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ORIGINAL PAPERS

SALTMED - THE THERAPY WITH SODIUM CHLORIDE DRY AEROSOLS

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Abstract. To assess the effects of halotherapy, we conducted a retrospective study on patients with obstructive bronchial disorders (asthma and chronic obstructive pulmonary disease), treated in the UPU-SMURD department of the Bucharest Emergency Hospital. The respiratory frequency, the ventricular aspect and the oxygen saturation were measured in all patients (initially and every 20 minutes, for an hour), as well as the blood gases (initially and after an hour). Saline inhalation determines a quicker improvement of parameters defining the respiratory failure in the worsening of obstructive pulmonary diseases.
Keywords: obstructive bronchial disorders, SaltMed, halotherapy

Introduction

Background

Halotherapy (gr. halos = salt) uses aerosol microparticles of salt (sodium chloride) to treat respiratory diseases. It appeared as an alternative to speleotherapy (gr. speleos = cave), a therapeutic method used in Eastern Europe in salinas from the beginning of 19th century [1].

In the 80's in the Soviet Union "halochambers" are conceived and used, which render the salina microclimates. The method is subsequently extended in Europe and North America to treat especially asthma [2].

The specialists focused then on the creation of "portable" devices that can be used in ambulances, in hospitals as well as at home. In Hungary a "ceramic pipe" was conceived that contained saline microparticles and through which the air was inhaled, while exhalation was nasal.

In Romania, the company TehnoBionic conceived a filter cartridge with saline microparticles that are nebulized by force under pressure of air or dehumidified oxygen, being connected to a face oxygen mask [3].

Principle of the method

The micronized sodium chloride (1-5 μm) is easily breathed in the upper and lower respiratory tract. At this level, it dissolves in the sol phase of the mucus layer that covers the respiratory epithelium. Here, through local osmotic effect, the water in the interstitial tissue is attracted to the respiratory tract lumen. The inflammatory edema thus decreases and the mucus quantity increases [4].

The mucus becomes more fluid and is easily mobilized to the cilia of respiratory epithelial cells, to be eliminated at pharynx level and then expectorated through coughing.

Through this easy mechanism the sodium chloride (NaCl) has a beneficial effect at respiratory tract level, improving a number of symptoms that appear in the acute disorders of the respiratory

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tract [5,6,7].

Thus, the nebulization of saline microparticles in the respiratory tract is a therapeutic method to be used in respiratory disorders such as: asthma, chronic obstructive pulmonary disease, pneumonia etc.

It seems that the method acts in pulmonary infectious disorders by decreasing the microbe contamination of upper respiratory tract (especially with staphylococci) in children with respiratory allergy. The capacity to kill bacteria could be explained through the complex immunomodulatory effects that the procedure determines: it increases the number and activation of T lymphocytes, it normalizes the number of B lymphocytes, it increases the level of IgA [3].

Though there are studies regarding the effects of halotherapy in other pulmonary pathologies as well: cystic fibrosis, acute respiratory distress syndrome, acute pulmonary injury etc., the effect is not fully demonstrated, though it seems to be favorable [4,8].

To assess the effects of halotherapy, we conducted a retrospective study on patients with obstructive bronchial disorders (asthma and chronic obstructive pulmonary disease), treated in the UPU-SMURD department of the Bucharest Emergency Hospital.

Material and methods

We conducted a retrospective group study on 393 patients who came to the UPU-SMURD department of the Floreasca Emergency Hospital, Bucharest, or who were transported by cars belonging to SMURD Bucharest due to worsening of asthma or of chronic obstructive pulmonary disease. All patients received standard treatment with inhalatory betamimetics, corticotherapy and oxygen and 204 of them were additionally treated with saline inhalations.

The respiratory frequency, the ventricular aspect and the oxygen saturation were measured in all patients (initially and every 20 minutes, for an hour), as well as the blood gases (initially and after an hour).

