Executive Summary
Corneal Diagnostic Indices

Innovation

This technology is a set of diagnostic indices to identify diseased corneas based on differences in corneal topographic maps between fellow eyes, enhanced through data mining and machine learning techniques. Specifically, this innovative method compares fellow eye data (difference between corresponding points on the cornea) to detect ectasia at its very early stages (before it has clinical signs or symptoms) so that patients can receive proper treatment in a timely manner and do not undergo any surgical procedures (e.g. LASIK and PRK) which can make their condition worse.

Market Need

Corneal topography is an integral part of a comprehensive eye examination and today's computerized topographers facilitate patient screening to a great extent. Currently, a wide range of topographers and imaging systems that use various technologies are available in the market. However, despite great scientific progress in our knowledge of corneal properties and technological advances in corneal imaging, identifying subclinical forms of corneal degenerative disorders remains a major challenge. Early diagnosis of keratoconus, for example, is necessary for preventing iatrogenic corneal ectasia in cases undergoing refractive surgery as well as for the early treatment of the condition using corneal collagen cross-linking, which has the potential to halt disease progression and reduce the need of corneal transplantation.

Intellectual Property

Provisional Patent Application No. 63/276,179 was filed in November 2021.

Stage of Development

The following has been completed with an I-GAP grant from OTT: 1) Code for identifying the type of symmetry (direct vs mirror) written and the workflow for each group separated; 2) Potential "tilts" identified and mitigated to compensate so that minimum interocular difference is achieved; 3) Masked the matrices by "ring" (rather than circle) and repeated some of the work done in the preliminary analyses performed in support of the thesis; and 4) Created a pipeline with the code, and run datafiles through the pipeline, doing the same steps for posterior corneal surface elevation matrices.

Technology Transfer Opportunity

Novel aspects of this innovation provide OTT the opportunity to impact a $631.1 million (2019) industry. Unique features include direct use of fellow cornea as reference for measuring elevation differences, using data from entire corneal surface, creating colormaps, and clustering analysis natural grouping of symmetry patterns in general population. These features can be integrated into larger ophthalmic instrument systems.

Key Investigators:
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Field(s) of Use:
-Ophthalmology
-Diagnostics
-Computer Science

Key Words:
-Machine Learning
-Topography
-Cornea
-Ecstasia

Advantages:
-Enables early diagnosis of corneal disorders
-Avoid unnecessary, or even detrimental, surgical procedures

Status:
Provisional Patent filed; I-GAP grant executed.

Links:
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