Detection and clinical significance of immune function, inflammatory factors and ESR levels in children with Mycoplasma pneumoniae infection

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ABSTRACT

Objective: To explore the detection and clinical significance of immune function, inflammatory factors and ESR levels in children with Mycoplasma pneumoniae infection. Methods: A total of 122 children with Mycoplasma pneumoniae from September 2015 to February 2017 were selected as the observation group, while 120 healthy children were selected as the control group. The differences of immunoglobulin, T lymphocyte subsets, inflammatory factors and erythrocyte sedimentation rate (ESR) were compared in the two groups, and the correlation between ESR and inflammatory factors was analyzed. Results: There was a significant difference in peripheral blood T lymphocyte level between the two groups; CD3+, CD4+ and CD4+/CD8+ in the observation group were significantly lower than those in the control group, while CD8+ was significantly higher in the observation group than in the control group. The IgA of the observation group was significantly lower than that of the control group, and there was no significant difference between IgG and the control group, and IgM was significantly higher than that of the control group. The two groups of hypersensitive C reactive protein (hs-CRP), tumor necrosis factor-α (TNF-α), interferon-γ (IFN-γ) and ESR expression level were significant differences; the hs-CRP, TNF-α, IFN-γ and ESR in the observation group were significantly higher than those in the control group; the ESR of the children with mycoplasma pneumonia was positively correlated with the level of hs-CRP, TNF-α and IFN-γ, which was statistically significant. Conclusions: The cell immunity, humoral immune function of children with Mycoplasma pneumoniae infection are relatively low, and the inflammatory reaction is more severe, and the inflammatory factors of the body are positively related to the level of ESR expression.

1. Introduction

The incidence of Mycoplasma pneumoniae infection in children is high, and the child has symptoms such as low fever, dry cough, pleural effusion and pulmonary fibrosis, which can cause death[1-3]. However, the pathogenesis of Mycoplasma pneumoniae infection is still unclear. Many studies have found that its pathogenesis may be related to immune dysfunction and abnormal expression of inflammatory factors[4,5]. When the body is infected with Mycoplasma pneumoniae, it will cause inflammatory cells to release a large number of inflammatory factors, and accelerate the production of immunoglobulins, further aggravating the body’s inflammatory response[6]. Erythrocyte sedimentation rate (ESR) is a non-specific inflammatory index, and its level of change is of great significance for monitoring the severity of pneumonia[7]. Therefore, this study aimed to investigate the mechanism of immune inflammatory changes in children with Mycoplasma pneumoniae infection and further analyze the correlation between ESR and inflammatory factors. It is reported as follows.
2. Data and methods

2.1 General information

A total of 122 children with Mycoplasma pneumoniae from September 2015 to February 2017 were selected as the observation group, while 120 healthy children were selected as the control group. The control group consisted of 58 males and 62 females, aged 4-12 years. There were 60 males and 62 females in the observation group, aged 3-12 years. There was no significant difference in gender and age between the two groups (P>0.05), which was comparable.

Inclusion criteria: age not more than 12 years old; respiratory tract, X-ray and CT examination were diagnosed as Mycoplasma pneumoniae pneumonia; pathological and clinical integrity; patients or their relatives were informed of this study. Exclusion criteria: other respiratory tract diseases except Mycoplasma pneumoniae infection; patients with allergic history; abnormal mental and psychological state.

2.2 Observation index

Fasting venous blood was collected 6 mL, T lymphocyte subsets: CD3+, CD4+, CD8+ expression levels were detected by flow cytometry, and CD4+/CD8+ was calculated. Immunoglobulin: Immunoglobulin (IgA, IgM, IgG) was determined by immunoturbidimetric assay. Inflammatory factors: ELISA method for the determination of hypersensitive C-reactive protein (hs-CRP), tumor necrosis factor-α (TNF-α), interferon-γ (IFN-γ). The erythrocyte sedimentation rate (ESR) was measured by the Weiss method. The above instruments were purchased from Beckman Coulter Trading (China) Co., Ltd., and the kit was purchased from Wuhan Merck Biotech Co., Ltd.

