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Results of electron-reducing treatment for HIV/AIDS

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Noboru Horiguchi[*1)], Daiqiang Shi[**], Hiroshi Horiguchi[*2)]

Summary

This study was conducted to examine the efficacy of electron-reducing treatment for HIV/AIDS. Out of a total of 60 subjects, 40 who were either under treatment with anti-HIV drugs (HAART) and scheduled to start such treatment were randomly divided into two groups of 20 patients each; one group of patients received electron-reducing treatment and one group did not. Similarly, 20 untreated patients who were placed under observation were classified into two groups of 10 patients each; one group received electron-reducing treatment alone and one group did not. The effectiveness of therapy was compared among the four groups. At the time of termination of the 12-week study, the group receiving a combination of electron-reducing treatment and HAART showed obvious improvements in the amount of HIV-RNA, the number of CD4-positive T-lymphocytes, the CD4/CD8 ratio, and body weight. In addition, the group that received electron-reducing treatment alone had significant improvements in the amount of HIV-RNA and body weight, similarly to the HAART combination group.

Key Words: HIV/AIDS / Electron-reducing treatment /
Combination of HAART and electron-reducing treatment

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I. Introduction

HIV/AIDS is one of the most difficult infectious diseases to treat. Currently, the mainstay of treatment is a multi-drug regimen (HAART) comprising a combination of nucleoside or nonnucleoside reverse transcriptase inhibitors and protease inhibitors. According to a research report published by Janet D Siliciano, et al., however, even if HAART is continued in HIV/AIDS patients, latently infected cells will remain in the patient's body for a long period of time, and a treatment period of about 73 years is needed to completely remove HIV from the body [1]. Therefore, it can be said that a radical cure of HIV infection by HAART is virtually impossible. Furthermore, long-term administration of drugs has caused an increase in the nation's healthcare costs, and the chronic adverse reactions of anti-viral drugs [2] as well as the development of drug-resistant viruses [3] have made it difficult to continue treatment. Thus, the utility of treatment with anti-HIV drugs alone is limited, and the development of new therapies to treat the disease is now an urgent issue. For this reason, we implemented a clinical study in HIV/AIDS patients using MIE-01, an electron-reducing treatment device that we independently researched and developed as an alternative to anti-HIV drugs.

Gas molecules in the atmosphere are ionized by cosmic rays or radiation rays from crystal ores and become positive ions (mainly H_3O^+, NH_4^+) or negative ions (mainly NO_3^-) through several chemical reactions [4, 5]. In electron-reducing treatment, negative ions are artificially produced with a specific apparatus called an ion converter [6], and then they are sent into the body. Negative air ions predominate in the parasympathetic nervous system, which constitutes part of the autonomic nervous system, and have been shown to improve peripheral blood circulation [7]. Moreover, it is known that negative air ions improve acidosis in the human body [8]. Because the essential elements of negative air ions are electrons (e^-), this electron-reducing treatment provides the human body with electrons, which can produce negative ions. Mi Energy® ET-16 (manufactured by Serumi Medical Instruments Co., Ltd. Medical device approval code: 21500BZZ00602000) has been approved as a medical instrument for use in medical institutions, and indications for the device are stiff shoulders, headache, insomnia, and chronic constipation. Electrons

delivered percutaneously into the body react with hydrogen ions and become hydrogen atoms, which then lead to the production of reduced forms of vitamins and amino acids, and improve acidity and oxidation in the human body [9)-11)]. In addition, electron-reducing treatment is characterized by increasing cellular immunity, such as that due to NK cell activity [12)]. On the basis of these findings, this study was performed to verify the effectiveness of electron-reducing treatment in HIV/AIDS patients.

II. Subjects and methods

The study (clinical study) was conducted in compliance with the Declaration of Helsinki.

1. Trial site and period

The clinical trial was implemented in the Infectious Disease Department at the Sixth People's Hospital of Hangzhou, China, between December 2006 and November 2007. Each subject's clinical trial period was 12 weeks following screening.

2. Subjects

The study subjects comprised 60 patients, 40 of whom were receiving treatment with HAART and scheduled to start such treatment, and 20 who were untreated and placed under observation; all were outpatients of the Infectious Disease Department at the Sixth People's Hospital of Hangzhou, China. Patients who were to remain untreated and placed under observation were required to have a CD4-positive T-lymphocyte count of more than 200 cells/mL based on the guideline to treat HIV/AIDS in China. There were 38 males and 22 females, aged 20 to 58 years, with a mean age of 37.7 years.

3. Selection criteria (screening)

The selection criteria were males or females between 20-60 years old and were diagnosed with AIDS or HIV infection with anti-HIV-1 antibody positive by ELISA and Western blotting within one month before the initiation of study or at the time of screening. However, patients with a fever or malignancy whose conditions were judged to be serious, pregnant women, and those who were using implantable/wearable medical electronic devices or metallic artificial medical devices were excluded. Patients who met

the selection criteria signed consent forms for the clinical study, and their intentions for participation were confirmed.

