



ORIGINAL ARTICLE

Research on AIDS patients' survival time after highly active antiretroviral therapy, treatment effect and treatment modes



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Abstract To fully define clinical efficacy of highly active antiretroviral therapy for AIDS, analyze patients' survival time and treatment mode after receiving treatment, and provide scientific theory to guide improvement of antiviral therapy, this paper selected 3100 cases of patients diagnosed with AIDS during April 2006 and April 2014 as object of this study. All patients were treated with highly active antiretroviral therapy. The main analysis contents of this study include CD4 + T lymphocyte count, viral load changes, incidence of opportunistic infections, specific cause of death and the like. The results show that patients' CD4 + T lymphocyte levels are significantly increased 3, 18, and 24 months after treatment, difference between the situation after and before receiving treatment, $P < 0.05$, with statistically significant difference. Analyzed from effective inhibition of virus, effective inhibition rate is 72.58.0% (2250/3100). Main causes of death in patients is usually respiratory failure. It thus can be concluded that highly active antiretroviral therapy for AIDS is with good clinical effect, which can effectively improve survival time of patients. So it enjoys application value of being widely used in clinical treatment of AIDS.

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1. Introduction

The AIDS is a infectious disease of great danger, which is caused by HIV virus. HIV is a virus that can attack the body's

immune system (Figs. 1–3), which takes T lymphocytes, the most important part in the body's immune system, as the main target, greatly destroy the cells, resulting in loss of human immune function. Thus, the body is susceptible to infection with various diseases, possibly leading to malignant tumors. The mortality is relatively high.

Average incubation period of HIV in the human body is 8–9 years. Before AIDS, patients can live and work for many years without any symptoms. Once AIDS is developed, patients will have a variety of clinical manifestations. Early symptoms are like common cold, flu, with general fatigue, weakness, loss of appetite, fever, etc. As the disease worsens,

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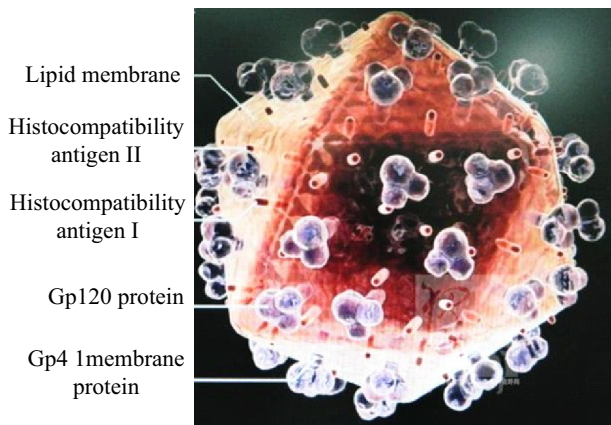


Figure 1 HIV virus structure.

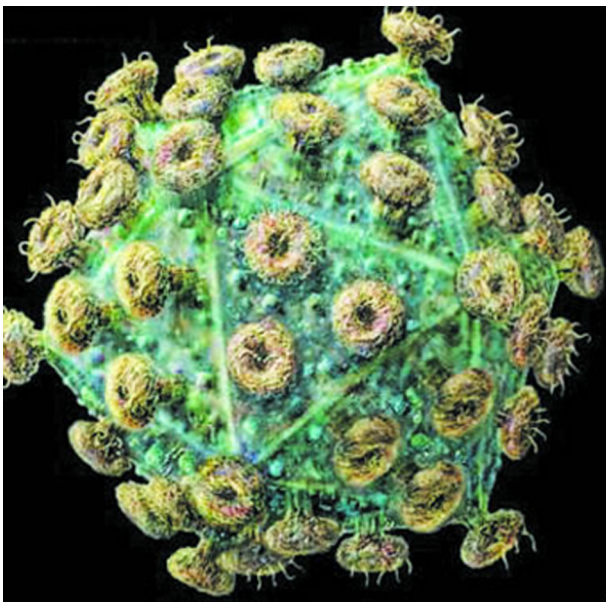


Figure 2 HIV virus form.

