The efficacy of decamethoxine as a part of multimodality therapy of infectious exacerbations of bronchial asthma

Key words: bronchial asthma, decamethoxine, infectious exacerbation.

In the recent years, there has been a consistent growth of the incidence of bronchial asthma (BA) in majority of countries worldwide. According to literature, from 1.0 % to 10.0 % of global population have BA. On the average, BA affects approximately 5.0 % to 7.0 % of the population [8]. According to official statistical data, the 2011 incidence of asthma in Ukraine was 515.9 patients per 100,000 of adult population; with each year, this number is steadily increasing [7].

Exacerbations of asthma (especially severe ones) cause deterioration of pulmonary function (which persists for prolonged periods of time and frequently fails to return to baseline); this aggravates both the course and prognosis of the disease [9, 11]. It has been proved that viral respiratory infections are a leading cause of BA exacerbations [12]. One of the components of the adverse impact of viral respiratory infection is creating the preconditions for bacterial superinfection and formation of viral-bacterial associations [10]. Therefore, the results of treatment of acute BA exacerbations greatly depend on adequate antibacterial therapy. However, there is currently no consensus concerning the strategy of antibacterial treatment and its administration routes.

In recent years, there are reports concerning the efficacy of decamethoxine-based antiseptic agents in the therapy of purulent and destructive pulmonary conditions, pneumonia and infectious exacerbations of chronic obstructive pulmonary disease [1, 2, 4]. A number of in vitro studies have demonstrated high sensitivity of viral and bacterial agents of infectious exacerbations of bronchial asthma to decamethoxine [5, 6]; it was also demonstrated that inhalations of 0.02 % solution of decamethoxine do not exert any negative influence on parameters of respiratory function (RF) in patients with infectious exacerbations of BA [3]. However, the efficacy of nebulised antimicrobial therapy with decamethoxine in patients with infectious exacerbations of BA has not been studied sufficiently, which has led the investigators to the aim of the study: to investigate clinical efficacy and substantiate the expedience of adding 0.02 % solution of decamethoxine (administered as inhalations) to the multimodality therapy of infectious exacerbations of bronchial asthma.

Materials and methods of the study

To meet the objectives of the study, we have selected 64 patients with virus-induced BA exacerbations, which were treated at the Department of therapeutic technologies in non-specific lung disease of the State Institution ‘The National Institute for Tuberculosis and Pulmonology named after F. G. Yanosky of the National Academy of Medical Sciences of Ukraine’ in 2012-2014. The diagnosis of infectious exacerbation of BA was established according to the guidelines specified in the Order of the Ministry of Health of Ukraine ‘Concerning the approval and implementation of medical and technological documents for standardization of care in bronchial asthma’ No. 868, dated 08.10.2013. [7].

The patients which did not receive adequate therapy for their BA exacerbations had their treatment adjusted accordingly. Depending on the severity of the exacerbation, the patients received anti-inflammatory drugs (inhaled and/or systemic steroids) in combination with bronchodilators (2-agonists and anti-cholinergic drugs of short and prolonged action). The scope of therapeutic interventions and routes of administration of the drugs (inhaled, oral or parenteral) were determined depending on the severity of the exacerbation and on the response to the initial stage of therapy according to the recommendations in the Order of the MoH of Ukraine No.868 dated 08.10.2013. [7]. Mucolytic agents and antihistamines were simultaneously used when indicated.

It should be noted that all patients with BA received their basic therapy according to the severity of their disease and per
The main group (Group 1): 41 patients (17 males and 24 females); mean age 48.2 ± 11.7 years, FEV1 = 66.8 ± 2.4 %, the increment in a bronchodilator test: 15.7 ± 2.0 %. As a part of multimodality therapy, these patients received 0.02 % solution of decamethoxine, 4 mL via inhalation (through a nebulizer) twice a day for 10 days.

The control group (Group 2): 23 patients (9 males and 14 females); mean age 47.4 ± 13.9 years, FEV1 = 64.9 ± 2.7 %, the increment in a bronchodilator test: 16.4 ± 2.8 %; these patients received standard therapy only (matching the severity of BA exacerbation).

According to the findings of clinical and instrumental assessment, patients with moderate BA exacerbations
The matched populations was rejected at p value $< 0.05$. The null hypothesis of the absence of significant differences between linked samples and independent samples, respectively. The used: Wilcoxon signed-rank test and Wilcoxon rank-sum test distributed, non-parametric analogues of Student’s t-test were used when the population could not be assumed to be normally distributed.