4. Electron-reducing treatment device

An improved treatment device (electron-reducing treatment device: MIE-01) based on Mi Energy® manufactured by Serumi Medical Instruments Co., Ltd. was used. Mi Energy® is a treatment device covered by medical insurance (Medical device approval code: 21500BZZ00602000), which was approved by the Ministry of Health, Labour and Welfare, and indications for treatment with the device are stiff shoulders, headache, insomnia, and chronic constipation. In the electron-reducing treatment device MIE-01, weak electric currents occur due to transfer of electrons delivered into the human body. The generated electric currents are fed back through an AMP (Amplifier) and are controlled to constantly stay within the therapeutic electric current range between -1.5 μ A and -4.5 μ A by CPU (Central Processing Unit). This can minimize environmental influences due to outside air temperatures or humidity, and body temperatures or moisture content. The internal structure of the device is shown in Figure 1.

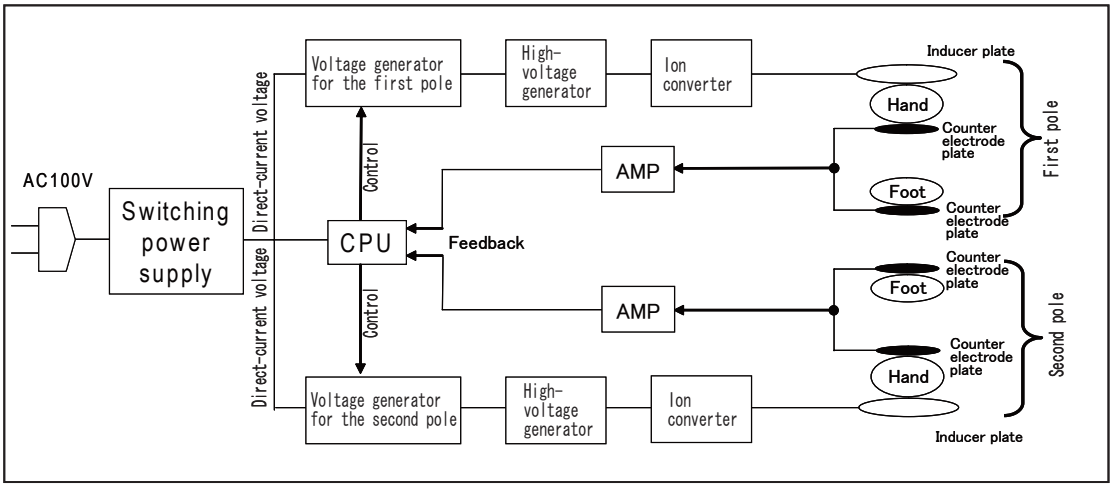

Fig. 1 Electron-reducing treatment device: Circuit diagram of MIE-01

A current of 100 volts AC from the commercial power source is converted into a direct-current voltage, which is set to a specified voltage by a voltage generator. The voltage is raised by a high-voltage generator. Output power from each high-voltage generator at the first and second poles are input into each ion converter, and negative potentials between -4000 and -6000 V are applied to a metal plate of the inductor plate. As a result, electron transfer occurs in the human body between the insulation part outside the inductor plate and the counter electrode plate of 0V.

5. Testing methods

(1) Composition of the subject group

Out of 60 subjects who met the selection criteria, 40 of the patients who were receiving treatment with HAART and scheduled to start such treatment were randomly divided into two groups of 20 patients each: one group to receive electron-reducing treatment and the other not to. Similarly, 20 untreated patients who were placed under observation were classified into two groups of 10 patients each: one group to receive electron-reducing treatment and the other not to. The resulting four groups were then compared.

(2) Therapeutic drugs

For HAART, three out of the five drugs of EFV/ efavirenz, AZT/ zidovudine (or azidothymidine), 3TC/ lamivudine, d4T/ sanilvudine, and NVP/ nevirapine were selected and administered.

(3) Electron-reducing treatment device: Treatment with MIE-01

According to the procedure shown in Fig. 2, the treatment was given 7 days a week for 12 weeks. The time per treatment was 20 minutes, and the treatment was performed 5 times daily at intervals of more than 60 minutes.