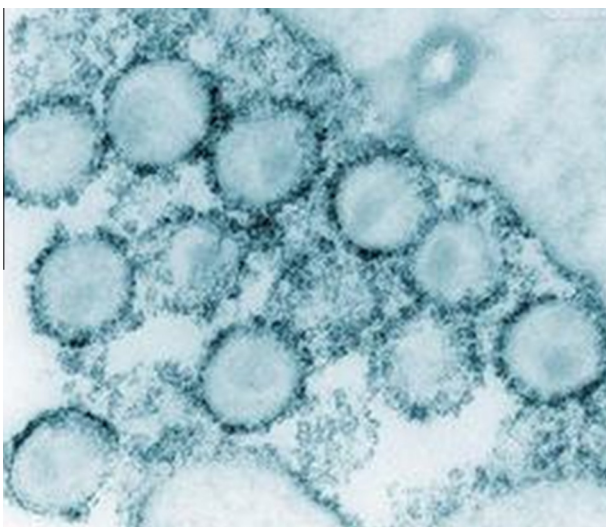


Figure 3 HIV virus slice.

symptoms increase in number, such as candida albican infection of skin and mucous membrane, appearance of herpes simplex, herpes zoster, purple plague, blood blisters, and congestion spots; later, visceral organs are gradually violated, which leads to unexplained persistent fever up to 3–4 months; also cough, shortness of breath, difficulty breathing, persistent diarrhea, hemafecia, hepatosplenomegaly, malignancy and the like will occur. Clinical symptoms are complex and changeful, but each patient doesn't have all above symptoms. In case of violation of the lung, difficulty in breathing, chest pain, and cough will occur; gastrointestinal violation can cause persistent diarrhea, abdominal pain, weight loss and weakness; violations of the nervous system and cardiovascular system can also be caused. As AIDS will cause long-term consumption of patients' body organ function, most patients show systemic organ failure at death. Many medical researchers all over the world have done a lot of research in treatment of AIDS, but so far specific drug that can cure AIDS has not yet been developed, and also, there exists no effective vaccines for prevention. Due to its high risk and difficulty to cure, AIDS is listed as one of communicable diseases of frontier health surveillance. In recent years, highly active antiretroviral treatment has been found in clinics to have a more favorable therapeutic effect. Combination of several (usually three or four) antiretroviral drugs is known as highly active antiretroviral therapy (HAART). However, due to complexity of drug combinations and administration methods, as well as serious possible side effects, moreover, drug resistance of the virus for the drugs, clinical studies suggest that risk and benefits of this type of iatrotechnique for patients without symptoms should be analyzed to choose therapeutic method, as antiretroviral drugs of different types act on different stages of HIV life cycle (Yin et al., 2015; Gulisaina et al., 2015; Liang, 2015). The paper conducts sampling study of 3000 cases of AIDS patients, with specific circumstances shown below.

2. Materials and methods

2.1. General information

The 3100 cases are randomly selected from AIDS patients treated in 2011 for investigation and analysis. All patients were confirmed as anti-HIV positive, with minimum follow-up of six months and maximum follow-up of 10 years. Among them, there are 1818 cases of male, 1282 cases of female; patients were aged 10–71 years, with average age at (38.9 ± 6.9) years; transmission routes include intravenous drug addiction, sexual transmission, blood transfusion transmission, single plasma transmission, and unknown routes.

2.2. Treatment methods

In this study, used highly active antiretroviral therapy drugs are provided free of charge, including nucleoside reverse transcriptase inhibitor, non-nucleoside reverse transcriptase inhibitor and protease inhibitor. Nucleoside reverse transcriptase inhibitors include zidovudine (AZT, ZDV), lamivudine (3TC), stavudine (D4T); non-nucleoside reverse transcriptase inhibitors include nevirapine (NVP) and efavirenz (EFV), and protease inhibitor is kaletra (LVP). The pharmaceutical compositions selected by patients conform to state regulations:

AZT + 3TC + NVP (EFV); D4T + 3TC + NVP (EFV), wherein, AZT + TC + NVP belongs to first-line drug use in national regulation. Before patients' antiviral therapy, when hemoglobin < 90 g/L, use D4T + 3TC + NVP (EFV); when there is NVP allergy, switch to EFV; in case of tuberculosis infection and antituberculosis therapy, NVP is replaced by EFV; in case of allergy to NVP and EFV, switch to LVP. The specific treatment regimens used in the study process include the following: AZT + 3TC + EFV, D4T + 3TC + NVP, D4T + 3TC + EFV, AZT + 3TC + LVP, LVP + TDF + 3TC, EFV + TDF + 3TC.

