

Effects of Hyperbaric Oxygen Therapy on Intraocular Pressure in Dogs

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ABSTRACT

Hyperbaric oxygen therapy (HBOT) is a method in which pressurized oxygen is used to improve oxygen delivery to tissues. This treatment has been found to be effective in a variety of disorders in human and animal medicine, however it is underutilized in small animal medicine, in part because veterinary professionals may not be adequately familiar with how it works and when it is worthwhile. There has been hesitancy to utilize this method of treatment due to the fear of the unknowns, one example being a potential for an increase in intraocular pressure. The mission of this project was to expand knowledge of HBOT treatment and also determine the effect of increased oxygen pressures on the internal aqueous pressure in the anterior chamber of the eye to identify any negative effects that there could be on the canine eye. Patients in this study underwent hyperbaric oxygen therapy for a specific condition that was recorded and did not receive unnecessary treatments. Each participant had a complete physical examination performed by a licensed veterinarian to assure that there was not underlying pathology that would contraindicate HBOT and patients were not selected to participate if they had a known underlying ocular condition. For this study, eighteen dogs were subject to hyperbaric oxygen therapy and were treated with 100% oxygen at a pressure of 14.7 PSI for 30 minutes. Overall treatments lasted approximately 60 minutes, allowing roughly 15 minutes to achieve 14.7 PSI and roughly 15 minutes to decompress after the treatment to avoid barotrauma. Intraocular pressures were obtained using an Icare® TONOVET Plus Tonometer and the chamber that was utilized in this study is a Companion Animal Hyperbarics, LP chamber. Patient intraocular pressures were measured immediately prior to HBOT and immediately after. A single credentialed veterinary technician was responsible for obtaining each intraocular pressure reading in order to ensure that there was no discrepancy amongst individuals. Due to the nature of the treatment being within an enclosed chamber, intraocular pressures were not taken during the treatment. Analysis of results compared an increase or decrease in post-HBOT intraocular pressure compared to pre-HBOT readings. Results of this trial suggest that there is no clinically significant impact on intraocular pressure in patients receiving hyperbaric oxygen therapy.

INTRODUCTION

To put into perspective how HBOT is still developing in veterinary medicine, there are only 3 small animal chambers in the state of Kentucky, and approximately 60 small and large animal chambers in North America. Treatment with hyperbaric oxygen therapy increases oxygen transport throughout the body, effectively encouraging the healing process, especially in areas that typically experience poor circulation. It has been noted that HBOT used in conjunction with prescribed medications can be beneficial to treatment. Previous research has shown that intraocular pressure was not influenced in human patients with glaucoma receiving hyperbaric oxygen therapy (Bojic et. al 1993). Another study published in 2006 found there was a significant decrease in intraocular pressure when both humans and rabbits received hyperbaric oxygen therapy (Ersanli et. al 2006).

HYPOTHESIS

Our objective in this study was to contribute to the current understanding of HBOT, as well as determine the effects of increased oxygen pressure on the intraocular pressure of the canine eye. Our hypothesis was that hyperbaric oxygen therapy would result in a notable decrease in intraocular pressure.

MATERIALS AND METHODS

- This research was approved by the MSU Institutional Animal Care and Use Committee, 19-02-03R3
- 18 Dogs were used in this experiment
- Dogs were placed in a Companion Animal Hyperbarics, LP chamber to receive Hyperbaric Oxygen Therapy
- Dogs received Hyperbaric Oxygen Therapy at 100% oxygen and 14.7PSI for 52-64 minutes.
- Intraocular pressure was checked directly before and directly after HBOT treatment by one licensed technician using an Icare TonoVet Plus tonometer.
- Disposable probes were used each time intraocular pressure was measured.
- All animals had a physical exam performed by Dr. Alford prior to treatment
- Behavior of dogs was observed and recorded during treatment
- Medical conditions and medications of all dogs were recorded
- All medications were checked to assure they had no effect on intraocular pressure



