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VISIONANIMALE

Anima-Vet
clinique vétérinaire

Bertrand Michaud

Vétérinaire Ophtalmo
VisionAnimale

Fiche contact Partager

Site internet Visionanimale

Formulaire de référé

Vente de matériel ophtalmo

Site internet AnimaVet

Comparaison d'un tonomètre à rebond (**Tonovet Plus®**) et d'un tonomètre à indentation à usage unique (**IopVet®**) chez 61 chiens de races différentes

Liens d’intérêt

- J’ai organisé un achat groupé de IOPvet à destination des vétérinaires
- Relations avec Ingeneus pour l’optimisation de l’appareil (non rémunéré)

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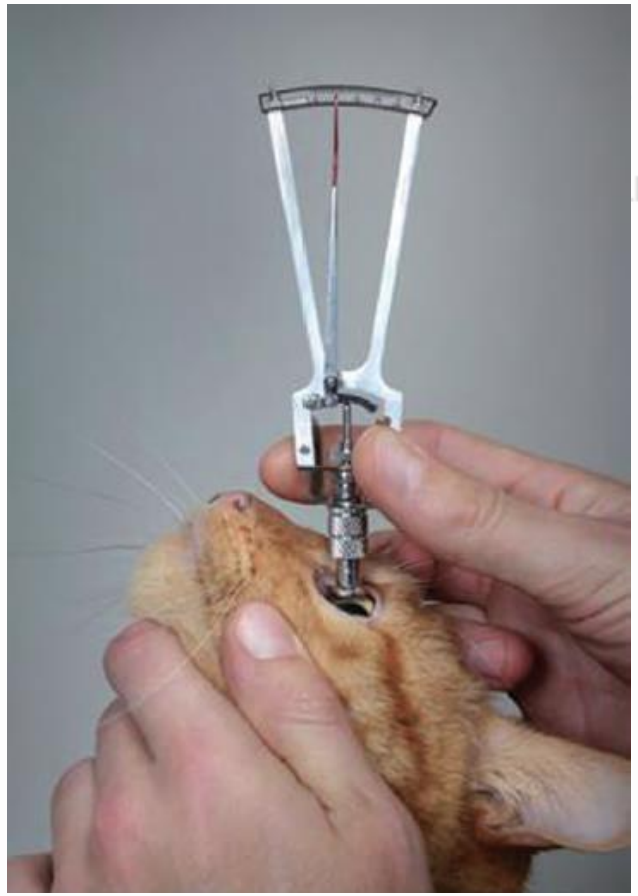
Introduction

- **Tonométrie** = évaluation indirecte de la PIO
- Diagnostic du **glaucome** et **uvéite**
- Premier Tonomètre : **Schiötz** *(Friedwald, 1937)*
- Tonomètres modernes : **digitaux**
- Inconvénient = **prix**

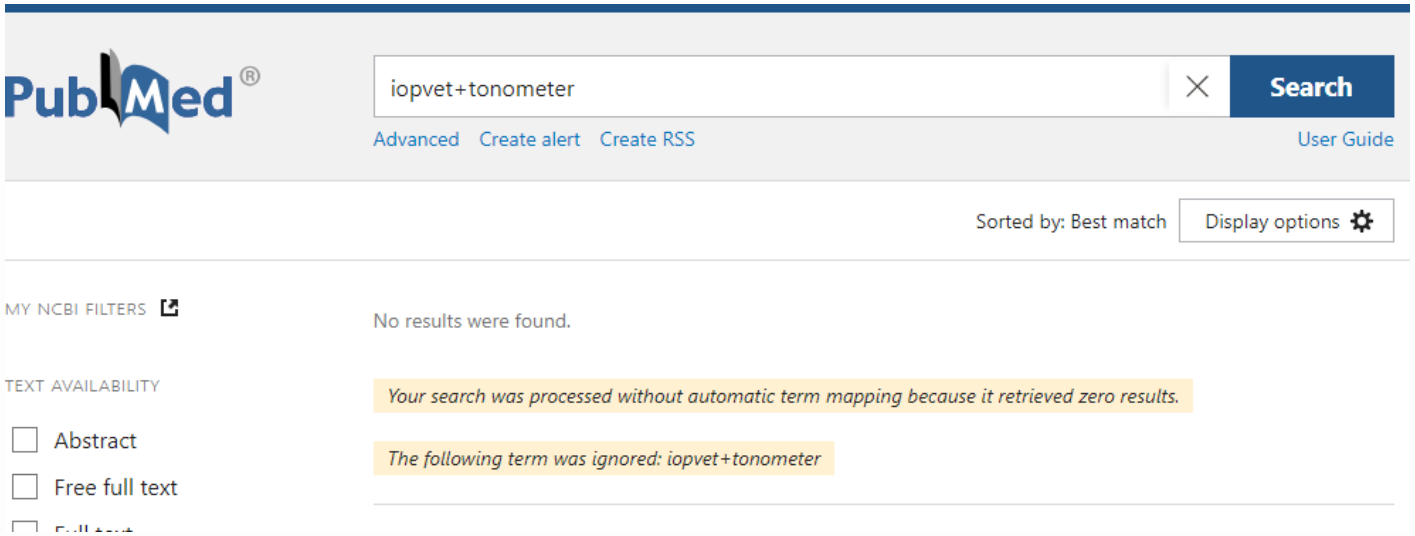


Introduction

- En 2021 un **tonomètre à indentation** à **usage unique**
- **Deuxième** génération avec échelle numérique

Objectifs

- Vérifier la **précision** du Iopvet
- Etudier la **répétabilité** des mesures sur la durée avec le même appareil



Matériel & Méthode - Animaux

- **61 chiens** de propriétaire de **races différentes**
  - **Groupe A** : 36 chiens (70 yeux) présentés pour motif ophtalmo
  - **Groupe B** : 25 chiens (49 yeux) présentés en médecine préventive