For statistic purposes, the Mann-Whitney U test was used in the univariate analysis (the variable distribution was not normal) for parameter comparison between the SaltMed group and the standard therapy group, as well as for the assessment of differences between the average improvement of PaO2 and PaCO2 during the first hour, between the group treated with SaltMed and the untreated group. In order to evaluate the differences between the two groups as far as the other repeatedly measured parameters are concerned (respiratory frequency and SaO2, measured 4 times each, every 20 minutes), the General Linear Model for repeated measures was used, in which the initial PaO2, age and sex were introduced as covariable. The statistic analysis was conducted with SPSS 16.0 for Windows, SPSS Inc.

Results

Out of 393 patients, 204 received standard treatment and SaltMed treatment, while 189 only received standard treatment. The basal characteristics of the two groups are presented in table I.

This table shows that the patients in the group treated with SaltMed were in general in a more serious condition as they were older and the CO2 partial pressure was higher, while the oxygen saturation and partial pressure were lower.

Despite this situation, at the end of the first hour

Characteristic	SaltMed treatment (n=204)	Standard treatment (n=189)	P
Age*	64 (35. 88)	59 (3. 88)	0.001
Males **	115 (61%)	131 (64%)	0.532
Basal respiratory frequency *	23 (18. 37)	23 (18. 36)	0.764
Basal SaO2 *	90 (78. 97)	94 (75. 99)	<0.001
Basal PaO2 *	61.5 (47. 96)	80 (42. 97)	<0.001
Basal PaCO2 *	58 (35. 80)	44 (35. 95)	<0.001

Table I. Basal characteristics of the two groups of patients
* Average (min, max) (distribution was not normal); data were compared based on Mann-Whitney U test
**Number (percentage); data were compared based on X2 test

of therapy all parameters were significantly better in the SaltMed group (table II).

Moreover, the SaO2 and the respiratory frequency were significantly improved in the SaltMed group as compared to the witness group after adjustment for age and initial PaO2, which were significantly different between groups (in favor of the witness group) (p<0.01, fig. 4).

Parameter	SaltMed treatment (n=204)	Standard treatment (n=189)	P
Respiratory frequency *	17 (15. 32)	19 (16. 32)	0.764
Basal SaO2 *	98 (82. 100)	97 (83. 99)	<0.001
Basal PaO2 *	92 (56. 98)	85 (54. 97)	<0.001
Basal PaCO2 *	38 (32. 77)	41 (34. 99)	<0.001

Table II. Respiratory parameters of the two groups of patients after the first 60 minutes of treatment
* Average (min, max) (distribution was not normal); data were compared based on Mann-Whitney U test

The PaO2 improvement was significantly better in the SaltMed group as compared to the group without SaltMed (p<0.001, fig. 1); the same was valid with respect to PaCO2 decrease (p<0.001, fig. 2).

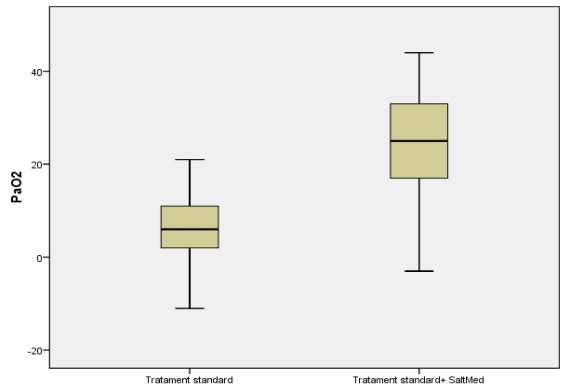


Figure 1. Improvement of PaO2 in the two groups of patients (SaltMed group and witness group)

