

Addition of Hyperbaric Oxygen Therapy vs Standard Therapy in SSNHL

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Abstract

The background of sudden sensorineural hearing loss is that occurs suddenly, with unknown causes, and the number of cases increases with age. The modality of therapy that is often used today is empiric therapy. The purpose of this literature review is to determine the impact of adding hyperbaric oxygen therapy compared to standard therapy in cases of sudden sensorineural hearing loss. **Methods** The article search was carried out in various valid online data centers, namely PubMed, Science Direct, Cochrane Library, and Google Scholar. Looking for articles that discuss the addition of hyperbaric oxygen therapy in sudden sensorineural hearing loss. **The results** search yielded 1 observational study and 2 systematic studies. The addition of hyperbaric oxygen therapy provides a better clinical outcome. **Conclusion:** Hyperbaric oxygen therapy has a better effect than standard therapy only in cases of sudden sensorineural hearing loss.

Keywords : Hyperbaric Oxygen Therapy; Sudden Sensorineural Hearing Loss; Salvage Treatment;

Introduction

Sudden sensorineural hearing loss (SSNHL) is defined as hearing loss that occurs suddenly and lasts for at least 3 days with audiometric findings of hearing loss of 30 dB or more occurring at 3 consecutive frequencies. Hearing loss that occurs in SSNHL is a type of sensorineural deafness that generally only occurs in one ear (Soepardi, et al., 2007; Lavoie & Mutluoglu, 2021). The incidence of SSNHL in the United States is 27 per 100,000 population with more than 66,000 new cases annually. The incidence of SSNHL also increases with age, starting from 11 per 100,000 population for patients <18 years and 77 per 100,000 population for patients 65 years. (Alexander & Harris, 2013).

The etiology of SSNHL is as follows:

- Idiopathic (71%)
- Infection (12,8%)
- Ear disease (4,7%)
- Trauma (4,2%)
- Vascular disorders (2,8%)
- Neoplastic (2,3%)
- Other Causes (2,2%)

(Chau, et al., 2010)

The cause of SSNHL is generally not known with certainty, but there are several theories that are suspected as the cause of SSNHL, such as vascular disorders, viral infections, and intra-cochlear membrane rupture. Viral infection is said to cause damage to the organ of Corti, damage to the Reisner membrane, the membrane that limits the scala vestibule to the scala media, and causes damage to the tectorial membrane. Then on vascular disorders it is said that cochlear ischemia caused by spasm, thrombosis, or bleeding of the internal auditive arteries can cause damage to the ganglion cells of the stria vascularis and damage to the spiral ligament. Intra-cochlear membrane rupture caused by trauma will result in a mixture of endolymph and perilymph which will also play a role in hearing loss in patients. These theories suggest that the course of the disease will lead to cochlear damage or damage to the auditory nerve (Soepardi, et al., 2007; Kuhn, et al., 2011).

Currently, because most cases of SSNHL are idiopathic cases, the treatment modality given is empirical therapy only such as systemic steroids, vasodilator therapy, rheological agents, and antioxidants (Singh & Irugu, 2020; Prince & Stucken, 2021). Systemic steroids can be administered in several ways, namely orally, intravenously, intratympanically, and intracochlearly. Of the four methods of administering systemic steroids, the intratympanic route is the route that is most often the route of choice when compared to other routes of administration (Leung, et al., 2016). This is because the method of intratympanic administration of systemic steroids is able to deliver higher drug concentrations at the target site when compared to other administration methods so that the number of drugs required for a therapeutic regimen can be less. In addition, this method of administration also shows a low risk of complications and is able to avoid the first-pass effect. Research conducted by Kakehata, et al in 2006 showed that intratympanic steroid administration was able to provide a greater beneficial effect than oral and intravenous administration (Kakehata, et al., 2006). A systematic study conducted by Spear et al concluded that intratympanic steroid therapy in SSNHL patients can act as both first-line and last-line therapy (salvage therapy) (Spear & Schwartz, 2011).

Method

A literature review is to provide a framework related to new findings and previous findings in order to identify indications of whether or not there is progress from the results of a study through comprehensive research and interpretation of the results of the literature related to a particular topic which identifies research questions by searching and analyzing relevant literature. using a systematic approach (Randolph 2009).

Discussion

Hyperbaric oxygen therapy (HBOT) is a therapy that utilizes 100% oxygen and a pressure of more than 1 atmosphere absolute (ATA) in patients, giving this therapy in a high-pressure air chamber or a hyperbaric chamber(Zarychta, 2020). HBOT at the beginning of use is used to help relieve respiratory problems. However, over time the development of HBOT is not only used for respiratory problems, but can also be used in various conditions such as hypoperfusion, infection, ischemia, and SSNHL (Huchim, et al., 2017). Based on the undersea and hyperbaric medicine society (UMSA) there are several indications for HBOT therapy, namely air embolism, carbon monoxide gas poisoning, thermal burns, gas gangrene, compartment syndrome, osteomyelitis, necrotizing fasciitis, injury, anemia with profuse blood loss, ischemia. acute periphery, decompression sickness, radiation injury (soft tissue and bone necrosis), increased wound healing, and skin flaps and grafts (impaired) (Fife, et al., 2016).

In normobaric conditions, the oxygen content in the blood serum is about 0.3 ml/100 ml, while in normobaric conditions with the administration of pure oxygen there will be an increase in oxygen in the serum to 1.5 ml/100 ml, and if 100% oxygen is given in hyperbaric conditions (3 ATA). will increase the oxygen content in the blood serum to 6 ml/100 ml. Changes from normobaric to hyperbaric conditions with 100% oxygen administration can cause an increase in oxygen tension in the lungs which also has an impact on increasing serum oxygen. So in principle the use of hyperbaric oxygen therapy is useful in increasing the flow of oxygen to the tissues so that it can help repair damaged tissues (Zarychta, 2020).

Hyperbaric oxygen therapy has been shown to be beneficial for patients with SSNHL. A systematic study published by Rhee et al in 2018 concluded that hyperbaric oxygen therapy as an adjuvant therapy provided a better clinical outcome when compared to patients who were only given standard therapy (Rhee, et al., 2018). This systematic review involved 19 intervention studies that compared the clinical outcomes of SSNHL patients who were given hyperbaric oxygen therapy + medication with those who were given drug therapy alone. In line with these conclusions, a study conducted by Horn et al in 2005 also showed improvement in the group of patients given hyperbaric oxygen therapy when compared to the group of patients who were only given drug therapy (Horn, et al., 2005). The study also found that hyperbaric oxygen therapy showed the most beneficial effects in patients who experienced relapse after receiving drug therapy as well as in patients who did not show clinical improvement after receiving drug therapy. A systematic study published by Erygit et al in 2018 found that hyperbaric oxygen therapy showed the highest efficacy in patients with SSHNL with severe hearing loss (Erygit, et al., 2018).

Conclusion

Based on the above explanation, hyperbaric oxygen therapy in SSNHL patients shows a greater beneficial impact than drug therapy that has been implemented at this time. This impact is especially felt in patients who are classified as severe and patients who do not show clinical improvement after administration of drugs.

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