Expression and detection significance of immune markers and inflammatory factors in peripheral blood of children with bronchial asthma

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Objective: To explore the expression and detection significance of immune markers and inflammatory factors in peripheral blood of children with bronchial asthma. Method: A total of 86 cases of children with bronchial asthma admitted in our hospital from March 2015 to January 2017 were selected as observation group, and 86 cases of healthy children were selected as control group. The level of peripheral blood immunity included CD3+, CD4+, CD8+, CD4+/CD8+, Th1, Th2, Th1/Th2, Th9, Th17, and the level of inflammatory factors included interferon-γ (IFN-γ), tumor necrosis factor-α (TNF-α), interleukin-17 (IL-17) and interleukin-9 (IL-9) were compared in the two groups. Result: The expression levels of CD3+ and CD8+ in the observation group were significantly lower than those in the control group, and the levels of CD4+ and CD4+/CD8+ were significantly higher than those in the control group. The expression levels of Th2, Th9 and Th17 in the observation group were significantly higher than those in the control group, while the expression levels of Th1 and Th1/Th2 were significantly lower than those in the control group. The expression levels of TNF-α, IL-17 and IL-9 in the observation group were significantly higher than those in the control group, while the expression level of IFN-γ was significantly lower than that in the control group. Conclusion: The expression level of peripheral blood immunity and inflammatory factors in children with bronchial asthma plays an important role in the occurrence of bronchial asthma, and it is of great significance in clinical practice.

1. Introduction

Bronchial asthma is an inflammatory disease that occurs mostly in children. It is clinically associated with dyspnea, cough, asthma, and high airway response[1,2]. The incidence of this disease is increasing year by year, which has seriously threatened the quality of life and physical and mental health of children. The specific pathogenesis of children with bronchial asthma is still unclear, and studies[3,4] found that allergies and airway inflammation are closely related to the pathological mechanism of bronchial asthma, in which the body’s immune function and inflammatory response are critical factors affect the body’s allergic reaction. T lymphocytes are mainly involved in the immune response, while auxiliary T cells play an auxiliary and intensifying role in the immune response elicited by other T lymphocytes. At the same time, inflammatory factors are involved in the regulation of each part of inflammatory response in bronchial asthma[5,6]. Therefore, this study was conducted to determine the changes of peripheral blood T lymphocyte subsets and related inflammatory factors in children with bronchial tubes, in order to explore the detection of immunological indicators and inflammatory factors in peripheral blood of bronchial children and its clinical significance. It is reported as follows

2. Materials and methods

2.1. General data

A total of 86 children with bronchial asthma admitted to our hospital from March 2015 to January 2017 were selected as observation group, including 47 males and 39 females, aged 3 to 9
years old, with an average age of (6±3) years. Another 86 healthy children were selected as the control group, including 45 males and 43 females, aged 3 to 10 years old, with an average age of (6±4) years old. There were no significant differences in gender and age between the two groups (P>0.05), that was comparable. Inclusion criteria: All children in the observation group met the diagnostic criteria for bronchial asthma[7]; all subjects in the observation group were in the onset of the disease; all subjects were informed. Exclusion criteria: combined with heart, brain, liver, kidney and lung diseases; autoimmune, tumor diseases; those who have recently used related drugs; those who are unwilling to cooperate.

2.2 Instruments and reagents

(1) Main instruments: flow cytometer, CytoFLEX S, Beckman Coulter Trading (China) Co., Ltd.; High-speed refrigerated centrifuge, AVANTI J-15, Beckman Coulter Trading (China) Co., Ltd.; CO2 Incubator, BPN-40RHP, Shanghai Yiheng Scientific Instrument Co., Ltd. (2) Main reagents: CD3/CD8/CD45/CD4 test kit was purchased from BD Medical Devices (Shanghai) Co., Ltd.; ELISA kit was purchased from Shanghai Renjie Biotechnology Co., Ltd.

2.3 Test indicators

6 mL of fasting venous blood was taken from all subjects, and CD3+, CD4+, CD8+ and CD4+/CD8+ were detected by flow cytometry. Interferon-γ (IFN-γ), tumor necrosis factor-α (TNF-α), interleukin-17 (IL-17) and interleukin-9 (IL-9) were determined by ELISA method, the specific procedures are strictly in accordance with the instructions.

2.4 Statistical methods

The data were analyzed by SPSS 22.0 statistical software. The expression levels of immune index and inflammatory factor were expressed by mean ± standard deviation. The t test was used for comparison between the two groups. P<0.05 showed that the difference was statistically significant.

3. Results

3.1. Comparative analysis of CD3+, CD4+, CD8+ and CD4+/CD8+ expression levels in the two groups

The expression levels of CD3+ and CD8+ in the observation group were significantly decreased than those in the control group (P<0.05), and CD4+ and CD4+/CD8+ were significantly increased compared with the control group (P<0.05). See Table 1.

3.2 Comparative analysis of expression levels of Th1, Th2, Th1/Th2, Th9 and Th17 in two groups

Th2, Th9 and Th17 levels in the observation group were significantly increased compared with the control group (P<0.05), and Th1 and Th1/Th2 were obviously decreased than the control group (P<0.05). See Table 2.

