Tinnitus

the Text book of Hyperbaric Oxygen Medicine, K.K. Jain Vol.3

Lamm (1969) was the first to use HBOT in Vestibular disorders. Clinical studies of the use of HBOT (Hyperbaric Oxygen Tank) in acute Acoustic Trauma are summarized in below. Most of the studies show that HBOT is useful in relieving Tinnitus accompanying acute acoustic trauma, provided it is started within a few days following trauma. Many different pressures and duration's of exposure are described in the literature.

The following protocol recommended is:

- Institution of treatment within the first 3 days after the episode.
- Ten exposures on 10 consecutive days at 2.5 ATA using 100% oxygen for 1 hour.

Lamm and Gerstmann 7 Patients (Noise damage)
Results: 4 obtained relief in 3 treatment was started three weeks after injury.

Demaetelaere and Van Opstal 50 Patients (Gunshot noise)
Results: HBOT combined with vasodilators and explosion and anti-inflammatory drugs: better results with early treatment.

Le Moel et al (1985) 22 Patients (Diving accidents)
Results: Good

Pilgramm and Schumann (1985) 22 Pts. (Gunshots Noise)
Results: Best result seen with Therapy #1 10% Dextran-40+ 5% sorbitol and 10 HBOT sessions spontaneous recovery, HBOT shortens course of recovery and reduces relapse rate after improvement of Hearing and Tinnitus.

Concluding Remarks about the Use of HBOT in Hearing Loss
In conclusion, HBOT is recommended and warranted in patients with Idiopathic sudden deafness, acoustic trauma or noise-induced hearing loss within 3 months after onset of disorder.

Neuro-Otological Vascular Disturbances:

Kozyro and Matskevich (1981) Obtained good results with HBOT in 107 Patients with Transient ischemia of the vertebrobasilar territory and the artery to the labyrinth. Their session included the following protocol: HBOT at 1.5-2 ATA for 35-40 minutes with daily sessions for 8-10 days. There was considerable improvement in Vertigo in 12 of the patients

Reference: *The Text Book of Hyperbaric Oxygen Medicine, K.K. Jain Vol 3*
Hyperbaric Oxygen Medicine, Dr. Eric Kindwall MD

Different treatment modalities of tinnitus at the EuromedClinic.

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PMID: 14689618 [PubMed - indexed for MEDLINE]

A retrospective study at the ear, nose, and throat department of the EuromedClinic showed considerable improvements immediately after the end of the treatments for acute and for chronic tinnitus. Eighty percent of our patients suffering from acute tinnitus showed an improvement with intravenous medication without hyperbaric oxygen treatment, and 65.7% showed improvement with infusion therapy and hyperbaric oxygen. However, at 3 months and then later (long-term results), the figures decreased to 67% and 46%, respectively. In the chronic tinnitus group, the therapeutic effect dropped from 66.7% to 34% (with only intravenous medication) and from 60% to 28% (with combined therapy). These facts can explain the importance of beginning the treatment of patients suffering from tinnitus as early as possible (i.e., acute stage).

[Outcome of hyperbaric oxygen therapy in therapy refractory tinnitus]

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PMID: 10654180 [PubMed - indexed for MEDLINE]

Although many studies are available concerning the treatment of sudden deafness using hyperbaric oxygenation, only a few of these deal with tinnitus. The aim of the present study was to evaluate the therapeutic use of hyperbaric oxygenation in cases of tinnitus. A total of 193 patients, having undergone primary intravenous hemorheologic therapy, were treated with hyperbaric oxygenation. Tinnitus was evaluated before, after ten sessions and after 15 sessions using a tinnitus questionnaire. Additionally, an audiometric examination was performed. Measurable improvements of the tinnitus occurred in 22% of the patients, whereas a moderate improvement was seen in 17% of cases. 10.4% showed an excellent improvement and tinnitus disappeared completely in two patients. The improvement rate decreased in those cases where the time from onset of tinnitus exceeded 40 days. In conclusion, hyperbaric oxygenation seems to be a moderately effective additional treatment in the therapy of tinnitus after primary hemorheologic therapy, provided the time from onset of tinnitus is less than 1 month.

Long-term effect of hyperbaric oxygenation treatment on chronic distressing tinnitus.

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PMID: 10384896 [PubMed - indexed for MEDLINE]

Tinnitus is still a phenomenon with an unknown pathophysiology with few therapeutic measures. During the last two decades, hyperbaric oxygenation therapy (HBO) has been used in the treatment of sudden deafness and chronic distressing tinnitus. In this study, we prescribed HBO to 20 patients who had had severe tinnitus for more than one year and who had already had other forms of tinnitus therapy with unsatisfactory results. Four patients could not cope with the pressure gradient. The effect of HBO was assessed using subjective evaluation and VAS scores before and after HBO. Follow-up continued until one year after treatment. Six patients had a reduction of tinnitus and accompanying symptoms, eight patients did not notice any change and two patients experienced an adverse effect. Any outcome persisted with minor changes until one year after treatment. HBO may contribute to the treatment of severe tinnitus, but the negative effect on tinnitus should be weighed carefully.