2.3 Statistical processing

The experimental data were analyzed by SPSS 22.0. The chi-square test was used for the count data. T lymphocyte subsets, immunoglobulins, inflammatory markers and ESR were all expressed by (Mean ± SD), and t test was performed between the two groups. The correlation between ESR and hs-CRP, TNF-α and IFN-γ was analyzed by Pearson correlation analysis. P<0.05 was significantly different and statistically significant.

3. Results

3.1. Comparison of T lymphocyte levels in the two groups

The T lymphocyte levels in the two groups were compared as follows: CD3+, CD4+, CD8+, and CD4+/CD8+ in the observation group were (49.26±5.72)%,(32.55±3.60)%, (29.67±3.29)%, and (1.09±0.22)%, respectively. The control group was (60.03±7.26)%,(39.18±4.02)%,(24.35±2.88)%,(1.61±0.39)%, respectively. There was a significant difference in T lymphocyte levels between the two groups (P<0.05). CD3+, CD4+ and CD4+/CD8+ in the observation group were significantly lower than those in the control group (P<0.05), while CD8+ was significantly higher than the control group (P<0.05). See Table 1.

3.2 Comparison of immunoglobulin levels of two groups

The immunoglobulin levels of the two groups were compared as follows: IgA, IgG and IgM in the observation group were (0.65±0.08) g/L, (7.41±0.83) g/L and the control group was (1.28±0.30) g/L, (0.98±0.19) g/L, (7.39±0.97) g/L and (1.05±0.19) g/L, respectively. The IgA of the observation group was significantly lower than that of the control group (P<0.05). There was no significant difference of the IgG between the two groups (P>0.05), and the IgM was significantly higher than the control group (P<0.05). See Table 2.
3.3 Comparison of the inflammation and ESR levels in both groups

The levels of inflammation and ESR in the two groups were compared as follows: hs-CRP, TNF-α, IFN-γ and ESR in the observation group were (10.03±1.85) mg/L, (106.74±16.33) pg/mL, (33.79±5.73) pg/mL and (53.80±7.19) mm/h, respectively. While the control group were (2.88±0.56) mg/L, (42.09±3.78) pg/mL, (15.03±2.20) pg/mL, and (20.17±3.55) mm/h. There were significant differences in the levels of inflammation and ESR between the two groups (P<0.05). The hs-CRP, TNF-α, IFN-γ and ESR in the observation group were significantly higher than those in the control group (P<0.05). See Table 3.

3.4 Correlation between ESR and hs-CRP, TNF-α and IFN-γ in children with Mycoplasma pneumoniae infection

The correlation between ESR and hs-CRP, TNF-α and IFN-γ in children with mycoplasma pneumoniae infection was as follows: ESR of children infected with mycoplasma pneumonia was significantly positively correlated with hs-CRP, TNF-α and IFN-γ levels. Statistical significance (r=0.435, 0.398, 0.417, P<0.05). See Table 4.

4. Discussion

In recent years, the probability of children infected with Mycoplasma pneumoniae is significantly increased, not only can cause pneumonia in children, but also can cause complications such as encephalitis and myocarditis, resulting in serious damage to various organs, bringing great threat to the physical and mental health of children[8-10]. Therefore, Mycoplasma pneumoniae infection is more harmful to children. It is clear that the pathogenesis of Mycoplasma pneumoniae pneumonia is the key to reducing the risk of Mycoplasma pneumoniae infection. At present, the specific pathogenesis of Mycoplasma pneumoniae infection is still unclear. Some studies have suggested that[11,12] a variety of inflammatory factors, humoral immunity and cellular immunity play an important role in the pathogenesis of the disease, when the body is infected with Mycoplasma pneumoniae. Inflammatory cells and immune cells are activated, releasing a large number of inflammatory factors and immune factors, and eventually causing certain damage to the lung tissue structure. In order to clarify the specific mechanism of action of immunoinflammatory and ESR factors in the pathogenesis of Mycoplasma pneumoniae pneumonia, this inquiry is discussed in depth, as detailed below.

