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# Comparison of the amount of aqueous flare between laser photometry and subjective evaluation techniques in dogs undergoing phacoemulsification

## Comparação do quantitativo de flare do aquoso entre as técnicas de fotometria à laser e avaliação subjetiva em cães submetidos à facoemulsificação

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**Abstract:** This study aimed to compare the quantification of aqueous flares using laser photometry and subjective clinical determination after phacoemulsification through the V-prechop nucleodissection technique in dogs. Forty-three dogs of different breeds, males and females, aged 3–10 years, with mature (G2, n = 22) and immature (G1, n = 21) cataracts, were included. After surgery, the patients were evaluated weekly for aqueous flares (using laser flare photometry) and clinically evaluated using slit-lamp biomicroscopy over different periods. Intraocular inflammation was more evident in patients with stage G2 disease than in those with stage G1 disease. Over time, it regressed in most animals, persisting to a mild degree in three animals by the end of the observation period. Statistical analyses revealed key differences between the groups in the immediate postoperative period and after 30 days of observation. "Aqueous flare" (ph/ms), quantified using laser flare photometry, was higher in the operated eyes of both groups (G1 and G2). However, a significant difference was observed in the immediate postoperative period and at 45 and 30 days in groups G1 and G2, respectively. Furthermore, when comparing the operated eyes of each group, a significant difference was observed in the preoperative period and 60 days postoperatively; the mean values were always higher in the G2 patients (G1-preop = 25.5 ± 11.4 ph/ms and G2-preop = 45.7 ± 17.7 ph/ms; G1-60d = 23.4 ± 8.9 ph/ms and G2-60d = 39.8 ± 13.4 ph/ms). In conclusion, laser cell and flare photometry showed higher accuracy in evaluating aqueous flares than clinical evaluation based on scores during the postoperative period in phacoemulsification by V-prechop nucleodissection. The quantitative values of flares obtained using this non-invasive method may also be used to evaluate other nucleodissection techniques in phacoemulsification.

**Keywords:** aqueous flare; intraocular inflammation; Kowa FM600; cataract

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**Resumo:** Objetivou-se com este estudo comparar a quantificação do "flare" do aquoso por fotometria à laser e a quantificação clínica subjetiva do "flare" do aquoso após facoemulsificação pela técnica V-Prechop de nucleodissecção, em cães. Foram utilizados 43 cães de diferentes raças, machos e fêmeas, com idades entre 3 e 10 anos, portadores de catarata madura (G1, n=22) e imatura (G2, n=21). Após a cirurgia, os pacientes foram avaliados semanalmente para quantificação do *flare* por fotometria laser em diferentes períodos, e para observação clínica do *flare* por biomicroscopia de lâmpada de fenda, nos mesmos períodos. A exacerbação clínica da inflamação intraocular foi mais evidente nos pacientes do G2 quando comparados com os do G1. Com o tempo regrediu na maioria deles, persistindo em grau leve em três animais ao final do período de observação. A análise estatística demonstrou diferenças entre os grupos estudados no pós-operatório imediato e após 30 dias de observação. A avaliação quantitativa do "flare" do aquoso (em ph/ms) na fotometria à laser mostrou-se maior nos olhos operados de ambos os grupos (G1 e G2). No entanto, houve diferença significativa no pós-operatório imediato e aos 45 e 30 dias no G1 e G2, respectivamente. Ao comparar os olhos operados de cada grupo, observou-se diferença significativa no pré-operatório e 60 dias de pós-operatório; os valores médios foram sempre maiores nos pacientes do G2 (G1-pré-operatório = 25,5 ± 11,4 ph/ms e G2-pré-operatório = 45,7 ± 17,7 ph/ms; G1-60d = 23,4 ± 8,9 ph/ms e G2- 60d = 39,8 ± 13,4 ph/ms). Em conclusão, pode-se supor que a fotometria de célula a laser e flare apresentou maior acurácia em comparação à avaliação clínica do flare usando escores no pós-operatório na facoemulsificação por nucleodissecção V-Prechop. É possível que os valores quantitativos de flare encontrados sejam semelhantes utilizando outras técnicas de nucleodissecção em facoemulsificação, utilizando este método não invasivo de avaliação do flare.

