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T-Lymphocyte Subset Studies to Monitor Patients with AIDS and AIDS-Related Complex

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Multiple specimens from 124 patients from our clinic were evaluated for T4/T8 cell ratio over three to 28 months. Twenty-nine of 30 patients with the acquired immunodeficiency syndrome (AIDS), 58 of 71 patients with AIDS-related complex (ARC), and four of 23 patients at risk showed initial T4/T8 cell ratios of less than 0.8, which either remained unchanged or decreased. Seventeen of 23 AIDS patients and two of 20 ARC patients with a consistently low ratio (0.3 or less) died during the follow-up period. This indicated that the severity of disease could be predicted by periodical T4/T8 cell ratio studies. These serial studies appeared to be valuable in monitoring the course of patients with AIDS, ARC, and the human immunodeficiency virus infection and also in evaluating the effects of available drug treatments. (Henry Ford Hosp Med J 1987;35:30-2)

The most commonly used laboratory tests for evaluating patients with the acquired immunodeficiency syndrome (AIDS) are the anti-human immunodeficiency virus (anti-HIV) antibody test (1) and the subpopulation study of T-lymphocytes (helper/suppressor or T4/T8 cell ratio) (2). [Naming of the human immunodeficiency virus (HIV) for lymphadenopathy-associated virus (LAV), human T-cell lymphotropic virus type III (HTLV-III), immunodeficiency-associated virus (IDAV), and AIDS-associated retrovirus (ARV) was proposed by the subcommittee and endorsed by the executive committee of the International Committee on the Taxonomy of Viruses (3).] Since the etiological agent of AIDS was established (4-6), the anti-HIV test has been used at blood donor stations to screen for the HIV-infected donor (7,8). It is also used at clinics as a diagnostic tool for patients with AIDS or AIDS-related complex (ARC). This serologic test can detect the antibody which indicates past or present infection with HIV. This test, however, is of limited value in the follow-up or prognosis of disease, because when a patient tests positive, the antibody usually stays positive thereafter. The relationship of antibody levels to the course of disease is not established.

Serial study of T4/T8 cell ratio is useful for monitoring the immunological status of a given patient over time. We are reporting an application of the T4/T8 cell ratio in the prognosis of patients with AIDS and ARC.

Clinical Specimens

For purposes of clinical classification, the following criteria were adopted. The definition of AIDS was based on criteria from the Centers for Disease Control (9). ARC was defined to include those patients who were anti-HIV antibody positive by both enzyme immunoassay (1) and Western blot technique (10) and who did not have AIDS but displayed the symptoms, signs, or laboratory abnormalities consistent with HIV infections. At-risk patients were HIV antibody positive without clinical manifestations of disease.

The 124 patients studied were classified into three groups: 1) 30 AIDS patients, 2) 71 ARC patients, and 3) 23 at-risk patients. Blood specimens from these patients were evaluated over three to 28 months (average 8.7 months).

Methods

Testing for anti-HIV antibody

Antibody to HIV was measured with the Abbott HTLV-III enzyme immunoassay (Abbott Laboratories, North Chicago, IL) (1). Reactive serum specimens were tested by the Western blot technique for confirmation (10).

Testing for T-lymphocyte subset

T-lymphocyte subset study was performed by direct immunofluorescence on a flow cytometer (Coulter EPICS V) with use of commercially available monoclonal antibodies (OKT11 for total T, OKT4 for T-helper, and OKT8 for T-suppressor cells from Ortho Pharmaceuticals, Raritan, NJ) (11). Theuffy coat from heparinized blood was first reacted with each monoclonal antibody conjugated with fluorescence isothiocyanate for 30 minutes in an ice bath. After eliminating erythrocytes by a lysing reagent, tagged cells were fixed with 0.5% paraformaldehyde before testing. The percent of positive cells for each subset was measured on "gated" lymphocytes by flow cytometer. The absolute count of each T-cell population was also calculated.

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Results

The normal ranges of T-lymphocyte subpopulations established from 84 “normal” individuals at our laboratory are summarized in Table 1. A T4/T8 cell ratio lower than 0.8 was considered “low” and 0.3 or less “extremely low.”

Table 2 summarizes a comparison of T4/T8 cell ratio and anti-HIV antibody in 124 patients (30 AIDS patients, 71 ARC patients, and 23 at-risk patients). The HIV-antibody test detected exposure to the virus. When patients tested positive, they usually stayed positive thereafter, regardless of the clinical course. On the other hand, the T4/T8 cell ratio can stratify the patients by a low (0.4 to 0.7) or extremely low (0.3 or less) ratio. These values were subsequently shown to be related to the clinical course.

Table 3 shows the follow-up study of these patients by T4/T8 cell ratio. A total of 377 specimens from 124 patients were submitted (average 3.0 specimens per patient). The T4/T8 cell ratio in those patients with low and extremely low ratios did not change. However, some patients who had an initially normal ratio fell to low or extremely low ratios during the follow-up period. One AIDS patient, nine ARC patients, and six at-risk patients demonstrated a reversal of T4/T8 cell ratios on subsequent specimens. None of the patients improved the ratio on the subsequent specimens. Seventeen of 23 AIDS patients and two of 20 ARC patients with a consistently low ratio (0.3 or less) died during the follow-up period. This indicated that the severity of disease could be predicted by an extremely low T4/T8 cell ratio.

The follow-up data for two patients are shown in Table 4 as examples. Decrease of the absolute count of T-lymphocytes was also evident with extremely low cell ratios, although the two were not always associated.

Discussion

Enzyme immunoassay for anti-HIV antibody is a simple test to detect a patient’s exposure to the virus and is sensitive for screening at-risk patients. The T-lymphocyte subset study reveals the degree of suppression in T-lymphocytes.

The simultaneous anti-HIV antibody and T4/T8 cell ratio assays are most helpful for the stratification of patients with AIDS or ARC. These patients were found to have low or extremely low T4/T8 cell ratios. The patients with extremely low ratios had a poor prognosis. Patients with HIV antibody and normal T4/T8 cell ratios were usually in the asymptomatic at-risk group.

Serial testing of the T4/T8 cell ratio is useful in monitoring the changing immunological status of the following groups: 1) patients with ARC (not full-blown AIDS); 2) individuals at risk (anti-HIV antibody positive by routine screening, but without symptoms); and 3) patients with HIV under antiviral therapy.

References

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