	Groupe A	Groupe B
Echantillon	36	25
Age Moyen (années) (5-95 percentile)	10,0 (4,3-15,0)	10,0 (1,2-15,4)
Répartition Male/Femelle	1,3 (20/16)	0,92 (12/13)
Stérilisé (Mâle/Femelle)	30% / 87,5%	25,0% / 76,9%

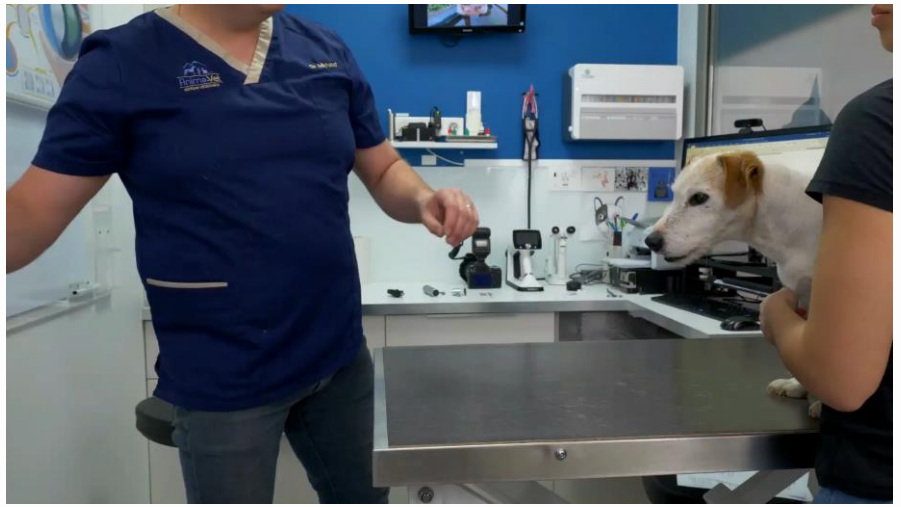
Matériel & Méthode - Animaux

Races	N	Percent
Boston Terrier	4	6,56%
Jack Russell	4	6,56%
American Bully	3	4,92%
Chihuahua	3	4,92%
Teckel	3	4,92%
Springer Spaniel Anglais	3	4,92%
Golden Retriever	3	4,92%
Bichon Maltais	3	4,92%
Shih Tzu	3	4,92%
Berger Belge	2	3,28%
Bouledogue français	2	3,28%
Husky Sibérien	2	3,28%
Whippet	2	3,28%
Autres	24	39,34%
Total	61	100,00%

Motif de consultation	N	%
Glaucome	22	61,1%
Ulcère cornéen superficiel	5	13,9%
Cataracte	3	8,3%
Kératite	2	5,6%
Rétine silencieuse (SARD)	1	2,8%
Uvéite	1	2,8%
Atrophie Progressive de la Rétine	1	2,8%
Traumatisme	1	2,8%
Total	36	100,0%

Matériel & Méthode - Tonométrie

- Examen ophtalmologique complet
- Mesure de la **PIO**
  - Par la **même personne**
  - **Contention** céphalique minimale
  - Mesure avec **Tonovet Plus®**
  - **Anesthésie** topique
  - Mesure avec **IopVet®** 1 minute après



Matériel & Méthode - Statistiques

- **Impossible** de comparer les valeurs
  - Quantitative vs Qualitative
- Regroupement des résultats par **intervalles cohérents**
- **T-test de Student**

PIO
<20mmHg
21-30 mmHg
>30mmHg

Résultats

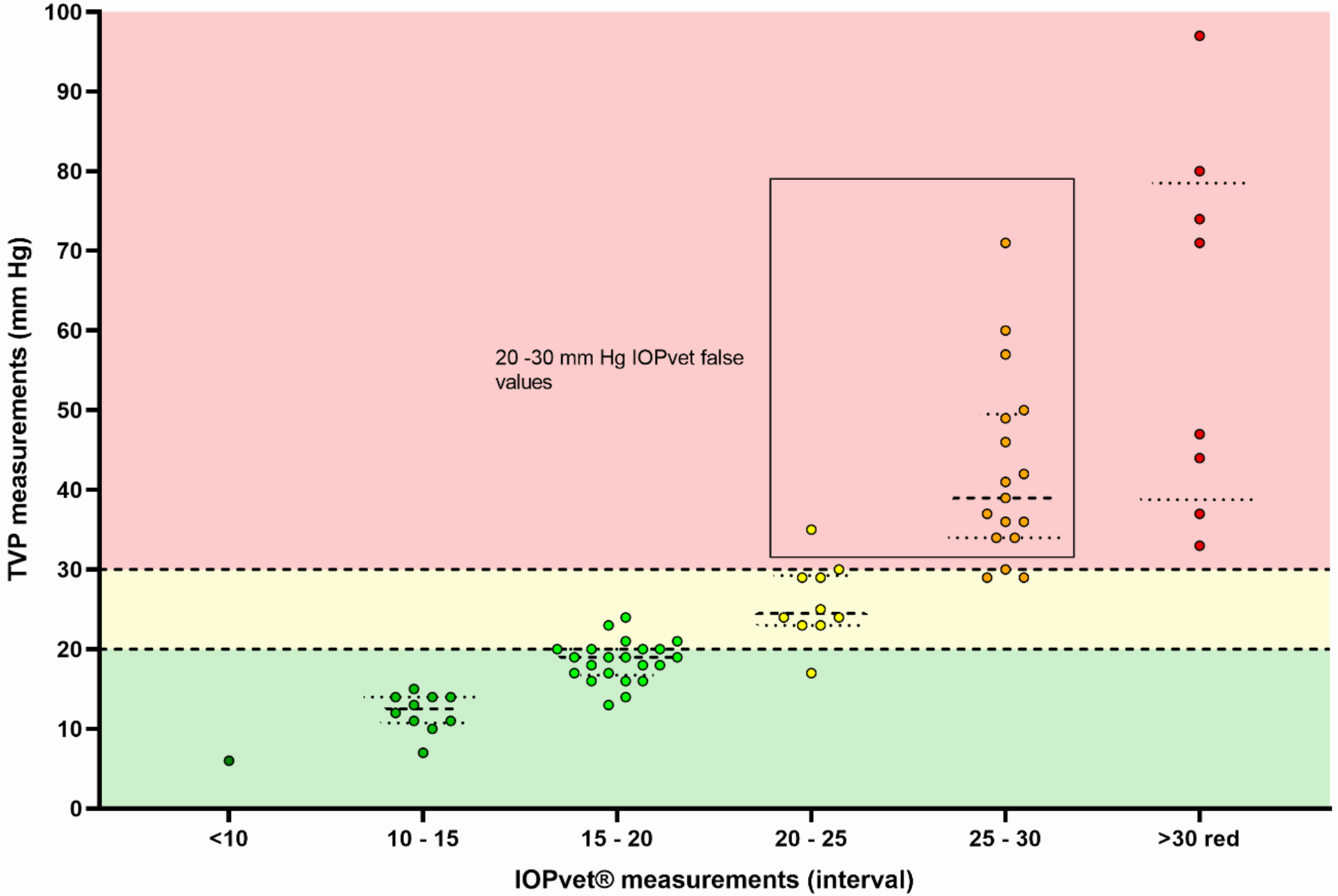
- **Pas de différence significative OD/OS**

