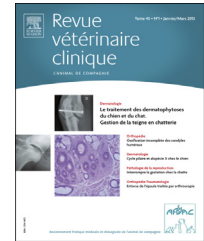Disponible en ligne sur

ScienceDirect
www.sciencedirect.com

Elsevier Masson France

EM|consulte
www.em-consulte.com

ELSEVIER

ORIGINAL ARTICLE

Analysis of factors of variation in lens equatorial length and axial globe length measurements using ultrasonography in dogs with cataract[☆]

Analyse des facteurs de variation des mesures de diamètre équatorial du cristallin et de longueur axiale du globe oculaire à l'échographie chez le chien atteint de cataracte

C. Barbé[*], N. Harran, F. Goulle

Clinique vétérinaire Aquivet, parc d'activités Mermoz, 19, avenue de la Forêt, 33320 Eysines, France

Summary

Purpose. — To evaluate biological variation of lens equatorial length (LEL) and axial globe length (AL) measurements on B-mode ultrasound and to calculate a formula to predict LEL using AL.

Methods. — Ocular ultrasonography was performed in dogs with cataract, divided into study ($n = 40$) and control ($n = 30$) samples. LEL and AL were measured on images obtained at 10 MHz (AL, LEL10) and 35 MHz (LEL35). Breed, sex, weight, age and stage of the cataract were recorded. Dogs were categorized into groups depending on their breed. Effects of these variables on measurements were evaluated. Correlations of AL to LEL10 and LEL35 were assessed; linear regression formulas were calculated then validated.

Results. — No significant effect of age and sex on measurements but significant effects of dogs' group, weight and stage of the cataract were found. We found strong correlations between AL and LEL10 and between AL and LEL35. Regression formulas were $LEL10 = 0.72 \times AL - 1.09$ and $LEL35 = 0.49 \times AL + 0.89$. Means of the difference between measured and calculated LEL in control sample were 0.28 mm for LEL10 and −0.13 mm for LEL35.

Conclusions. — Ocular measurements were higher in medium/large dogs than in small dogs and in intumescent and hypermature cataract than in mature. Regression formulas to predict LEL might be used with caution.

Résumé
Objectifs. — Évaluer les variations biologiques des mesures de diamètre équatorial du cristallin (DEC) et de longueur axiale du globe oculaire (LA) à l'échographie en mode B et calculer une formule pour prédire DEC en utilisant LA.
Méthodes. — Une échographie oculaire était réalisée sur des chiens atteints de cataracte, divisés en échantillons d'étude ($n = 40$) et contrôle ($n = 30$). DEC et LA étaient mesurés sur des images obtenues à 10 MHz (LA et DEC10) et 35 MHz (DEC35). La race, le sexe, le poids, l'âge et le stade de la cataracte étaient enregistrés. Les chiens étaient catégorisés en groupes en fonction de leur race. Les effets de ces variables sur les mesures étaient évalués. Les corrélations de LA à DEC10 et DEC35 étaient évaluées ; des formules de régression linéaires étaient calculées puis validées.
Résultats. — Aucun effet significatif de l'âge et du sexe sur les mesures mais des effets significatifs du groupe, du poids et du stade de la cataracte étaient trouvés. Nous avons trouvé de fortes corrélations entre LA et DEC10 et entre LA et DEC35. Les formules de régression étaient DEC10 = 0,72 × LA − 1,09 et DEC35 = 0,49 × LA + 0,89. Les moyennes des différences entre DEC mesuré et calculé dans l'échantillon contrôle étaient de 0,28 mm pour DEC10 et de −0,13 mm pour DEC35.
Conclusions. — Les mesures oculaires étaient plus grandes chez les chiens moyens et grands par rapport aux petits chiens et lors de cataracte intumescente et hypermature par rapport aux matures. Les formules de régression pour prédire DEC en utilisant LA pourraient être utilisées avec précaution.

Introduction

Posterior capsular opacification (PCO) remains a significant problem, which becomes a challenge for vision restoration after phacoemulsification and intraocular lens (IOL) implantation for cataract surgery in dogs [1—5]. Better sizing the IOL could help to further improve surgical results in dogs [1,2]. In humans, it is well accepted for a while that a well-fitted IOL delays PCO by contact inhibition and a barrier effect [6—8]. Accurate sizing of an IOL intended for in the bag fixation may depend on knowledge of the size of the empty capsular bag depending on the lens equatorial length [9,10]. Given that the variation in lens equatorial length is probably greater in dogs than in humans, this dimension could be of interest when choosing IOL in dogs.

B-mode ultrasonography has become widely available in veterinary practice, providing reproducible measurements of intraocular structures [11—13]. In dogs with cataract, assessment of lens equatorial length measurement using 35 MHz immersion probe and axial globe length measurement using 10 MHz sectorial probe gave good results. In previous studies, we found high intraobserver repeatability and acceptable interobserver reproducibility for these measurements [14,15]. Biological variations of measurements between individuals depending on their age, gender, weight, breed and the severity of the cataract remained to be established.

The new systems of UBM are now being used to provide dimensions needed for successful applications of IOLs in humans [16]. Studies in humans have ever tried to give formulas and methods to predict the lens equatorial length for choosing the best IOL size [7,8,17,18]. In veterinary ophthalmology practice, most surgeons have been using 10 MHz sector probe for the preoperative assessment of dogs with cataract, the 35 MHz immersion probe being not widely used. Axial globe length measurement being more easily obtained than lens equatorial length measurement, regression formulas to predict LEL using AL could be of interest for dogs with cataract.

The purpose of this study was to analyze factors of variation on lens equatorial length (LEL) and axial globe length (AL) measurements. We also investigated correlation between AL and LEL, in order to find a formula to predict LEL using AL measurement in dogs with cataract.

Material and methods

Sample description

Two samples of dogs presented with a cataract at the institution AQUIVET between 2013 and 2015 were used in this study. A study sample consisted of 40 dogs, aged from 10 months to 14 years and weighing from 2.8 to 35.5 kg. A control