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AUTHORS

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Commercial Relationships Disclosure (Abstract): Kaleena Michael: Commercial Relationship: Code N (No Commercial Relationship) | siti salwa Md Noor: Commercial Relationship: Code N (No Commercial Relationship) | Julius Tschannerl: Commercial Relationship: Code N (No Commercial Relationship) | Jinchang Ren: Commercial Relationship: Code N (No Commercial Relationship) | Stephen Marshall: Commercial Relationship: Code N (No Commercial Relationship)
Study Group: (none)

ABSTRACT

TITLE: The properties of the cornea based on hyperspectral imaging
ABSTRACT BODY:
Purpose: Hyperspectral Imaging (HSI) is a hybrid modality that combines imaging and spectroscopy. Here we investigate the ability of a hyperspectral device in extracting data from the layers in the porcine corneal tissue through the wavelength spectrum, in foreseeing its potential in clinical diagnostics by simplifying methods of examination by clinicians in detecting corneal injuries.
Methods: Hyperspectral imaging using 400 to 1000nm visible wavelength camera was used to scan five porcine eyes, containing a mix of eyes with intact and unintact epithelial layer.

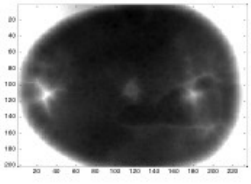
Images were saved and analysed in three dimensional rows, columns and depth slices at 1200 to 1300 x 804 x 604 resolution. The Matlab image processing toolbox was utilised to process the images for inspection in grayscale, HSV format and reflectance spectrum.

All laboratory works were performed in accordance with the general risk assessment of University of Strathclyde.
Results: The obtained hyperspectral images were able to demonstrate distinct differences through the wavelength. Images at longer wavelength reveal distinct shapes in regular arrangements, and could be descriptive of the physical properties of the corneal tissue in particular layers.

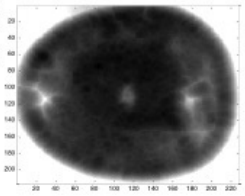
When comparing reflectance spectrum obtained from both eyes with intact and unintact epithelium, we were able to demonstrate distinct separation in reflectance values from 578 to 818nm wavelenghth.
Conclusions: Our analysis was able to demonstrate a gap in the reflectance spectrum between the intact and unintact epithelium of a porcine's cornea, illustrating its potential value in the assessment of corneal tissue integrity.
Further image processing with grayscale slices reveal distinct tissue properties at varying wavelengths strongly suggests a novel role for hyperspectral image technology in the diagnostics of corneal tissues, alongside traditional methods such as microscopy. These findings support our proposition for the role of hyperspectral imaging in aiding the development of innovative, mobile devices.

PRELIMINARY RESULT

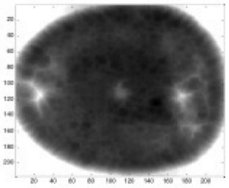
- Grey images sliced into areas of interest.
- Image sliced at band 518, 698, 758, and 818 nm respectively.
- Images at longer wavelengths reveal distinct shapes in regular arrangements, and is likely to represent individual cells.



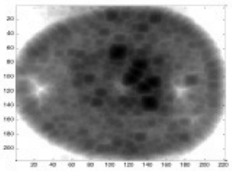
518nm



698nm



758nm

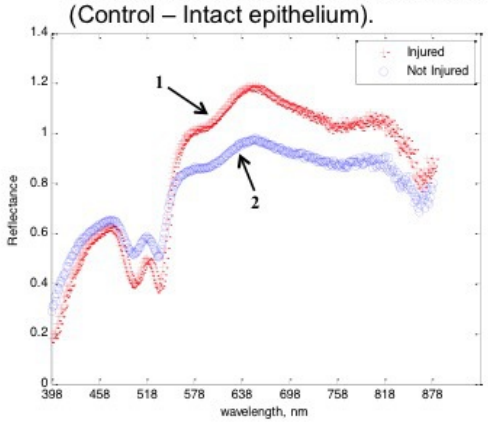


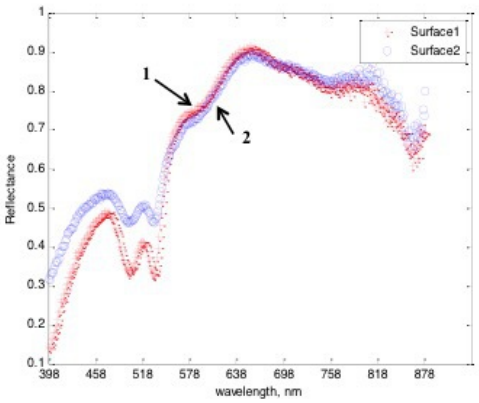
818nm

Selection of hyperspectral images slices

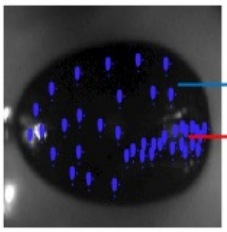
PRELIMINARY RESULT

- Reflectance spectrum acquired from Eye 1 (Unintact epithelium) and Eye 2 (Control – Intact epithelium).





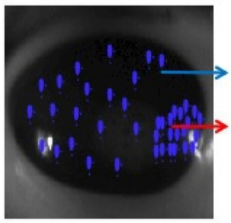
EYE1



Intact epithelium

Unintact epithelium

EYE2



Intact epithelium

DETAILS

PRESENTATION TYPE: #1 Paper, #2 Poster
CURRENT REVIEWING CODE: 1800 corneal imaging and topography - CO
CURRENT SECTION: Cornea
Clinical Trial Registration (Abstract): No
Other Registry Site (Abstract): (none)
Registration Number (Abstract): (none)
Date Trial was Registered (MM/DD/YYYY) (Abstract): (none)
Date Trial Began (MM/DD/YYYY) (Abstract): (none)
Grant Support (Abstract): No
Support Detail (Abstract): None

TRAVEL GRANTS and AWARDS APPLICATIONS

AWARDS: ARVO and ARVO Foundation Travel Grants|ARVO Members-in-Training Outstanding Poster Award

AFFIRMATIONS

Affirmations: Affirmation that submission of this abstract has been approved by the Principal Investigator.
Affirmations: Affirmation to pay Annual Meeting's full registration fee.
Affirmations: Affirmation to present same work as abstract submission.
Affirmations: Affirmation that abstract data/conclusions have not been published; not redundant with other submissions from same investigators.
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