	Groupe A	Groupe B
Taille de l'échantillon	36	25
Moyenne PIO (mmHg)	29,5	16,9
(5-95 percentile)	(13,2-73,1)	(11,4-23,0)

Résultats

Sensibilité du IOPvet®				
	Groupe A	(N yeux)	**Groupe B**	(N yeux)
Tous les intervalles	65,7%	(70)	93,9%	(49)
<20mm Hg	96,8%	(31)	100,0%	(36)
20-30 mm Hg	60,0%	(15)	76,9%	(13)
>30mm Hg	33,3%	(24)	-	(0)
Détail de la zone critique				
20-25 mmHg	55,6%	(9)	72,7%	(11)
25-30 mmHg	50,0%	(6)	100,0%	(2)

TVP vs. IOPvet® tonometers



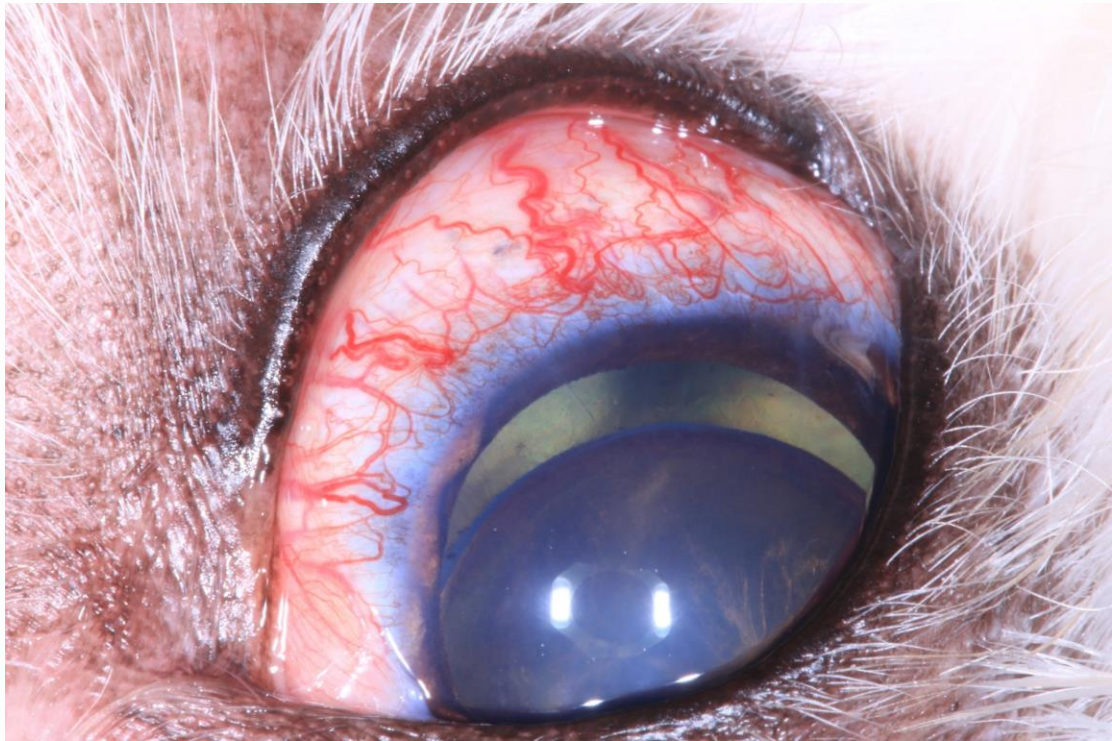
Résultats – Répétabilité

- **Un seul appareil** utilisé pour les 119 mesures
- Répartition des mesures en **3 périodes**
- Pas d'effet période sur les données étudiées

  (p = 0.1005)

