



**Project title:**

***Use of biocompatible filler material to correct refraction error in Hyperopia and Presbyopia***

**Background**

Hyperopia is typically a genetic condition in which normally the eye is too short or, rarely, the cornea is too flat to focus light on the retina. If the hyperopia is mild, muscles in the eye can adjust the lens shape (called 'accommodation') to properly focus light on the retina, effectively compensating for the hyperopic condition without the person being aware. If the hyperopia is too severe or the ability to accommodate weakens with age hyperopia needs to be corrected optically. Hyperopia affects about 5 – 10% of the US population across all age ranges.

In adults, the onset of presbyopia typically occurs in the mid-30's or early-40's and is often evidenced by the occurrence of frequent headaches, increased frequency of red, teary eyes and patients' need to hold reading materials further away in order to focus. Eventually, the purchase of 'reading glasses' is required. The worldwide patient population affected by presbyopia in 2005 was estimated to be over one billion people.

**The proposed solution:**

A bio-compatible transparent viscous liquid filler will be injected into a corneal pocket to precisely shape the cornea for refraction correction in hyperopia and presbyopia. The filler will be injected using a nano-liter injector into corneal pockets formed using an existing laser technology used in refraction corneal surgery. The refraction correction can be fine-tuned by adding or removing filler material as needed during and/or after the initial filler injection.

**Feasibility experiments:**

**A:** *In vitro* filler in pig eyes to evaluate various corneal pocket and channel configurations and to determine filler volume requirement for various levels of refraction correction.

**B:** *in vivo* filler materials in rabbits to evaluate selected corneal filler materials for tolerance/immunogenicity and stability.

**C:** *in vivo* filler in mini pigs to evaluate stability of refraction correction. (if there is time left)

**Personnel:**

1 Ophthalmology fellow – 1 year

1 Master student – 1 year

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