Treating Tinnitus with Hyperbaric Oxygenation.

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Hyperbaric Oxygenation permits a controlled increase of the partial oxygen pressure in the blood. This technique can be used in cases of tinnitus and sudden deafness when the development in the inner ear and the brain lead to a lack of oxygen and so to a limited energy provision. The results to date allow the recommendation to apply an oxygen high pressure therapy when standard treatments have failed. One can work on an improvement rate of 60-65% with tinnitus. HBO therapy should start as soon as possible. Especially in cases of sudden deafness the success depends on a speedy application of HBO. The HBO therapy

broadens the spectrum of treatment possibilities for tinnitus and sudden deafness.

Effectiveness of hyperbaric oxygen therapy in patients with acute and chronic cochlear disorders.

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PMID: 9166876 [PubMed - indexed for MEDLINE]

Over the course of 18 months 359 patients with defined acute and chronic inner ear disorders who had not responded to treatment with medication were given hyperbaric oxygen (HBO) therapy. The inner ear diseases of the patients were divided, based on the duration of their conditions, into four symptomatic groups. Of the patients who had had hearing loss for less than 3 months, noticeable improvement or complete recovery was seen in 13% (20 dB in at least three test frequencies); 25.2% showed an improvement between 10 and 20 dB. Changes up to 10 dB or less were not considered to be positive. Patients with a pretreated hearing loss for more than 3 months had markedly less benefit from HBO therapy. Two percent regained normal hearing function. In 30% an improvement of more than 10 dB was achieved. For patients who had suffered from tinnitus for less than 3 months excellent improvement was seen in 6.7% and noticeable improvement in 44.3% expressed by means of a visual analog scale. In 44.3% the tinnitus was described as unchanged. Patients who had had tinnitus for more than 3 months before HBO therapy showed a less favorable response to HBO. In none of the patients did the tinnitus disappear; 34.4% of the patients described a noticeable improvement in their complaints.

[Treatment of 522 patients with sudden deafness performed oxygenation at high pressure]

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PMID: 10853338 [PubMed - indexed for MEDLINE]

INTRODUCTION: Oxygenation at high pressure (OHP) is thought to be useful, even though regional blood flow is decreased, because increasing dissolved oxygen prevents the death of nerve tissue. In this report, we retrospectively investigated the effect of OHP on sudden deafness. OBJECT AND METHOD: We reviewed 522 patients treated with OHP at Kagawa Rosai Hospital over a ten-year period (January 1989 to December 1998). We discussed some prognostic factors: comparison between cases which had been treated with OHP previously and those which had not, number of days between onset and beginning of the treatment which included OHP, age, initial averaged five-frequency hearing level, vertigo, tinnitus, complications of OHP, cases of relapse and the time of the onset, which is about season, month and week. OHP was administered at a pressure of 2.5 atmospheres for 80 minutes a day from 10 to 15 times. All patients also received a course of intravenous administration of steroid, vitamin B12, Prostaglandin E1, ATP, and low-molecular dextran. RESULTS: Overall, complete recovery occurred in 19.7% of the patients, definite improvement in 34.9% (complete recovery included), and slight improvement in 58.1% (definite improvement included). Most of the patients (78.0%) were referred by other hospitals, because our hospital was the only one in the Sikoku area which had a big equipment of OHP. All 161 patients had already been treated in other hospitals over 8 days, but they had shown little improvement after the initial therapy. Of this group, complete recovery after the second course of treatment occurred in 13.0% of the patients, definite improvement in 19.3%, and slight improvement in 39.1%. OHP was thus effective for about 40% of patients who had been unresponsive to the initial therapy. Delay in treatment usually produces poor hearing recovery. There was a significant difference between those patients treated within 14 days and those treated 15 days or more after onset. The improvement rate also decreased with age. The prognosis of patients with vertigo was worse than those

without vertigo. Tinnitus had no influence on the prognosis. There were no severe complications during the course of OHP, but otitis media with effusion occurred in 90 patients, and paracentesis was performed for 53 patients. CONCLUSION: The treatment of sudden deafness with OHP has been discussed in this report. Important prognostic factors were time between onset and beginning of the treatment which included OHP, age, vertigo, and the initial averaged five-frequency hearing level. We conclude that OHP should be performed within 14 days from onset, and that OHP was able to achieve hearing improvement in many cases unresponsive to the initial therapy if it was performed very early.

Effect of hyperbaric oxygen therapy in comparison to conventional or placebo therapy or no treatment in idiopathic sudden hearing loss, acoustic trauma, noise-induced hearing loss and tinnitus. A literature survey.