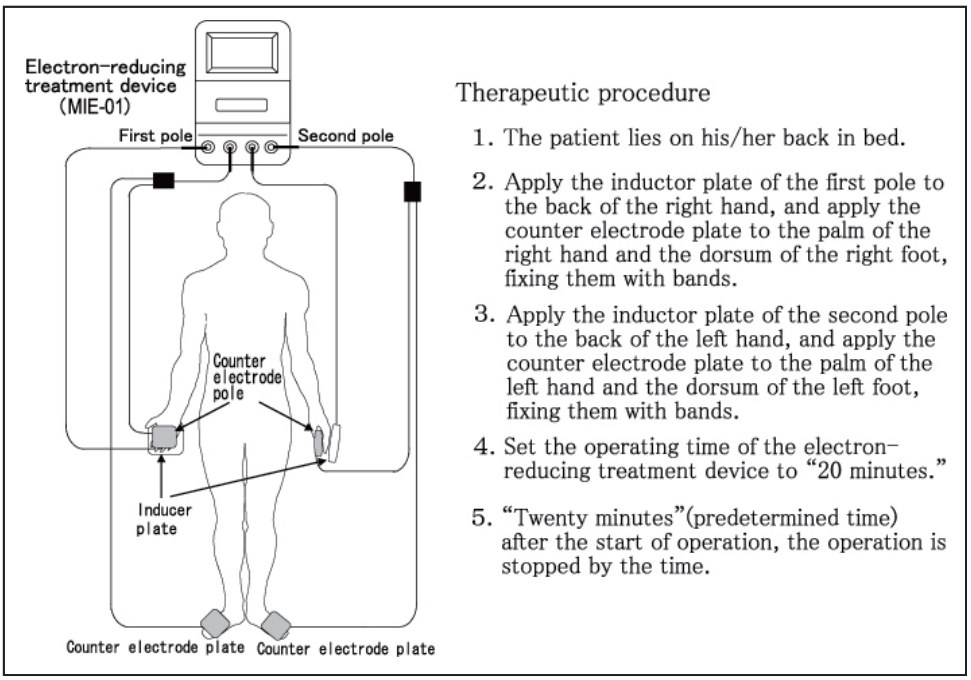

Fig. 2 Electron-reducing treatment procedure

Apply the inductor plates to the backs of the right and left hands, and apply the counter electrode plates to both palms, fixing them with bands. In addition, apply the counter electrode plates to the backs of both feet (bare feet), fixing them with bands. After that, press the display panel for the start of the electron-reducing treatment device and continue treatment for 20 minutes.

(4) Research schedule and test items

The tests were conducted before starting treatment with the device, 4, 8, and 12 weeks later, and the amount of HIV-RNA, the CD4-positive T-lymphocyte count, the CD4/CD8 ratio, and body weight were measured.

(5) Measurement of test items

① Amount of HIV-RNA

The amount of serum RNA was measured by the RT-PCR method (Roche Diagnostics: Amplicor HIV-1 Monitor, a high-sensitivity method)

② Count of CD4-positive T-lymphocytes

Peripheral blood was collected using EDTA-containing vacuum tubes (manufactured by Zhejiang Kangshi Medical Equipments Co., Ltd.), and the peripheral blood leukocyte count and the proportion of lymphocytes in the leukocytes were measured to calculate the total lymphocyte count using a fully automatic blood analyzer (Abbott: CELL-DYN® 3200). The count was multiplied by the proportion (%) of CD4-positive T-lymphocytes measured in

the following item ③ , and the number of CD4-positive T-lymphocytes was calculated.

③ CD4/CD8 ratio

20 μ L of fluorescent-labeled monoclonal antibodies (Immunotech: CD4-FITC/CD8-PE, IgG 1-FITC/IgG 1-PE (negative control)) were added to heparinized whole blood 100 μ L, and after a 30-minute reaction at 4℃ , they were hemolyzed by an automatic hemolyzer (Beckman Coulter: COULTER® Q-Prep TMWorkstation). After leaving the cells undisturbed at room temperature for 15 minutes, the lymphocytes were washed by centrifugation with phosphate buffered saline, and cell surface markers were analyzed using a flow cytometer (Beckman Coulter: COULTER® EPICS® XLTM/XL-MCLTM Flow Cytometer). The accuracy of the flow cytometer was adjusted beforehand according to standard particles for accuracy management (Beckman Coulter: Flow-CheckTM Fluorospheres). The CD4/CD8 ratio was calculated from the results of analysis.

④ Statistics and analysis

All data were processed with the statistical software, Stat Mate III (ATOMS Co., Ltd.). The data are shown as Mean ± S.D. A paired-t test (two-sided test) was used for the assay.

III. Results

1. Patient background (Table 1, Table 2)

In a retrospective comparison, conducted after completion of the study, between patients who received combined therapy with the electron-reducing treatment and HAART and those who received HAART alone, the male-female ratios were almost the same, and the age distribution was also similar. However, the amount of HIV-RNA was larger in the combination treatment group than in the HAART alone group, and body weight was greater in the group with HAART alone than in the combination treatment group, showing an imbalance (bias). The mean length of HAART prior to the study was 11.65 ± 18.51 months in the combination treatment group, and 14.65 ± 14.20 months in the HAART alone group, not a significant difference. Additionally, there were 7 patients in the combination treatment group who had been receiving HAART for a period of less than 3 months and 5 in the HAART alone group. There were no differences in any factors

between the electron-reducing treatment alone group and the untreated patients.

Table 1 Patient background

Subject groups	Number of patients (males/females)	Mean age ± S.D. (Range)	Baseline data (Mean ± S.D.) (Range)			
			Amount of HIV-RNA log_{10}copies/mL	Number of CD4-positive T-lymphocytes cell/μL	CD4/CD8 ratio	Body weight (kg)
Combined electron-reducing treatment and HAART group	20 (15/5)	39.8±10.1 (20~58)	3.48±0.985 (1.70~4.67)	241.65±182.51 (12~569)	0.274±0.267 (0.070~0.956)	52.78±7.17 (42~66)
HAART treatment alone group	20 (14/6)	41.8±7.3 (25~58)	2.78±0.725 (1.70~4.00)	339.85±239.15 (34~984)	0.350±0.261 (0.065~0.986)	60.00±7.68 (47~70)
Electron-reducing treatment alone group	10 (4/6)	29.3±6.5 (23~40)	3.19±0.573 (2.07~4.13)	365.40±102.98 (247~543)	0.397±0.138 (0.289~0.761)	52.25±9.25 (44~66)
Untreated group	10 (5/5)	33.8±6.3 (24~42)	2.96±1.019 (1.70~4.59)	368.40±233.92 (228~1020)	0.341±0.167 (0.110~0.710)	57.40±9.44 (44~70)

Table 2 Patient background

Subject groups	Number of patients	Period of HAART before the start of the study (months) Mean ± S.D.(Range)
Combined electron-reducing treatment and HAART group	n=20	11.65±18.51 (0~77)
HAART treatment alone group	n=20	14.65±14.20 (0~42)

2. Changes in the amount of HIV-RNA

Changes in the amount of HIV-RNA (log_{10} copies/mL) in each subject group are shown in Figure 3.

