Breakthrough Technologies on the Horizon in Eye Care and Medicine

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Eye Care Technology

Smart Contact Lens Technology

Vision Related Apps

Medical Technology

Electronic Eye Occluder

Temporary LCD digital patch which alternates from clear to opaque every 30 seconds mimicking the therapeutic effect of eye patches and eye drops

3 month study 33 children between 3 - 8 years old with moderate amblyopia of 20/40 to 20/100 vision

• Half - used patch 2 hours a day
• Half - wore Amblyz 4 hours a day

AMBLYZ: High-Tech Glasses
Replaces Patch for Amblyopia...

Both groups obtained two additional lines on a standard reading chart

• Potentially easier, less distressing and may improve compliance
• Potential downside is cost...Parents may not judge the coolness of the digital glasses to be worth the $450 price

Atropine .01% Myopia Control

400 children age 6 to 12 - randomly assigned a daily dose of atropine for 2 years

Developed Asian countries report myopia rates of 80 to 90 percent among young adults.

United States, an estimated 42 percent of the population is currently myopic

Inhibits axial growth of the eye associated with nearsightedness

Exact mechanism of action unknown

Conclusion - showed .01% slowed down myopia by roughly 50% in five-year clinical trial on Singaporean children.
§ 438 children ages 4 to 12 years with myopia treated with low-dose atropine for 1 year

Kids were randomly assigned to receive .05%, .025% or .01% atropine drops or placebo once nightly to both eyes for 1 year.

Of the three concentrations used, 0.05% atropine was most effective in controlling myopic progression and elongation over a period of one year.

**LAMP Study:**

Low-Concentration Atropine for Myopia Progression study

- 438 children ages 4 to 12 years with myopia treated with low-dose atropine for 1 year
- Kids were randomly assigned to receive .05%, .025% or .01% atropine drops or placebo once nightly to both eyes for 1 year
- Of the three concentrations used, 0.05% atropine was most effective in controlling myopic progression and elongation over a period of one year.

**Brown Eyes Blue – Stroma Procedure**

- 30 sec. laser photo-disruption of the brown stromal melanocytes of the iris keeping the cornea and posterior iris intact.
- First clinical trials began Nov. 2018 in Costa Rica (14 patients) and in Panama (20 patients).
- Laser owned by US company, but doesn’t have FDA approval yet.
- No evidence of Pigmentary GLA.
- Cost $5K per eye.

**Lanosterol Eye Drops - Cataracts melt away**

- Leading cause of Blindness Worldwide affecting over 20 million people (90% of all cataracts in underdeveloped countries)
- Steroid eye drops which prevents protein from building up in the lens
- Non-invasive treatment for mild to moderate cataracts
- Prevents re-ocurrance
- Initial trials required drops plus injection
- ThruDelivery nanotechnology made drop only possible
- Currently used in Veterinary medicine
- NOT available on-line.

**Dr. Sanduk Ruit – “Nepal’s god of sight”**

- Simple small incision cataract microsurgery technique without stitches developed by Nepali eye doctor Dr. Sanduk Ruit
- Costs only $25 per patient and is virtually always successful.
- Current surgery in Nepal and Himalayan countries, but taking his model to other low-income countries.
- “Miracle Doctor” has restored sight to more than 100 K people!

**Corneal Cross Linking**

- Slows progression of corneal ectatic disease like keratoconus, other degenerations and refractive surgery ectasia.
- Cornea is infused with riboflavin (vitamin B2) and UV light in the 360 - 370 nm range is applied creating covalent bonding between collagen fibrils, increasing the tensile strength of the corneal stroma.
- Also used for unresponsive corneal ulcers.
Is the end of Eye Drops near?

- Eyenovia’s Optejet dispenser delivers 8 µL of drug, most likely in non-preserved form, in a fine mist gently onto the cornea.
- Kedalion AcuStream similarly delivers approximately 10 µL of drug most likely in a thin stream of fluid that makes contact with the cornea before one can blink.

