Efficacy of oxygen-driven atomizing inhalation of budesonide in the treatment of acute laryngitis

Lei Zhang*

Worker’s Hospital of Xuanhua Iron and Steel Group, 075100

Objective: To explore the clinical efficacy of oxygen-driven atomizing inhalation of budesonide in the treatment of acute laryngitis. Methods: Based on the routine treatment, the patients in the observation group were given oxygen-driven atomizing inhalation of budesonide, while the patients in the control group were given oxygen-driven atomizing inhalation of dexamethasone. The change of SpO2 before treatment and 30 min after treatment, the changes of serum IL-4 and IL-8 before treatment and 3 d after treatment, the clinical symptom disappearing time, hospitalization time, and clinical therapeutic effect after drug administration in the two groups were observed. Results: The improved degree of SpO2, 30 min after treatment in the observation group was significantly superior to that in the control group. The decreased degree of IL-4 and IL-8 levels 3 d after treatment in the observation group was significantly superior to that in the control group. The clinical symptom disappearing time and hospitalization time in the observation group were significantly shorter than those in the control group. The total effective rate in the observation group (94.3%) was significantly superior to that in the control group (74.3%). Conclusions: Oxygen-driven atomizing inhalation of budesonide in the treatment of acute laryngitis can rapidly alleviate the local inflammatory reaction, improve the clinical symptoms, and enhance the safety of drug administration; therefore, it deserves to be widely recommended in the clinic.
2.2. Methods

Based on the routine treatments of anti-inflammation, anti-virus, and sedation, the patients in the observation group were given oxygen-driven atomizing inhalation of budesonide (2 mg) + 0.9% sodium chloride injection (2 mL), bid; while the patients in the control group were given oxygen-driven atomizing inhalation of dexamethasone (2 mg) + 0.9% sodium chloride injection (2 mL), bid. Three-day treatment was regarded as one course.

2.3. Observation indicators

The change of SpO2 before treatment and 30 min after treatment was observed. ELISA was used to detect the serum IL-4 and IL-8 levels before treatment and 3 d after treatment. The clinical symptom disappearing time, hospitalization time, and clinical therapeutic effect after drug administration in the two groups were observed.

2.4. Efficacy evaluation[4,5]

Excellent: the symptoms of cough, dyspnea, hoarseness, and laryngeal stridor were basically disappeared, and the laryngeal obstruction was obviously alleviated. Effective: the symptoms of cough, dyspnea, hoarseness, and laryngeal stridor were obviously turned better, and the laryngeal obstruction was improved. Invalid: The above symptoms were not improved or further accelerated.

2.5. Statistical analysis

SPSS 18.0 software was used for statistical analysis. The measurement data were expressed as mean ± SD, and t test was used. The enumeration data were expressed as percentage and χ² test was used. P<0.05 was regarded as statistically significant.

3. Results

3.1. Comparison of the change of SpO2 before treatment and 30 min after treatment between the two groups

The comparison of SpO2 before treatment between the two groups was not statistically significant (P>0.05). The SpO2 30 min after treatment in the two groups was improved when compared with before treatment, and the improved degree of SpO2 30 min after treatment in the observation group was significantly superior to that in the control group (P<0.05) (Table 1).

<table>
<thead>
<tr>
<th>Groups</th>
<th>n</th>
<th>Before treatment</th>
<th>After treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation</td>
<td>35</td>
<td>90.47±1.68</td>
<td>96.55±3.58*</td>
</tr>
<tr>
<td>Control</td>
<td>35</td>
<td>91.15±1.57</td>
<td>92.37±3.03</td>
</tr>
</tbody>
</table>

*P<0.05, when compared with the control group.

3.2. Comparison of the changes of cytokines before treatment and 3 d after treatment between the two groups

The comparison of IL-4 and IL-8 levels before treatment between the two groups was not statistically significant (P>0.05). The IL-4 and IL-8 levels 3 d after treatment in the two groups were declined, and the decreased degree of IL-4 and IL-8 levels 3 d after treatment in the observation group was significantly superior to that in the control group (P<0.05) (Table 2).

<table>
<thead>
<tr>
<th>Groups</th>
<th>n</th>
<th>IL-4 BT</th>
<th>IL-4 AT</th>
<th>IL-8 BT</th>
<th>IL-8 AT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation</td>
<td>35</td>
<td>28.05±3.21</td>
<td>23.62±2.76*</td>
<td>35.67±8.48</td>
<td>27.95±7.07*</td>
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<tr>
<td>Control</td>
<td>35</td>
<td>27.83±4.15</td>
<td>26.55±3.41</td>
<td>35.69±8.45</td>
<td>31.53±6.87</td>
</tr>
</tbody>
</table>

*P<0.05, when compared with the control group. BT: Before treatment; AT: After treatment.

3.3. Comparison of the clinical symptom disappearing time and the hospitalization time

The disappearing time of cough, dyspnea, hoarseness, and laryngeal stridor in the observation group was (5.05±1.75) d, (1.13±0.54) d, (2.27±0.97) d, (1.98±1.39) d, respectively, and the average hospitalization time was (6.73±1.62) d; while in the control group were (6.27±2.13) d, (1.57±0.71) d, (2.85±1.20) d, (2.87±1.41) d, respectively. The clinical symptom disappearing time and hospitalization time in the observation group were significantly shorter than those in the control group (P<0.05).