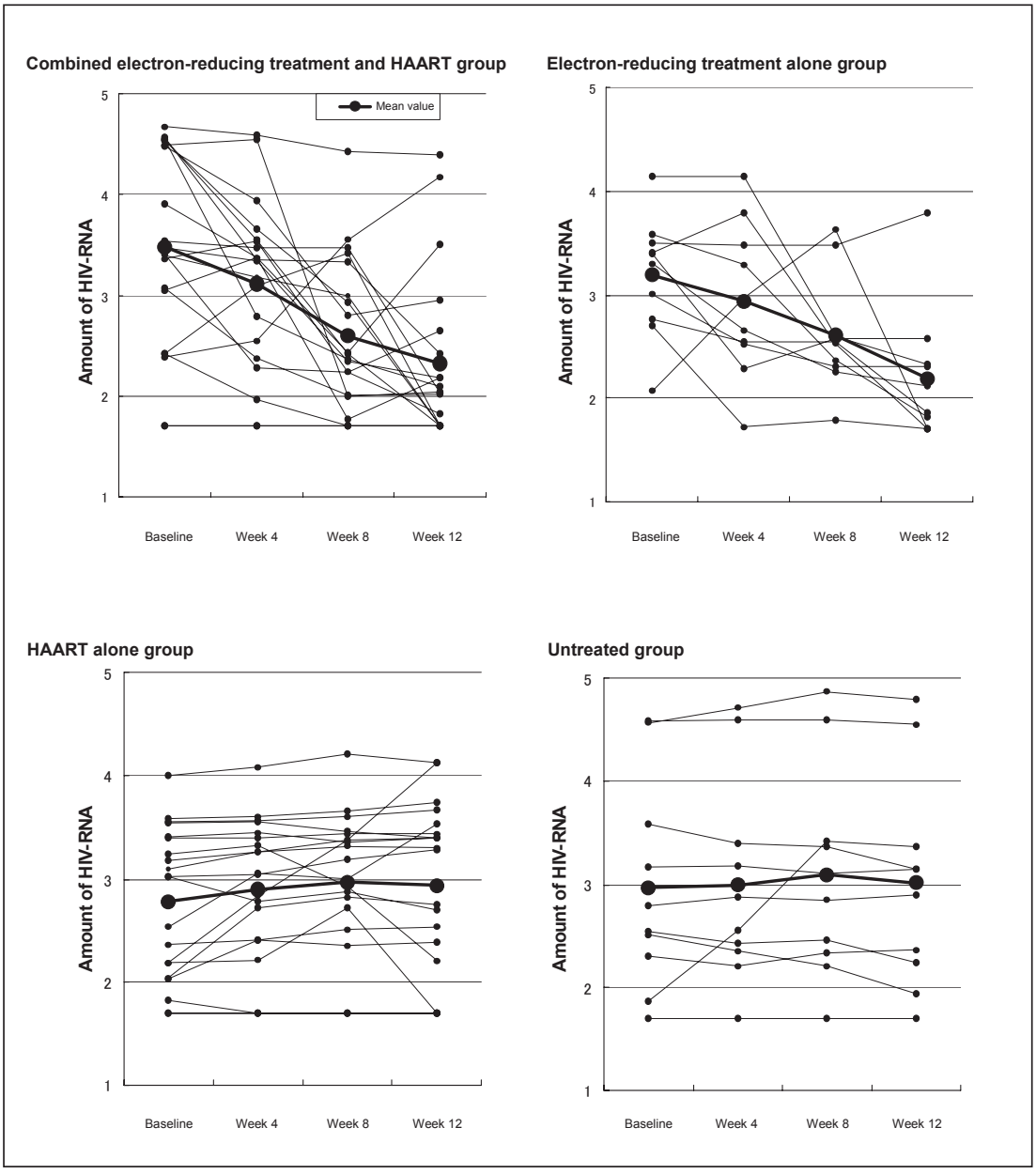

Fig. 3 Changes in the amount of HIV-RNA (log_{10} copies/mL)

The amounts of HIV-RNA before and at the end of the 12-week study period decreased in 17 out of 20 patients who received combined electron-reducing treatment and HAART, and in 9 out of 10 patients who received electron-reducing treatment alone.

(1) Combination electron-reducing treatment and HAART group

In the group who received electron-reducing treatment during HAART, the amount of HIV-RNA at the end of the 12-week study (with the amount before the study set as baseline) decreased in 17 out of 20 patients, was unchanged in 2, and increased in 1 (P=0.00018). The mean value of baseline HIV-RNA before the study was 3.48 ± 0.985, and that at the termination of the study was 2.32 ± 0.826. The mean amount of change of HIV-RNA was a reduction of 1.16 $\log_{10}$.