RESULTS

Figure 1

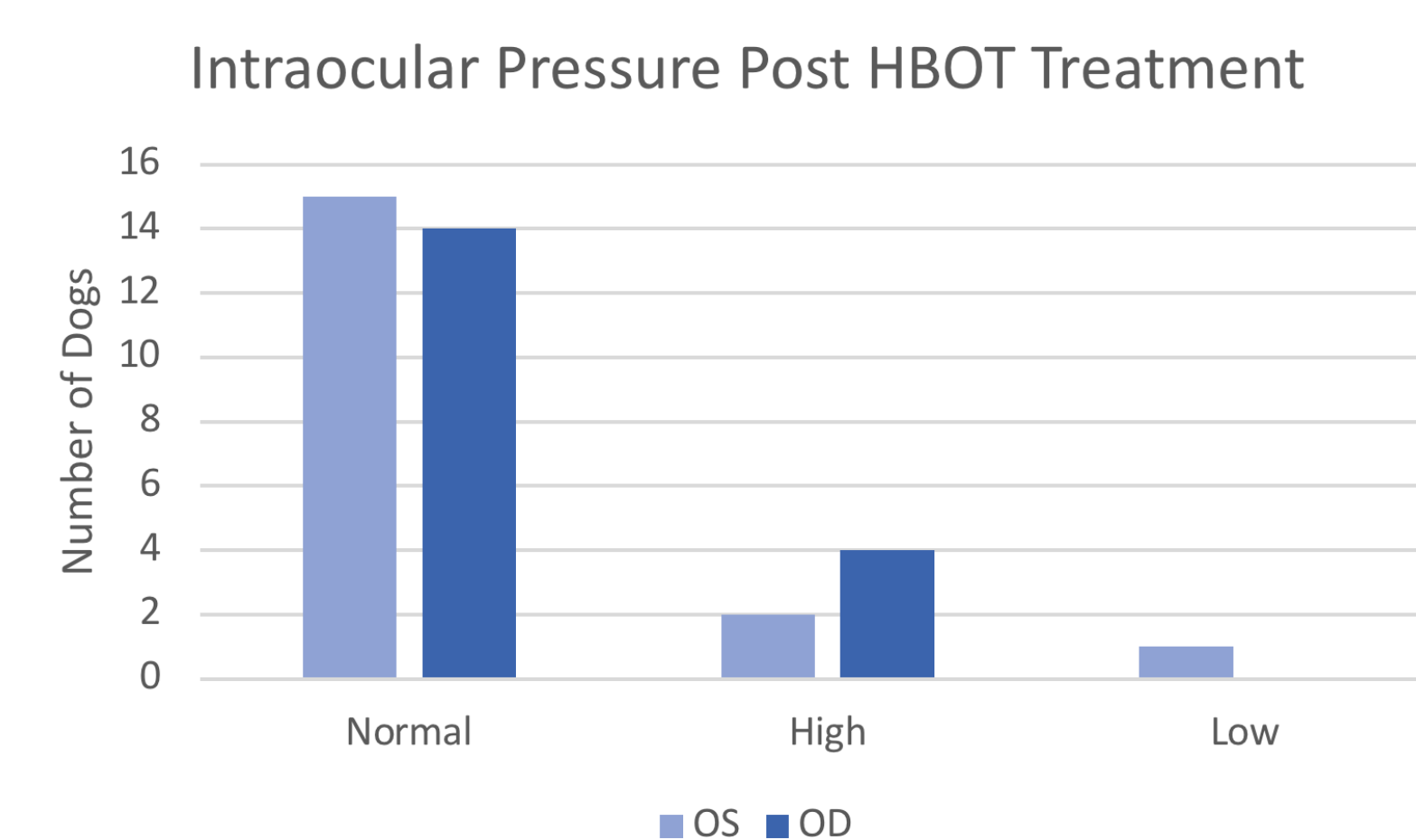
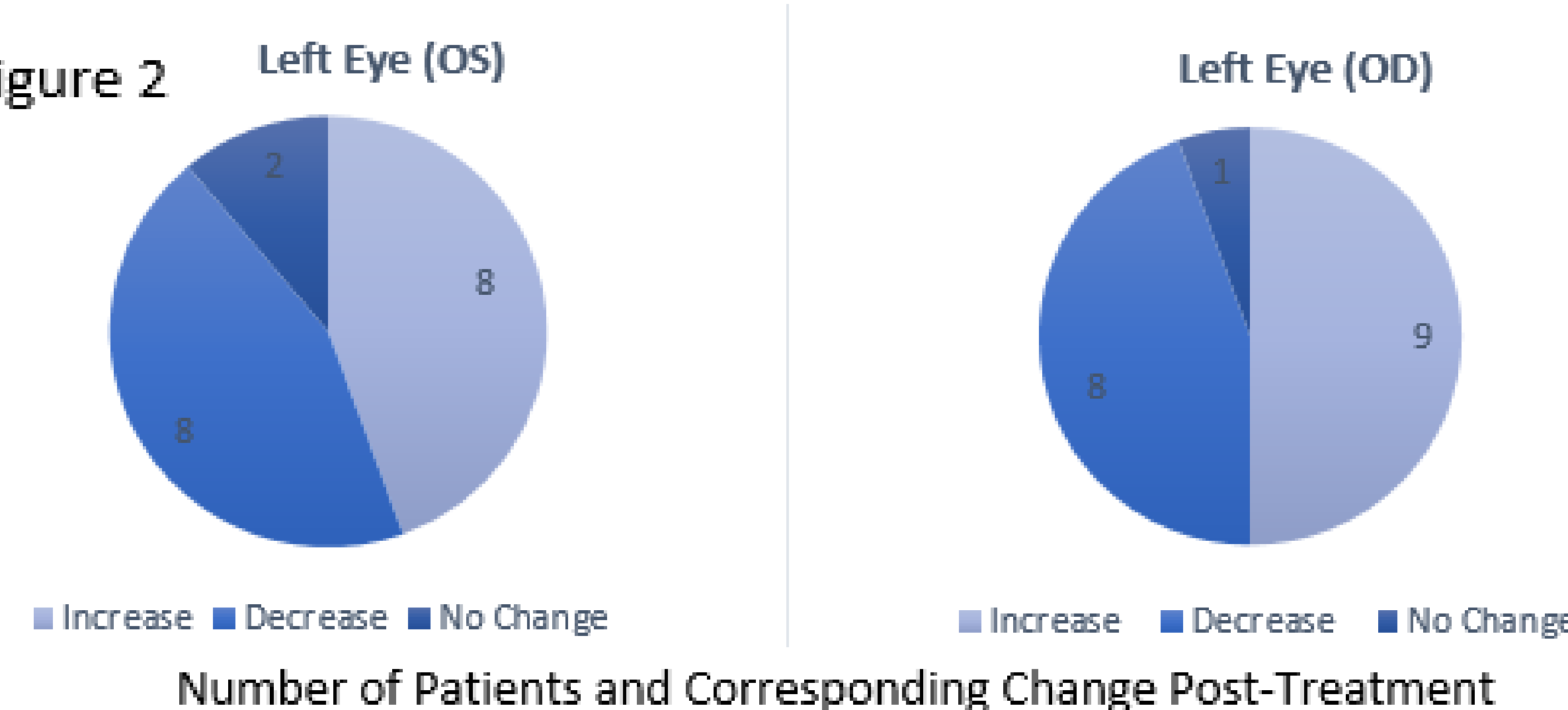