EagleEyes Technology

- Eye gaze controlled device
- For individuals who have limited to no intentional muscular control and whose only controlled muscular movement is their eyes.
- Gives access to computer for severe physical disabilities
  - Stroke
  - TBI
  - Cerebral Palsy
  - Neurological disorders

EagleEyes Technology

- Uses a set of 5 electrodes placed around the eyes to communicate eye movement through a computer, interpreting it as movement of a computer mouse.
- Allows people who are unable to move their head or arms to manipulate a computer mouse through eye movement.
- Used for education, communication and recreation

eSight Electronic Glasses

- Wearable electronic glasses with small, high-speed camera that captures and creates a live video stream.
- Instantly sent to computer that uses proprietary software to process video and projects on two screens in front of eyes.
- Remote control and zooms up to 24X.
- Able to take photos.
- Cost for eSight 3 is $9,5K (Down from $15K).

Kamra device

- Implantable Inlay for Reading
- 508 patient U.S. trial funded by AcuFocus.
- 87% of patients who kept the inlay/implant for the 3 year study had at least 20/40 vision in the treated eye.
- $3.5K - $6.5K

Optical Technology

2019-2020 Consumer Electronics Show

- Wearable Virtual Reality Technology
- Smart Wear designed to track Athletic performance with High Def. Cameras
Optogenetics - Emerging Light Therapy

- Works by using light energy to activate or awaken neural retinal cells allowing for restoration of vision in the blind like in RP

- May be used in the future by bestowing light sensitivity to the brain to restore neurodegenerative diseases like Parkinson’s, Depression, MS, Sleep disorders

“Bionic Lens”

- Custom made “vision enhancement/lens” to be surgically injected in the eye that promises to give pts. eyesight 3X better than 20/20 regardless of a person’s health or age.
- 8 minute procedure
- Best candidates are over age of 25
- Designed to replace the natural lens
- $3K/eye

RightEye

- Uses eye-tracking technologies to quickly and accurately MEASURE and ANALYZE data about a person’s vision and brain health with a 5 minute test
- Reveals areas where individuals can improve and TRANSFORMS their vision and their health through customized online games that help improve deficient areas

RightEye Uses

- Vision Care - Visual acuity, Eye dominance, Peripheral vision, Vergences, Reading
- Sports - meeting Maximal visual performance by increasing Dynamic visual acuity, Visual processing time and Concussions
- Military and Law Enforcement - improving Focus, Peripheral vision, and Visual reaction times

Second Site Retinal Implants

- Glasses with a video camera mounted on them which sends signals to an implanted retinal microchip
- Electrical signals stimulate the remaining healthy receptors in the retina by traveling from the optic nerve to the brain.
- Initially used in Retinitis Pigmentosa patients
- Future use with GLA, Diabetic Retinopathy, Optic Nerve disease
- 150 Second Sight systems World wide =$145 K

Second Site System

- Video camera mounted on a pair of eyeglasses
- Video processing unit that transforms images from the camera, wirelessly transmits electronic signals to the implanted retinal microchip to stimulate visual neurons
- Gives blind pts the ability to perceive light, detect motion and locate large objects
Telescope for AMD

- Implantable miniature telescope, behind the iris, used in pts with late-stage bilateral AMD
- Projects enlarged images in your field of view onto healthy areas of your central retina outside of the degenerated macula
- 5 year study showed best improvement in VAs in pts aged 65-75 yrs

Vasotide Eyedrops

- Molecule used to treat AMD and ROP by preventing neovascularization (Animals)
- When delivered in the form of eye drops it offers a promising alternative to current therapies for retinal diseases
- Future clinical trials with diabetic retinopathy
- Potential to replace injections