(2) HAART alone group

In the group of patients who received HAART alone, the amount of HIV-RNA at the end of the 12-week study period had decreased in 6 out of 20 patients, was unchanged in 2, and had increased in 12 (P=0.243). The mean value of HIV-RNA before the study was 2.78 ± 0.725, and that at the completion of the examination was 2.94 ± 0.818.

(3) Electron-reducing treatment alone group

In the patients who received only electron-reducing treatment, the amount of HIV-RNA at the end of the 12-week study decreased in 9 out of 10 subjects, and increased in 1 (P=0.0010). The mean value of HIV-RNA before the study was 3.19 ± 0.573, and that at the termination of the study was 2.19 ± 0.642. The mean amount of change was a reduction of 1.0 $\log_{10}$.

(4) The untreated group

In the group without any treatment, the amount of HIV-RNA at the end of the 12-week study period had decreased in 5 out of 10 patients, was unchanged in 1, and had increased in 4 (P=0.775). The mean value of HIV-RNA before the study was 2.96 ± 1.019, and that at the completion of the study was 3.01 ± 1.034.

3. Number of CD4-positive T-lymphocytes

Changes in the number of CD4-positive T-lymphocytes (cells/ μ L) for each of the groups are shown in Figure 4.

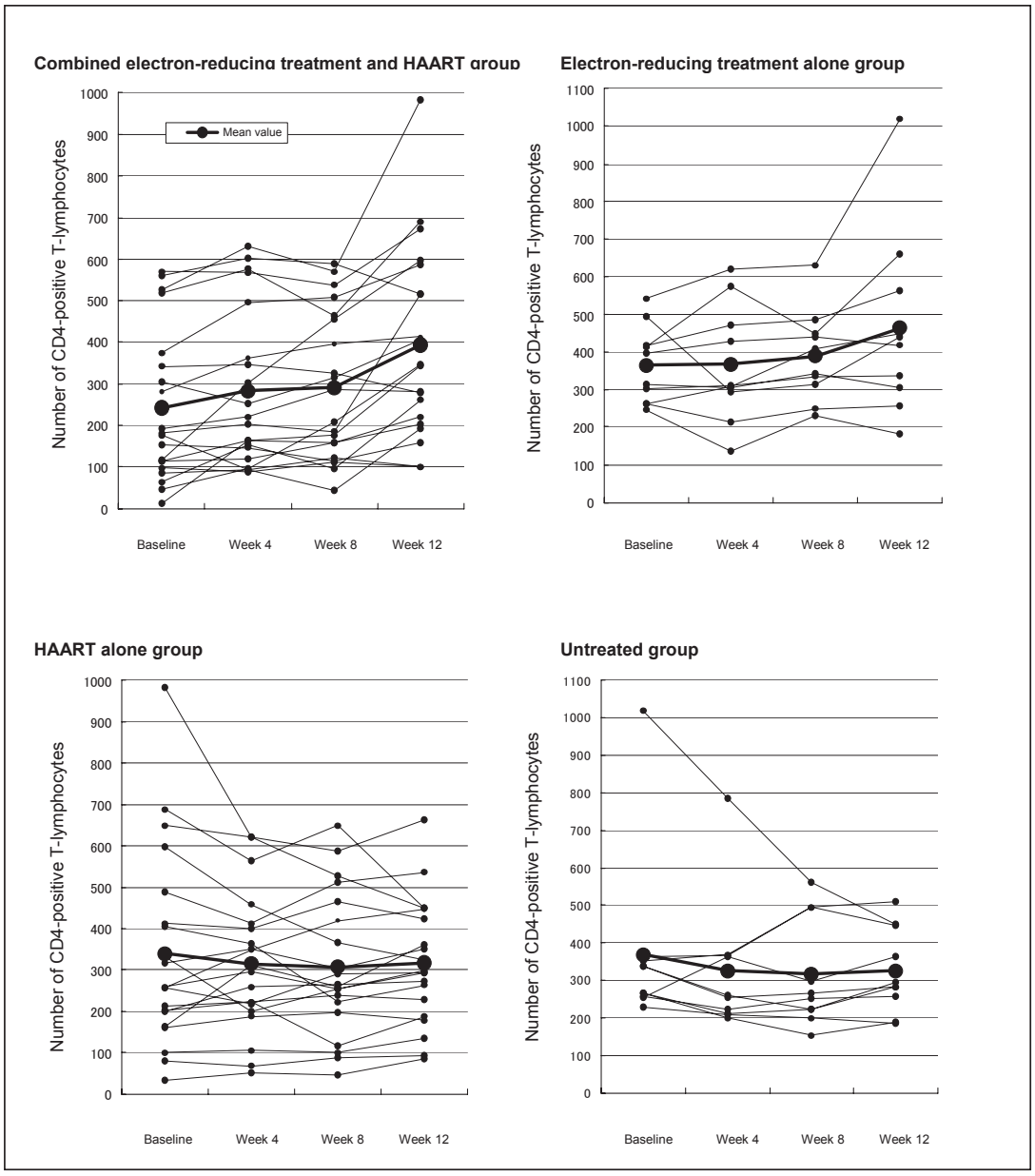

Fig. 4 Changes in the number of CD4-positive T-lymphocytes (cells/μL)

The number of CD4-positive T-lymphocytes before and at the end of the 12-week study increased in 18 out of 20 patients with combined electron-reducing treatment and HAART, and in 6 out of 10 patients with electron-reducing treatment alone.

