Sight & Science: Vision Research

Pilot Program 2

External Funding Opportunity (Multiple Awards Anticipated)

Four Areas of Immediate Medical Need
1. The Neuroscience of Light

Beyond vision correction. Improving patient’s health and quality of life.

- How can we use the management of light to improve patient health

- Example: Can we use static or photochromic spectral filters to selectively block specific stressful light wavelengths known to trigger migraine and/or transmit those known to alleviate it?
  - Link between visual stimuli, particularly photophobia and migraine attacks
  - Photophobia is commonly identified by patients as a disabling symptom of migraine

- Other potential applications:
  - Can harnessing specific wavelengths of light improve visual outcomes
  - Can harnessing specific wavelengths of light improve color perception
2. Myopia Control

CAN WE PREVENT THE RAPIDLY INCREASING PREVALENCE IN PEDIATRIC MYOPIA?

• How do we stop myopia progressing from -1.0D to -3.0D or -6.0D?

• Currently, there are no FDA approved treatments for controlling myopia progression in a pediatric population.

• Treatments currently under investigation include:
  • Orthokeratology
  • Soft contact lens- multifocal/peripheral blur optical designs
  • Atropine eye drops (0.05 -0.1%)
  • Spectacles – PALS, peripheral blur optical designs

Myopia is a Global Epidemic

• Incidence has skyrocketed in the last few decades.
• Prevalence in SE Asia is particularly high.
• Students (school & university) are most at risk.
• Genetics alone can’t account for the epidemic. Environment (modern lifestyle) is implicated.

THE MECHANISMS OF ONSET AND PROGRESSION MAY DIFFER. BOTH REMAIN UNKNOWN.

In 2004, 95.9% of 3709 freshman attending National Taiwan University were found to be myopic. In 2009, 93.3% of 5083 students at Donghua university were found to be myopic.
3. Cataract Removal

Rapid, low energy break-up and extraction of a crystalline lens with focal or diffuse opacification.

- **Large volume of surgeries > 20M globally.**
  - High surgical burden – most common surgery in western world.
  - Drive to reduce time and improve outcomes.
- **Current standard of phacoemulsification using ultrasound.**
- **Goal to Improve extraction of all cataract types.**
  - Nuclear, cortical and posterior subcapsular.
- **Reduce intra-operative and post-operative complications including:**
  - Capsular tears with and without vitreous loss;
  - Endothelial cell loss;
  - Retinal detachment; and
  - Hemorrhage.
4. Post-Surgical Refractive IOL Enhancement

Improving and fine tuning refractive outcomes.

- **Cataracts**: Clouding of the crystalline lens resulting in degradation of vision.
- **Cataracts** are globally the leading cause of preventable blindness.
- **USA >3.3M cataract surgeries performed per year**: Globally >20M.
  - Results in removal of cataract.
  - Implantation of a synthetic intraocular lens (IOL) to restore vision.
- **However, not all surgeries meet refractive targets**.
  - Between 35-50% patients will still require spectacle correction.
  - IOL replacement complicated and risky.
4. Post-Surgical Refractive IOL Enhancement

Improving and fine tuning refractive outcomes

- High unmet need to improve patient outcomes.
  - Can we safely adjust the power of the IOL after its implanted to improve patient vision? Preferably without invasive surgical intervention.
  - Can we safely adjust the power of the IOL intraoperatively?
  - Can we improve the predictability of IOL positioning in the eye?
  - Make the IOL design more robust to patient/patient variations.
  - Make IOL more robust to effective lens position with in the eye.