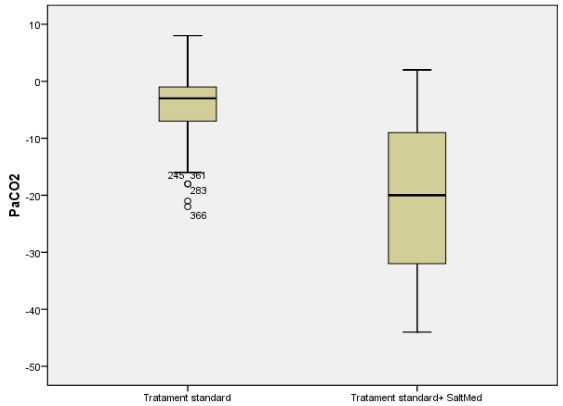
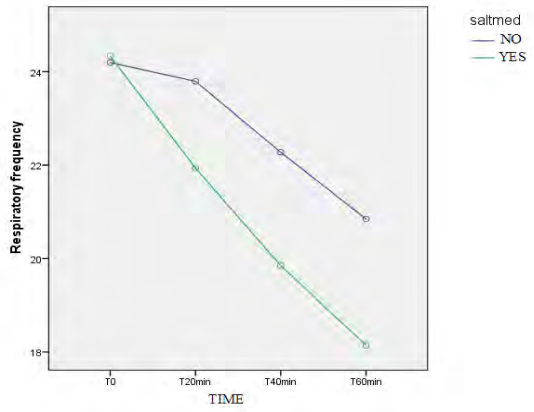


Figure 2. Improvement of PaCO2 in the two groups of patients (SaltMed group and witness group)



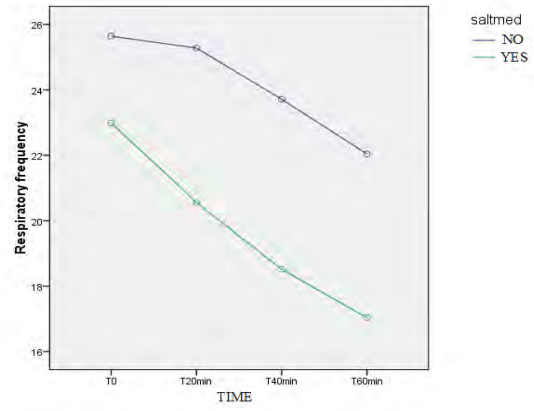


Figure 3. SaltMed effect on respiratory frequency, gross (a) and adjusted for initial PaO2 and age (b)

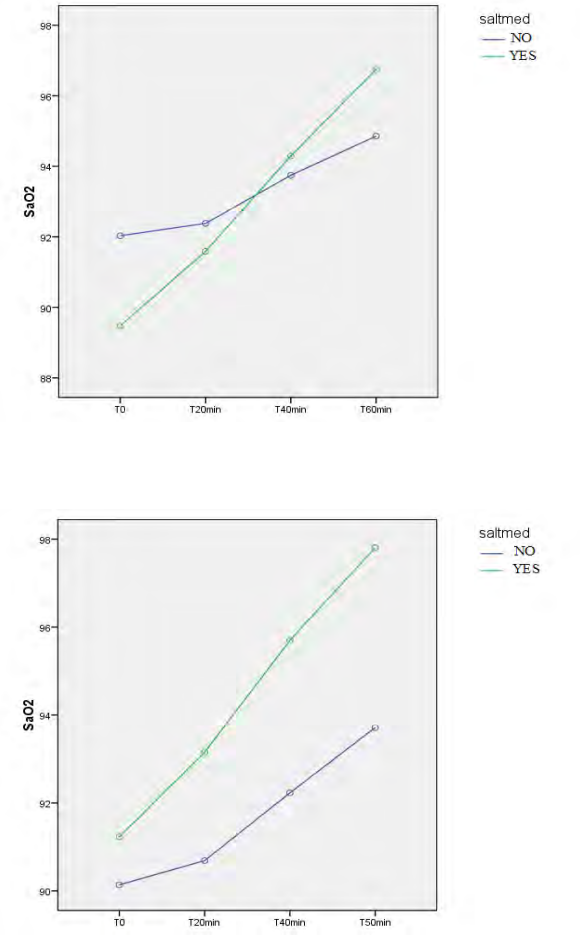


Figure 4. SaltMed effect on oxygen saturation, gross (a) and adjusted for initial PaO2 and age (b)

Discussions

This study proves that halotherapy added to the initial treatment of patients with chronic obstructive pulmonary disease and asthma with acute respiratory failure leads to significant improvement during the first hour of all clinical and paraclinical parameters: respiratory frequency, O2 saturation and partial pressure of blood gases.