2.3. Analysis method

Follow-up time after treatment is 3, 6, and 12 months after treatment starts, with one detection every six months after 1-year of treatment.

2.4. Statistical method

The study uses SPSS19.0 for statistical analysis, with (n, %) to denote count data to be tested with chi-square test. Mean value \pm mean is adopted to denote measurement data, to be tested with t-value test. When $P < 0.05$, it indicates that difference is with statistical significance.

3. Results

CD4 + T lymphocyte test results and regression analysis show that after treatment, CD4 + T cell counts of all patients are increased gradually, increasing from pre-treatment average of $230 \times 10^6/L$ to $660 \times 10^6/L$ at 12 months after treatment, difference between groups $P < 0.05$, statistically significant.

Research result of survival time of patients after highly active antiretroviral therapy shows that, among 3000 patients in this study, analysis is done based on patients' mortality and treatment data. Kaplan–Meier method is adopted to make survival curve, and survival situation of patients who receive antiretroviral therapy is analyzed with Cox regression analysis method. Final results show that, with the passage of treatment time, patients' survival rate continuously drops. In the beginning 1–3 months, patients' survival situation is relatively good, but from the beginning of third month, there appears a sharp decline, with not big falling range from fifth to ninth month, and continued decline by 10th month.

Highly active antiretroviral therapy (HAART) can effectively inhibit viral replication in vivo in patients and promote immune function recovery, change morbidity after HIV infection, and reduce various opportunistic infections and mortality, so as to prolong lives of patients and improve their quality of life. Also, because of significant decline in amount of virus in patients' body, spread of HIV can be reduced, thereby reducing new-onset infection rate. Overseas studies have shown that HAART can make HIV spread in heterosexual transmission reduced by 92–98%. As effect of HAART is affected by many factors, such as patient compliance, individual differences, drug regimen, drug toxic and side effects, beginning time of treatment, pre-treatment levels of plasma viral load, etc., timely evaluation of patients' survival time after HAART and treatment effect, and understanding of fac-

tors that affect survival time of patients and HAART effect are very important and urgent.

4. Discussion and conclusion

Guangxi is one of China's high-prevalence areas of AIDS, ranking second in the country. As of December 31, 2011, Guangxi has accumulatively reported 72,295 cases of HIV infected persons and AIDS patients, including 44,316 cases of HIV infected persons, 27,979 cases of AIDS patients and 18,418 cases of death. In 2011, a total of 14183 HIV infected persons and patients were reported, with heterosexual transmission ratio reaching 90.8%, which indicates that sexual transmission continues to be the main route of transmission in our region. Given the grim situation of AIDS epidemic in Guangxi, how to use limited medical resources to treat HIV infected persons and AIDS patients, so as to minimize morbidity and mortality and reduce the spread of AIDS, has become an important link of our region's AIDS prevention and control work. This research study is mainly aimed at survival time and therapeutic effect of patients after highly active antiretroviral therapy, which retrospectively and prospectively collected information of about 3000 AIDS cases through integrated information management system for AIDS prevention and control, observed patients' survival time, monitored viral load, CD4 + T lymphocytes and detection clinical parameters of patients, and evaluated HAART effect. The results demonstrate obvious relationship between survival time of patients and cycle length of treatment duration. With longer duration of treatment, patients' survival rate will be reduced accordingly. In addition, this study demonstrates that the present study is with significant treatment effect and good clinical effect.

