Evaluation of the optic nerve head and peripapillarity retinal nerve fiber layer using optical coherence tomography in normal canines

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What is Optical Coherence Tomography (OCT)?
OCT
ultrasound of the cellular layers of the retina
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used in human medicine to monitor vision-threatening conditions
repetitive!
non-invasive!
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used in human medicine to monitor vision-threatening conditions
repeatitive!
non-invasive!
Objective
This study aims to establish reference ranges for measurements of the optic nerve head (ONH) and peripapillary retinal nerve fiber layer (RNFL) using optical coherence tomography (OCT) in normal canines to monitor patients predisposed to or suffering from glaucoma and prolong vision.
Why is this important?
Glaucoma

*In dogs, one of the most common vision-threatening and painful ocular diseases*

↑ intraocular pressure (IOP)
Glaucoma

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↓

**pain** and irreversible damage to the optic nerve head (ONH) and retina
Glaucoma


blindness
Controlling Glaucoma

- Timely diagnoses
- Consistent therapeutics
- *Frequent monitoring*
Methods
Recruiting

• Enroll 8 normal dogs
  – Without history of ocular disease
  – 4 males and 4 females
  – 5-7 years of age
  – 10-20 kg in weight
Recruiting

- Enroll 8 normal dogs  Enroll 12 normal dogs
  - Without history of ocular disease
  - 4 males and 4 females  6 males and 6 females
  - 5-7 years of age  4.5-8.75 years of age
  - 10-20 kg in weight  7.8-45.5 kg in weight
Ophthalmic and Glaucoma Work-up

- Comprehensive ophthalmologic examination
  - Slit-lamp biomicroscopy
  - Fundic exam – indirect ophthalmoscopy, fundic photography
- Glaucoma work-up
  - Tonometry (TonoVet®; Icare, Helsinki, Finland)
  - Gonioscopy
  - Ultrasound biomicroscopy (Compact Touch STS/UBM, Quantel Medical, Cournon d’Auvergne, France)
Subjects were sedated

MANY OCT images were taken (Spectralis®, Heidelberg Engineering)
Imaging

Circle – peripapillary RNFL

Line – ONH parameters
Measurements

- Measured using ImageJ
- Area of peripapillary RNFL
- Cup Volume (CV)
- Maximum Cup Depth (MCD)  
  - Depth of deepest portion of the cup
- Bruch’s Membrane Opening (BMO)  
  - Distance between each side of the termination of the retinal pigment epithelium layer (or neural canal opening)
- Lamina Cribrosa Displacement (LCD)  
  - Perpendicular distance from BMO to posterior laminar surface at the most depressed point
Results
Results

Age & Weight

- age and weight are **insignificant** in ONH parameters
Results

Age & Weight
- age and weight are **insignificant** in ONH parameters
- peripapillary RNFL trends with weight, but not age
Results

In normal canines, variation in the ONH and peripapillary RNFL is critically influenced by the differences in myelination between subjects.
## Results

### Measurements
- Our method of measuring ONH and peripapillary RNFL parameters is repeatable, except LCD.
- The most accurate value to use is MCD due to the low standard deviation and it can account for differences in myelination between patients.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean ± SD</th>
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<tbody>
<tr>
<td>Peripapillary RFNL (µm²)</td>
<td>1,259,472.5 ± 179,698.8</td>
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<tr>
<td>CV (µm²)</td>
<td>236,487.2 ± 85,466.9</td>
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<tr>
<td>MCD (µm)</td>
<td>309.8 ± 49.7</td>
</tr>
<tr>
<td>BMO (µm)</td>
<td>2,123.6 ± 163.0</td>
</tr>
<tr>
<td>LCD (µm)</td>
<td>81.1 ± 35.7</td>
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Future Outcomes

- Increasing the number of subjects
- Perform the same study on patients affected by or are predisposed to glaucoma to make comparisons
  - Specifically using MCD and peripapillary RNFL
Acknowledgements

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Thank you for listening! 
Questions?