Acute NAION study QRK207

- Phase 3, Randomized, Double-Blind, Sham-Controlled Trial of QPI-1007 Delivered By Single or Multi-Dose Intravitreal Injection(s) to Subjects With Acute NAION
- 510 subjects with recent-onset NAION
- 5 groups in a 1:1:1:1:1 ratio, and assigned to receive QPI-1007 or a sham procedure. Subjects will have a one in five (20%) chance of receiving sham procedure
- 5 cohorts: single low dose injection, single high dose injection, multiple low dose injections, multiple high dose injections, and sham injection procedure

Study Purpose

- Determine the effect of QPI-1007 on visual function in subjects with recent-onset NAION
- Assess the safety and tolerability of intravitreal injections of QPI-1007 in this population
- Evaluate the structural changes in the retina following administration of QPI-1007
- Total study time involvement is approximately 12 months.

Key Inclusion Criteria

- Males and females 50-80 years old
- Positive diagnosis of first episode of NAION in the study eye with symptom onset within 14 days prior to planned study drug administration/sham procedure
- Clear ocular media and able to undergo adequate pupil dilation to allow a good fundus examination

Go to www.EyeActNow.com for current sites

SMART CONTACT LENS TECHNOLOGY
Smart Contact Lens Technology

- Revolutionary opportunity for Optometric Industry
- Ocular monitoring of patient medical and ocular health
- Next wave in consumer electronics

Google Smart Contact Lenses May Help Monitor Health

- Next-generation contact lenses are packed with circuits, sensors and wireless technology – all designed to keep an eye on your health

Smart Contact Lenses Potential to Replace Blood testing

- Biomarkers
- Cholesterol
- Sodium
- Potassium
- Glucose

Smart Glucose Lens

- Measures glucose in the tears
-Wireless chip & miniaturized sensor
- Takes a glucose reading once every second
- Diabetes diagnosis and management

Sensimed Trigger Fish (IOP) 02/2016

- 24 hr. IOP monitoring
- Sensor detects changes in lens curvature as IOP fluctuates, the curve changes, generating an electrical signal
- Method to determine effectiveness of a new medication
- Possible use for slow release medication
- Used to monitor GLA (Europe and Japan)

Drug Delivery Nanowafer Technology

- Potential to replace eye drops due to inefficient and poor compliance
- Small transparent circular disc that contains nanoreservoirs for delivery of a drug slowly and consistently before dissolving
- Blink activated and 1/20th the thickness of a CL
- GLA, Dry Eye and Corneal Neo.
- Antibiotics, Anti-inflammatories, Antivirals, Lubricants
CL for Macular Degeneration
- Scleral CL with tiny reflective telescope with small mirrors that bounce light to allow variation between normal and magnified vision
- Center is unmagnified
- Periphery is magnified by 2.8 X
- Works with Blink controlled glasses that activate the magnification process

Google Lens with built in Camera
- Captures images and transmits wirelessly to a smart device for processing
- Possible Uses:
  - Data from lenses could emit an audible warning for low vision pts in case of danger as in a busy traffic intersection
  - Police and Security Spot criminal faces, Incoming fire, Seeing through smoke, etc.

Photo-responsive CL
- Mimics the iris' natural response to light
- Photochromic material changes opacity levels when exposed to blue light
- Rapid reversible activation can alleviate photophobia, glare and poor vision in those with poor iris function
- Aniridia and trauma

Will Smart Contact Lenses Be the Bluetooth Headsets of the Future?
- **Solar Powered CLs** with transparent LEDs embedded onto the lens with the following applications:
  - Text translation right in front of the wearer's eyes to find out about your surroundings (Traffic Report, weather, etc.)
  - Access to internet
  - Zoom in and out to enhance vision
  - Provide better color and resolution to enhance vision

VISION Performance APPS
- Presbyopes can improve the image processing function by teaching the brain to better interpret blurred images
- 15 min/day 3 D/week for 3 months
- Study at University of CA. Berkley showed 10 year age improvement

GlassesOff Iphone
iNview (VOLK)
- Apple Mobile App
- Indirect Ophthalmoscopic lens attachment
- Apple iPhone or iPod
- 50-degree field of view
- Auto-Capture Technology
- $1495

Magnifying Smart Phone Glasses
- Projects a magnified smartphone screen to Google Glasses
- Users can navigate using head movements to view the magnified screen.
- Can benefit low-vision users

Vision Tap for I-pad
- Enhances visual perception, reading speed, reaction time, eye-hand coordination, reaction time, as well as some reading and learning issues.