3.3 Comparison of serum IFN-γ, TNF-α, IL-17 and IL-9 expression levels in two groups

Compared with the control group, TNF-α, IL-17 and IL-9 were significantly increased in the observation group (P<0.05), and IFN-γ was significantly decreased than the control group (P<0.05). See Table 3.

4. Discussion

As a common pulmonary allergic reaction and airway inflammatory disease, bronchial asthma is a frequent disease in children. A large number of studies have found that abnormal expression of T lymphocyte subsets has a greater impact on the condition of...
children with bronchial asthma[8,9]. CD3+, CD4+, and CD8+ are important components of T lymphocyte subsets[10]. The ratio of CD4+ and CD8+ reveals the degree of enhancement or weakening of immune function, respectively. CD4+/CD8+ is considered as a key indicator for assessing immune function[11]. This study compared the expression levels of CD3+, CD4+, CD8+ and CD4+/CD8+ in children with bronchial asthma and healthy persons. It was found that the expression levels of CD3+ and CD8+ in the observation group were significantly decreased than those in the control group, and CD4+ and CD4+/CD8+ were significantly increased compared with the control group. This result is consistent with the activation of CD4+ cells, inhibition of CD8+ cell function during asthma attacks reported by Wang Yan et al[12]. It is suggested that when bronchial asthma in children attack, the proportion of auxiliary T cells is obviously superior, and the proportion of inhibitory T cells is at a disadvantage, further indicating that the expression of CD4+ T lymphocyte subsets plays an important role in the onset of bronchial asthma[13].

CD4+ T lymphocyte subsets can be divided into Th1, Th2, Th17, Th9, Th22 and Treg cells according to different cytokines. Th1 cells have protective effects on bronchial asthma, and Th1/Th2 cell balance prefer to Th2, that considered as the most classic theory of the pathogenesis of bronchial asthma[14,15]. However, the Th1/Th2 imbalance theory in research is slightly different from the clinical experimental results. The blocking of Th2 cytokines does not effectively inhibit the first occurrence. Therefore, this theory does not fully reflect the mechanism of bronchial asthma attacks[16]. Neutrophils are closely related to bronchial asthma in domestic and overseas researches[17], while Th17 cells promote the accumulation of neutrophils by secreting IL-17, producing a large number of pro-inflammatory factors and metalloproteinases, further aggravating airway inflammation[18]. Th9 cells are a novel sub-population of Th cells, which are closely related to Th1, Th2 and Th17 cell subsets. Th2 cells can be transformed into Th9 cells by TGF-β, and Th9 cells can be induced by chicken egg lysozyme in Th1, Th2, Th17 cell polarization medium and transformed into Th1, Th2 and Th17 cells, and can promote Th17 cell levels and enhance the immunosuppressive effect of Treg cells[19]. Therefore, this study comprehensively analyzed the pathogenesis of children with bronchial asthma by detecting Th1, Th2, Th17, and Th9 cell subsets. By comparing and analyzing the immune and cytokine levels in children with bronchial asthma and healthy people, this study found that Th2, Th9, Th17, TNF-α, IL-9 and IL-17 in the observed group increased significantly compared with the control group, Th1, Th1/Th2 and IFN-γ were obviously lower than control group, indicating that Th1/Th2 balance disorder is closely related to bronchial asthma attack, moreover Th1 expression level is low, and Th2, Th9 and Th17 are highly expressed when bronchial asthma attack. The reason may be that Th1 cells can secrete cytokines such as IFN-γ, IL-2 and TNF-β[21], and these cytokines are mainly involved in cellular cytotoxic and local inflammation-related immune responses, assisting antibody production and alleviating inflammation in patients' bodies. Therefore, the expression level of Th1 and its secreted IFN-γ is lower at the onset of bronchial asthma. Th2, Th9 and Th17 cells secrete pro-inflammatory factors TNF-α, IL-9 and IL-17, mediate inflammatory reactions, and promote the pathogenesis of bronchial asthma, therefore Th2, Th9 and Th17 and their secreted TNF-α, IL-9 and IL-17 were higher in children with bronchial asthma.

In summary, T lymphocyte subsets in peripheral blood of children with bronchial asthma and their secreted inflammatory factors are closely related to the pathogenesis, including increased expression level of CD4+ and CD4+/CD8+, and higher expression of Th2, Th9 and Th17 cells and Th1/Th2 balance disorder are major causes of bronchial asthma progression.

Table 3.
Comparison of serum IFN-γ, TNF-α, IL-17 and IL-9 expression levels in two groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>IFN-γ (ng/L)</th>
<th>TNF-α (μg/L)</th>
<th>IL-17 (ng/L)</th>
<th>IL-9 (ng/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group</td>
<td>86</td>
<td>51.36±7.24</td>
<td>0.86±0.17</td>
<td>2.93±0.67</td>
<td>3.15±0.76</td>
</tr>
<tr>
<td>Observation group</td>
<td>86</td>
<td>34.69±6.00</td>
<td>1.69±0.33</td>
<td>5.82±1.01</td>
<td>6.29±1.99</td>
</tr>
</tbody>
</table>

Note: compared with control group, *P<0.05.

References

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significance of Th17 and Th9 cells and cytokines in peripheral blood of children with bronchial asthma. *Int J Lab Med* 2017; 38(23): 3262-3264.


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