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With the published clinical data to hand on the therapeutic results of patients with idiopathic sudden hearing loss, acoustic trauma or noise-induced hearing loss, it may be confirmed that 65% of those polypragmatically treated patients demonstrated a hearing improvement of 19 +/- 4 dB. In 35% of the cases, no hearing improvement was detected independent of the drugs administered. This corresponds to the results obtained from placebo-treated patients who demonstrated a hearing improvement of 20 +/- 2 dB in 61% of cases and no hearing gain in 39% of cases (fig. 1). A different set of results was obtained from patients with a hearing loss who were treated either with prednisolone or placebo. The percentage of patients who achieved normal hearing again in the placebo-treated group amounted to 31% and 38% and in the verum-treated group

50% and 78%. It may be concluded that a placebo therapy is equally effective to that of all nonsteroidal drugs. Problems arise when comparing non-treated patients since information on spontaneous remission rates differs greatly in the references, i.e. between 25-68% for spontaneous full remissions and 47-89% for spontaneous partial remissions. From a statistical view, 35% and 39% of patients experienced no success with nonsteroidal drugs or placebo, respectively. These patients can still be helped with HBO therapy. 18 patients only underwent primary HBO therapy. In all other 50 studies evaluated here with a total of 4, 109 patients suffering from idiopathic sudden hearing loss, acoustic trauma or noise-induced hearing loss and/or tinnitus, HBO therapy was administered as a secondary therapy, i.e. following unsuccessful conventional therapy. If the onset of affliction was more than 2 weeks but no longer than 6 weeks, one half of the cases showed a marked hearing gain (in at least 3 frequencies of more than 20 dB), one-third showed a moderate improvement (10-20 dB) and 13% showed no hearing improvement at all (fig. 2). 4% no longer experienced tinnitus, 81.3% observed an intensity decrease and 1.2% an intensity increase of their tinnitus condition. 13.5% remained unchanged (fig. 2). If HBO therapy was administered at a later stage, but still within 3 months following onset of affliction, 13% showed a definite improvement in hearing, 25% a moderate improvement and 62% no improvement at all. 7% no longer suffered from tinnitus, 44% reported an intensity decrease, a similar percentage noticed no change and 5% a temporary deterioration of their tinnitus condition. If the onset of affliction was longer than 3 months up to several years, no hearing improvement can be expected in the majority of patients (fig. 3); however, one third of the cases reported an intensity decrease of tinnitus, 60-62% reported no change and 4-7% noticed a temporary intensity increase (fig. 4). In conclusion, it may be deduced that HBO therapy is recommended and warranted in those patients with idiopathic sudden deafness, acoustic trauma or noise-induced hearing loss within 3 months after onset of disorder.

Therapeutic effect of hyperbaric oxygenation in acute acoustic trauma.

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Retrospectively 78 patients with uni- or bilateral acute acoustic trauma (AAT) were evaluated to assess the therapeutic effect of hyperbaric oxygenation (HBO). All subjects received saline or dextran (Rheomacodrex) infusions with Ginkgo extracts (Tebonin) and prednisone. Thirty six patients underwent additional hyperbaric oxygenation at a pressure of 2 atmospheres absolute for 60 minutes once daily. Both treatment groups were comparable as far as age, gender, initial hearing loss and prednisone dose are concerned. The delay of therapy onset was 15 hours in both groups and treatment was started within 72 hours in all cases. Control audiometry was performed after 6.5 days, when the HBO group had had 5 exposures to hyperbaric oxygenation. The average hearing gain in the group without HBO was 74.3 dB and in the group treated additionally with HBO 121.3 dB ($P < 0.004$). It is concluded, that hyperbaric oxygenation significantly improves hearing recovery after AAT. Therefore acute acoustic trauma with significant hearing threshold depression remains an ontological emergency. Minimal therapy involving waiting for spontaneous recovery, which is mostly incomplete leaving a residual C5 or C6 and handicapping tinnitus, is not the treatment of choice. Randomized prospective clinical trials with a larger patient series are needed and further experimental studies are required to understand the physiological mechanisms of HBO responsible for the clinical success in AAT.

Alternobaric and hyperbaric oxygen therapy in the immediate and long-term treatment of Meniere's disease.

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Forty-five patients suffering from Meniere's disease were submitted to pressure chamber therapy: 20 with constant pressure (2.2 ATA, hyperbaric treatment) and 25 with continuous variations in pressure levels (from 1.7 to 2.2 ATA, alternobaric treatment). Oxygenation therapy consisted of one session per day lasting 90 minutes for 15 days during the acute attacks followed by five consecutive sessions per month during a follow-up of two years. For a control group we used 18 patients treated with 10 per cent intravenous glycerol during the acute episode and 8 mg tid of betahistine thereafter. We compared hearing loss, vertigo and tinnitus in the three groups 15 days after starting treatment and at the end of the follow-up, according to the criteria suggested by the 1995 Committee on Hearing and Equilibrium. We found no statistically significant differences in recovery from the cochlear-vestibular symptoms in the three groups at the end of the first 15 days of therapy, whereas hyperbaric and, in particular, alternobaric treatment permitted a significant control of the principal attacks of vertigo during the follow-up period. Hearing loss also showed a more significant and more persistent improvement in the patients treated with alternobaric oxygenation compared to the patients in the other two groups.