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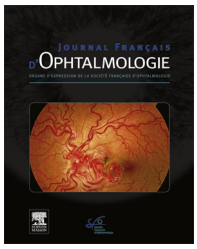

ORIGINAL ARTICLE

Effect of topical application of tetracaine on intraocular pressure in dogs: Preliminary results

Effets de l'application topique de tétracaïne sur la pression intraoculaire chez le chien : résultats préliminaires

T. Boillot[a], **M. Gauvin**[b], **S.-G. Rosolen**[c,*,d,e]

[a] *Vétéa — Clinique Vétérinaire, 4, rue de Rétaud, 17100 Saintes, France*
[b] *Department of ophthalmology & neurology-neurosurgery, McGill university, McGill university health centre, Montreal children's hospital research institute, 2300 Tupper street, Montreal, QC, H3H 1P3, Montreal, Quebec, Canada*
[c] *Clinique vétérinaire Voltaire, 119, boulevard Voltaire, 92600 Asnières, France*
[d] *Inserm, U968, institut de la Vision, 17, rue Moreau, 75012 Paris, France*
[e] *UPMC université Paris 06, UMR_S968, institut de la Vision, 17, rue Moreau, 75012 Paris, France*

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KEYWORDS
Intraocular pressure (IOP);
Applanation tonometry;
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Tetracaine;
Dog

Summary
Purpose. — To evaluate the effect of topical application of tetracaine on intraocular pressure (IOP) measurement by Tonopen in dogs.
Subjects and methods. — Six healthy male Epagneul Bretons (group 1) and six healthy male black Labrador Retrievers (group 2) were examined. IOP was measured in the right eye (OD) prior to (IOP1) and 1 minute following instillation of one drop of topical tetracaine (IOP 2), and the left eye (OS) (control) prior to (IOP 3) and 1 minute following instillation of one drop of isotonic saline solution (IOP 4). Measurements were performed on two occasions: at 8:00 AM and 3:00 PM.
Results. — For both groups, IOP measurements were higher in the morning than in the afternoon. For group 1, IOP1 mean (SD), IOP2 mean (SD), IOP3 mean (SD) and IOP4 mean (SD) were 14.6 (2.2) mmHg, 11.3 (3.2) mmHg, 14.4 (2.2) mmHg and 13.5 (3.9) mmHg respectively, while in group 2, IOP1 mean (SD), IOP2 mean (SD), IOP3 mean (SD) and IOP4 mean (SD) were 14.2 (3.8) mmHg, 9.5 (3.7) mmHg, 13.5 (2.8) mmHg and 13.0 (3.8) mmHg respectively. For both groups at each time point, IOP 2 values were significantly lower ($P < 0.007$) than IOP 1 values, whereas IOP 3 and 4 values were not significantly different ($P > 0.27$).

* Corresponding author.
E-mail address: sg.rosolen@orange.fr (S.-G. Rosolen).

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Conclusion. — This study demonstrates that topical application of tetracaine significantly lowers IOP measured by Tonopen due to a possible interaction with melanin. The potential effect of topical anesthetics should be taken in consideration when performing applanation tonometry for clinical, pharmacological and toxicological studies.

MOTS CLÉS
PIO ;
Tonométrie par applanation ;
Anesthésiques topiques ;
Tétracaïne ;
Chien

Résumé
Objectifs. — Évaluer les effets de l'application topique de tétracaïne sur la mesure de la pression intraoculaire (PIO) au moyen du Tonopen, chez le chien.
Sujets et méthodes. — Six Epagneuls Bretons males, cliniquement normaux (groupe 1) et six Labrador Retrievers males à pelage noir, cliniquement normaux (group 2) ont été examinés. La PIO a été mesurée sur l'œil droit (OD) avant (PIO1) et une minute après instillation d'une goutte de collyre à la tétracaine (PIO2 2), et sur l'œil gauche OS (témoin) avant (PIO 3) et une minute après instillation d'une goutte de solution saline isotonique (PIO 4). Les mesures ont été effectuées à 8 heures et à 15 heures.
Résultats. — Pour les deux groupes, les valeurs de PIO étaient plus élevées le matin que l'après-midi. Pour le groupe 1, les valeurs de la moyenne (écart-type) de la PIO étaient de 14,6 (2,2) mmHg pour la PIO1, 11,3 (3,2) mmHg pour la PIO2, 14,4 (2,2) mmHg pour la PIO3 et 13,5 (3,9) mmHg pour la PIO4 alors que pour le groupe 2, les valeurs de la moyenne (écart-type) de la PIO étaient de 14,2 (3,8) mmHg pour la PIO1, 9,5 (3,7) mmHg pour la PIO2, 13,5 (2,8) mm Hg pour la PIO3, et 13,0 (3,8) mmHg pour la PIO4. Pour les deux groupes et quelle que soit l'heure de mesure, les valeurs PIO2 étaient significativement ($p < 0{,}007$) inférieures aux valeurs PIO 1 alors que les valeurs PIO3 et PIO4 n'étaient pas significativement différentes ($p > 0{,}27$).
Conclusion. — Cette étude montre que l'application topique de tétracaïne entraîne une diminution significative de la PIO mesurée avec un Tonopen, peut-être due à une interaction avec la mélanine. Les effets potentiels d'anesthésiques topiques devraient être pris en considération lors de la mesure de tonométrie par applanation pour des études cliniques, pharmacologiques et toxicologiques.

Introduction

The estimation of intraocular pressure (IOP) is an important clinical procedure in the diagnosis and monitoring of glaucoma in animals, but also in other ocular diseases such as uveitis, and in the postoperative management of lenticular and vitreoretinal conditions [1]. The applanation tonometer is one of the most precise and trustworthy instruments for diagnosing small animal intraocular diseases [2,3]. Because of its convenient price and its efficiency in the acquisition of clinically reliable readings in many species, the Tonopen® is currently the most widely used instrument for estimating IOP in veterinary ophthalmology [4—6] and investigative ophthalmology [7—9], while being small, light and easy to handle. According to manufacturers' specifications, an average of three successive readings is sufficient to record IOP after application of topical anesthesia. It is important to consider that since the Tonopen® is very accurate in the normal range of IOP it tends to overestimate IOP in the low range and underestimate IOP in the high range [10]. Therefore, IOP measurements using this tonometer have variable results due to the operator and other factors including gender, age, breed, ocular diseases [11] and circadian rhythms [12,13]. IOP is a biologic variable and diurnal variations in IOP have been documented in the dog, with higher levels in the early morning and the lowest reading in the early evening [13,14]. These diurnal variations observed in normal dogs are enhanced in untreated primary open angle glaucoma (POAG) [14]. Finally, it has been shown in humans that local drops of anesthetics may reduce the IOP readings [15]. Interestingly and according to the author's knowledge, there are no similar studies published about canine eyes despite the very wide use of Tonopen®.

In addition, given that the incidence of glaucoma seems to vary markedly between different dog breeds [16,17] this study was performed to see whether there was an interbreed variability of any change in IOP measurement using Tono-Pen Vet® following corneal application of tetracaine. The present study was performed using animals chosen from two popular breeds of dogs in the South West of France: Epagneul Bretons and Labrador retrievers.

Subjects and methods

The protocol adhered to the Association for Research in Vision and Ophthalmology Statement for the Use of Animals in Ophthalmic and Vision Research. Animals were examined at the Veterinary Eye Clinic (Dr Thomas Boillot) following the consent of the owners.

Animals

Six intact white and red coated males Epagneul Bretons with light yellow/brown iris (Fig. 1a, group 1) and six black coated intact males Labrador Retrievers with dark brown