**Palavras-chave:** *flare* do aquoso; inflamação intraocular; Kowa FM600; catarata

## 1. Introduction

The diagnosis and management of intraocular inflammation involve measuring the number of cells and the levels of proteins (flares) in the aqueous humor. This can be achieved using a laser flare photometer, which allows objective quantification, both in the clinic and in research, to assess the inflammatory reaction in the anterior segment[1]; however, studies using laser flare photometers are scarce in veterinary medicine. The measurement of flares provides information about the severity of inflammatory processes and the extent of blood-aqueous barrier (BHA) breakdown. To this end, flare photometry allows for the recording of protein concentrations in the anterior chamber in an objective, rapid, and noninvasive manner, qualitatively and quantitatively evaluating the function of the BHA, despite high equipment costs[2].

The BHA, a selectively permeable barrier formed by the nonpigmented layer of the epithelium of the ciliary body and the endothelium of blood vessels in the iris, normally prevents the passage of proteins into the aqueous humor. However, a reduction in the rate of aqueous flow or disruption of the BHA causes proteins to leak from the blood vessels into the inflamed iris or ciliary body, resulting in increased protein components in the aqueous humor[3, 4]. Furthermore, the BHA is fragile and can be altered by numerous noxious stimuli. Corneal abrasion, anterior chamber paracentesis, intraocular infections, uveal inflammation, intraocular surgeries, and some instilled drugs can break the BHA and alter the aqueous humor composition[5]. Moreover, the inflammatory process in the anterior segment, likely

caused by the action of prostaglandins, is associated with an increase in BHA permeability to proteins. It is clinically characterized as a flare, which, in severe cases, may give the aqueous humor a cloudy or milky appearance[4].

Quantification of flares in the aqueous humor provides valuable information regarding the severity and intensity of inflammatory processes[6]. Subjective grading of the anterior segment by biomicroscopy has been widely used to quantify flares in uveitis. Despite its wide use and ease of application, the subjectivity of the examiner and low reproducibility of the procedure may restrict its use when a precise and judicious assessment is required[7].

In surgical intraocular procedures such as phacoemulsification, postoperative uveitis is common in dogs because of intraocular manipulation and ultrasound exposure during surgery. Uveitis is the most important factor for surgical success, as it affects both immediate and late results. Currently, the success rate of phacoemulsification surgery in dogs is approximately 80–90%, which decreases by approximately 10–20% after three–five years of surgery[8]. Andrade et al. (2020)[9] evaluated the feasibility of the V-prechop nucleodissection technique in phacoemulsification and observed that although this technique can be used in selective cases of dogs with immature cataracts, it presents technical difficulties for implementation in patients with mature cataracts.

This study aimed to compare aqueous flare quantification using laser photometry with a subjective clinical evaluation using slit-lamp biomicroscopy in dogs subjected to phacoemulsification through the V-prechop nucleodissection technique.

## 2. Material and methods

### 2.1 Ethical consideration

The study was conducted with express authorization from the animal owners/trainers and the Committee of Ethics in Animal Experimentation of São Paulo State University (UNESP), School of Agricultural and Veterinarian Sciences, Jaboticabal campus (Process n. 018663-08). Bioethical care was provided according to the standards of the Association for Research in Vision and Ophthalmology - ARVO (National Institutes of Health Publications No. 85-23: Revised 1985).

