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## Preliminary Communication

## TREATMENT OF CHRONIC VERTIGO WITH HYPERBARIC OXYGEN

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## Summary

Hyperbaric oxygen was used in the treatment of symptoms associated with chronic vertigo. Good results were obtained after therapy with oxygen at 2 atmospheres absolute. In most of the 7 cases treated, there was remission of the nausea, dizziness, and the inability to walk.

## INTRODUCTION

Hart et al.<sup>1</sup> listed fifty-four clinical conditions in which hyperbaric-oxygen therapy has been tried. In many of these conditions there have been encouraging results.

Treatment with hyperbaric oxygen for chronic intractable vertigo was tried in 7 patients at the Norwalk Hospital. These patients were considered for hyperbaric-oxygen therapy because of the possibility that oxygen under hyperbaric conditions may correct chronic anoxia of the labyrinthine apparatus and/or the pathways and centres which maintain equilibrium.

## METHODS

All the patients chosen for the present study were in the fifty to eighty year age-group. The chief complaints were dizziness (vertigo) (7), nausea (2), vomiting (1), and difficulty in walking (7). There were arteriosclerotic retinal changes in 6 patients and no signs of cerebellar dysfunction in any of the patients. 1 patient had had chronic middle-ear disease with labyrinthitis and chronic ear discharge for six years. This was the only case which did not fall into the category of arteriosclerotic disease. 2 patients were diagnosed as having vertebrobasilar-artery insufficiency. There was no evidence in any patient to suggest a psychogenic factor or conversion symptoms. All patients were treated with hyperbaric oxygen only after all accepted medical and surgical measures had been tried and had not benefited the patient. The conditions which we treated could not be paired with control groups. Because of this, the patient himself served as his control.

The apparatus used was the Vickers single-bed hyperbaric chamber. Each compression was given at 2 atmospheres absolute for two hours. None of the patients had adverse reactions.

## RESULTS

The number of hours of compression, clinical diagnosis and response to treatment are given in the accompanying table. The clinical response was described after subjective and objective examination as well as a detailed examination of the nervous system. The response in all 7 cases was good. Vertigo, nausea, and vomiting disappeared (4 cases) or was greatly reduced (2 cases). On examination, all signs

SUMMARY OF PATIENTS' HISTORY, HOURS OF COMPRESSION TREATMENT, AND RESPONSE

Patient no.	Age	Sex	Complaints	Duration	Diagnosis	Hours at 2 atmospheres absolute	Recurrence	Response
1	82	F	Dizziness; inability to sit, stand, or walk	6 mo.	Vertigo, syncope	26	2 recurrences, 4 months apart	Excellent, dizziness disappeared after 6 hr. of therapy
2	68	M	Severe dizziness; staggering gait; inability to walk	2 yr.	Vertigo	24	None	Excellent, dizziness disappeared after 8 hr. of therapy
3	72	F	Severe dizziness; inability to stand or walk	2 mo.	Vertigo	30	None	Excellent, vertigo disappeared after 12 hr. of therapy
4	52	F	Dizziness; recurrent nausea and vomiting	3 mo.	Vertigo; chronic middle-ear disease	10	Dizzy spells recurred after 8 months	Excellent
5	89	F	Dizziness; confused state	2 mo.	Vertigo; chronic cerebrovascular disease	6	None	Good
6	55	M	Dizzy spells; nausea; staggering gait	6 wk.	Vertigo	16	None	Good
7	88	F	Dizziness; confused state	2 mo.	Vertigo; cerebrovascular disease	26	None	Excellent

elicited before treatment were greatly reduced or had disappeared.

The patient with chronic middle-ear disease (case 4) continued to have ear discharge with no change in bacterial flora, but she improved considerably since the dizziness and nausea disappeared. Possibly, she had endarteritis obliterans of labyrinthine vessels caused by chronic labyrinthitis, resulting in ischaemia of the organ. This was, to some extent, corrected by the hyperbaric oxygen.

The patients were followed up on an outpatient basis. The longest follow-up period after therapy was thirteen months (case 1). In none of the cases have the symptoms been aggravated by treatment.

#### DISCUSSION

Hyperbaric oxygen greatly increases the oxygen carried in the blood in physical solution, since the solubility of oxygen in plasma is directly proportional to the alveolar  $PO_2$ . The resulting high plasma/tissue oxygen gradient supplements the oxygen supply to hypoxic tissues. Hyperbaric oxygen produces vasoconstriction, but this effect is seldom so pronounced as to impede the delivery of oxygen to tissues. Jacobson et al.<sup>2</sup> found that although a 21% reduction of cerebral blood-flow was demonstrated under 2 atmospheres absolute of oxygen, cerebral venous  $PO_2$  was high. The overall effect was one of increased tissue oxygenation.

A slight decrease in the lactate/pyruvate ratio in the cerebrospinal fluid was noted by Mogami et al.,<sup>3</sup> and this finding was interpreted as being the result of a possible beneficial effect of hyperbaric oxygenation on cerebral damage. These workers also found that hyperbaric oxygenation produced only temporary neurological improvement and reduction of electroencephalogram (E.E.G.) abnormalities in most of their cases of acute cerebral damage. Heyman et al.<sup>4</sup> concluded that hyperbaric oxygen is useful only when neurons are still viable after an ischaemic attack. Cerebral cortical activity as shown in E.E.G. tracings

has been shown to be extended in animals after experimentally induced cerebral anoxia.<sup>5,6</sup> Jacobson et al.<sup>7</sup> reported a case of severe vertebro-basilar insufficiency in which the E.E.G. flattening-time was extended after carotid compression under oxygen at 2 atmospheres absolute. Other workers have found hyperbaric oxygenation to be therapeutically beneficial in cerebral ischaemia.<sup>8</sup>

The good results in the present study possibly come from the beneficial effect of oxygen under hyperbaric conditions on end organs, pathways, and/or centres of the vestibular system whose functions have been compromised by chronic ischaemia arising from arteriosclerotic cerebrovascular disease.

#### CONCLUSION

Hyperbaric oxygen may be of benefit in intractable vertigo caused by ischaemic changes of the labyrinthine apparatus and its pathways. This new application of hyperbaric-oxygen therapy requires further evaluation and study.

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