At the current stage of research[13], cellular immune dysfunction is closely related to tissue damage after infection with Mycoplasma pneumoniae. CD3+ cells are typical markers of mature T lymphocytes, CD4+ cells are characteristic markers of helper T lymphocytes, CD8+ cells belong to cytotoxic T lymphocytes, and CD4+/CD8+ responds to the immune system function. The results of this study showed that CD3+, CD4+ and CD4+/CD8+ in the observation group were significantly lower than those in the control group (P<0.05), while CD8+ was significantly higher than the control group, suggesting that the cellular immune function of children with Mycoplasma pneumoniae pneumonia was more disordered than that of healthy children. This is also an important cause of structural damage in children with pneumonia mycoplasma pneumonia. The reason for this result may be that when the body is infected by the pathogen, the cellular immune system in the body is activated, and the resulting immune factors clear a large number of pathogens. The body loses a lot of immune factors, resulting in abnormal cellular immune function.

Humoral immunity and cellular immunity in the body are complementary, and the disorder of cellular immune function will also have a certain impact on humoral immune function. Domestic and foreign studies have reported[14], humoral immunity will directly participate in the pathogenesis of Mycoplasma pneumoniae pneumonia. IgA is a key factor in mucosal local
immunity, accounting for about 10% of the total amount of serum immunoglobulin, and has antiviral and antibacterial effects. Related studies have reported that the reduction of IgA can inhibit the resistance of respiratory tract to foreign pathogens, and thus cause infection[15]. IgG is abundant and long-lived in children with long-term infection with mycoplasma pneumoniae, and has the effect of eliminating free toxins and regulating phagocytic cells[16]. IgM is the first antibody to humoral immunity and is closely related to the severity of pneumonia mycoplasma pneumonia[13,17]. The results of this study showed that the IgA in the observation group was significantly lower than that in the control group, which may be related to the low cellular immunity of children with pneumonia mycoplasma pneumonia. There was no significant difference between IgG and the control group, which may be the long-term infection of the child, which was consumed by the body. IgG was used to neutralize free toxins, and IgM was significantly higher than the control group. The level of the disease was positively correlated with the severity of the disease[18]. The above results suggest that the humoral immune function of children with pneumonia mycoplasma pneumonia is relatively low, causing infection and other the possibility of pulmonary complications increases.

A large number of studies have confirmed[19,20] that abnormalities in inflammatory response are closely related to lung tissue damage and even severe organ abnormalities in children with Mycoplasma pneumoniae pneumonia. hs-CRP is an acute phase protein produced by the liver when the body is stimulated by pathogenic toxins or tissue damage. TNF-α is a typical pro-inflammatory factor, when the body is stimulated by the outside world, it can be released by mast cells or T lymphocytes to activate the body's inflammatory response. IFN-γ is synthesized by activated T cells and natural killer cells, and has antiviral and immunomodulatory effects. ESR indicates the sedimentation rate of red blood cells under defined conditions. The ESR fluctuation is stable in healthy people. Under many pathological conditions, the red blood cells are said to increase the speed significantly. It belongs to a non-specific inflammation index, which can reflect the inflammatory state and the degree of tissue damage. The diagnosis and treatment of pneumonia is of great significance[21,22]. The results of this study showed that hs-CRP, TNF-α, IFN-γ and ESR in the observation group were significantly higher than those in the control group, suggesting that the inflammatory response of children with mycoplasma pneumoniae pneumonia was more severe, and the lung tissue damage was more serious, and the ESR was significantly increased. The mechanism of action may be that after the body is infected with Mycoplasma pneumoniae, it stimulates the liver, granulocytes and T cells in the body, releasing a large number of inflammatory factors such as hs-CRP, TNF-α, IFN-γ, and the increase of ESR may be related to fibrinogen, Globulin aggregation and increased expression levels of inflammatory factors[12]. Furthermore, the correlation between ESR and inflammatory factors such as hs-CRP, TNF-α and IFN-γ was analyzed. The results of this study showed that ESR and hs-CRP, TNF-α and IFN-γ levels were significantly higher in children infected with mycoplasmal pneumoniae. The positive correlation further proves that the level of ESR expression can reflect the intensity of inflammatory response in children, that is, the red blood cells of children with pneumonia mycoplasma pneumoniae are said to increase significantly faster than healthy children.

In summary, the cellular immunity and humoral immunity of children with Mycoplasma pneumoniae infection are relatively low, the inflammatory response is elevated, and the inflammatory factors of the body are positively correlated with the expression level of ESR.

References

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