### 2.2 Animals

In total, 43 dogs were included in this study. The dogs ranged in age from 3–10 years, included both males and females, and were divided into groups 1 (G1, immature cataract, n = 21) and 2 (G2, mature cataract, n = 22). All dogs underwent a pupillary light reflex test, Schirmer tear test (Ophthalmos, São Paulo, Brazil), slit lamp biomicroscopy (SL-15 Kowa Company, Tokyo, Japan), gonioscopy (Koeppe Medium Diagnostic lens 18 mm; Ocular Instruments Inc., Bellevue, Washington, USA), and applanation tonometry (Tonopen XL, Mentor Inc., Norwell, MA, USA) in their corneas, which were desensitized with 0.5% proxymetacaine (Anestalcon®; Alcon, São Paulo, Brazil). They were also subjected to indirect binocular (OCH – 3.3; Opto

Eletrônica S.A., São Carlos, Brazil) and direct monocular ophthalmoscopy (7100 -C; Welch Allyn, Mississauga, Ontario, Canada) after pupil dilation with a mydriatic and mild cycloplegic (Mydriacyl®, Alcon). Fluorescein eye staining (fluorescein strips; Ophthalmos) was also performed.

Subjective tests for assessing visual perception, including the maze, cotton, and dazzle reflexes, were administered. These were considered together with the observations made by the animal owners/trainers regarding ambulation and objective avoidance. Only animals without concurrent abnormalities were included. General clinical conditions were determined by physical examination and assessment of global blood cell counts, hepatic and renal functions, and glycemia. Pre-selected animals were subjected to ocular ultrasonography (UltraScan Imaging System; Alcon) in modes A and B. Electroretinography (Handheld Multi-species ERG; Retvetcorp, Columbia, MO, USA) in the flash and flicker modes, according to the Dog Diagnostic Protocol[10], was used to identify severe concurrent retinopathy. Only electroretinographically healthy animals were included in this study.

### 2.3 Preoperative therapeutic procedures

Preoperative therapeutics began before the initial surgical procedures and included administration of one drop of tobramycin (0.3%) and dexamethasone (0.1%) eye drops (Trobadex®; Alcon) four times daily. One drop of atropine sulfate (Atropina 1%®; Allergan, São Paulo, Brazil) was administered 30 min prior to the surgical procedure. A single injection of flunixin meglumine (Banamine®; Schering-Plough, São Paulo, Brazil; 1.1 mg kg-1, i.m.) was administered 30 min prior to surgery.

### 2.4 Anesthetic procedures

After food and water fasting for 12 and 6 h, respectively, animals were pre-anesthetized with meperidine (Dolosal®, Cristália, Itapira, Brazil; 0.005 mg kg-1, i.v.), and administered diazepam (Diazepamil®, Hipolabor, Belo Horizonte, Brazil; 0.03 mg kg-1). After 15 min, general anesthesia was administered using propofol (Profolen®, Blausiegel, São Paulo, Brazil; 5.0 mg kg-1, i.v.). Anesthesia was maintained with a halogenating agent (Isoforine®, Cristália, São Paulo, Brazil), vaporized in oxygen, in a semi-closed gas re-inhalation circuit. After isolating the surgical field, intravenous rocuronium bromide (Esmeron®, Organos, São Paulo, Brazil; 0.3 mg kg-1 i.v.) was used for neuromuscular blockade, and automated mechanical ventilation was performed.

### 2.5 Phacoemulsification

The surgical procedure (V-prechop nucleodissection) was previously described by Andrade et al. (2020)[9]; all cataract surgeries were performed by a single surgeon. Only the right eye of each animal was included in this study. An aqueous solution of pyrrolidone iodine (Laboriodine PVPI topical; Laboratórios Biossintética, São Paulo, Brazil) was used for antisepsis of the eyelids by dilution at a ratio of 1:1 in saline solution (sodium chloride 0.9%;

Baxter Hospitalar, São Paulo, Brazil). The same solution was diluted to 1:50 for use on the ocular surface. A two-handed phacoemulsification technique was used, with a primary corneal incision located 1 mm from the limbus. The main incision was tunneled in the 11 o'clock position, with a 3.2-mm angled scalpel (Surgical Knife 3.2 mm; Alcon). The anterior chamber was filled with a vital dye (Trypan Blue; Ophthalmos) to stain the anterior lens capsule. Chondroitin sulfate (4%), sodium hyaluronate (3%; Viscoat®; Alcon), and methylcellulose (2%; Ophthalmos) were used as ophthalmic viscosurgical devices as per the 'soft-shell' technique proposed by Arshinoff (1999).

