

RESPIRATORY HYGIENE WITH DRY SODIUM CHLORIDE AEROSOL

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INTRODUCTION

It is generally accepted that persons (prs) with exogenous risk factors of COPD (tobacco smokers, prs are exposed to industrial pollutants) are required sanitation of respiratory tract to prevent development of lung diseases. Physical aerosol factors are preferable as they can be possessed of clinical efficacy without system effects.

It has been known, that nebulised sodium chloride solution is used with therapeutic and diagnostic purposes. There is a little doubt that inhalation of isotonic saline does not produce any evident therapeutic effects. Aerosolized hypertonic saline influences on impaired mucociliary clearance but it is not used for therapy, because can provoke bronchospasm in patients with asthma and even in healthy persons. Generally, hypertonic and hypotonic solutions are used to diagnose bronchial hyper reactivity.

Take into account the fact, that saline aerosol can possess therapeutic action, we decided to apply dry sodium chloride aerosol (DSCA). DSCA is characterized with physical properties, differing from those of the saline aerosols. It is possible to apply a little dose of sodium chloride with dry aerosol, which is safety and does not induce bronchospasm.

AIM OF RESEARCH

The aim was to study influence of DSCA on respiratory tract with assessment of clinical and lung function parameters of the persons with exogenous risk factors of COPD.

STUDY DESIGN AND PROCEDURES

54 persons (prs) with exogenous risk factors of COPD were examined. They had the productive cough associated with smoking and/or exposure to industrial pollutants. They were selected after medical and lung function examination. Chronic respiratory pathologies had been diagnosed in none of them.

The test group (TG) (26 male, 8 female, 43±2.4 yrs) was treated with the DSCA. The control group (CG) included 15 male, 5 female (46.5±2.8 yrs). The groups did not differ significantly by sex, age, smoking duration and intensity, exposing to industrial hazards.

DSCA was given using table-mounted inhaler Haloneb[™]. Inhalation procedure continued 10 minutes with subject breathing quietly through a mouthpiece in sitting position. Each participant had 14 inhalation procedures. Haloneb[™] is the self-milling device, it produces rock salt particles with size of 1-5 µm (80%) and 0.8-1.2 mg/min density (on average-1.0 mg/min, total dose is approximately 10 mg per procedure). Owing to the special technique to DSCA, its particles are electrically negative charged.

Pts of the CG received inhalation with plain air using inhaler Haloneb[™], specially designed for the study. It was a single blind study with placebo.

Changes in the character of cough, sputum, general condition and auscultation data were estimated before each next inhalation procedure.

Respiratory function was carried out by standard techniques with "E. Jaeger" (Germany) equipment. The parameters of flow-volume loop were estimated before and after course of procedures.

RESULTS

After the procedures the cough retained in 27% of the pts of TG and 91% - CG ($p < 0.001$). The significant decrease of the number prs with dry rales (15%-TG, 55%-CG, $p < 0.05$) was observed as well. Relief of cough and improvement of sputum properties were remarked in the 88% of TG and 22% - CG ($p < 0.05$).

The character of sputum changed gradually in TG pts during the course of DSCA inhalations. By the 5th procedure, the number of pts expectorating yellow sputum decreased, and by the 8th - there was decrease in the number of pts expectorating gray sputum ($p < 0.05$). By the end of the course DSCA procedures expectorating of gray or yellow sputum was only in separate cases. The number of pts who stopped producing sputum increased significantly, while sputum turned light in the rest ($p < 0.01$) (fig.1).

There were no specific changes in the character of sputum in CG.

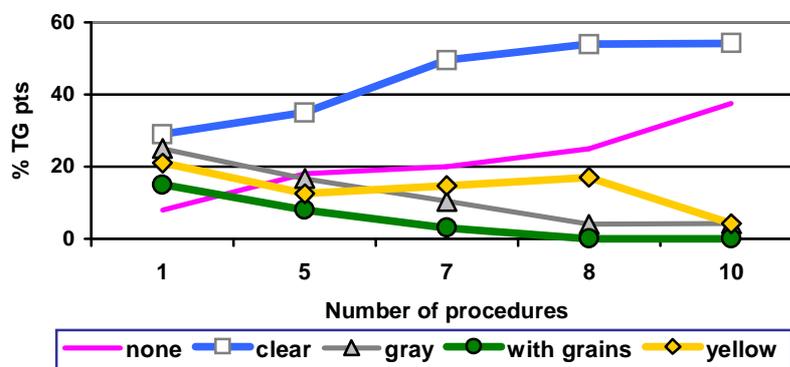


Fig. 1 - Changes in the character of sputum during the course of DSCA inhalation (n=34).

Significant increase of parameters FEF₂₅ ($p < 0.05$), FEF₅₀ ($p < 0.01$) и FEF₇₅ ($p < 0.05$) was marked in TG. There were no significant changes of the average values of functional parameters in CG (table 1).

Table 1 - Respiratory functional parameters in the Test and Control groups before and after the course of the dry sodium chloride inhalation

Parameter (% D), M±SE	Test group (n=34)		Control group (n=20)	
	Before inhalations	After inhalations	Before inhalations	After inhalations
FVC	98.2 ± 2.8	101.3 ± 2.6	99.9 ± 3.7	98.7 ± 5.5
FEV ₁	95.2 ± 3.7	98.2 ± 3.5	96.2 ± 4.4	99.5 ± 5.5
FEF ₂₅	85.0 ± 3.2	98.0 ± 4.4*	90.2 ± 4.9	94.6 ± 4.5
FEF ₅₀	67.4 ± 2.7	81.6 ± 3.8**	70.1 ± 5.0	69.8 ± 6.7
FEF ₇₅	59.3 ± 2.3	69.5 ± 4.3*	62.5 ± 3.1	64.2 ± 4.2
PEF	99.2 ± 4.5	101.1 ± 4.7	102.8 ± 4.2	105.8 ± 3.0
FEF ₂₅₋₇₅	78.4 ± 5.2	84.9 ± 5.1	82.4 ± 3.3	86.4 ± 4.9

* significant ($p < 0.05$) changes vs. initial values; ** significant ($p < 0.01$) changes vs. initial values

Individual evaluation of lung function in both groups before and after inhalations of DSCA showed positive dynamics of the flow-volume indexes in 16 prs (47%) and only in 1 person (5%) of CC group. That differed significantly ($p < 0.01$).

Procedures of inhalation of DSCA were well tolerated subjectively by participants of the study. There were no adverse events reported during the course of the study.

CONCLUSION

Respiratory symptoms and functional parameters of the prs with risk factors of COPD had the significant changes under the action of DSCA. Relief of the cough, improvement of the sputum properties, positive dynamics of auscultative finding and functional parameters was demonstrated. The findings of the research demonstrated the stimulation of bronchial drainage of prs with risk factor of COPD.

Inhalations of the fine DSCA, which characterized with fixed density and low dose of sodium chloride, render sanitary action in respiratory tract and can be use for primary prevention of COPD.