Antiretroviral drugs are substantially classified in accordance with different times of drugs that inhibit life cycle of retrovirus (Lv et al., 2015; Hu et al., 2015; Sun, 2015). Therefore, antiretroviral drugs are generally classified as follows:

Enzyme inhibitor: Reverse transcriptase inhibitor (RTI) targets at inhibiting virus DNA synthesis through inhibition of activity of reverse transcriptase.

Protease inhibitor (PI): It targets at assembly of inhibiting virus through inhibition of activity of protease. HIV uses protease to split the initial protein and assemble the final new virions.

Fusion inhibitor: It prevents HIV from entering into and infecting cell through fusion of cell membrane. Integrase inhibits integration of inhibitory enzyme and is very important for viral DNA's fusion into infection cell.

Fixed-dose combination: Fixed-dose combination combines a variety of antiretroviral drugs to form a tablet.

In just 1.5 days, HIV virus can finish the process of entry into the cell, replicating genetic material, assembling new virus and releasing infection to other cells (Fu et al., 2014). HIV virus lacks enzyme to correct errors in the process from RNA to DNA reverse transcription. In such a short period, high error rate results in quite rapid virus mutation, bringing in high genetic mutation rate of HIV (Yu et al., 2014; Zhang et al., 2010). Compared to parental virus, most variations have no advantage, but some mutations inherit parental advantage,

so that the virus is easier to resist the body's immune system and antiretroviral drug prevention (Chen and Ju, 2012). The higher activity of the virus, the stronger drug resistance to antiretroviral drug. Therefore, combination therapy of antiretroviral drugs is very important for suppression of HIV viral replication and antiviral resistance.

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References

- Chen, X.D., Ju, S.Z., 2012. Effect observation of highly active antiretroviral therapy for 25 cases of HIV infected persons/patients. *Chin. Commun. Doctors (medical professionals)* 35, 161–164.
- Fu, L., Hu, Y., Cha, L.J., Pan, C.G., 2014. Advances in medication compliance evaluation method of highly active antiretroviral therapy. *Chin. J. Nurs.* 17, 452–457.
- Gulisaina, A., Alim, P., Mamat, E.B., Pan, K.J., Zhang, Y.X., 2015. Highly active antiretroviral therapy effect of 482 cases of AIDS patients. *Chin. J. Front. Med. Sci. (electronic version)*. 34, 32–35.
- Hu, F.Q., Wu, Y., Zhang, Z., Zhang, L., Huang, M.M., 2015. Immune reconstitution effect of different CD₄ ~ + Baseline AIDS patients after highly active antiretroviral therapy. *Chin. J. Nosocomiol.* 12, 5521–5523.
- Liang, C.Y., 2015. Clinical characteristics of immune reconstitution syndrome with pulmonary tuberculosis of AIDS after highly active antiretroviral therapy. *China Foreign Med. Treatment* 12, 191–192.
- Ly, R.Y., Li, J.L., Tan, X.L., Zhu, Y.J., Tan, Q.F., Fu, S.P., 2015. Guangxi AIDS patients' highly active antiretroviral treatment effect and survival time. *J. Pract. Med.* 16, 2826–2829.
- Sun, Y.F., 2015. Observation of curative effect and side effect of two years' highly active antiretroviral therapy for AIDS patients. *Heilongjiang Med. J.* 23, 1098–1100.
- Yin, J.H., He, W.H., Lian, X.Y., Xu, L., Zhang, Y., Yu, X.F., Lu, Q. Y., Chen, D.D., Huang, W.C., 2015. Antituberculosis therapy and antiviral therapy effect of patients with double infections of HIV/TB in Suizhou, Hubei Province. *China Prevent. Med.* 12, 171–174.
- Yu, H., Yang, C.B., Huang, J., Zhu, Z.D., Lai, W.H., Wu, M., Yang, W., 2014. Antiviral therapy effectiveness analysis of 102 cases of AIDS patients in Butuo Town. *Chongqing Med.* 25, 3329–3330.
- Zhang, H.M., Cao, P., Wei, D.G., 2010. Effect observation of highly active antiretroviral therapy for 49 AIDS patients. *Guizhou Med. J.* 34, 1024–1026.