1.0.0. Abstract

The composition of the laryngeal moistening secretion is clearly influenced by the function of the exocrine glands in the area of the vocal and the vestibular folds, as well as in the oral area. In this respect, sufficient liquid intake is of vital importance, just as in the physiology of nutrition. From the viewpoint of voice physiology, it is imperative for professional voice users to drink 2.5 to 3.0 litres a day as an "internal hydration", in order to provide the laryngeal high-performancer vibration generator with an adequate moistening secretion. Especially if external influences like desiccating medication, stimulants like coffee, or infections, stress traumata and dry ambient conditions lead to pathological changes in the viscosity of the laryngeal secretion of professional voice users.

The External Hydration is also of vital importance. In this respect the degree of particle deposition in the larynx is decisive, and the best physiological effect is created by coarse-dropped aerosol particles.

This presentation will mainly refer to the methods of external hydration and will discuss the various technical inhalation aids used in Europe. In particular we will consider the simple principle of inhaling using the pocket inhaler by Macholdt, and the aerosol production will be shown by experimental principles. In a self-experiment with colour and technetium inhalation, we will prove the laryngeal deposition of the aerosol. Furthermore, we will present the results of a patient inquiry on the subjective effect of this inhaler.
2.0.0. Introduction

From the physical point of view, the larynx is a high-performance vibration generator which can produce continuous high performance by economical function only. For such purpose the superficial layers of the vocal folds must be well moistened in order to avoid overheating through stress and thus obstruction of the vibrations of the mucosa. To achieve this, the viscosity of the moistening surface layer must be developed to an optimum value. The viscosity of the oil in a racing engine serves the same purpose. The viscosity is measured in the physical dimension figure of poise. The viscosity of water is 0.01 poise, that of saliva is 0.03 poise, that of the sucus in the tracheal system is 0.06 poise (Titze 1994). Assuming that in the process of swallowing, "silent" physiological aspiration (silent aspiration according to Logemann) will occur at any time, when particles of saliva will pass under the epiglottis on to the surface of the vocal fold, the conclusion is that the viscosity of the layer of the laryngeal net must be 0.01 - 0.03 poise. This value can be reached by adequate internal hydration. From the viewpoint of nutritional physiology and voice physiology, a professional voice user is required to drink a daily quantity of 2.5 to 3 litres, which will provide for a thin-bodied property of the saliva and the laryngeal secretion.

3.0.0.

Various external influences like infections, prolonged speaking, medication, dry ambient conditions, will change the viscosity of the accretion of the laryngeal net, reducing the cooling and sliding effect (lubrification) of the circulating laryngeal secretion on the superficial vocal fold epithel (Cooper an Titze 1983). With this in mind, the inhalation therapy, the "external hydration", gains great importance.

An optimum inhaling aid should have the following properties:

- In view of the professional and private situation, it should be ready for use at any time
- it should produce coarse-dropped aerosol particles (10 - 40 micrometers), being mainly deposited in the upper respiratory tract.
- it should allow simple handling and uncomplicated hygienic maintenance.
For these reasons I have studied the functional principle of the Macholdt pocket inhaler carefully.

In the German-speaking countries, this inhaler has been available for appr. 100 years and was mainly used in combination with etheric oils. I made efforts to use this simple functional principle also for medical laryngeal inhalations. For this purpose I experimented with various inhalation mixtures. These solutions had to have the following properties:

1. good physiological tolerance
2. good moistening of the mucosa
3. good dilution of the mucus

The aerosol formation and aerosol deposition were verified with the following methods:

**3.1.0. Experimental arrangement with a vacuum aspirator**

The Macholdt inhaler was connected to plastic hoses, at the ends of which hang a vacuum aspirator imitating the suction of an inhalation. I added various substances coloured with methylene blue to the inhalation solution. Depending on the formula of the solution an under steady suction, the vertically arranged plastic hoses were coloured over a certain length, thus showing the aerosol deposition.

**3.2.0. The following inhalation mixture produced the greatest aerosol deposition:**

Inhalation solution according to Schlömicher-Thier:

OP1:

- Tacholiquin 1 % 10.00
- Prospan 10.00
- Dexpanthenol 0.05

add 200 ml 0.9% physiological NaCl
3.3.0. Self-Experiments

3.3.1. Colour inhalation with videostroboscopic checks

Methylen blue was added to the above-mentioned inhalation solution and then inhaled using the Macholdt inhaler, with the lower leg of the inhaler standing in a 60° water bath (cup of tea with hot water).

In the magnifying endoscopic check a laryngeal colour deposition was clearly visible.

3.3.2. Technetium inhalation with gamma camera measurement

Technetium was added to the inhalation solution described above and the inhalation was also performed with the Macholdt inhaler (also warm).

The gamma camera showed clear activity in the areas of the larynx and the trachea.

4.0.0.

The good topic effect of the inhaler can be proved by the methods described above. The use of this pocket inhaler brings great benefits to the professional voice users, because it is at hand at any time and any place.

The good patient compliance is shown through the evaluation of a user inquiry in which 35 persons took part. 31 persons gave a very positive assessment of the inhaler, 4 persons were not satisfied.

5.0.0. Bibliography

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