Treatment of a Cluster Headache Patient in a Hyperbaric Chamber

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SYNOPSIS

A patient with severe cluster headaches was treated in a hyperbaric chamber on two occasions. Her symptoms had been refractory to other treatment modalities including conventional oxygen therapy. On both occasions her pain was promptly relieved while breathing 100% oxygen at two atmospheres of pressure. This is the first known reported case of a cluster headache treated with hyperbaric oxygen. A prospective study is needed to substantiate the efficacy of this treatment modality for cluster headaches.


INTRODUCTION

The original use of the term "cluster" is often attributed to Kunkle et al1 who described recurrent brief headaches in a "cluster pattern" in 30 patients. The precise cause of cluster headaches is still unknown, even though the entity has been described in the literature since the turn of the century.2–4 Various mechanisms have been proposed including histamine release, sphenopalatine ganglion neuralgia, and cerebral vasodilation.

While ergotamine and other drugs have been extensively used to treat this disorder, many cases are refractory to these agents and oxygen has been successfully administered as an alternate mode of therapy. The proposed mechanism of action involves cerebral vasoconstriction. Recently, several prospective studies have confirmed the efficacy of oxygen.5–6 We describe a case where cluster headache symptoms promptly resolved after exposure to hyperbaric oxygen (HBO).

CASE REPORT

A 49 year old white female with a 26 year history of cluster headaches presented with severe, sharp, right-sided retro-orbital pain for 45 minutes. She was in the midst of a 2½ month "cluster" period, having 3-5 severe headaches per week. Most of her headaches were retro-orbital, lasted 1-4 hours, and occurred in the late night or early morning, soon after falling asleep. At the time of presentation she was taking no medications at home. She had minimal lacrimation from the right eye and had considerable nasal stuffiness on the right side.

Her past medical history was otherwise negative, except for a concurrent history of occasional migraine headaches which were quite distinct from her cluster headaches. The latter had been resistant to multiple drug therapy including ergotamine, amitriptyline, methysergide, prednisolone, lithium, various non-steroidal anti-inflammatory drugs, narcotics, calcium channel blockers, beta-blockers, and intra-nasal lidocaine. A number of operative procedures had been performed in attempts to alleviate the pain. These included hysterectionomy, arterial embolization, microvascular decompression of the V nerve, and local nerve blocks. Oxygen therapy delivered by nasal cannula at varying flow rates had also been tried.

Because of the debilitating and resistant nature of the patient's headaches, permission was obtained from our Institutional Review Board for emergency treatment of this patient in a hyperbaric chamber. Appropriate informed consent was obtained from the patient after the experimental nature of the treatment had been fully explained. Treatment was administered in a monoplace chamber manufactured by Nautilus Enviromedical Systems (Houston, Texas) and delivered 100% oxygen at a pressure of 2 atmospheres-absolute (2.0 ATA). This is equivalent to delivering a concentration of 200% oxygen.

The patient presented with a typical headache prior to the first hyperbaric treatment. The pain was right-sided, retro-orbital in location, and was accompanied by nasal congestion. The remainder of her physical exam was unremarkable, she had not taken any medication for her pain. After being placed in the chamber, the pressure was gradually increased to 2.0 ATA every 15 minute period. Within 20 minutes after initiation of the treatment (5 minutes after reaching 2.0 ATA) the patient's pain and nasal con-
gestation had completely resolved. She was treated for a total of 60 minutes. She was not treated with any pain medication after exiting the chamber. Two-and-a-half hours later she returned to the emergency department with another cluster headache which required the use of parenteral narcotics. Three days later she presented with another typical cluster headache. She was given a second HBO treatment with prompt relief of her pain. At that point her "cluster" appeared to have broken. She has not had another cluster headache since that time (seven months ago).

**DISCUSSION**

This is the first known reported case of a cluster headache treated with HBO therapy. In our patient, the administration of HBO therapy appeared to be quite efficacious in the treatment of cluster headaches. In both instances, the pain and nasal congestion had been promptly relieved soon after reaching a pressure of 2.0 ATA while breathing 100% oxygen. A rebound headache occurred 2½ hours after her first treatment. This phenomenon has also been described after the routine use of surface (ie: normobaric or "room-pressure") oxygen. She did not have a rebound headache after her second treatment. The cluster bout was terminated at that time, which may have been coincidental. She has since been free of cluster headaches for seven months. The use of a monoplace hyperbaric chamber involves placing the patient into a cylindrical acrylic tube which is approximately seven feet in length. The chamber has an airtight steel hatch through which intravenous and arterial lines, monitoring lines, and even an endotrachael tube can be placed. The chamber is ventilated with 100% oxygen. The pressure can be increased to 3.0 ATA. Most treatment schedules use pressures of 2.0-2.4 ATA. The oxygen is inhaled resulting in the systemic effects hyperoxia and vasoconstriction. The possibility of a placebo effect cannot be discounted. This is especially true when the parameters; we are observing are subjective — in our patient, pain and nasal congestion. We therefore cannot be certain that the hyperoxia relieved her symptoms, prospective, randomized, blinded study is clearly needed. Patient-blinded studies have been performed in the past with hyperbaric chambers, using "sham treatments" for the control population. There is a physiological basis for the use of high concentrations of oxygen in the treatment of cluster headaches. Several studies have confirmed the role CNS vasodilation in the pathogenesis of cluster headaches. Drummond et al even demonstrated the concomitant relief of pain with a decrease in cerebral blood flow after the delivery of 100% oxygen by face mask. HBO therapy has the advantage of delivering far greater concentrations of oxygen, which may result in greater vasoconstriction. This may be beneficial for patients with refractory symptoms. The potential benefits of HBO therapy must be weighed against the costs, inconvenience, and adverse effects of such therapy.

Adverse effects of HBO therapy are unusual with episodic use. The most common problem is middle ear barotrauma due to improper pressure-equalization. Patients must be instructed in techniques of self-insufflation of the eustachian tubes. Barotrauma to the sinuses is also possible. Other problems are quite rare and include oxygen toxicity seizures and pulmonary barotrauma. Our patient suffered no adverse effects.

The efficacy of 100% oxygen therapy delivered by conventional means has already been proven. In theory, HBO therapy appears to be justified for the treatment of otherwise refractory cluster headaches. The efficacy of HBO therapy in this setting, however, needs to be tested in a prospective trial comparing it to 100% surface oxygen. The precise clinical indications for its use would then have to be defined, considering the expense and patient inconvenience involved.

**REFERENCES**