3.4. Observation on the clinical efficacy in the two groups

After treatment, in the observation group, 23 (65.7%) was excellent, 10 (28.6%) was effective, and 2 (5.7%) was invalid, the total effective rate was 94.3%; in the control group, 12 (34.3%) was excellent, 14 (40.0%) was effective, and 9 (25.7%) was invalid, the total effective rate was 74.3%. The total effective rate in the observation group was significantly superior to that in the control group (P<0.05).

4. Discussion

The acute laryngitis is an acute and diffused laryngeal mucosa inflammation. The laryngeal edema is easy to be caused due to the narrow pediatric laryngeal cavity, abundant and tender mucosal vessels, lymph, and glandular tissues, and loosen tissue adherence, while the glottic obstruction is caused due to the soft laryngeal cartilages. Due to the incomplete development of pediatric central nervous system and cough reflex, and the poor protective reflex, the laryngeal and tracheal secretions are not easy to be discharged after stimulation, thus leading to laryngospasm which can accelerate the pharyngeal mucosal congestion and edema, complicated with laryngeal obstruction. If the condition is further accelerated, the inspiratory dyspnea and anoxia will occur, in a severe condition, asphyxia will occur, leading to death; therefore, it is crucial to timely alleviate the mucosal edema in order to maintain the airway obstructed [6,7].

Currently, the glucocorticoids are mainly adopted in the treatment of acute laryngitis, among which the most common drug used is dexamethasone which can reduce the capillary permeability and prevent...
inflammatory cell aggregation and infiltration. Aerosol inhalation of dexamethasone in the clinic can make the drugs directly reach the focus without through the hepatic first pass effect, shortening the initial effect time, but dexamethasone is easy to be decomposed by the endotracheal hydroxyl steroids enzyme, resulting in inactivation, with poor hydrophilic activity and slow effect taking, belonging to long-term hormone, and continuous application can cause an increased biological effect and side effects[8,9]. Budesonide is a new type glucocorticoid, with a stronger anti-inflammatory effect than dexamethasone, a strong binding force with glucocorticoid receptors and affinity with the hepatic microsomal enzymes, and an increased local deposition rate; therefore, when inhaling, budesonide can combine with the fatty acids in the lung tissues to form an inactivated compound, i.e. budesonide-fatty acid ester. When the free budesonide level in the lung tissues is reduced, the fatty acid ester can be dissociated through the lipolytic enzyme to release the activated free budesonide in order to play an inflammatory effect, reduce the vascular permeability, decrease the mucosal edema and tracheospasm, reduce the production of secretions, relieve the laryngeal edema, improve the ventilation function, and alleviate dyspnea and wheeze[10,11]. After inhalation of budesonide, it can take a rapid local effect to reduce the respiratory mucosal inflammatory reaction, inhibit the synthesis and release of CC chemokine and growth factor in the local tissues of respiratory tract, and alleviate the release of inflammatory mediators, such as eosinophils, lymphocytes, and mastocytes[12].

In the study, the patients in the observation group given oxygen-driven atomizing inhalation of budesonide which can be dissolved in the drug liquids for full warming and humidification in order to satisfy the requirements of inhaled gas humiture of the respiratory tract, and promote the oxygen supply of histocytes to improve the anoxia in a short time, thus, SpO2 is enhanced[13]. The results in the study showed that the improved degree of SpO2 30 min after treatment in the observation group was significantly superior to that in the control group (\(P<0.05\)), showing that oxygen atomization can turn the drug liquids to tiny fogdrops by adopting oxygen as the power, in which the surface of fog droplets can carry more oxygen and drugs to strengthen the effective dispersity of oxygen and the oxygenation efficiency of alveolar vessels and enhance the oxygen partial pressure in order to effectively alleviate the clinical symptoms[14]. IL-4 belongs to the immune cell cytokines, mainly produced by the activated Th2 cells, and is distributed on the surface of various type cells, resulting in an accumulation of sputum in the bronchial epithelial cells, and increased sputum due to a proliferation of goblet cells. IL-8 is an important leukocyte chemokine, and can prolong the lifetime of inflammatory cells, cause the release the inflammatory mediators, and induce neutrophil degranulation to release the elastase, cathepsin, and collagenase to cause a tissue injury[15,16]. The results in the study showed that the decreased degree of IL-4 and IL-8 levels 3d after treatment in the observation group was significantly superior to that in the control group (\(P<0.05\)), showing that detection of IL-4 and IL-8 levels can evaluate the disease degree and therapeutic effect. The clinical symptom disappearing time and hospitalization time in the observation group were significantly shorter than those in the control group (\(P<0.05\)), and the total effective rate in the observation group (94.3%) was significantly superior to that in the control group (74.3%) (\(P<0.05\)), showing that the therapeutic effect of oxygen-driven atomizing inhalation of budesonide in the treatment of acute laryngitis was significantly superior to that of dexamethasone.

In conclusion, oxygen-driven atomizing inhalation of budesonide in the treatment of acute laryngitis can rapidly alleviate the local inflammatory reaction, improve the clinical symptoms, and enhance the safety of drug administration; therefore, it deserves to be widely recommended in the clinic.

References