An incision in the anterior lens capsule was made using an angled 3.3-mm scalpel, followed by continuous curvilinear capsulorhexis with a Utrata collet (Capsulorhexis Forceps, Utrata Steel Inox, Guarulhos, Brazil). Hydrodissection was performed using a syringe coupled to an irrigation cannula and a balanced salt solution (BSS). Using an Akahoshi *prechopper* (Prechopper Akahoshi, Storz Instruments, El Segundo, CA, USA), inserted through the main incision, nucleodissection was conducted using an oblique fracture followed by a second, to form a "V." To facilitate this maneuver, a nucleus manipulator was used to exert counterpressure to the Akahoshi *prechopper*. A second hydrodissection was performed for the expulsion of the viscoelastic material; then, projection of the "V" segment was promoted for phacoemulsification of the nucleus. For cataract surgery, we deployed a phacoemulsifier (Facoemulisificador Universal II, Alcon) using a Legacy ultrasound phaco handpiece that came attached to the equipment.

The technique proceeded to aspiration of the "V" segment, followed by aspiration of the cortical remnants and the remaining viscoelastics. To finalize the steps, the principal corneal incision was sutured with two simple separate points, not transfixed, and buried, using monofilament nylon thread 9-0 (Mononylon 9-0, Ethicon, Cincinnati, OH, USA). Intraocular lenses were not implanted, thereby generating an afascial condition.

### 2.6 Postoperative procedures

Following surgery, the patients received systemic prednisone (Meticorten®, Schering-Plough) (1 mg.kg-1) every 24 h for 15 days; topical dexamethasone combined with tobramycin (Tobradex®, Alcon) (q4 h) for at least 30 days; 1% brinzolamide (Azopt®, Alcon) (q12 h); and 1% tropicamide (Mydriacyl®, Alcon) (q8 h) for up to seven days. Patients wore an Elizabethan collar for at least 15 days.

### 2.7 Moments and variables of the postoperative clinical evaluation

Each patient was examined at 7, 14, 21, 30, 45, and 60 days after surgery by monitoring their intraocular pressure. Subjective tests, such as the maze, cotton, and obfuscation tests, were used to evaluate visual perception, in addition to the observations reported by the owners regarding ambulation and object avoidance. Qualitative and quantitative evaluations of photophobia, blepharospasm, conjunctival congestion, edema, corneal ulceration, transparency of the aqueous humor (flare), abnormal content in the anterior chamber

(hyphema and hypopyon), posterior lenticular capsule opacity, and vitreoretinal alterations were recorded and retained following the same criteria used in the ophthalmic examination described above. The assessed parameters were categorized as absent (0), slight (1), moderate (2), or severe (3). The patients were assessed by two blinded examiners.

### 2.8 Laser flare and cell photometry to measure intraocular inflammation

Laser cells and flare photometry were used to measure aqueous humor flares using the procedures described for the Kowa Laser Flare Cell Meter in dogs (Krohne et al., 1995) [13]. The flares were counted numerically using specialized equipment (Laser Flare Cell Meter, FM600, Kowa). The flare quantity was determined using a helium-neon laser beam to scan the anterior chambers of both eyes (RE = operated eye; LE = control) (Figure 1). The data are expressed as photon counts per millisecond (PC ms-1). Laser photometry requires sedation or general anesthesia. Thus, meperidine (Dolosal®, Cristália; 0.005 mg kg-1, i.v.) combined with diazepam (Diazepamil®, Hipolabor, Belo Horizonte, Brazil; 0.03 mg kg-1) was used for sedation in the preoperative and postoperative evaluations. After 5–10 min of deep sedation, the dog's head was optimally positioned. To avoid variations in the results, all animals were positioned by the same person, and the examination was performed by a single-blinded examiner. The left eye of each animal was also subjected to laser cell and flare photometry and was used as a control (no surgery). The animals were evaluated during the preoperative period, immediately following surgery, and at 7, 14, 21, 30, 45, and 60 days after surgery. Other clinical parameters were measured before laser photometry, as was reported for patient selection.

