

Tonometry Technique Tips

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In the literature

Pe'er O, Chiu E, Arad D, Lelescu C, Ross M, Ofri R. Does the order of intraocular pressure measurement affect tonometry results? *Vet Ophthalmol.* 2021;24(S1):146-153.

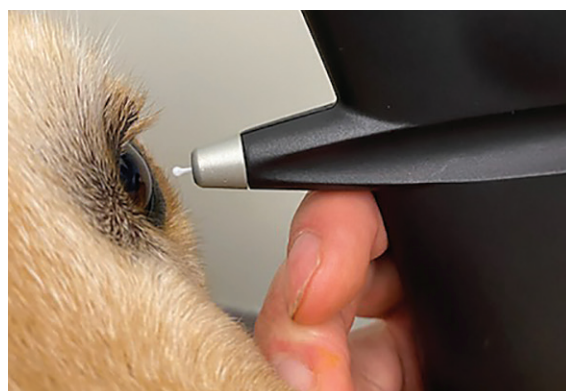
FROM THE PAGE ...

Tonometry is a critical test in diagnosing and monitoring conditions such as glaucoma or uveitis and should be performed in all dogs with a red eye. Normal intraocular pressure (IOP) in dogs is reported^{1,2} as 15 to 25 mm Hg; readings that differ >20% between the right and left eye may be abnormal.

Most tonometers work by the principles of applanation (ie, force needed to flatten a specific area of cornea) or rebound (ie, analysis of motion parameters of a bouncing probe). Applanation tonometry requires a topical anesthetic, whereas rebound tonometry does not.

Restraint and patient positioning can affect tonometer readings. Any external pressure on the globe, eyelids, or neck (eg, jugular vein compression) can artifactually increase IOP.

This study evaluated 72 normal dogs using either applanation or rebound tonometry. IOP readings taken in the second eye were significantly lower than in the first eye, regardless of which eye was measured first (ie, left vs right) or the type of tonometer used. Measurements repeated in the first eye were also lower than the initial reading. This phenomenon was reproducible 15 minutes later, with



▲ **FIGURE 1** Rebound tonometry in a dog

readings lower than the initial set. These findings suggest that, in normal dogs, the IOP of the fellow eye will be slightly lower than that of the first eye and repeated measurements may yield further decreased IOP readings.

Most readings differed by an average of <2 mm Hg and were <20% different between eyes, which is considered clinically insignificant; however, some individual readings differed by 5 to 8 mm Hg, representing up to a 30% difference. Although this could be interpreted as a clinically significant difference, it may simply be the result of the order in which IOP was measured.

It is unclear what exactly causes decreased IOP readings in the second eye and in repeated measurements in the first eye. In humans, a “white coat” phenomenon has been noted in which stress and anxiety can raise IOP and acclimatization and relaxation of the patient can lower IOP³; this may also apply to dogs. Other theories include mechanical changes in the fluid outflow of the eye, tear film changes, or additional factors related to tonometry itself.

... TO YOUR PATIENTS

Key pearls to put into practice:

- 1** When performing tonometry, regardless of device used, it is important to use careful patient restraint and avoid pressure on the globe, eyelids, and neck to avoid iatrogenically increased IOP readings.
- 2** IOP readings in the first eye are often slightly higher than in the second eye. If the difference between eyes is >20% or appears to be elevated in the first eye, repeating the IOP reading should be considered before deciding on treatment.
- 3** When monitoring patients with glaucoma or uveitis, it is important to use the same equipment and consider the order of tonometry reading at each visit to maintain consistency.

References

1. Maggs DJ. Ophthalmic examination and diagnostic testing. In: Maggs DJ, Miller PE, Ofri R, eds. *Slatter's Fundamentals of Veterinary Ophthalmology*. 6th ed. W.B. Saunders; 2018:18-53.
2. Featherstone HJ, Heinrich CL. Ophthalmic examination and diagnostics. In: Gelatt KN, Gilger BC, Kern TJ, eds. *Veterinary Ophthalmology*. 5th ed. Wiley-Blackwell; 2013:533-613.
3. Méndez-Ulrich JL, Sanz A, Feliu-Soler A, Álvarez M, Borràs X. Could white coat ocular hypertension affect to the accuracy of the diagnosis of glaucoma? Relationships between anxiety and intraocular pressure in a simulated clinical setting. *Appl Psychophysiol Biofeedback*. 2018;43(1):49-56.

Research Note: Predicting Heart Failure or Cardiac Death in Dogs with Preclinical Myxomatous Mitral Valve Disease

This prospective, placebo-controlled study of 168 dogs with preclinical myxomatous mitral valve disease (MMVD) and cardiomegaly assessed the ability of echocardiographic values and cardiac biomarkers (ie, N-terminal pro brain natriuretic peptide [NTproBNP], cardiac troponin I) to help predict the risk for heart failure or cardiac death. A composite of 3 variables (left atrium:aortic root ratio, early transmitral peak velocity, and NTproBNP value) was significantly associated with increased risk for heart failure or cardiac death and represents a useful predictive model. Results of this study may provide a basis for future therapeutic interventions to delay the progression of MMVD.

Source

Borgarelli M, Ferasin L, Lamb K, et al. The predictive value of clinical, radiographic, echocardiographic variables and cardiac biomarkers for assessing risk of the onset of heart failure or cardiac death in dogs with preclinical myxomatous mitral valve disease enrolled in the DELAY study. *J Vet Cardiol*. 2021;36:77-88.