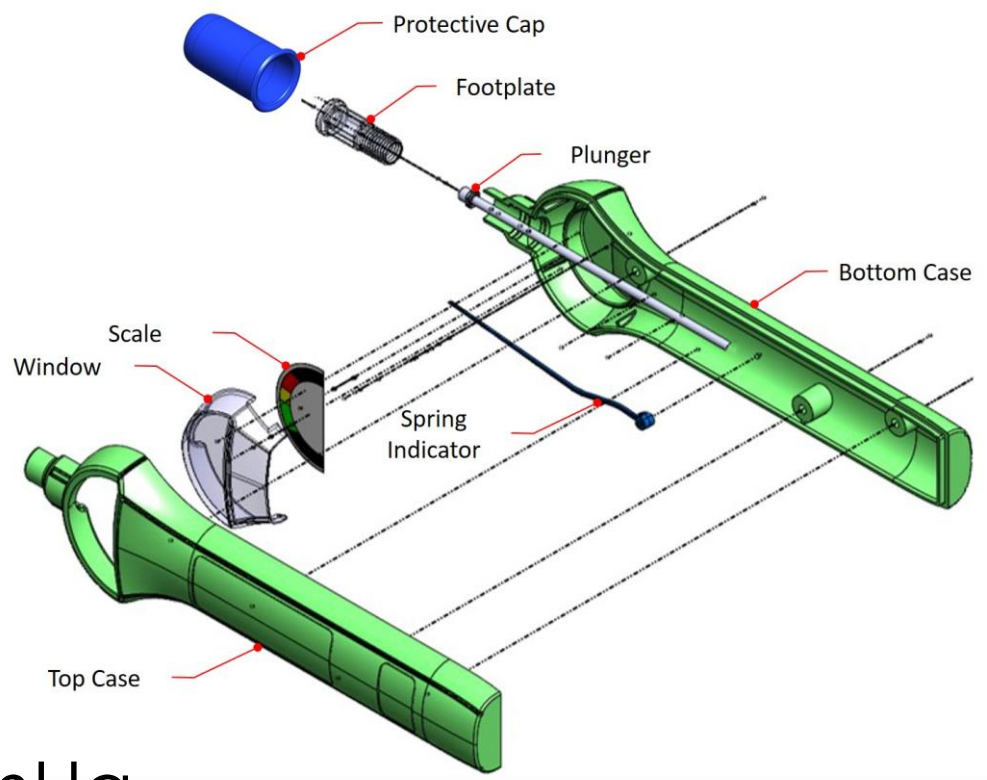
Discussion

- **Evaluation et suivi** de la PIO
- Nécessité d'établir des **normes** selon
  - **Appareil**
  - **Espèces**
- Nombreux **facteurs de variation**
  - Praticien
  - Moment de la journée
  - Etat émotionnel de l'animal

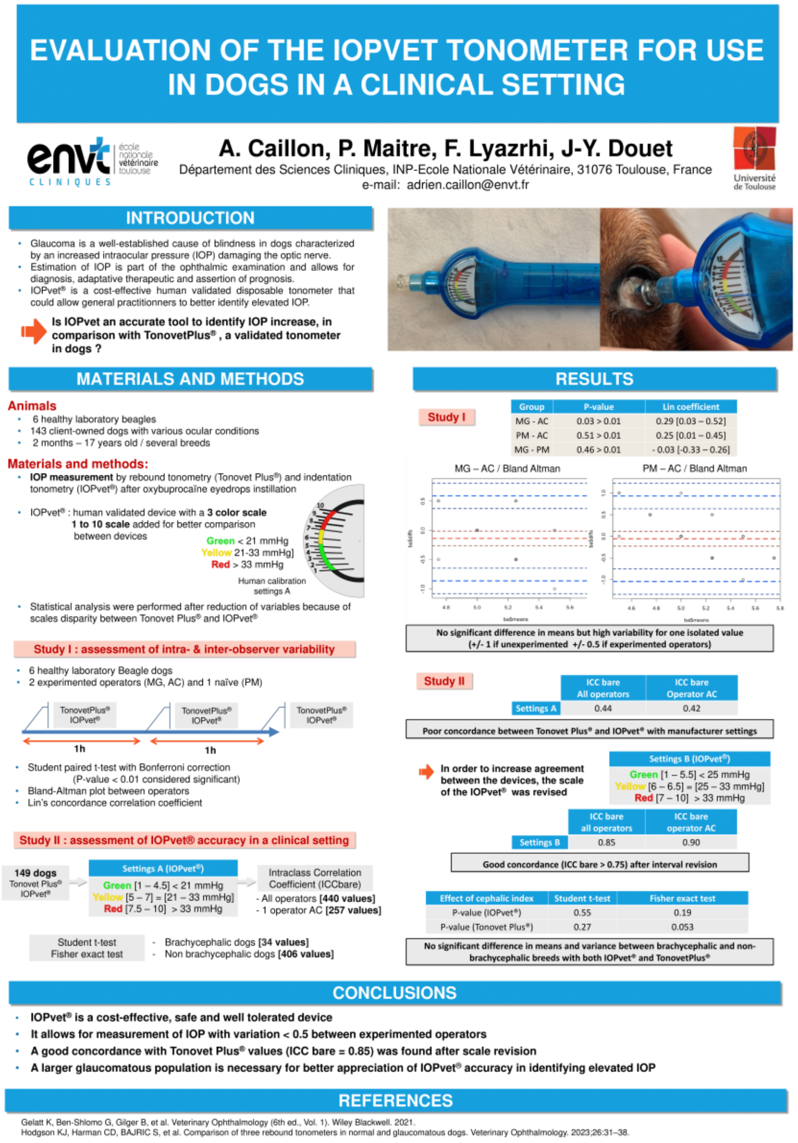


Discussion

- **Etude comparative** entre ces deux tonomètres
  - sur **une population canine variée** et **représentative**
  - **24 yeux glaucomateux**
- Mesures bien tolérées
- IopVet® semble être **fiable pour** :
  - Les valeurs de PIO **normales**
  - **Répéter** les mesures dans le temps
- **Valeurs PIO sous-estimées** de 21 à 30mmHg
- **Limites de l'appareil** au delà de 30mmHg



Discussion



EVALUATION OF THE IOPVET TONOMETER FOR USE IN DOGS IN A CLINICAL SETTING

envt école nationale vétérinaire toulouse CLINIQUES

A. Caillon, P. Maitre, F. Lyazrhi, J-Y. Douet
Département des Sciences Cliniques, INP-Ecole Nationale Vétérinaire, 31076 Toulouse, France
e-mail: adrien.caillon@envt.fr

Université de Toulouse

INTRODUCTION

- Glaucoma is a well-established cause of blindness in dogs characterized by an increased intraocular pressure (IOP) damaging the optic nerve.
- Estimation of IOP is part of the ophthalmic examination and allows for diagnosis, adaptative therapeutic and assertion of prognosis.
- IOPvet® is a cost-effective human validated disposable tonometer that could allow general practitionners to better identify elevated IOP.

Is IOPvet an accurate tool to identify IOP increase, in comparison with TonovetPlus®, a validated tonometer in dogs ?

MATERIALS AND METHODS

Animals
- 6 healthy laboratory beagles
- 143 client-owned dogs with various ocular conditions
- 2 months – 17 years old / several breeds

Materials and methods:
- **IOP measurement** by rebound tonometry (Tonovet Plus®) and indentation tonometry (IOPvet®) after oxybuprocaïne eyedrops instillation
- IOPvet® : human validated device with a **3 color scale**
  1 to 10 scale added for better comparison between devices
  Green < 21 mmHg
  Yellow 21-33 mmHg]
  Red > 33 mmHg
  Human calibration settings A
- Statistical analysis were performed after reduction of variables because of scales disparity between Tonovet Plus® and IOPvet®

Study I : assessment of intra- & inter-observer variability
- 6 healthy laboratory Beagle dogs
- 2 experimented operators (MG, AC) and 1 naïve (PM)

TonovetPlus® IOPvet® — 1h — TonovetPlus® IOPvet® — 1h — TonovetPlus® IOPvet®

- Student paired t-test with Bonferroni correction (P-value < 0.01 considered significant)
- Bland-Altman plot between operators
- Lin's concordance correlation coefficient

Study II : assessment of IOPvet® accuracy in a clinical setting

149 dogs Tonovet Plus® IOPvet® → Settings A (IOPvet®): Green [1 – 4.5] < 21 mmHg; Yellow [5 – 7] = [21 – 33 mmHg]; Red [7.5 – 10] > 33 mmHg → Intraclass Correlation Coefficient (ICCbare) - All operators **[440 values]** - 1 operator AC **[257 values]**

Student t-test, Fisher exact test - Brachycephalic dogs **[34 values]** - Non brachycephalic dogs **[406 values]**

RESULTS

Study I

Group	P-value	Lin coefficient
MG - AC	0.03 > 0.01	0.29 [0.03 – 0.52]
PM - AC	0.51 > 0.01	0.25 [0.01 – 0.45]
MG - PM	0.46 > 0.01	- 0.03 [-0.33 – 0.26]

MG – AC / Bland Altman — PM – AC / Bland Altman

No significant difference in means but high variability for one isolated value (+/- 1 if unexperimented +/- 0.5 if experimented operators)

Study II

	ICC bare All operators	ICC bare Operator AC
Settings A	0.44	0.42

Poor concordance between Tonovet Plus® and IOPvet® with manufacturer settings

In order to increase agreement between the devices, the scale of the IOPvet® was revised

Settings B (IOPvet®): Green [1 – 5.5] < 25 mmHg; Yellow [6 – 6.5] = [25 – 33 mmHg]; Red [7 – 10] > 33 mmHg

	ICC bare all operators	ICC bare operator AC
Settings B	0.85	0.90

Good concordance (ICC bare > 0.75) after interval revision

Effect of cephalic index	Student t-test	Fisher exact test
P-value (IOPvet®)	0.55	0.19
P-value (Tonovet Plus®)	0.27	0.053

No significant difference in means and variance between brachycephalic and non-brachycephalic breeds with both IOPvet® and TonovetPlus®

CONCLUSIONS

- **IOPvet® is a cost-effective, safe and well tolerated device**
- **It allows for measurement of IOP with variation < 0.5 between experimented operators**
- **A good concordance with Tonovet Plus® values (ICC bare = 0.85) was found after scale revision**
- **A larger glaucomatous population is necessary for better appreciation of IOPvet® accuracy in identifying elevated IOP**

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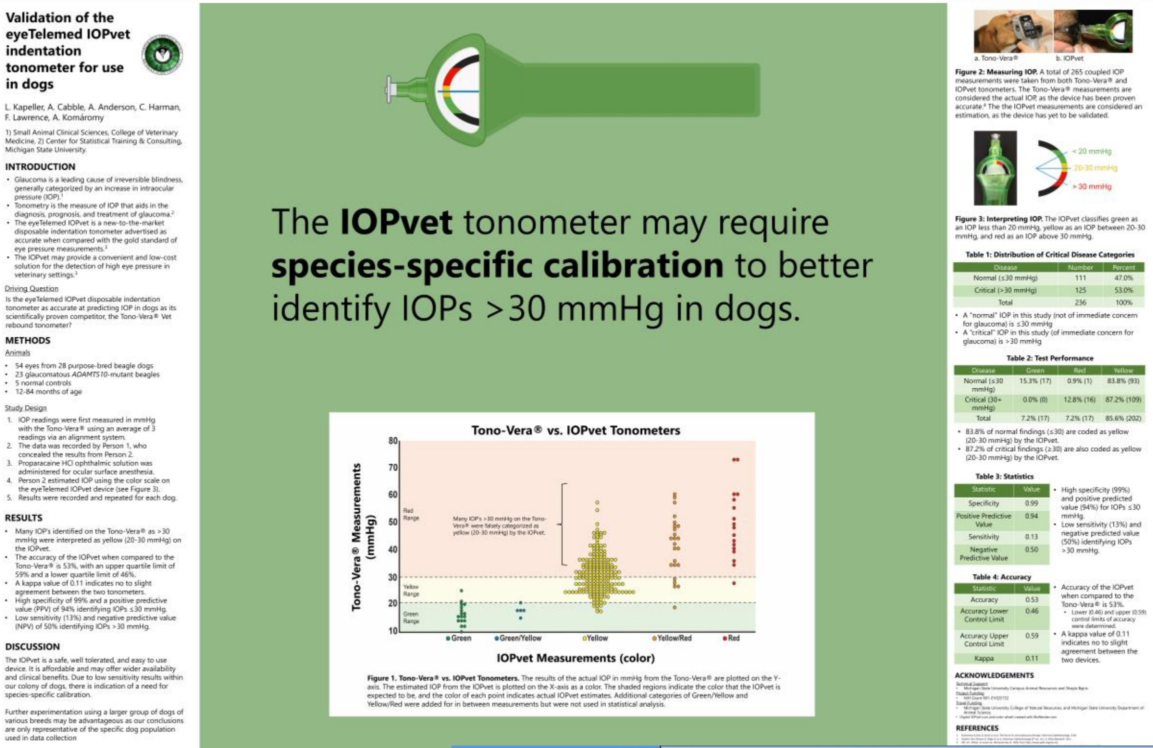


Validation of the eyeTelemed IOPvet indentation tonometer for use in dogs

L. Kapeller, A. Cabble, A. Anderson, C. Harman, F. Lawrence, A. Komáromy

1) Small Animal Clinical Sciences, College of Veterinary Medicine, 2) Center for Statistical Training & Consulting, Michigan State University.

INTRODUCTION

- Glaucoma is a leading cause of irreversible blindness, generally categorized by an increase in intraocular pressure (IOP).[1]
- Tonometry is the measure of IOP that aids in the diagnosis, prognosis, and treatment of glaucoma.[2]
- The eyeTelemed IOPvet is a new-to-the-market disposable indentation tonometer advertised as accurate when compared with the gold standard of eye pressure measurements.[3]
- The IOPvet may provide a convenient and low-cost solution for the detection of high eye pressure in veterinary settings.[3]

Driving Question

Is the eyeTelemed IOPvet disposable indentation tonometer as accurate at predicting IOP in dogs as its scientifically proven competitor, the Tono-Vera® Vet rebound tonometer?

METHODS

Animals
- 54 eyes from 28 purpose-bred beagle dogs
- 23 glaucomatous *ADAMTS10*-mutant beagles
- 5 normal controls
- 12-84 months of age

Study Design
1. IOP readings were first measured in mmHg with the Tono-Vera® using an average of 3 readings via an alignment system.
2. The data was recorded by Person 1, who concealed the results from Person 2.
3. Proparacaine HCl ophthalmic solution was administered for ocular surface anesthesia.
4. Person 2 estimated IOP using the color scale on the eyeTelemed IOPvet device (see Figure 3).
5. Results were recorded and repeated for each dog.

RESULTS

- Many IOP's identified on the Tono-Vera® as >30 mmHg were interpreted as yellow (20-30 mmHg) on the IOPvet.
- The accuracy of the IOPvet when compared to the Tono-Vera® is 53%, with an upper quartile limit of 59% and a lower quartile limit of 46%.
- A kappa value of 0.11 indicates no to slight agreement between the two tonometers.
- High specificity of 99% and a positive predictive value (PPV) of 94% identifying IOPs ≤30 mmHg.
- Low sensitivity (13%) and negative predictive value (NPV) of 50% identifying IOPs >30 mmHg.

DISCUSSION

The IOPvet is a safe, well tolerated, and easy to use device. It is affordable and may offer wider availability and clinical benefits. Due to low sensitivity results within our colony of dogs, there is indication of a need for species-specific calibration.

Further experimentation using a larger group of dogs of various breeds may be advantageous as our conclusions are only representative of the specific dog population used in data collection

The **IOPvet** tonometer may require **species-specific calibration** to better identify IOPs >30 mmHg in dogs.

Tono-Vera® vs. IOPvet Tonometers

Tono-Vera® Measurements (mmHg) — IOPvet Measurements (color): Green, Green/Yellow, Yellow, Yellow/Red, Red. Red Range, Yellow Range, Green Range. Many IOP's >30 mmHg on the Tono-Vera® were falsely categorized as yellow (20-30 mmHg) by the IOPvet.

Figure 1. Tono-Vera® vs. IOPvet Tonometers. The results of the actual IOP in mmHg from the Tono-Vera® are plotted on the Y-axis. The estimated IOP from the IOPvet is plotted on the X-axis as a color. The shaded regions indicate the color that the IOPvet is expected to be, and the color of each point indicates actual IOPvet estimates. Additional categories of Green/Yellow and Yellow/Red were added for in between measurements but were not used in statistical analysis.

a. Tono-Vera® b. IOPvet

Figure 2: Measuring IOP. A total of 265 coupled IOP measurements were taken from both Tono-Vera® and IOPvet tonometers. The Tono-Vera® measurements are considered the actual IOP, as the device has been proven accurate.[4] The the IOPvet measurements are considered an estimation, as the device has yet to be validated.

< 20 mmHg, 20-30 mmHg, > 30 mmHg

Figure 3: Interpreting IOP. The IOPvet classifies green as an IOP less than 20 mmHg, yellow as an IOP between 20-30 mmHg, and red as an IOP above 30 mmHg.

Table 1: Distribution of Critical Disease Categories

Disease	Number	Percent
Normal (≤30 mmHg)	111	47.0%
Critical (>30 mmHg)	125	53.0%
Total	236	100%

- A "normal" IOP in this study (not of immediate concern for glaucoma) is ≤30 mmHg
- A "critical" IOP in this study (of immediate concern for glaucoma) is >30 mmHg

Table 2: Test Performance

Disease	Green	Red	Yellow
Normal (≤30 mmHg)	15.3% (17)	0.9% (1)	83.8% (93)
Critical (30+ mmHg)	0.0% (0)	12.8% (16)	87.2% (109)
Total	7.2% (17)	7.2% (17)	85.6% (202)

- 83.8% of normal findings (≤30) are coded as yellow (20-30 mmHg) by the IOPvet.
- 87.2% of critical findings (≥30) are also coded as yellow (20-30 mmHg) by the IOPvet.

