

ABSTRACT FORM, ECVO/ESVO MEETING

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In vivo confocal microscopy of the cornea

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Purpose: To evaluate the applicability of in vivo confocal microscopy (IVCM) in veterinary ophthalmology and to analyse the in vivo morphology of corneal sublayers, corneal nerve distribution and density in different animal species.

Methods: 95 privately owned animals were examined with a confocal corneal microscope (HRTII/RCM; Heidelberg Retina Tomograph II/Rostock Cornea Module®, Heidelberg Engineering, Dossenheim, Germany). 5 awake dogs with usage of topical anesthesia (Proparacain/POS®, Ursapharm, Germany) and 90 patients were measured under general anesthesia for reasons unrelated to this project.

23 dogs, 19 cats, 3 birds, 1 horse, 1 guinea pig were included in this morphology study. Patients subjected to the examination of slit-lamp biomicroscopy must be free of any corneal abnormalities. In a contact procedure, the cornea is scanned sequentially in the z-axis with a periodically deflected diode laser beam (670nm) in a confocal system.

Two dimensional sectional images consisted of 384x384 µm with an optical resolution of 2µm and magnification of 800 x. 50-200 images per patient was performed. For the examination a swiveling holder mounted on a moveable S7 floor stand® (Carl Zeiss Meditec AG, Jena, Germany) was constructed. In this through focusing system all layers of the cornea were investigated and differences of the species were compared.

The analyzation of the images was focused on the distribution and morphology of corneal nerves, especially on the quantification of central subepithelial and basalepithelial nerve plexus in 6 mesaticephalic dogs and 7 domestic short-haired cats. Nerve fiber length (NFL) was determined using Scion Image 4.0.2b (Scion Corporation, Frederick, Ma., USA). NFL was defined as total length of nerve fibers and branches in µm/frame, calculated in mm/mm². Statistical analyses of the morphometric data were performed with SPSS 11.0.1 software (Lead Technologies, Chicago, Illinois, USA).

Results: In all patients the different epithelial cells, the corneal stroma and the endothelial layer were demonstrated. The corneal stromal nerve trunks, subepithelial and basalepithelial nerve plexus were observed. With IVCM the basal laminae and epithelial nerve endings can not be visualised. The basalepithelial nerve plexus can only be demonstrated in dogs and cats. The mean NFL in dogs were 12.48 ± 4.21 mm/mm² in the subepithelial nerve plexus and 12.56 ± 4.01 mm/mm² in the basalepithelial nerve plexus (P=0.98). The NFL of the subepithelial nerve plexus in cats were 14.63 ± 2.79 mm/mm² and 19.13 ± 3.82 mm/mm² in the basalepithelial nerve plexus (P=0.055). The differences between NFL of the subepithelial nerve plexus in dogs and cats was not significant (P=0.45). The NFL of the feline basalepithelial nerve plexus being significantly higher than in those of dogs (P=0.037). In comparison to the canine or feline subepithelial nerve plexus, the avian subepithelial nerve plexus seemed to be more reticulated and densely innervated, with a NFL of 25.26 mm/mm².

Conclusion: The non-invasive IVCM provides an accurate detection of corneal sublayers, innervation and enables a reliable quantification of corneal nerves in different animal species. For clinical usage of the adapted HRTII/RCM® in veterinary ophthalmology the patients must still be under general anaesthesia at present. The canine and feline NFLs represent reference values of corneal nerve density.

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