

Pain Management with Peribulbar Anesthesia versus Retrobulbar Anesthesia in a Cat Undergoing Bilateral Enucleation

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ABSTRACT

A 14 year old, 6 kg, domestic short hair, spayed female cat was presented with bilateral uveitis, iris bombè, glaucoma, and blindness. Conventional treatment did not resolve the glaucoma, thus a bilateral enucleation was scheduled. Methadone was administered intravenously for anesthetic premedication, and anesthesia was induced with etomidate and midazolam given intravenously to effect, and maintained with isoflurane in 100% oxygen. Atropine was administered intramuscularly after induction. Preoperatively, a peribulbar anesthesia with 9 mg of bupivacaine 0.5% diluted with 1.8 mL of saline 0.9% was performed on the left eye, and a retrobulbar anesthesia with 2.5 mg of bupivacaine 0.5% diluted with 0.5 mL of saline 0.9% was performed on the right eye. During enucleation of the left eye, the cat did not move, and had low isoflurane vaporizer settings; however, during surgery of the right eye, the cat moved several times, and required higher isoflurane vaporizer settings, and additional methadone. After extubation the cat did not react to manual pressure on the left eye incision, but moved its head when the right eye incision was touched. Postoperative analgesia was provided with methadone. The cat recovered uneventfully, and had an increase in appetite several hours after surgery. The administration of peribulbar anesthesia was more likely to decrease inhalant requirements, and provide postoperative analgesia of the incision site. Additional research is indicated to investigate whether peribulbar anesthesia is preferable in cases of feline enucleation.

Keywords: Analgesia; Bupivacaine; Cat; Enucleation; Peribulbar Anesthesia; Retrobulbar Anesthesia.

INTRODUCTION

Enucleation is commonly performed in cats, and is considered a painful procedure (1-3). Administration of regional anesthesia before surgery can reduce the requirements for general anesthetic agents during surgery, and thus reduce their adverse effects (4-6). In addition, regional anesthesia provides excellent analgesia that could reduce the need for perioperative systemic administration of analgesics (2, 7, 8).

Recently, retrobulbar anesthesia (RBA) and peribulbar anesthesia (PBA) were described in cat cadavers (9), and in experimental cats (10). However, to our knowledge, there are

no reports describing perioperative pain management in cats undergoing enucleation, except a case report that describes suspected brainstem anesthesia following RBA (11).

CASE PRESENTATION

A 14-year-old, 6 kg, domestic short hair, spayed female cat was presented to the Koret Veterinary Teaching Hospital for acute, bilateral ocular opacities and blindness that were noticed by the owners that same morning. The cat had no significant medical history, good appetite and normal urine and stool. The cat was fractious, and required sedation for all

examinations, and procedures. Physical examination under sedation was unremarkable, other than a 7/9 body condition score. On ophthalmic examination, the cat lacked menace responses and dazzle reflexes bilaterally. Corneal examination was unremarkable. Pupils could not be evaluated due to large fibrin clots in the anterior chambers, but iris bombè could be seen bilaterally. Intraocular pressure (IOP) was 52 and 53 mmHg in the right and left eye, respectively. The diagnosis was bilateral blindness and glaucoma secondary to uveitis. Urinalysis, blood count and biochemistry were within normal limits.

The cat was hospitalized, an intravenous catheter was placed, and Lactated Ringer's solution (LRS; Hartmann's solution, Teva Medical Ltd., Ashdod, Israel) was administered at 4 mL/kg/hour. Treatment with systemic prednisolone (Prednisolone 5, CP-Pharma Handelsgesellschaft mbH, Burgdorf, Germany; 1.7 mg/kg once daily), topical prednisolone acetate 1% (Pred Forte Ophthalmic suspension, Allergan, Inc., Irvine, CA, USA), and dorzolamide hydrochloride 2.0% combined with timolol 0.5% (Dorzolamide-Timolol Eye Drops, Teva Pharmaceutical Industries Ltd., Petach-Tikva, Israel; administered 3 times a day) was initiated. Topical atropine sulfate 1% (Atrospan, Fischer Pharmaceutical Labs Ltd., Tel-Aviv, Israel) was administered twice daily for two days in an attempt to dilate the pupil and break down the presumed posterior synechiae. In addition, 45 µg tissue plasminogen activator (Actilyse, Boehringer Ingelheim Pty Ltd., North Ryde, Australia) was injected intracamerally in both eyes. At recheck one day later, the fibrin clots had largely disappeared, revealing complete posterior synechia. Pupillary light and dazzle reflexes, and menace responses, were absent, and IOP was 36 and 35 mm Hg in the right and left eyes, respectively. After five days of hospitalization, as the cat became anorectic and no further improvement was observed, bilateral enucleation was scheduled.