(1) Combined electron-reducing treatment and HAART group

The number of CD4-positive T-lymphocytes at the end of the 12-week study had increased from baseline in 18 out of 20 patients, and decreased in 2 (P=0.0004). The mean value of CD4-positive T-lymphocytes before the study was 241.7 ± 182.51, and that at the termination of the study was 393.4 ± 229.77. The mean amount of change was an increase of 151.7 cells/ μ L.

(2) HAART alone group

The number of CD4-positive T-lymphocytes at the end of the 12-week study had increased in 13 out of 20 patients, and reduced in 7 (P=0.473). The mean value of CD4-positive T-lymphocytes before the study was 339.9 ± 239.15, and that at the completion of the study was 316.8 ± 149.05.

(3) Electron-reducing treatment alone group

The number of CD4-positive T-lymphocytes at the end of the 12-week study increased in 6 out of 10 patients, and decreased in 4 (P=0.099). The mean value of CD4-positive T-lymphocytes before the study was 365.4 ± 102.98, and that at the termination of the study was 463.4 ± 241.16. The mean amount of change was an increase of 98 cells/ μ L.

(4) The untreated group

The number of CD4-positive T-lymphocytes at the completion of the 12-week study had increased in 4 out of 10 patients, was unchanged in 1, and had decreased in 5 (P=0.523). The mean value of CD4-positive T-lymphocytes before the study was 368.4 ± 233.92, and that at the end of the study was 326.0 ± 112.55.

4. CD4/CD8 ratio

Changes in the CD4/CD8 ratio for each subject group are shown in Figure 5.

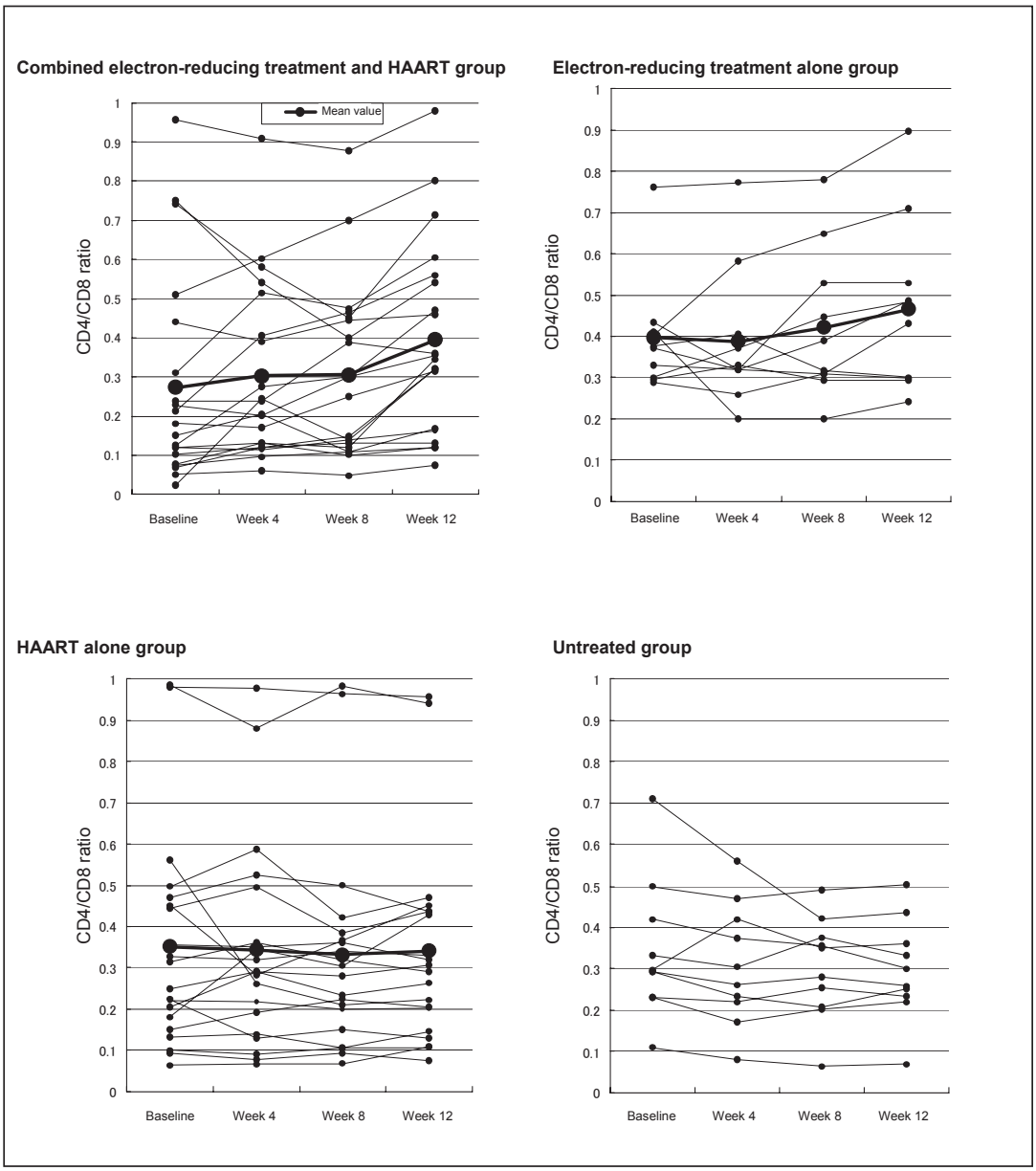

Fig. 5 Changes in the CD4/CD8 ratio

The CD4/CD8 ratio before and at the end of the 12-week study increased in 18 out of 20 patients who received combined electron-reducing treatment and HAART, and in 6 out of 10 patients who received electron-reducing treatment alone.

