CD4+ T cell and tuberculosis results of AIDS patients with different types of tuberculosis

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1. Introduction

AIDS and tuberculosis is a major infectious disease affecting human health. Especially in developing countries, the incidence of AIDS and tuberculosis is increasing. It seriously affects people’s physical and mental health and quality of life[1,2]. AIDS and tuberculosis are not two simple merger with original map infection, but mutual promotion and interaction, which brings severe challenges to disease diagnosis and treatment[3-4]. Therefore, it is particularly important to adopt an effective method to diagnose AIDS with tuberculosis, and to provide a reference[5,6] for further early detection and early treatment. This study was to investigate the correlation between CD4+T cells and tuberculosis test in patients with different types of tuberculosis. It will be reported as follows:

2. Materials and methods

2.1. Clinical data

From June 2014 to June 2017, 127 cases of tuberculosis combined with AIDS (observation group) were selected from our hospital. The diagnosis of AIDS is based on the diagnostic criteria and principles of HIV/AIDS[7], and the diagnostic criteria of tuberculosis on the guideline for tuberculosis in clinical diagnosis and treatment [8]. Among 127 patients with tuberculosis and AIDS, there were 49 males and 78 females. The age of the patients was 18-65 years old, with an average age of (52 ± 5) years. Tuberculosis types: 75 cases of tuberculosis, 28 cases of tuberculous pleurisy, 24 cases of lymph node metastasis. Inclusion criteria: (1) meet the diagnostic criteria of tuberculosis and AIDS; (2) confirmed by pleural biopsy, sputum test and X-ray examination; (3) The age is between 18 and 65 years old;
(4) volunteer to join the study, and signs informed consent. Exclusion criteria: (1) patients complicated with pulmonary tuberculosis except for tuberculosis; (2) those with severe liver and renal insufficiency and severe hematopoietic system; (3) patients with mental disorders. Another 50 cases of non-tuberculosis respiratory system treated in our hospital from June 2014 to June 2017 were selected. There were 32 male patients and 18 female patients. The age of the patients was 18-65 years old and the average age was (53 ± 5) years. The general data of the two groups were comparable in sex and age ($P>$0.05).

2.2. Methods

2.2.1. T.spotTB test
A total of 127 patients was exsanguinated 3 mL of venous blood in the early morning. The blood was mixed with medium at room temperature and separated for a single layer of cells which was added into 10 μL cell suspension and 40 μL of 0.4% dilution. Then, the cell mixture was added in cell counting plate for treatment of living cells count, and in the culture plate with 50 μL antigen A, 50 μL antigen B, and 50 μL serum-free AIM-V medium. After the addition, the mixture was cultured on incubation box under the condition of 5% CO2 and 37℃. After 24 h culture, the old medium was discarded and 50 μL fresh enzyme labeled antibody solution was added. The new mixture was then placed at 4℃. After 60 min culture, the mixture was added into 50 μL substrate solution, reacted in 8 min, then washed and dried for the dot count.

2.2.2. TST test
A total of 127 patients were intradermally injected with 5 U human type Purified Protein Derivative of Tuberculin. The injection site was in 1/3 left dorsal forearm. The test result was obtained after 72 h, the average diameter of induration = (diameter + vertical diameter)/2, which was larger than cm diameter induration or ulceration, blister is Purified Protein Derivative of Tuberculin test which is positive.

2.2.3. CD4+T in the peripheral blood lymphocyte test
Patients in the observation group were exsanguinated venous blood 3 mL in the early morning. The blood was placed in EDTA tubes. After addition of 10 μL CD4+ antibody, it was placed at the room temperature and lucifugally incubated for 30 min. About 200 μL hemolysin was added into each tube and then the mixture was placed under light for 15 min at the room temperature for erythrocyte lysis. After the solution which was clear and transparent was observed, 1 mL of pre-cooling PBS solution was added and then placed at room temperature with 15 cm centrifugal radius, 3,000 r/min. After 12 min centrifugal separation of serum, the obtained was added with 100 μL of 1% poly formaldehyde solution and fixed. Determination of T lymphocyte subsets in peripheral blood was carried out by using flow cytometry reagents produced by American BD Company.

2.2.4. Observation index
(1) To observe the positive rate of the two groups in T.spotTB test and TST test; (2) To observe the changes of CD4+T lymphocyte levels in the two groups; (3) To observe the positive rate of different types of tuberculosis with HIV/AIDS in T.spotTB test and TST test; (4) To observe the changes of CD4+T lymph cell level in patients with different types of tuberculosis with AIDS; (5) To observe the correlation between two tests and CD4+T lymphocyte level.

2.3. Statistical method
SPSS 22.0 software was used for data statistics and processing, counting data was $X^2$ test, and Pearson test was used for correlation analysis, with statistical difference expressed as $P<$0.05.

3. Results

3.1. Comparison of positive rates of T.spotTB and TST tests in two groups

The positive rates of T.spotTB test and TST test in the observation group were higher than those of the control group. Thus there was a statistically significant difference ($P<$0.05).

Table 1.

<table>
<thead>
<tr>
<th>GroupS</th>
<th>n</th>
<th>T.spotTB (%)</th>
<th>TST (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation group</td>
<td>127</td>
<td>106(83.46)</td>
<td>42(33.07)</td>
</tr>
<tr>
<td>Control group</td>
<td>50</td>
<td>5(10.00)</td>
<td>2(4.00)</td>
</tr>
<tr>
<td>$X^2$</td>
<td>-</td>
<td>82.8011</td>
<td>16.2315</td>
</tr>
<tr>
<td>$P$</td>
<td>-</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

3.1. Comparison of positive rates of T.spotTB test and TST test between the observation group and the control group

The positive rates of T.spotTB test and TST test in the observation group were higher than those of the control group. Thus there was a statistically significant difference ($P<$0.05).

