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TEARS PRODUCTION EVALUATION DURING A PROTOCOL OF ANAESTHESIA FOR GERIATRIC DOGS

EVALUAREA PRODUCȚIEI DE LACRIMI FOLOSIND UN PROTOCOL ANESTEZIC LA CÂINII GERIATRICI

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ABSTRACT | REZUMAT

This study was performed in order to evaluate tear production during a protocol of anaesthesia for geriatric dogs. The study was conducted on 19 geriatric dogs that were presented at the Faculty of Veterinary Medicine in Bucharest. Preanaesthetic examination was performed and patients assigned to a risk group according to the / their ASA status (American Society of Anesthesiologists). The patients were premedicated with Midazolam 0.2 mg/kg and Butorphanol 0.2 mg/kg, injected intramuscularly (IM), induction was made with Propofol 4-6 mg/kg intravenously (IV). Afterwards, all dogs were intubated and maintained with Isoflurane. Tear production was evaluated with the use of a Schirmer Tear Test (STT) before premedication and 10 minutes after extubation. The results suggested a reduction of tear production, evaluated by STT, at the end of the procedure, compared with the first measurement. Before premedication the mean average results were 16.10 mm/min and at the end of the procedure, the mean average STT readings 10 minutes after extubation was 5.44 mm/min. There is a significant positive relationship between the value of STT before premedication and 10 minutes post extubation ($p<0.05$). Ocular lubricant or tear replacement should be used as a corneal protectant during geriatric dog anesthesia according to this protocol.

Keywords: Butorphanol, Isoflurane, Midazolam, premedication, Schirmer tear test (STT)

Scopul lucrării este de a evalua producția de lacrimi folosind un protocol anestezic la câinii geriatrici. Prezentul studiu a fost efectuat pe un număr de 19 pacienți geriatrici care s-au prezentat în cadrul Clinicii Facultății de Medicină Veterinară din București. Examinarea preanestezică a fost efectuată iar, pacienții au fost încadrați într-o grupă de risc conform statusului ASA (American Society of Anesthesiologists /Societatea Americană a Anesteziștilor). Premedicația pacienților a fost efectuată cu 0,2 mg/kg Midazolam și 0,2 mg/kg Butorphanol intramuscular (IM). Toți câinii incluși în studiu au fost intubați oro-traheal, inducerea fiind realizată cu Propofol 4-6 mg/kg și menținerea cu izofluran și oxigen. Testul Schirmer (STT) a fost efectuat pe întregul lot de câini. Valorile STT au fost determinate înainte de premedicație, și la 10 minute după extubare. Rezultatele obținute sugerează o reducere a producției de lacrimi, evaluată prin folosirea testului Schirmer, la finalul procedurii comparativ cu valorile la prima măsurătoare. Înaintea premedicației, valorile medii înregistrate erau 16.10 mm/min comparativ cu valorile medii ale STT la 10 minute de la detubare care au fost de 5.44 mm/min. Există o corelație semnificativă între valorile STT înainte de premedicație și valoarea STT la 10 minute după detubarea pacientului ($p< 0.05$). Se recomandă folosirea unui lubrifiant ocular sau aplicarea lacrimilor artificiale pentru protecția corneei pe parcursul anesteziei geriatricilor folosind acest protocol.

Cuvinte cheie: Butorfanol, Isofluran, Midazolam, premedicație, test Schirmer

Geriatric patients are prone to have a decreased lacrimal secretion. Tears that are continuously being produced and transported onto the ocular surface are considered basal tears (2). Autonomic depression accounts for decreases in reflex tear production in anaesthetized dogs (4). Clinical estimation of the tear production in dogs is performed with the Schirmer tear test (STT), which measures both reflex and basal aqueous tear formation rates (3, 6). Commercial standardized strips have a millimeter scale and may be impregnated with blue dye at the 5-mm point to evince tear fluid migration. Schirmer tear test remains the standard method for quantifying aqueous tear production in veterinary ophthalmology. Anaesthetics agents can determine a reduction in tear production, drying the cornea, that could cause ulceration or other pathological changes

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that may affect vision. Premedication is used in most anaesthetic protocols to provide sedation and anxyolysis, allowing a reduction in the amount of anaesthetic drugs and a smooth recovery from anaesthesia. The purpose of this study is to evaluate tear production during a protocol of anaesthesia for geriatric dogs.

MATERIALS AND METHODS

This article represents a clinical study conducted on 19 canine geriatric patients of different ages, belonging to different breeds that were anaesthetized for different surgical procedures: castration, ovariohysterectomy, mastectomy and cistotomy (Table 1).