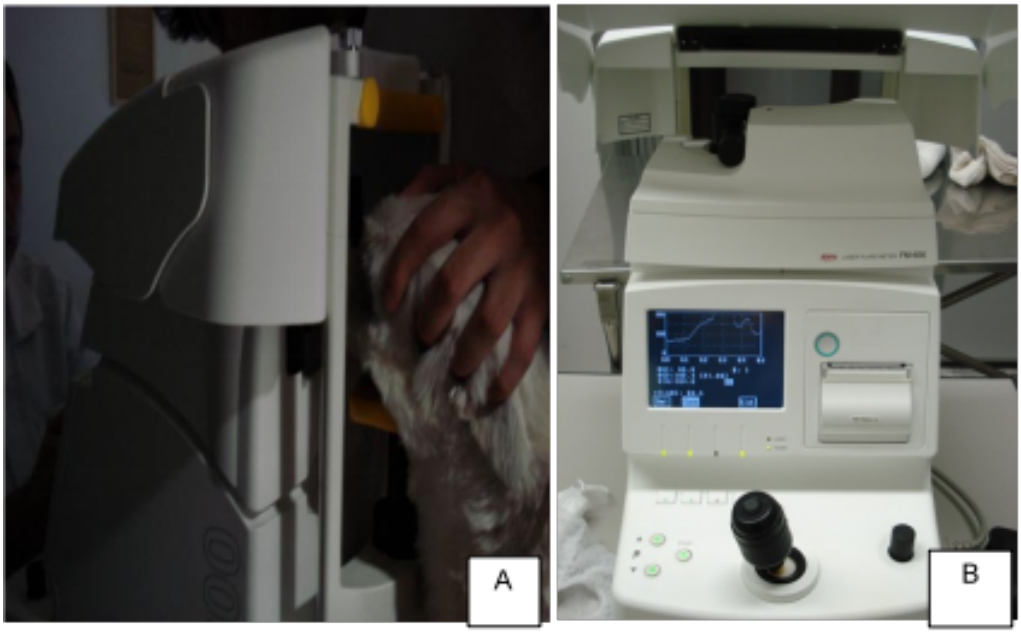


**Figure 1. A.** Illustrative picture of the procedure during the Laser Flare Cell-Meter examination in dogs. **B.** Image from the Laser Flare Cell-Meter, FM600 (Kowa) after obtaining a numerical count of the flare; note the quantity of flare expressed as a graph on the screen (15 days postoperative, from a dog in the G1 group).

### 2.9 Statistical analysis

The Shapiro–Wilk test was used to assess data normality. The data were subjected to repeated-measures analysis of variance and the means were compared using Tukey's test at a 5% significance level. The postoperative clinical variables were analyzed using the Mann–Whitney test to compare the groups at each time point after surgery (7, 14, 21, 30, 45, and 60 days after surgery), and the Friedman test was used to compare the time points of each group, followed by Dunn's test for multiple comparisons. Results were considered significant at $P < 0.05$. The tests were conducted using Statistical Analysis System (SAS) software.

## 3. Results

There were no cases of posterior capsule rupture, vitreous herniation, lens dislocation, retinal detachment, or intra-operative intraocular hemorrhage, as described by Andrade et al. (2020)[9]; furthermore, there were no complications that increased intraocular inflammation. Among the clinical variables, discernible visual perception was observed during the immediate postoperative period after the anesthetic effect, which persisted throughout all evaluation periods in both groups. Direct pupillary reflex was absent in all patients seven days after surgery but returned to normal over time. A moderate degree of photophobia and blepharospasm was observed in most G1 and G2 patients during the immediate postoperative period. However, these symptoms abated in intensity as early as seven days after surgery and were eliminated 30 days after surgery in G1 patients and 60 days after surgery in G2 patients. Despite the presence of symptoms in both groups, no statistically significant differences were observed at any time point.