Table 2.

<table>
<thead>
<tr>
<th>Groups</th>
<th>n</th>
<th>0-100/mm$^3$</th>
<th>100-200/mm$^3$</th>
<th>&gt;200/mm$^3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation group</td>
<td>127</td>
<td>89(70.08)</td>
<td>20(15.75)</td>
<td>18(14.17)</td>
</tr>
<tr>
<td>Control group</td>
<td>50</td>
<td>24(40.00)</td>
<td>10(20.00)</td>
<td>38(76.00)</td>
</tr>
<tr>
<td>$X^2$</td>
<td>-</td>
<td>62.7091</td>
<td>0.4608</td>
<td>63.4055</td>
</tr>
<tr>
<td>$P$</td>
<td>-</td>
<td>&lt;0.05</td>
<td>&gt;0.05</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>
3.2. Comparison of the level of CD4+T lymphocyte in two groups

The level of CD4+T lymphocyte (0-100/mm$^3$) in the observation group was significantly higher than that in the control group. Thus there was a statistically significant difference ($P<0.05$).

3.3. Positive rates of T.spotTB test and TST test in different types of tuberculosis with AIDS

No significant difference in the positive rates of T.spotTB test and TST test was found in different types of tuberculosis ($P>0.05$).

3.4. Comparison of CD4+T lymphocyte level in different types of tuberculosis with AIDS

There was no significant difference in the level of CD4+T lymphocyte of different types of tuberculosis with AIDS ($P>0.05$).

3.5. Correlation analysis of CD4+T lymphocyte level with T.spotTB test and TST test

There were negative correlations between 100-200/mm$^3$ and >200/mm$^3$ CD4+T lymphocyte level and positive rates of T.spotTB test and TST test, while 0-100/mm$^3$ CD4+T lymphocyte level was positively correlated with positive rates of T.spotTB test and TST test.

4. Discussion

Tuberculosis is the most common opportunistic infection of AIDS, and is one of the main cause of AIDS death. With the increasing popularity of AIDS epidemic in China, the infection rate of Mycobacterium tuberculosis/AIDS is increasing. Therefore, it is urgent to improve the early diagnosis of AIDS complicated with tuberculosis.[9-11]. TST is a commonly used method for tuberculosis, the only means of rapid diagnosis of tuberculosis infection, but because the immune function of Bacillus/HIV dual infection of Mycobacterium tuberculosis patients decreases and the symptoms and signs are not typical and have certain limitations, so as to bring great challenges to diagnosis of pulmonary tuberculosis combined with AIDS[12]. With the continuous development of diagnostic technology in recent years, enzyme-linked immunospot technology, as a new immune enzyme technology, can detect cytokine secreting cells or antibody cells mainly from single cell level and is currently the most sensitive monitoring of antigen specific T cell[13]. In recent years, the clinical investigation shows that T.spotTB test has achieved good results in the diagnosis of tuberculosis combined with AIDS. The results of this study showed that the positive rates of T.spotTB test and TST test in the observation group was higher than those in the control group.

The main cause of tuberculosis combined with AIDS is that the body’s immune function defects result in resurgence of dormant tuberculosis in the body or body lesions or tuberculosis reinfection causes the formation of new lesions, and drives its rapid development. Tuberculosis also has adverse effects on HIV infection, and macrophages activated by granuloma can produce TNF, further activate and promote HIV proliferation in CD4+T cells, finally bringing about the development of the disease. As the number of CD4+ cells is low and the immune function of the body is reduced, AIDS is easy to merge with tuberculosis, and the infection of tuberculosis also promotes the progress of AIDS. It is considered that tuberculosis is the most common complication of AIDS, and it is a major cause of AIDS death. CD4+ cell function and low count may be a very important factor[14]. And with the decrease of CD4+T lymphocyte count and the increased incidence rate, the main reason is that cell immunity plays an important role in tuberculosis defense. CD4+T lymphocytes play a leading role in tuberculosis immunity. In addition, after HIV infection, it will make a large...
number of virus propagation in CD4+T cells, resulting in apoptosis of CD4+T cells, and with the function and CD4+T lymphocyte counts were decreased and the killing effect on TB decreased significantly, resulting in tuberculosis and tuberculosis multiply[15]. The results of this study showed that CD4+T lymphocyte level of 0-100/mm$^3$ in the observation group was significantly higher than that in the control group, indicating TB patients with AIDS CD4+T lymphocytes decreased significantly; there were no significant differences between different types of tuberculosis with HIV CD4+T lymphocyte levels, changes of different types of tuberculosis with HIV CD4+T lymphocyte levels were not significantly different.

In addition, the results of this study showed that 100-200/mm$^3$ and >200/mm$^3$ at CD4+T lymphocyte level were negatively correlated with positive rates of T.spotTB test and TST test, while 0-100/mm$^3$ of CD4+T lymphocyte level positively correlated with positive rates of T.spotTB test and TST test. To sum up, the low level of CD4+T cells in AIDS patients with different types of tuberculosis was positively correlated with positive rates of T.spotTB test and TST test.

### Table 5.

<table>
<thead>
<tr>
<th>Relevance</th>
<th>T.spotTB</th>
<th>TST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>r</td>
<td>P</td>
</tr>
<tr>
<td>CD4+T lymphocyte level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-100/mm$^3$</td>
<td>0.582</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>100-200/mm$^3$</td>
<td>-0.117</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>&gt;200/mm$^3$</td>
<td>-0.412</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

### References