Parameters, PEF and the fraction (%) of patients that required systemic antibiotic therapy during or after the treatment.

Results

Efficacy assessment of a 10-day course of inhaled 0.02 % solution of decamethoxine as a part of multi-modality therapy of BA exacerbation was performed judging by the temporal changes in toxic syndrome, clinical symptoms of BA, RF parameters, PEF and the fraction (%) of patients that required systemic antibiotic therapy during or after the treatment.

The results were processed and analysed using the methodology of analysis of variance. Student’s t-test was used to compare the populations which followed normal distribution. When the population could not be assumed to be normally distributed, non-parametric analogues of Student’s t-test were used: Wilcoxon signed-rank test and Wilcoxon rank-sum test for linked samples and independent samples, respectively. The null hypothesis of the absence of significant differences between the matched populations was rejected at $p$ value 0.05. The study was financially supported by the State Budget.

The changes of RF in patients of study groups ($M \pm m$)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Visit 1</th>
<th>Visit 2</th>
<th>Visit 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Main (n = 41)</td>
<td>Control (n=23)</td>
<td>Main (n = 41)</td>
</tr>
<tr>
<td>FEV$_1$, % of normal</td>
<td>66.8 ± 2.4</td>
<td>64.9 ± 2.7</td>
<td>74.6 ± 2.6*</td>
</tr>
<tr>
<td>Morning PEF, L/min</td>
<td>236.6 ± 13.2</td>
<td>230.9 ± 14.5</td>
<td>254.0 ± 14.1</td>
</tr>
<tr>
<td>Evening PEF, L/min</td>
<td>265.4 ± 14.9</td>
<td>266.4 ± 15.4</td>
<td>268.6 ± 16.8</td>
</tr>
<tr>
<td>Daily PEF variability, %</td>
<td>32.9 ± 4.9</td>
<td>33.1 ± 2.7</td>
<td>26.1 ± 2.0</td>
</tr>
<tr>
<td>The increment in a bronchodilator test, %</td>
<td>15.7 ± 2.0</td>
<td>16.4 ± 2.8</td>
<td>13.5 ± 2.4</td>
</tr>
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Note. * The difference of parameters in the group (compared to Visit 1) is statistically significant ($p < 0.05$).
66.8 ± 2.4 % to 74.6 ± 2.6 % in the main group (p < 0.05); the increase in a bronchodilator test reduced to 13.5 ± 2.4 %. In the control group there was an increase of FEV1 from 64.9 ± 2.7 % to 76.4 ± 2.2 % (p < 0.05); the increase in a bronchodilator test reduced to 14.1 ± 2.6 %.

Compared with Visit 1, there was a significant increase of FEV1 in the main group at Treatment Day 7 –10 (Visit 3), from 66.8 ± 2.4 % to 81.6 ± 2.5 %, p < 0.05; the increase in a bronchodilator test reduced to 10.2 ± 1.8 %, p < 0.05. There also was an increase of FEV1 from 64.9 ± 2.7 % to 77.9 ± 2.3 % in the control group (p < 0.05); the increase in a bronchodilator test reduced to 11.5 ± 2.7 %. When Group 1 and Group 2 were compared, FEV1 values tended to be higher in Group 1: 81.6 ± 2.5 % and 77.9 ± 2.3 % in Group 1 and Group 2, respectively.

Therefore, compared to standard inhaled therapy alone, complementing the therapy of infectious exacerbation of BA using a 10-day course of inhaled 0.02 % solution of decamethoxine contributed to a faster elimination of toxicity and clinical symptoms of BA exacerbations and improved RF and PEV more significantly.

Conclusions
Using a 10-day course of inhaled 0.02 % solution of decamethoxine as a part of multi-modality therapy in patients with BA exacerbations ensures the control of the disease is achieved in 92.4 % patients.

Using a 10-day course of inhaled 0.02 % solution of decamethoxine (as a part of multi-modality therapy in infectious exacerbations of BA) is 23.1 % more effective than standard inhaled therapy.

Infectious exacerbation of BA is an indication to use a 10-day course of inhaled 0.02 % solution of decamethoxine.

References

10. Global Initiative for Asthma. Asthma and allergy, 2016, 2 M. I. Gumieniuk Doctor of medical science, Leading researcher Department of technologies of treatment of nonspecific lung diseases SO «National institute of phthisiology and pulmonology named after F. G. Yanovskyi NAMS of Ukraine» M. Amosova str., 10, Kyiv, Ukraine. 03680 tel./fax: +38 (044) 275-53-04 e-mail: mykolagumieniuk@gmail.com