(1) Combined electron-reducing treatment and HAART group

The CD4/CD8 ratio at the end of the 12-week study had increased from baseline in 18 out of 20 patients, and reduced in 2 (P=0.00155). The mean CD4/CD8 ratio before the study was 0.274 ± 0.267, and that at the termination of the study was 0.396 ± 0.247.

(2) HAART alone group

The CD4/CD8 ratio at the end of the 12-week study had increased in 9 out of 20 patients, and decreased in 11 (P=0.710). The mean CD4/CD8 ratio before the study was 0.350 ± 0.261, and that at the completion of the study was 0.341 ± 0.242.

(3) Electron-reducing treatment alone group

The CD4/CD8 ratio at the termination of the 12-week study increased in 6 out of 10 patients, and decreased in 4 (P=0.153). The mean CD4/CD8 ratio before the study was 0.397 ± 0.138, and that at the end of the study was 0.467 ± 0.208.

(4) The untreated group

The CD4/CD8 ratio at the termination of the 12-week study increased in 3 out of 10 patients, and decreased in 7 (P=0.156). The mean CD4/CD8 ratio before the study was 0.341 ± 0.167, and that at the end of the study was 0.296 ± 0.121.

5. Body weight

Changes in the body weight (kg) of each subject group are shown in Figure 6.

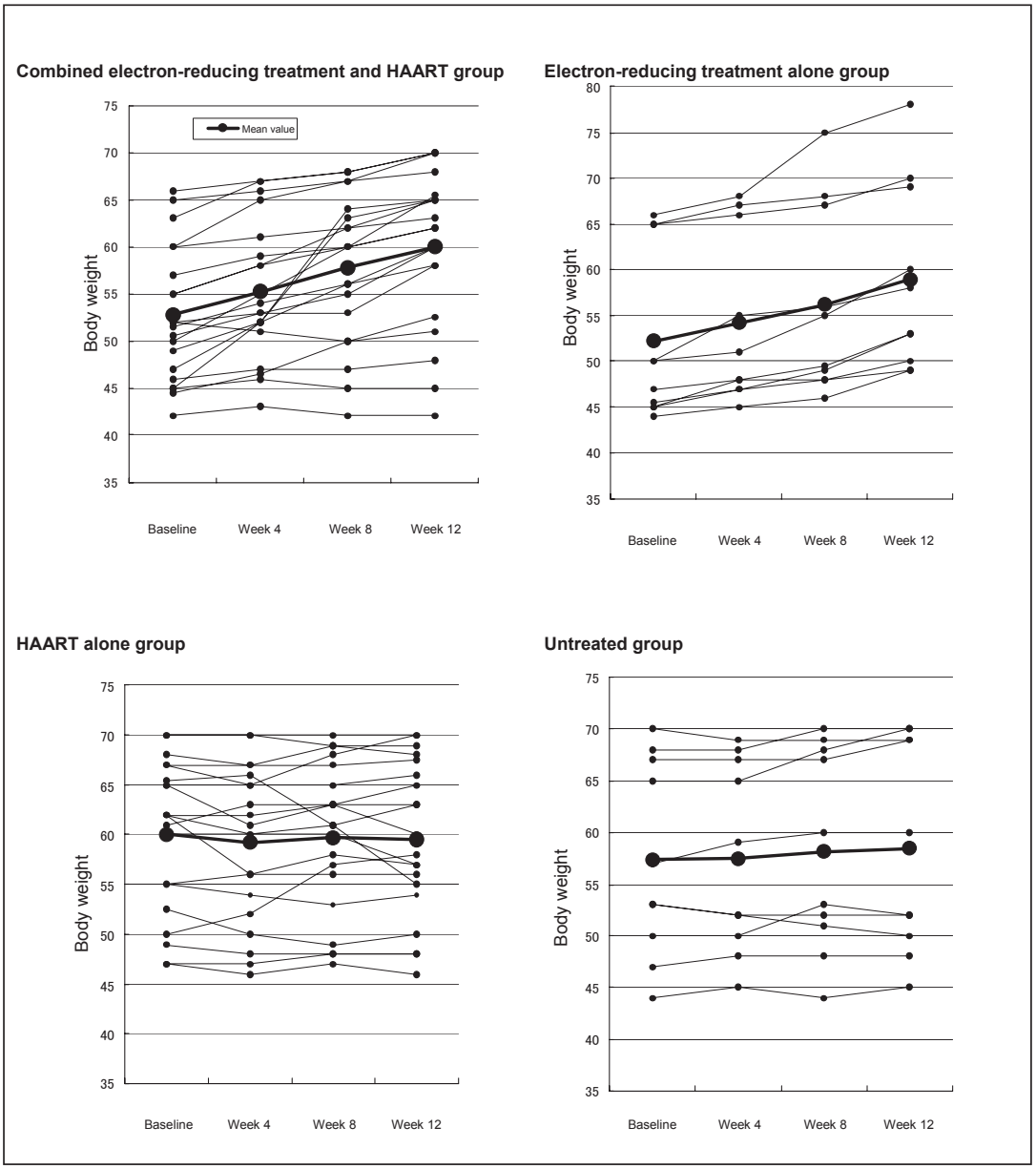

Fig. 6 Changes in body weight (kg)

The body weights before and at the end of the 12-week study increased in 17 out of 20 patients with combined electron-reducing treatment and HAART and in all 10 patients with electron-reducing treatment alone.

