Adapting the RETeval™ ERG device into a veterinary tool (RETevet™)

INTRODUCTION

There are approximately 15 million dogs in the United States. Fully 45% of all U.S. households have at least one dog as a pet. Many pet owners view their dogs as cherished family members and are willing to spend considerable sums of money to prolong the quality and length of their pet's life. This provides a rising and lasting source of income for veterinary healthcare providers. There are approximately 100,000 veterinarians practicing in 8,000 clinics. The prevalence of dogs, veterinarians, clinics, and households with pets is similar in the European Union.

The formation of cataracts is a very common ophthalmic condition in dogs. A cataract is a clouding of the lens impairing their vision, especially in the old, in dogs, cataract formation is primarily an age-related ophthalmic disease, affecting 60% of dogs at 5 years of age regardless of breed (William, Heath, and Wells, 2004). However, certain breeds, such as the American Cocker Spaniel and the Miniature Poodle develop genetically triggered cataracts earlier in their life. Diabetes, cataracts, uveitis, glaucoma, dog tumor, and dermatitis can also be covered under cataract formation. Overall statistics show 2-2.5% cataract prevalence across all dog breeds with no significant difference between breeds (Ophelia and Marcelli, 2015).

In order to provide owners and patients with quality and treatment, veterinarians abuse the use of medical equipment designed for humans. The ophthalmic phacocentric filtration by introducing lenses is limited in the most suitable way to treat immature and mature cataracts in dogs (Matthews, 2006), in order to optimize the probability of success in removing past cataract surgery vision and to improve happiness, all clinics should properly perform an assessment of refractive correction prior to cataract surgery (Hoffman, 2010).

The full-field electroretinogram (ERG) is a diagnostic test that measures the electrical activity of the retina to a response to a light stimulus (Early). Rod-cone responses are obtained after a dark adaptation period, followed by near illumination. The rod function is derived by using the latency, amplitude, and threshold of the a-wave. Cone responses are obtained after a period of light adaptation with a constant background light and high intensity flashes. Typical ERG protocols combine three conditions in a short stimulation procedure involving shifts in stimulus duration and intensity to assess the basic function of individual photoreceptors. Obtaining full-field rod and light adapted ERGs allows to get the control or the cataract surgery vision but the retina is being done in fundus imaging. Usually, near ERG results suggest that the removal of the cataract will improve visual function if the retinal function is substantially decreased, cataract surgery might contribute to the improvement of visual function, possibly due to additional ocular disease.

In conclusion, electroretinogram testing is recommended to monitor the condition of a cat’s retina and to plan the treatment necessary to improve the quality of vision.

MATERIALS AND METHODS

All the cataracts observed in this study were obtained in Texas Veterinary Ophthalmology, a board-certified specialty practice providing eye care to animals of the Greater Fort Worth, Texas. Dr. Ophelia DeCoster performed the ERG and cataract surgery.

Subjects
- 17 dogs (14 males) evaluated for cataract surgery
- Small, and medium breeds
- 6-24 years (mean ± standard deviation 15.6 ± 3.5 years)
- Unilateral or bilateral
- 4 dogs with normal vision served as controls (2-4 yrs cachorros, 1 y/o, 6 yrs, 11 yrs, 2 yrs, 14 yrs, 18 yrs)

Methods

Electroretinography (ERGs)

- The RETeval device (LKC Technologies) was used to record the ERGs
- Dogs were treated with an 0.6% cocaine sodium to stop pupil size before recording a 30°-diameter field with a 10-2 protocol in the ERG measurement
- The photopic stimulus was 1000lux white light
- The scotopic stimulus was 3lux white light
- The photopic ERG was recorded using a 30°-diameter weberian light
- The scotopic ERG was recorded using a 30°-diameter light
- The photopic ERG was recorded using a 30°-diameter weberian light
- The scotopic ERG was recorded using a 30°-diameter light

RESULTS

Table 1: Cataract formation and refractive function of cataract surgery available.

<table>
<thead>
<tr>
<th>Dog ID</th>
<th>Cataract formation and refractive function of cataract surgery available</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Photopic ERG: Normal, scotopic ERG: Normal</td>
</tr>
<tr>
<td>2</td>
<td>Photopic ERG: Normal, scotopic ERG: Normal</td>
</tr>
<tr>
<td>3</td>
<td>Photopic ERG: Normal, scotopic ERG: Normal</td>
</tr>
<tr>
<td>4</td>
<td>Photopic ERG: Normal, scotopic ERG: Normal</td>
</tr>
</tbody>
</table>

Table 2: Normal (age-matched) ERG measurements.

<table>
<thead>
<tr>
<th>Waveform</th>
<th>Photopic</th>
<th>Scotopic</th>
</tr>
</thead>
<tbody>
<tr>
<td>a-waves</td>
<td>Amplitude</td>
<td>20 µV</td>
</tr>
<tr>
<td>b-waves</td>
<td>Amplitude</td>
<td>20 µV</td>
</tr>
</tbody>
</table>

DISCUSSION

- Due to the positive outcome of their electroretinograms, out of 17 dogs (94%) were deemed to be suitable candidates for the cataract surgery.
- ERG amplitudes greater than the norm in reference of age and breed in calculated and normal values were considered a good prognosis for light transference exhibits the presence of a discoidal function and are representative.
- The ERG results revealed to be:
  - Establishing the presence of the retina can be evaluated using 30°-diameter field.
  - Establishing and confirming the Bitemporal Optical Degeneration Syndrome (BODS) diagnosis.
  - Detecting and confirming the presence of discoidal function.

CONCLUSION

- ERG as an essential pre-surgical evaluation tool able to efficiently discriminating between suitable and unsuitable cataract surgery candidates.
- RETeval is readily available to be used in veterinary settings to measure dog retinal function.
- ERG recordings in dogs can be successfully obtained without any anesthesia or sedation using RETeval.
- Results obtained with RETeval were crucial in establishing diagnoses and further treatment of the animal.