Materials and methods

Optical filters were designed in a way that white light transmission was much reduced, near IR<800nm fully transmitted and light >800nm completely blocked. These filters were mounted on a filter wheel of an endoscopic light source (D-Light, Karl Storz, Tuttlingen). In front of the camera chip, blue light and the excitation wavelength range was completely blocked, the remainder of the visible wavelength range and NIR fully transmitted. White light remission was used as a reference for semi-quantitative fluorescence measurements.

Results

The restoration of a full-colour pseudo-white-light image from the green and blue channels was successfully established with minimal impact on colour perception. Fluorescence can be displayed in a separate window or in false colour overlay. White light remission also was used as reference light for semi-quantitative, online fluorescence measurements. By using motion tracked 'regions of interest' (ROIs) on the corrected data, the recording of fluorescence kinetics was possible

without influence of movement, illumination inhomogeneities and tissue geometry. Therefore calculations such as deconvolution of flap perfusion resistance were possible by comparing the fluorescence kinetics of the flap with the ones of the surrounding tissue.

Conclusions

Simultaneous recording of white light and ICG-fluorescence images is possible with a single 3-chip camera head. Motion tracking and correction of fluorescence images with white light remission images enables endoscopic ICG-perfusion imaging with semiquantitative measurements.

Published: 29 October 2010

doi:10.1186/1758-3284-2-S1-O14

Cite this article as: Stepp: Endoscopic ICG perfusion imaging for flap transplants: technical development. *Head & Neck Oncology* 2010 2(Suppl 1):O14.

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