Methadone at 0.33 mg/kg (Methadone, Martindale Pharmaceuticals, Romford, UK) was administered intravenously, and approximately 30 minutes later anesthesia was induced with 0.6 mg/kg etomidate (Lipuro, B. Brawn, Melsungen, Germany) and 0.33 mg/kg midazolam (Midolam 5, Rafa Laboratories Ltd., Jerusalem, Israel) administered intravenously to effect. During induction, oxygen was administered via a facemask as soon as the cat was accepting the mask. The cat's trachea was intubated with a cuffed 4.0 mm polyvinyl endotracheal tube. Anesthesia was maintained with

isoflurane (Isoflurane, USP Terrel, Piramal Critical Care, Inc., Bethlehem, PA, USA) in 100% oxygen delivered via a pediatric Y-piece rebreathing circuit with 1-2 L/min oxygen flow. Atropine (Atropine Sulphate, Teva Pharmaceutical Industries Ltd., Petach-Tikva, Israel) at 0.02 mg/kg was administered intramuscularly after induction. During anesthesia, the cat was monitored with an ECG, pulse oximetry, non-invasive blood pressure, and esophageal thermometer via a multiparameter monitor (Cardell 9500 HD Veterinary Monitor, Midmark Animal Health, Dayton, Ohio, USA), and with capnography (Capnocheck® II Handheld Capnograph/Oximeter, Smiths Medical PM, Inc., Waukesha, Wisconsin, USA). Throughout anesthesia, the cat received LRS at 5 mL/kg/hour, intermittent positive pressure ventilation, and was warmed with a warm water-circulating blanket.

After clipping and aseptic preparation of the surgical area, a PBA with 9 mg of bupivacaine 0.5% (Kamacaine, Kamada, Beit-Kama, Israel) diluted to 0.25% with 1.8 mL of saline (0.9% Sodium Chloride, B. Brawn, Melsungen, Germany) (3.6 mL total volume) was performed on the left eye. A 5/8-inch, 25-gauge needle (DYN Medical Equipment Ltd., Caesarea, Israel) was inserted through the superior eyelid at the dorsomedial region, and advanced to its full length in close proximity to the wall of the orbit. Slight pressure was applied to the needle during injection to ensure that it remained in the desired location. On the right eye a RBA with 2.5 mg of bupivacaine 0.5% diluted to 0.25% in 0.5 mL of saline 0.9% (1 mL total volume) was performed. A 3.5-inch, 27-gauge spinal needle (Spinocan, B. Braun, Melsungen, Germany) was bent at the proximal part to an angle of approximately 20°. The spinal needle was inserted through 1-inch, 21-gauge needle (DYN Medical Equipment Ltd., Caesarea, Israel), used as a guide to pass the skin, at the same dorsomedial region that was used for the PBA, and was advanced toward the apex of the orbit. For both techniques, injections were performed by a board-certified veterinary anesthesiologist after application of negative pressure to the syringe plunger. Exophthalmos was observed immediately after injection of the PBA, and chemosis was evident shortly afterwards, but neither were observed after injection of the RBA. The surgeon was unaware of the regional anesthesia technique used in each eye, but the student monitoring the anesthesia was aware of the anesthetic technique used in each eye.