Conjunctival congestion occurred in all the animals during the immediate postoperative period. Among the G1 animals (immature), eight displayed a moderate degree, with regression to light seven days after surgery and absence 30 days after surgery. In G2 animals, a mild degree of congestion was observed seven days after the operation in half of the animals, and a moderate degree was observed in the other half. Congestion regressed in subsequent periods, becoming absent after only 60 days of follow-up. There were significant differences between the groups on days 14, 21, and 30.

A mild degree of diffuse corneal edema was observed in two patients in G2 (mature), seven days after surgery, which gradually involuted over time. However, corneal edema limited to the incisional areas was observed in almost all patients, with regression at the end of the observation period when there was a discrete leukoma scar that was imperceptible because of coverage by the upper eyelid. No significant differences were observed between the groups at any time point.

The flare evaluated by clinical observation using slit-lamp biomicroscopy was more evident in G2 patients. A moderate degree of flare-up was observed in 12 patients during the immediate postoperative period. Over time, it regressed in most animals, persisting to a mild degree in three animals at the end of the observation period. In the G1 group, it was evident

from the fifteenth day after surgery in a mild form, regressed in subsequent periods, and became absent at 60 days postoperatively. Statistical analyses revealed differences between the groups in the immediate postoperative period and after 30 days of observation.

Quantitative evaluation of the "flare" (ph/ms) using laser flare photometry was shown to be higher in the operated eyes of both groups (G1 and G2). There was a significant difference in the immediate postoperative period and at 45 and 30 days for G1 and G2, respectively. When comparing the operated eyes of each group, a significant difference was observed between the values obtained in the preoperative period and 60 days postoperatively; furthermore, the mean values were always higher in the G2 patients (G1-preop = 25.5 ± 11.4 ph/ms and G2-preop = 45.7 ± 17.7 ph/ms; G1-60d = 23.4 ± 8.9 ph/ms and G2-60d = 39.8 ± 13.4 ph/ms; Table 1 and Figure 2).

**Table 1.** Mean ( $\bar{x}$ ) and standard deviation of the quantity of "flare" (ph/ms) in dogs with cataracts that underwent phacoemulsification by the "V-prechop" nucleodissection technique, according to the study groups and eyes at each evaluation moment

| | | *Flare* ( $\bar{x}$ ± s) | |
|---|---|---|---|
| | Moment | G1 Immature | G2 Mature |
| Eye Operated RE | PREOP | 25.5 ± 11.4 cB | 45.7 ± 17.7 bcA |
| | POI | 83.2 ± 19.5 a * | 96.4 ± 21.0 a * |
| | M07 | 88.5 ± 24.5 a * | 99.9 ± 17.8 a * |
| | M14 | 88.6 ± 64.1 a * | 81.7 ± 17.7 ab * |
| | M21 | 67.5 ± 39.9 ab * | 71.8 ± 40.8 abc * |
| | M30 | 40.3 ± 15.6 bc * | 56.1 ± 23.4 bc * |
| | M45 | 35.6 ± 12.1 bc * | 47.3 ± 18.6 bc |
| | M60 | 23.4 ± 8.9 cB | 39.8 ± 13.4 cA |
| Control LE | PRÉ | 25.7 ± 10.9 B | 44.7 ± 14.7 A |
| | POI | 26.3 ± 8.5 B | 45.0 ± 15.5 A |
| | M07 | 27.2 ± 7.5 B | 37.0 ± 11.7 A |
| | M14 | 27.1 ± 6.6 B | 39.5 ± 13.1 A |
| | M21 | 27.2 ± 7.3 B | 39.9 ± 13.2 A |
| | M30 | 26.9 ± 6.1 B | 39.5 ± 11.2 A |
| | M45 | 27.7 ± 5.3 B | 39.1 ± 8.1 A |
| | M60 | 26.1 ± 4.5 B | 40.9 ± 11.4 A |

*RE, right eye; LE = left eye; M, moment; PREP, preoperative period; POI, immediate postoperative period.*

*Means followed by different letters (lowercase in the column and uppercase in the row) differ from each other according to Tukey's test (**P** < 0.05).*

**Significant difference between the operated (OD) and control (OE) groups according to Tukey's test (**P** < 0.05).*

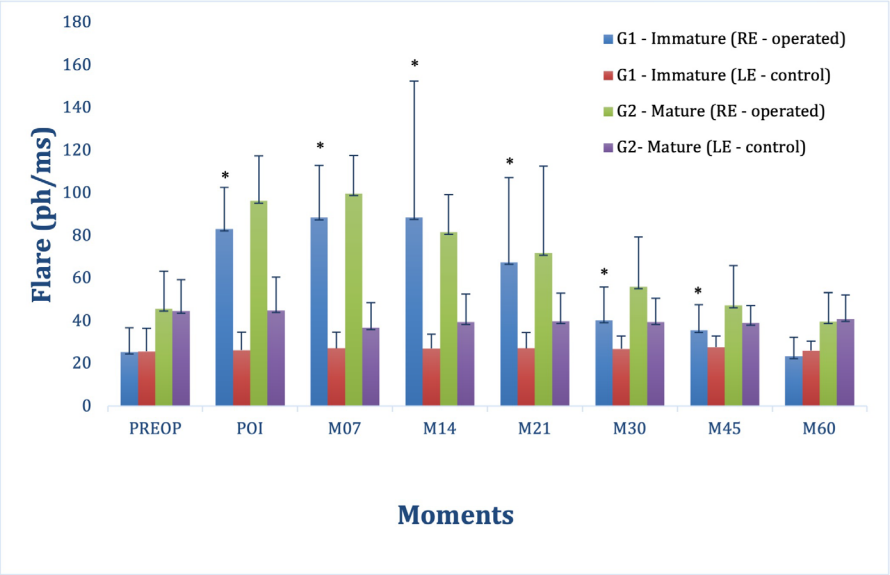


**Figure 2. Graphic representation of aqueous flare measurements using laser photometry in dogs with cataracts subjected to phacoemulsification using the nucleodissection V-prechop technique. Legend: RE: right eye; LE: Left Eye; (*) Significant difference between operated (RE) and control (LE) by Tukey's test ($P < 0.05$), in dog with immature cataract; (+): Significant difference between operated (RE) and control (LE) by Tukey's test ($P < 0.05$), in dogs with mature cataracts.**

Chemosis, corneal ulcers, hyphema, hypopyon, and vitreoretinal alterations were not observed at any time point during the clinical evaluation of any patient. Posterior capsular opacity was observed at the end of the intraoperative period in two G2 patients, but was not accentuated over time.

## 4. Discussion

The "V-prechop" nucleodissection technique gives rise to performance difficulties in patients with mature cataracts, owing to the hardness of the nuclei. This is indicated in select cases of patients with immature cataracts, in whom the production of nucleus-linear fragments in a "V" was easier to perform[9]. However, postoperative uveitis occurs independent of the technique used[11, 12] and is almost always evaluated by clinical features, which may vary between evaluators. Despite possible postoperative complications such as fibrovascular membranes, growth in lenticular fibers, lenticular epithelial membranes, and endophthalmitis[12], no such complications were identified in this study.

We found no difficulty performing laser photometry in any of the animals included in the study. The accuracy of laser flare photometry for quantifying flare in dogs has been confirmed, and the procedure requires sedation or short-term intravenous general anesthesia for safe and reliable execution. As described by Oshika et al. (1989)[6], this study provides valuable data on the intensity of induced inflammation. However, few studies have used the flare assessment method in veterinary medicine. The quantity of flare in both types of cataracts preoperatively was higher than that found in healthy patients and with reference to Krohne et al. (1998)[13], and was significant in mature cataracts, corroborating the data of Gelatt (2007)[11] and Slatter (2005)[14].

The number of flares increased significantly in the immediate postoperative period in both groups but was higher in G2 (mature). This was assumed to be related to greater surgical manipulation and longer ultrasound exposure owing to difficulties related to lens fractures. The presence of free lens fragments was evident in the anterior chamber of patients with mature cataracts (G2), along with an increased volume of BSS and intracameral turbulence[15]. The number of flares decreased with time. At 60 days, the values were close to the preoperative values, although still higher than those found in the eyes of healthy dogs[8].

Although an evaluation of the quantity of "flare" was conducted using laser flare photometry, quali-quantitative evaluation employing a subjective method routinely adopted in veterinary ophthalmologic practice was also performed. Moderate turbidity of the aqueous humor was observed in G2 patients during the immediate postoperative period. In both groups, this regressed over time, although it remained significantly different in the immediate postoperative period and at 30 days. The quantity of "flare" determined by photometry showed a significant difference in the preoperative period and at 60 days. These findings demonstrated no correlation between the methods, likely due to the accuracy of the second method, as described by El-Maghraby et al. (1992)[15] when measuring the anterior chamber reaction using a laser flare-cell meter (KOWA FCM-1000) before and after cataract surgery. The measurements were obtained by two examiners and the average flare values for both were determined to be practically identical, demonstrating the high reproducibility of the method.

Anti-inflammatory and antibiotic preparations for topical and systemic use collaborate to control postoperative uveitis and provide infection prophylaxis. The frequency and duration of treatment met recommendations proposed in the literature[12, 16, 17]. Effectiveness was observed in controlling inflammation, as demonstrated by a reduction in the intensity of the evaluated clinical parameters and values from laser flare photometry. This result is consistent with the mechanism of action of systemic carprofen as observed by Krohne et al. (1998)[18], who used this drug to control pilocarpine-induced irritative uveitis. In this study, we used systemic steroidal anti-inflammatory agents to control postoperative uveitis after phacoemulsification, with a positive impact on the data obtained from the laser flare-meter procedure over time.

Previous studies demonstrated that laser flare photometry values can be altered and influenced by non-disease factors that affect aqueous protein levels and the amount of light reflected from the anterior chamber[4]. All animals received mydriatic drugs during the pre- and postoperative periods to control ocular pain and uveitis. The effect of mydriatic agents and pupil size on aqueous flares in humans can decrease laser flare values by 10–20% after dilation in normal subjects[19]; however, we believe that this did not influence the values obtained in the animals included in this study. The decrease in the laser flare values likely occurred due to the anti-inflammatory therapy without interference from pupil dilation, as described by Ikej et al. (2010)[4].

## 5. Conclusion

In conclusion, laser cell and flare photometry showed higher accuracy than the clinical evaluation based on scores during the postoperative period of phacoemulsification using V-prechop nucleodissection. Similar quantitative values of flares can be obtained with this non-invasive method of flare assessment when using other nucleodissection techniques in phacoemulsification.

### Conflict of interest declaration

The authors declare no conflict of interest.

### Author contributions

*Conceptualization*: A. L. Andrade and L. F. Conceição. *Data curation*: A. L. Andrade, L. F. Conceição, A. Morales, D. Y. Trujillo, L. T. Tubone and J. L. Laus. *Investigation*: A. L. Andrade, L. F. Conceição and J. L. Laus. *Execution*: A. L. Andrade, L. F. Conceição, A. Morales, D. Y. Trujilllo and L. T. Tubone. *Project management*: A. L. Andrade and J. L. Laus. *Supervision*: A. L. Andrade and J. L. Laus. *Writing (original draft)*: A. L. Andrade.

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