RETINAL IMPLANTS AND PROSTHESES

Argus II: the Canadian experience & the future of retinal bionics

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Allergan: (c); Bausch and Lomb: (c); Bayer: (c); Novartis: (c);

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“Any sufficiently advanced technology is indistinguishable from magic.”

Toward the Miracle of Retinal Reanimation
Russel N. Van Geelker, MD, PhD - Seattle, Washington

- Optoelectronics.
- Cell replacement.
- Gene therapy.
- Photopharmacology.
ARGUS I


ARGUS II


INCLUSION AND EXCLUSION CRITERIA

- Affected by retinitis pigmentosa (RP)
- ≥ 25 years of age
- Patients with visual memory
- Flat electroretinographic readings
- Residual light perception
- Reasonable patient expectations
- Compliance to follow up
- Axial length (20.5 and 26.0 mm)

OUTCOME PARAMETERS

- Clinical
  - Mobility
  - Spatial localization
  - Reaction to motion
  - Framing visual acuity
  - Goldmann visual field
  - Optical coherence tomography

SURGICAL VIDEO

1ST ARGUS II SURGERY IN QUEBEC (SEP. 2015)

RETINAL CHIP IMPLANT

2016 ASRS FILM FESTIVAL WINNER
Optimizing Patient Selection
Optimizing Surgical Technique
Optimizing Device Fitting
Optimizing Visual Rehabilitation

RESULTS - SURGICAL COMPLICATIONS
- Device failure: 4 cases
- Explantation: 6 cases
- Repositioning: 1 case

OPTIMIZING SURGICAL TECHNIQUE

- Conjunctival erosion 5.4%
- Hypotony 5.4%
- Retinal detachment 1.8%
- Endophthalmitis 1.8%
- Macular edema 7.1%

Courtesy of Thiran Jayasundera, Kellogg Eye Center

OPTIMIZING DEVICE FITTING
- Programming takes 2-3 sessions (8-10 hours)
- Patient fatigue
- Inadequate RF link
- Overheating of the coil
- False positives
- Adaptation between stimulations
- Interference from spontaneous phosphenes

New Programming Assistant
Smaller coil with better alignment
Threshold testing done at a slower pace with rests

OPTIMIZING VISUAL REHABILITATION

Note: video may not represent usual use of the device. Do not attempt at home without the supervision of professionals.

PATIENT RESULT
ARGUS PROS AND CONS

• Advantages
  - Completely ocular surgery
  - Great support team for patients and surgeons.

• Limitations
  - Low image definition (large pixels);
  - Very limited field of view
  - Challenging visual rehab for patients;
  - Very large sclerotomy size (5.2-5.5 mm) with bulky apparatus
  - Equipment very sensitive to instrument touch (hard to handle to avoid damage);
  - Potential scleral gap and open wound where cable penetrates the eye;
  - Prolonged surgical time (requires general anesthesia);
  - Complex surgical steps (tacking, bimanual technique, experienced surgeons).

ALPHA IMS: TUBINGEN
- Stingl et al. Vis Res 2015;111:149-60.

PIXIUM VISION
- Pixium - Epiretinal
- 150 electrodes
- C E m a r k approval;
- 20 RP cases done in France.

PIXIUM IRIS AND PRIMA
- Iris
- Chirurgie Assistée
- 20 RP cases done in France.