Enucleation was performed on both eyes using the subconjunctival approach with ligation of the optic nerve and

two-layer closure with intra-dermal sutures. The left eye was enucleated first and during the procedure the isoflurane vaporizer setting was 0.9-1.5% with oxygen flow of 1-1.5 L/minute. The cat did not move at any time point. During the enucleation of the right eye, the cat moved several times - at incision, several times immediately after that (until methadone 0.25mg/kg was administered intravenously), and once more during placement of the skin sutures. Thus, isoflurane vaporizer setting was 1.8-3% with oxygen flow of 1.5-2 L/minute (i.e., higher concentrations of isoflurane were required during enucleation of the right eye). During dissection, a hematoma was seen in the ventral, periocular tissue of the left orbit, and there was a higher bleeding tendency in the medial aspect of the right orbit.

The cat was recovered in the operating room. Because of its fractious nature, the only incisions assessment occurred approximately 5 minutes after extubation. When manual pressure was applied to the left incision, the cat did not react; however, as soon as the right incision was touched gently, the cat moved away and shook its head.

Postoperative analgesia was provided by 0.5 mg/kg methadone intramuscularly approximately 10 minutes after extubation, and 6 hours later 0.02 mg/kg buprenorphine (Buprenorphine Hydrochloride, Siegfried, Zofingen, Switzerland) intravenously. The cat began eating several hours after surgery, and was discharged the next morning with oral dipyrone (Optalgin Drops, Teva Pharmaceutical Industries Ltd., Shoham, Israel; 15 mg/kg twice daily for 3 days).

Histopathology of the eyes revealed severe inflammatory infiltrate, predominantly neutrophils, with no evidence of neoplasia or infection. Diagnosis was consistent with sub-acute idiopathic uveitis.

Follow up telephone conversations with the owners at 1-week and 2-months post surgery revealed that the cat was healthy with a good quality of life.

DISCUSSION

In this report, PBA of the left eye provided better intraoperative anesthetic management, as well as better analgesia and comfort postoperatively, than RBA of the right eye. The combined dose of bupivacaine used in both techniques was 11.5 mg, in order not to exceed the maximum recommended

dose of 2 mg/kg (12, 13). The bupivacaine was diluted to 0.25%, in order to obtain the recommended volumes for these techniques in cats (9, 10).

The PBA is easy to perform, and relies on injectate distribution around and into the muscle cone (9, 14). In contrast, the RBA has to be deposited precisely into the orbital muscle cone (10, 14, 15), and thus may result in more severe complications (11, 16). In cats, PBA and RBA were reported to be successful in 86% (6/7) and in 67% (5/7) of cat cadavers (9), and in 100% (6/6) and in 50% (3/6) of experimental cats, respectively (10). It is impossible to know whether the RBA that was performed on the right eye in the present report was successful or not. Because higher isoflurane vaporizer settings were required for surgery in the RBA-injected eye, it is possible that the bupivacaine have been deposited outside the orbital muscle cone. In cats that had an unsuccessful RBA (injected extraconally), there was no decrease in corneal sensitivity or periorbital skin sensitivity (10). Alternatively, because the RBA-injected eye was the second eye to be enucleated, the RBA's effect might have decreased by that time (10). However, palpation of the incision site postoperatively, resulted in response to the RBA-injected eye, but not to the PBA-injected eye. Thus, clinically, the use of PBA for enucleation provided postoperative analgesia, while RBA did not.

Exophthalmos and conjunctival edema were present following PBA, and these were also reported in experimental cats (10) and in humans (16). These minor complications usually do not interfere with surgery or outcome and resolve spontaneously within a few hours (16, 17). In both eyes there were minor intraoperative complications (hematoma, and a higher bleeding tendency) that have been also reported in humans (18) and in dogs (19). However, these did not affect surgery, recovery or healing.

CONCLUSIONS

Although this is a report of a single cat, clinically, the administration of PBA resulted in decreased inhalant anesthetic requirements, and superior postoperative analgesia of the incision site in comparison to RBA. Additional research is indicated to investigate whether peribulbar anesthesia is preferable in cases of feline enucleation.

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