Table 1

	OS (n=18)	OD (n=18)
Increase	44.4%	50%
Decrease	44.4%	44.4%
No change	11.2%	5.6%

Percentage of patients and the corresponding change post-treatment in left and right eye, respectively.

Figure 2



DISCUSSION

Each patient had normal intraocular pressures in both eyes prior to receiving HBOT. Figure 1 demonstrates the number of patients whose post-treatment intraocular pressures were abnormally decreased or increased (<11; >25mmHg) in each eye. A more precise evaluation was performed to determine the average number of patients whose IOP increased, decreased or stayed the same after treatment. Overall, the number of patients that had an increase or decrease in IOP (not necessarily out of the normal range) was relatively close. The average intraocular pressure of the pre-treatment in the left eye was 18 and there was no change in the average, post-treatment. The average intraocular pressure of the pre-treatment in the right eye was 19 and there was no change in the average, post-treatment.

Hyperbaric oxygen therapy is emerging in veterinary medicine and it has enhanced our ability to treat many critically ill patients. The results obtained from this study provide evidence to allow veterinarians to have a better understanding of the safety of hyperbaric oxygen therapy in canine patients.

CONCLUSION

We conclude that the increased oxygen concentration associated with hyperbaric oxygen therapy does not have a clinically significant impact on the changes in intraocular pressure in dogs. Due to the nature of the treatment being within an enclosed chamber, intraocular pressures were not able to be taken during chamber treatments. Our hypothesis that hyperbaric oxygen therapy would result in a notable decrease in intraocular pressure was not supported by this data, although there is an approximate 15-minute decompression period after treatments in which it is possible that intraocular pressures alter.

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This project was made possible thanks to the Veterinary Wellness Center, Tonopen, and the Morehead State University Undergrad Research Fellowship Program.