Table 1

Breed, age and gender particularities of all dogs involved in the study

No.	Breed	Years	Gender
1	Poodle	14	M
2	Half breed	13	M
3	Pekinese	13	F
4	Half breed	12	F
5	Poodle	12	M
6	Great Dane	12	F
7	Bichon	11	F
8	Maltese Bichon	11	M
9	Cocker	11	M
10	Dwarf Schnautzer	10	M
11	Schitzu	10	F
12	Bichon	10	F
13	Half breed	10	M
14	Half breed	9	F
15	Golden Retriever	9	M
16	Pekinese	9	M
17	Poodle	8	F
18	Greyhound	8	F
19	Bichon	8	M

Fig. 1. Schirmer Tear Test before preanaesthetic medication

A complete physical examination, complete blood count (CBC) and ophthalmic examination were performed on both eyes for all dogs. They had no abnormalities detected during the physical and ophthalmic examination and they didn't receive any ocular medication.

Fig. 2. Patient monitoring (8)

Preanaesthetic testing using the STT was performed by placing the strip in the lateral half of the lower conjunctival sac so that the strip would be in contact with the cornea. The eyelids were gently held closed and the strip was left in place for 1 minute and tears were measured immediately upon removal. Both right and left eyes were tested at this time point (Fig. 1).

Table 2

STT values before premedication and after detubation; OD–right (oculus dexter) eye, OS–left (oculus sinister) eye

No.	PATIENT	STT before premedication (mm/min)	STT after 10 min. post extubation
1	Poodle	OD 20 OS 10	OD 0 OS 0
2	Half breed	OD 15 OS 16	OD 0 OS 0
3	Pekinese	OD 15 OS 10	OD 0 OS 0
4	Half breed	OD 20 OS 25	OD 10 OS 10
5	Poodle	OD 15 OS 15	OD 5 OS 5
6	Great Dane	OD 20 OS 18	OD 5 OD 5
7	Bichon	OD 15 OS 10	OD 0 OS 0
8	Maltese Bichon	OD 10 OS 25	OD 0 OS 10
9	Cocker	OD 15 OS 10	OD 10 OS 7
10	Dwarf Schnautzer	OD 15 OS 15	OD 5 OS 7
11	Schitzu	OD 20 OS 20	OD 10 OS 9
12	Bichon	OD 15 OS 15	OD 10 OS 5
13	Half breed	OD 15 OS 10	OD 10 OS 7
14	Half breed	OD 15 OS 15	OD 5 OS 7
15	Golden Retriever	OD 15 OS 16	OD 0 OS 0
16	Pekinese	OD 15 OS 10	OD 0 OS 0
17	Poodle	OD 20 OS 25	OD 10 OS 10
18	Greyhound	OD 17 OS 20	OD 10 OS 10
19	Bichon	OD 20 OS 15	OD 15 OS 10

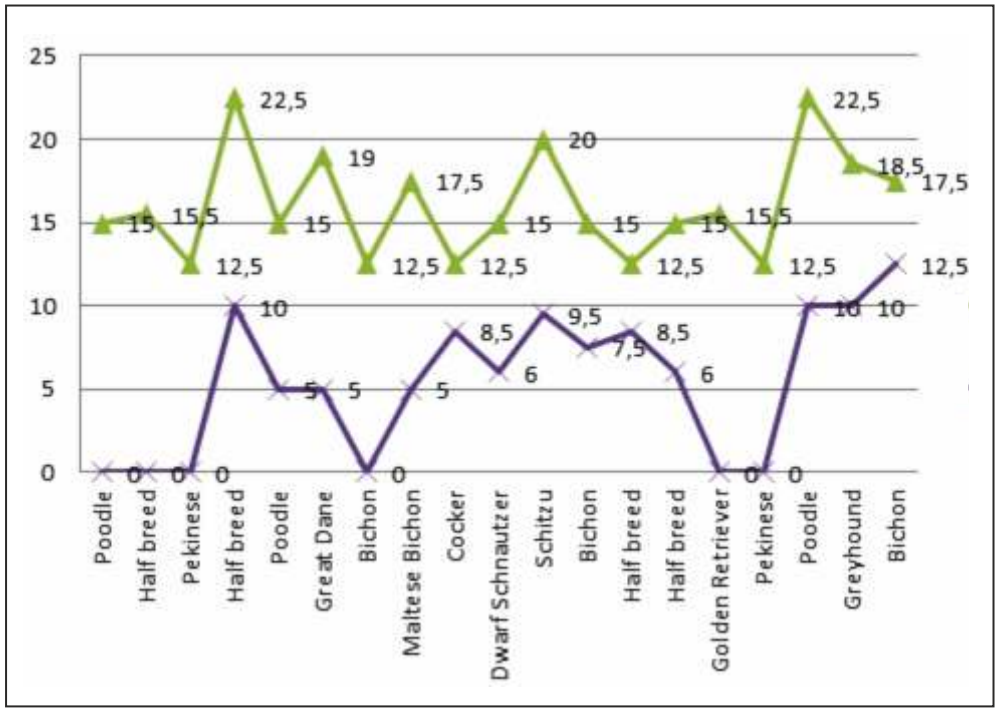

Fig. 3. Mean values of STT before preanaesthetic medication (—▲—) and 10 minutes post extubation (—×—)

Tear production was measured at baseline (before anaesthesia) and after 10 minutes post extubation. STT values in the normal adult dogs vary from 18.64+ -4.47 mm/min to 23.90 +-5.12 mm/min (3).

All dogs received for premedication a combination of Midazolam 0.2 mg/kg and Butorphanol 0.2 mg/kg injected intramuscular (IM). The length of anaesthesia varied depending on the length of the surgical procedure performed (35 min-120 min). Anaesthesia was induced with Propofol (4-6mg/kg IV) and followed by oro-tracheal intubation. Intermittent positive-pressure ventilation (IPPV) was initiated by use of a volume-cycled ventilator. Oxygen flow was initially delivered at 2L /min, 2.0% Isoflurane within 3-5 minutes of induction. After 3-5 minutes, oxygen flow was decreased to (500 +10*kg) L/min and Isoflurane maintained to a mean MAC of 1.7. Lactated Ringer solution was administered IV at 3-5 ml/kg/h throughout anaesthesia. The temperature was measured continuously by use of a probe place in the thoracic portion of the oesophagus and maintained between 36.6 ^{0}C and 37.8 ^{0}C with an external heating mattress (Fig. 2) (1).

At the end of the anaesthesia, the Isoflurane administration was ceased and the residual inhalant was flushed from the breathing circuit. When the dogs began to breathe spontaneously, they were extubated. Ten minutes post extubation an ocular lubricant was applied to each of the subject's eyes to protect the cornea.

RESULTS

The mean average values for the tear production of the dogs were determined. Before premedication the mean average results were 16.10 mm/min and at the end of the procedure, the mean average STT readings 10 minutes from extubation amounted to 5.44 mm/min (Fig. 3). There is a significant positive relationship between the value of STT before premedication and 10 minutes post extubation ($p<0.05$) (Table 2).

An adequate supply of tears covering the partially exposed anterior segment of the globe and the associated adnexa is necessary for optical integrity, maintenance of the cornea and normal eye function. Preocular and precorneal tear film has several functions: maintaining a uniform corneal surface, removing foreign material from the cornea and the conjunctival sac, providing an antimicrobial function and also permitting passage of oxygen and providing nutritional requirements to the cornea (3). Because a decreased rate of tear production may cause ocular pathology, the effect of an anaesthetic protocol (Midazolam, Butorphanol, Propofol, Isoflurane) on tear production in dogs by the use of the STT, was evaluated. The basal mean STT value of dogs measured before administration of the anaesthetic drugs did not differ from the normal values (17-20mm/min) (4). To our knowledge, there have been no reports published regarding the effects of Midazolam in

combination with Butorphanol, Propofol and Isoflurane on STT in adult / geriatric dogs.

The results from our study indicated that this protocol determined a significant decrease in STT values from baseline values. The decrease in intra-anaesthetic lacrimation observed in our study may be attributable to vagolytic or sympathomimetic effects of the inhaled anesthetic (5, 8, 10).

One possible mechanism for the reduction in tear production could be represented by changes of some ocular variables: the central eye position, lack of a blink reflex, decrease in corneal sensitivity and impairment of tearing reflex during anaesthesia, induced by administration of Midazolam and Butorphanol, maintained with Isoflurane.

CONCLUSION

Although the combination of Midazolam and Butorphanol in premedication, followed by Propofol and maintenance with Isoflurane is a commonly used and appropriate anaesthetic protocol for geriatric dogs undergoing surgery, this drug combination reduces aqueous tear production as determined by use of the STT. From the total of 19 canine geriatric patients, 36% had a final STT of 0 mm/min and 63% had a mean average value of 8.20 mm/min.

The present study highlights that, in geriatric dogs undergoing anaesthesia, ocular lubricant or tear replacement solution should always be used as a corneal protectant.

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