The efficacy for functional evaluation of feline hereditary rod cone degeneration using a portable mini-Ganzfeld electroretinography unit

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Background: Objective evaluation of retinal function is often needed in the clinical and research environment. We studied normal cats and cats affected with different stages of inherited rod cone degeneration to evaluate the efficacy for obtaining a diagnosis with a new portable mini-Ganzfeld ERG unit, using it in parallel with a conventional tabletop Ganzfeld ERG. Previous studies, with large ERG equipment and extended protocols, have shown that a significant reduction in scotopic high intensity a-wave amplitude together with a corresponding increase in b/a wave ratio is diagnostic for early stage feline rod cone degeneration.

Methods: Eleven affected cats in different stages of disease (S2 - S4; early (A), moderate (B) and advanced (C)), and four normal controls were anesthetized using a combination of medetomidine (0.09 mg/kg, IM) and ketamine (5 mg/kg, IM) and studied using the protocol recommended by ISCEV for diagnostic ERGs in humans. Cats were dark-adapted overnight and prepared under red lights. Scotopic ERGs were first obtained using a portable Ganzfeld unit (HMsERG, RetVet Corp., Columbia, MO) followed by photopic recordings using the larger unit. A- and b-wave amplitude and implicit times were evaluated along with waveform shape, b/a-wave ratios and oscillatory potentials (OPs). The latter were obtained from responses to high intensity stimuli under scotopic conditions through digital filtering at 100 to 300 Hz. The ISCEV protocol, followed by photopic recordings, were used with 30 cd/m² background light, with 30 cd/m² background.

Results: Figure (left) shows results of ERG tracings using the HMsERG and the TOR units, respectively. In affected animals, the mean amplitude of the scotopic a-wave using 3 (HMsERG) and 1 cd.s/m² (TOR) respectively, of white light stimulation was significantly lower already in early disease: 197 ± 82 µV using the HMsERG (p=0.004) and 116 ± 44 µV for the TOR unit, when compared to results of controls: 559 ± 115 µV and 307 ± 65 µV, respectively. Similarly, significant differences between affected early stage cats and controls were found for the b-wave amplitudes, although not as marked (p=0.014 for the HMsERG) in early disease compared to those of normal cats using both units. A- and b-wave implicit times, were not found to be diagnostic when comparing early stage affected and normal cats using either equipment, and 3 and 1 cd.s/m², respectively, of light intensity stimulation. OPs were reduced in affected cats in comparison to those of normal cats (data not shown) using both instruments. The ERG waveform shapes obtained using the portable unit were comparable to those of the conventional tabletop unit (Figure, left).

Conclusion: The portable mini-Ganzfeld HMsERG provided results that were remarkably similar to the conventional tabletop full-field ERG System TOR in normal and affected animals. Although subject to further evaluation, this study shows the efficacy of the portable unit in the diagnosis of generalized photoreceptor disorders. Additional work is underway to establish reference ranges using the portable ERG for research and in the clinical practice.

References: