

TOP 5

Mistakes When Measuring Intraocular Pressure

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Several methods of intraocular pressure (IOP) measurement, part of the complete ophthalmologic examination and critical to diagnosis and management of uveitis and glaucoma, have been used in veterinary patients (Figure 1, next page).¹⁻¹² The Schiøtz indentation tonometer is accurate but can be inconvenient to use, as its calculation requires a conversion chart. In addition, because the Schiøtz tonometer requires the patient's cornea to be directed upward, parallel to the ground, it is impractical for large animals, and the size of the footplate is too large for use in species with small corneas (eg, exotic pets).¹³

The rebound tonometer (TonoVet, icaretonometer.com) is a reliable and convenient veterinary tonometer that is gaining popularity and, unlike the indentation or applanation tonometer, does not require topical anesthesia.¹ Applanation tonometers measure the force necessary to flatten a defined area of the cornea; the Tono-Pen Vet (reichert.com) is widely used because of its ease of use and accuracy for multiple species.¹

Following are 5 of the most common mistakes made when measuring IOP, with emphasis on use of applanation tonometry.

1

Not having a tonometer

When presented with any patient affected by ocular disease, veterinarians should perform a minimum ophthalmic database (ie, menace response, direct and consensual pupillary light reflexes, Schirmer tear test, fluorescein stain, IOP measurement). With rare exception (eg, descemetocele, corneal rupture), measuring IOP is indicated when evaluating *any* red eye,¹³ as well as for all painful, cloudy, and/or blind eyes; eyes with fixed and dilated pupils; patients with anisocoria, cataracts, or uveitis; and breeds predisposed to glaucoma. In the authors' opinion, having no reliable means of measuring IOP represents a breach in today's practice standards. Vision can be easily and rapidly lost as a result of commonly encountered ophthalmic diseases that may affect IOP (eg, uveitis, glaucoma, lens luxation, cataracts). The ability



TOP 5 Mistakes When Measuring Intraocular Pressure

1. Not having a tonometer
2. Inappropriate patient restraint
3. Globe compression through eyelid manipulation
4. Misinterpretation of results
5. Inappropriate care and use of the applanation tonometer

Measurement of IOP is essential in diagnosing and managing vision-threatening ocular diseases, but proper technique and interpretation of results are critical for optimal patient care.

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to accurately diagnose a vision-threatening condition and institute prompt, appropriate therapy for IOP abnormalities is essential when striving to save a patient's vision and preserve ocular comfort.

2

Inappropriate patient restraint

Because pressure on jugular veins significantly increases IOP,^{14,15} care should be taken to avoid pressure caused by the handler's hands or arms or through collar or leash traction during tonography (Figure 2). In dogs, use of a harness is less likely to affect IOP values.¹⁵

3

Globe compression through eyelid manipulation

Excessive eyelid manipulation often leads to erroneously high IOP readings (Figure 3).¹⁴ Because the normal globe position is rostral to the orbital rim in brachycephalic breeds, it is easy to artificially increase IOP by compressing the globe while attempting to retract the eyelids.¹⁴ In dolichocephalic dogs, excessive traction on the eyelids can result in erroneous IOP elevations. Specifically, stretching the eyelid margins maximally in a superior or inferior direction or laterally can significantly increase mean IOP.¹⁴ Resting the examiner's fingers on the bony orbital rim allows gentle and appropriate eyelid retraction, ensuring accurate measurements.

4

Misinterpretation of results

Normal canine IOP is 15 to 25 mm Hg. During IOP measurement, obtaining the most accurate reading possible is imperative; the Tono-Pen Vet digital readout should show less than 5% standard error. The difference in IOP between fellow eyes should be less than 8 mm Hg.¹³ Patients with normal IOPs in both eyes can still have an IOP difference between the eyes exceeding 8 mm Hg, but it is important to evaluate for clinical disease (eg, aqueous flare, rubeosis iridis, keratic precipitates, corneal edema, mild episcleral vascular congestion) to determine whether low-grade uveitis (eg, low-normal IOP compared with contralateral eye) or early glaucoma (eg, high-normal IOP compared with contralateral eye) is present.



Three tonometers commonly used in veterinary medicine are the Schiottz indentation tonometer, the Tono-Pen Vet applanation tonometer, and the TonoVet rebound tonometer.



Pressure on one or both jugular veins from a collar and leash (arrow) can cause erroneously high IOP readings.



A

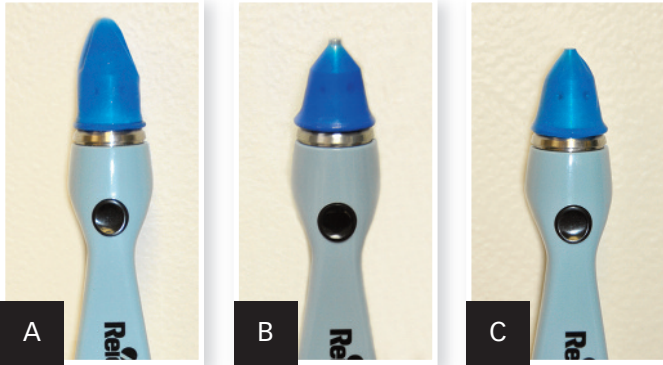


B

3 When performing applanation tonometry, it is important to avoid applying digital pressure through the eyelids to the globe itself (A, arrow). Resting fingers on the bony orbital rim allows gentle and appropriate eyelid retraction, ensuring accurate measurements (B).

IOP = intraocular pressure

4 Erroneous IOP readings may be obtained if the Tono-Pen Vet tip cover is applied too loosely (A) or tightly (B). When replacing the tip cover, proper placement (C) aids in obtaining the most accurate results.



5 Inappropriate care and use of the applanation tonometer

Routine maintenance is necessary to reliably obtain accurate results from the applanation tonometer. Calibration is recommended before each use or q24h if used daily. The manufacturer recommends frequent cleaning of the Tono-Pen Vet using compressed air.¹⁶ Inappropriate placement of tip covers (too loose or too tight) is another common cause for inaccurate IOP measurement (Figure 4). Tono-Pen Vet operators are encouraged to review the user guide.

Closing thoughts

Patients are often referred to veterinary ophthalmologists for an ocular condition that has been misdiagnosed because tonometry was not performed or because incorrect technique led to inaccurate IOP values. By avoiding these mistakes, veterinarians can proactively improve patient care. ■ cb

See Aids & Resources, back page, for references & suggested reading.

For More



For more on IOP measurement techniques, see **Determining Intraocular Pressure** by Dr. David A. Wilkie at cliniciansbrief.com/determining-IOP

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