Table 3: Statistics

Statistic	Value
Specificity	0.99
Positive Predictive Value	0.94
Sensitivity	0.13
Negative Predictive Value	0.50

- High specificity (99%) and positive predicted value (94%) for IOPs ≤30 mmHg.
- Low sensitivity (13%) and negative predicted value (50%) identifying IOPs >30 mmHg.

Table 4: Accuracy

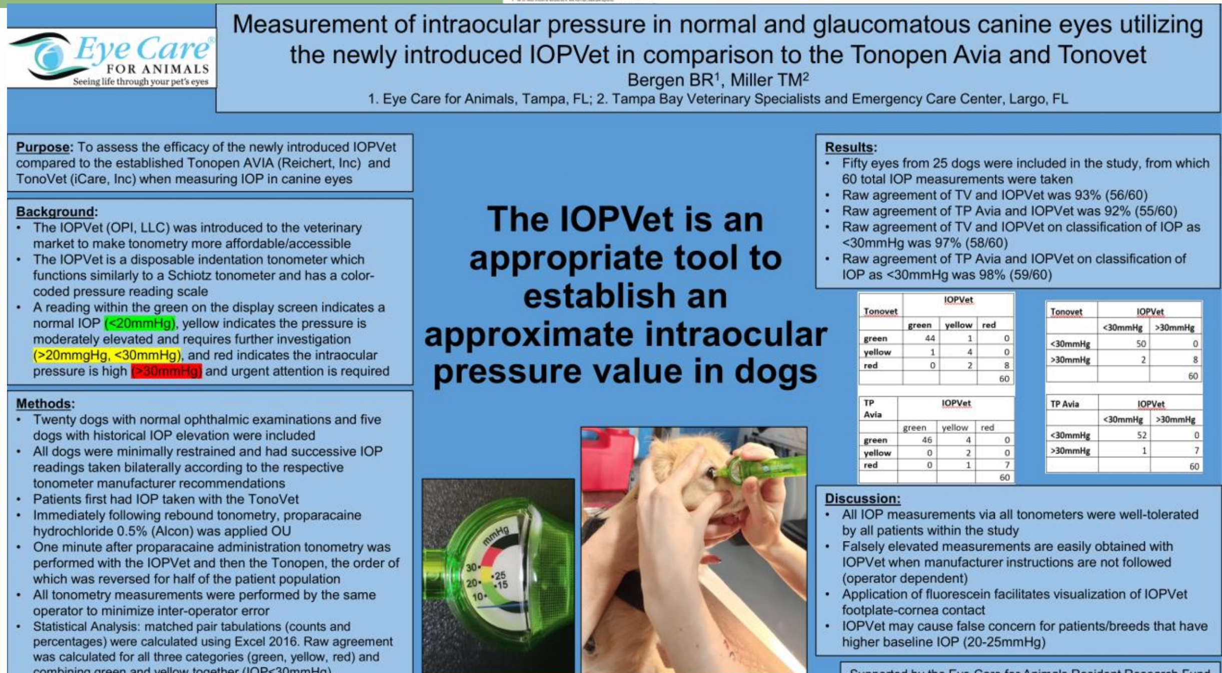
Statistic	Value
Accuracy	0.53
Accuracy Lower Control Limit	0.46
Accuracy Upper Control Limit	0.59
Kappa	0.11

- Accuracy of the IOPvet when compared to the Tono-Vera® is 53%.
  - Lower (0.46) and upper (0.59) control limits of accuracy were determined.
- A kappa value of 0.11 indicates no to slight agreement between the two devices.

ACKNOWLEDGEMENTS

REFERENCES

VISIONANIMALE



Measurement of intraocular pressure in normal and glaucomatous canine eyes utilizing the newly introduced IOPVet in comparison to the Tonopen Avia and Tonovet

Eye Care® FOR ANIMALS Seeing life through your pet's eyes

Bergen BR[1], Miller TM[2]
1. Eye Care for Animals, Tampa, FL; 2. Tampa Bay Veterinary Specialists and Emergency Care Center, Largo, FL

Purpose: To assess the efficacy of the newly introduced IOPVet compared to the established Tonopen AVIA (Reichert, Inc) and TonoVet (iCare, Inc) when measuring IOP in canine eyes

Background:
- The IOPVet (OPI, LLC) was introduced to the veterinary market to make tonometry more affordable/accessible
- The IOPVet is a disposable indentation tonometer which functions similarly to a Schiotz tonometer and has a color-coded pressure reading scale
- A reading within the green on the display screen indicates a normal IOP (<20mmHg), yellow indicates the pressure is moderately elevated and requires further investigation (>20mmgHg, <30mmHg), and red indicates the intraocular pressure is high (>30mmHg) and urgent attention is required

Methods:
- Twenty dogs with normal ophthalmic examinations and five dogs with historical IOP elevation were included
- All dogs were minimally restrained and had successive IOP readings taken bilaterally according to the respective tonometer manufacturer recommendations
- Patients first had IOP taken with the TonoVet
- Immediately following rebound tonometry, proparacaine hydrochloride 0.5% (Alcon) was applied OU
- One minute after proparacaine administration tonometry was performed with the IOPVet and then the Tonopen, the order of which was reversed for half of the patient population
- All tonometry measurements were performed by the same operator to minimize inter-operator error
- Statistical Analysis: matched pair tabulations (counts and percentages) were calculated using Excel 2016. Raw agreement was calculated for all three categories (green, yellow, red) and combining green and yellow together (IOP<30mmHg)