MEDICAL BREAKTHROUGHS

Focused Ultrasound - Cure For Alzheimer’s?
- Ultrasound technology breaks down the neurotoxic amyloid plaques that contribute to memory loss
- Tests on mice, restored memory function to 75%
- Phase 1 of first human trial completed July 2018

Cure For Alzheimer’s?
- Root of the problem lies within the brain’s defense mechanisms
- Brain responds to abnormal plaques by switching off the brain’s defense mechanism with an increase in enzyme production called PERK.
- PERK enzyme prevents the brain from healing itself, leading to the neurodegenerative damage associated with Alzheimer’s and Parkinson’s
- By using a drug that inhibits the production of Perk, that destructive effect might be prevented
NIH funded research at Orlando Health ER with 700 children and adults with probable Concussion

Identified a Blood test that detects levels of a protein indicating whether a person has a concussion and its severity

Correctly identified the presence of traumatic brain injuries in 94% of the cases

Much more accurate than symptoms only

CT Scans and Blood Test results compared

High definition imagery from the CT scans was able to identify which patients had suffered visible traumatic brain injuries.

Blood serum from the same patients was tested, which was taken less than 6 hours after their injuries and found that it accurately identified the presence of brain injuries 94% of the time.

Nearly as accurate as a state-of-the-art CT scan

Compound that mimics the effects of exercise, including weight loss and improved glucose tolerance

Tricks the body cells into acting as if they are running out of energy which then triggers the cells to increase glucose uptake and increase metabolism

Potential treatment for obesity and Type 2 Diabetes in pill form

Researchers analyzed medical records of 37,000 patients from a Wisconsin clinic

The researchers looked for signs whether or not those who took Levodopa had lower rates of age-related macular degeneration

Normal diagnosis of AMD around age 71

Among those who took levodopa, AMD diagnosis occurred much later around age 79

L-dopa may potentially be used to treat or prevent AMD

Research in Hong Kong due to high prevalence of Cancer in Chinese

Analyzes blood for circulating tumor cells to detect cancer

Goal is to be able to detect cancer by using special fast DNA sequencing machines

Still in research currently

Philips’s Lumify Level 11 App based Ultrasound

Paired with a smartphone or tablet and Ultrasound transducer to create a Handheld Ultrasound
Prosthetic Technology

- Boston Marathon victim - Adrianne Haslet-Davis lost leg in 2013 and ran in 2016
- Brendan Marrocco, a veteran of the Iraq war underwent a 13-hour surgery for his double hand and arm transplant and is now able to throw and catch a ball with his brand new limbs.

Smart Skin

- Highly sensitive artificial skins that can actually feel
- Uses microscopic 3D technology, this “smart skin” accurately imitates the sense of touch.
- Chameleon inspires “smart skin” that changes color in the sun for a range of potential applications, such as camouflage and chemical sensing

Clone Yourself An Organ...

- Tissue engineering has allowed scientists to take existing tissue from a patient and use it to grow a brand new organ
- Eliminates the need to wait for a good “match”
- No need for lifetime on immunosuppressant drugs decreasing overall healthcare cost
- In the long run can slash the cost of medical care

Regenerative Medicine

- Stem cells, 3-D printing and Bioengineering hold promise for sight restoration and organ replacement
- Stem cells to grow Retinal organoids (AOA First Look 10/11/18)
- Helping repair, and even regenerate, body parts and tissues damaged by disease, trauma or age.
- Harness the Healing Powers of the Human Body

Thank You for your attention!!

Any?

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