No orotracheal intubation was necessary in the group that benefited from halotherapy in order to facilitate mechanical ventilation during the first hour of therapeutic assistance, so it can be an option in the non-invasive management of such patients.

Though it was not quantified, it needs to be stated that patients that benefited from halotherapy with SaltMed tolerated very well the administration of saline microparticles and presented no emetic side effects, as it usually happens when humid nebulization is used, where the use of bronchodilating and/or mucolytic substances has a strong emetic effect, which makes the action hard to tolerate by the patient.

The fast improvement of the respiratory failure in the emergency room makes it possible for the patient to be quickly hospitalized in a unit where no intensive care measures are needed, avoiding thus the agglomeration or even the blocking of the emergency room.

One of the study limits is that it is only an observational study and the results can be affected by systematic selection errors. Based on data analysis, it seems that SaltMed treatment was applied especially to patients in a more serious condition (table I) and in this case the treatment results are more spectacular. It is necessary to conduct a randomized clinical trial that confirms these results as other confusion factors may be involved, which were not recognized or measured in this study.

Another limit is that patients were only monitored during the first hour since the SMURD team was requested or since they came to the emergency room, so we do not know if the good results in the first hour were maintained over the following hours or if the results extended to the necessity of hospitalization, hospitalization duration, life quality, necessity of intubation or even mortality, for which further studies are requested.

References

1. **Halotherapy –** Adjuvant therapy in the treatment of respiratory disorders; *www.scientiapress.com***. 31.03.2009.**

2. **Chervinskaya Alina, Zilber Nora.** Halotherapy for treatment of respiratory diseases. *Journal of aerosol medicine,* **Volume 8, Number 3, 1995.** Mary Ann Licbert, Inc.

3. **Tudorache V, Mihăicuță S, Potre Rodica, Kigyosi Anca.** Aeroionizarea forțată a aerului din încăpere ca și terapie adjuvantă în terapia astmului și bronșitei cronice. *www.SaltMed.blogspot.com.* **03.04.2009.**

4. **Wark PAB, McDonald V, Jones AP.** Nebulised hypertonic saline for cystic fibrosis**. Cochrane Review.**

5. **Anderson S, Spring J, Moore B and colab. T**he effect of inhaling a dry powder of sodium chloride on the airways of asthmatic subjects. *Eur. Respir. J.* **1997 Nov; 10(11): 2465-73.**

6. **Laube B, Swift D, Wagner H Jr and colab.** The effect of bronchial obstruction on central airway deposition of a saline aerosol in patients with asthma. *Am. Rev. Respir. Dis.* **1986 May, 133 (5): 740-3.**

7. **Phipps P, Gonda I, Anderson S and colab.** Regional deposition of saline aerosols of different tonicities in normal and asthmatic subjects, *Eur. Respir. J.* **1994, Aug.; 7(8): 1474-82.**

8. **Elkins M, Robinson M, Rose Barbara, Harbour C, Moriarty C, Marks G et al. A** Controlled Trial of Long-Term Inhaled Hypertonic Saline in Patients with Cystic Fibrosis. *The new England journal of medicine.* **January 19, 2006 vol. 354, no. 3, pag.229-240.**

9. **Longenecker C.** Respiratory Acidosis. **In: High-Yeld Acid-Base.1998, Lippincott Williams & Wilkins, pag.56-60.**