The IOPVet is an appropriate tool to establish an approximate intraocular pressure value in dogs

mmHg 30 25 20 15 10

Results:
- Fifty eyes from 25 dogs were included in the study, from which 60 total IOP measurements were taken
- Raw agreement of TV and IOPVet was 93% (56/60)
- Raw agreement of TP Avia and IOPVet was 92% (55/60)
- Raw agreement of TV and IOPVet on classification of IOP as <30mmHg was 97% (58/60)
- Raw agreement of TP Avia and IOPVet on classification of IOP as <30mmHg was 98% (59/60)

Tonovet	IOPVet green	IOPVet yellow	IOPVet red
green	44	1	0
yellow	1	4	0
red	0	2	8
			60

Tonovet	IOPVet <30mmHg	IOPVet >30mmHg
<30mmHg	50	0
>30mmHg	2	8
		60

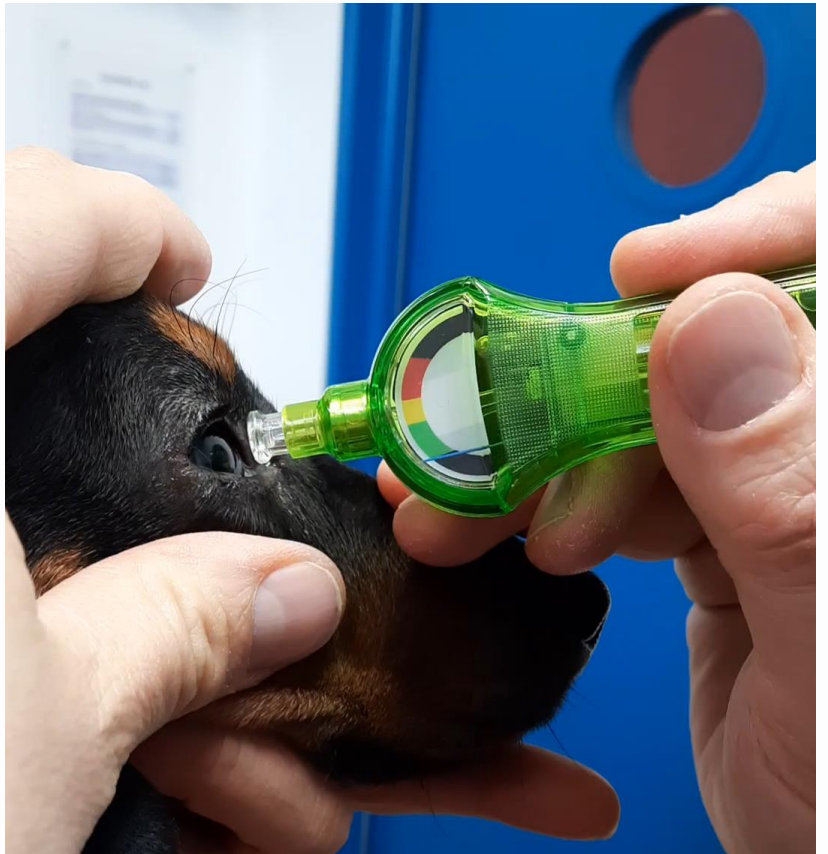
TP Avia	IOPVet green	IOPVet yellow	IOPVet red
green	46	4	0
yellow	0	2	0
red	0	1	7
			60

TP Avia	IOPVet <30mmHg	IOPVet >30mmHg
<30mmHg	52	0
>30mmHg	1	7
		60

Discussion:
- All IOP measurements via all tonometers were well-tolerated by all patients within the study
- Falsely elevated measurements are easily obtained with IOPVet when manufacturer instructions are not followed (operator dependent)
- Application of fluorescein facilitates visualization of IOPVet footplate-cornea contact
- IOPVet may cause false concern for patients/breeds that have higher baseline IOP (20-25mmHg)

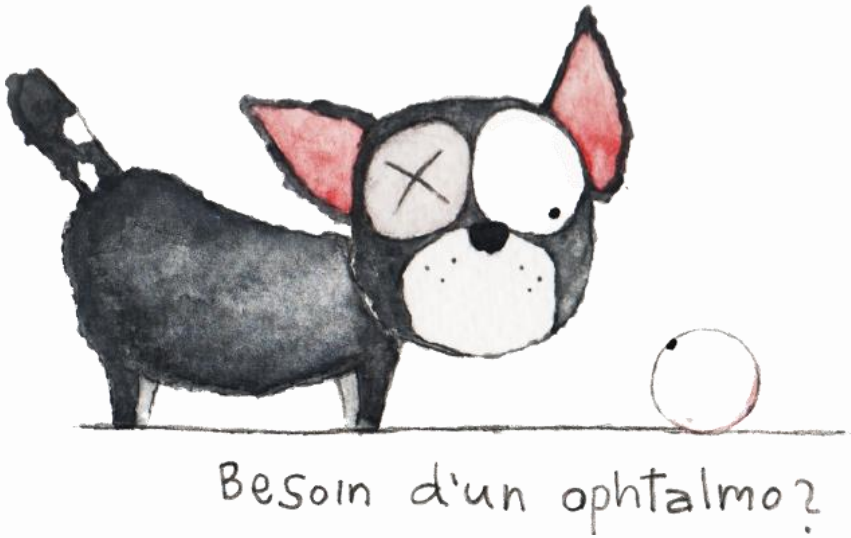
Discussion - limites

- Difficulté à **comparer** des valeurs **quantitatives** et **qualitatives**
- **Un seul utilisateur**
- Variations de PIO ’’**manipulateur dépendant’’**



Conclusion

- IOPVet appareil simple, bien toléré
- **Faible coût** et réutilisable
- Respect des conditions d'utilisation
- A intégrer dans un **examen complet** et un **contexte clinique**
- Intérêt => Vétérinaires **généralistes** et **propriétaires**
- **Perspectives** :
  - Révision de l'échelle nécessaire
  - Etude dans d'autres espèces
  - Etude pour animaux à PIO élevée



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