(1) Combined electron-reducing treatment and HAART group

The body weight at the end of the 12-week study increased from baseline in 17 out of 20, was unchanged in 2, and had decreased in 1 ($P<0.0001$). The mean weight value

before the study was 52.8 ± 7.17, and that at the end of the study was 60.0 ± 8.35. The mean amount of change was an increase of 7.2 kg.

(2) HAART alone group

The body weight at the completion of the 12-week study increased in 9 out of 20 patients, was unchanged in 1, and decreased in 10 (P=0.605). The mean weight value before the study was 60.0 ± 7.68, and that at the end of the study was 59.5 ± 7.81.

(3) Electron-reducing treatment alone group

The body weight at the termination of the 12-week study increased in all 10 patients (P<0.0001). The mean weight value before the study was 52.3 ± 9.25, and that at the end of the study was 58.9 ± 10.2. The mean amount of change was an increase of 6.6 kg.

(4) The untreated group

The body weight at the termination of the 12-week study increased in 7 out of 10 patients, and decreased in 3 (P=0.162). The mean weight value before the study was 57.4 ± 9.44, and that at the completion of the study was 58.5 ± 10.2.

6. Adverse events and adverse reactions

During the period of the clinical study, there were no adverse events or adverse reactions considered probably related to the electron-reducing treatment device, MIE-01.

IV. Discussion

The above results show that treatment with both HAART and electron-reducing treatment was effective for suppressing viral counts and improving cellular immunity, as well as improving patient body weight. In addition, suppression of viral counts and improvements in body weight were observed among patients receiving electron-reducing treatment alone. According to “Clinical Outcome of HAART in Japan: A Retrospective Study in AIDS-referral Hospitals” (by Satoshi Kimura, Shinichi Oka) in “Clinical studies

of HIV infection" issued by the 1999 research project for AIDS measures by the scientific research fund subsidies from the Ministry of Health, Labour and Welfare, patients starting HAART from the beginning showed a decrease of about 2 $\log_{10}$ in the amount of HIV-RNA and an increase of about 100 cells/ μ L in the number of CD4-positive T-lymphocytes three months after treatment during the two-year course. Additionally, patients having a pretreatment history and initiating HAART with three drugs that had not previously been used showed a reduction of about 0.9 $\log_{10}$ in the amount of HIV-RNA and an increase of about 70 cells/ μ L in the count of CD4-positive T-lymphocytes three months after the treatment. The number of patients in the study was small, and the periods of pre-treatment with HAART varied widely. Moreover, the period of the study was limited at only 12 weeks. For these reasons, a comparison of the present study data with retrospective study data cannot be conducted easily. However, the group of patients who received combined electron-reducing treatment and HAART had a decrease of 1.16 $\log_{10}$ in the amount of HIV-RNA, an increase of 151.7 cells/ μ L in the number of CD4-positive T-lymphocytes, and an increase of 7.2 kg in the amount of change of body weight. In addition, the number of patients who had been receiving HAART for less than 3 months before entry into the study was 7 in the combination group and 5 in the HAART alone group. Because it can be considered that the amount of HIV-RNA and the count of CD4-positive T-lymphocytes usually vary widely during this three-month period after the initiation of HAART, these 12 patients were excluded, and a repeat analysis of the data was performed. Nevertheless, the amount of HIV-RNA was still significantly reduced ($P<0.001$), and the number of CD4-positive T-lymphocytes significantly increased ($P<0.01$). Therefore, electron-reducing treatment was considered to be effective in improving the clinical condition of HIV/AIDS.

Electron-reducing treatment aims to supply the interior of the body with electrons, and its electrophysiologic action improves the acidity and amount of oxidation at the cellular level [13), 14)] as well as reducing peripheral microvascular damage [15)]. In other words, the treatment promotes metabolism at the cellular level. Although it is unknown how the electron-reducing treatment suppresses viral growth, it has been observed that the treatment enhances NK cell activity and increases the number of type 1 helper T-cells

(Th 1) [16) 17)]. It is very likely that enhancement of cellular immunity damages HIV-infected cells, leading to the suppression of viral growth.

Currently, the mainstay of treatment for HIV/AIDS is HAART, but the patients have to take these drugs all through their lives, which may lead to a national economic crisis, considering the increasing number of HIV/AIDS patients. Moreover, long-term administration of drugs causes chronic adverse reactions or the emergence of drug-resistant viruses, which makes continuation of treatment more difficult.

Electron-reducing treatment was researched and developed on the basis of negative air ions in nature. Importantly, there have not been any reports of serious adverse reactions resulting from this treatment, and adverse events or serious adverse reactions due to the treatment were not observed during the period of the study. The therapeutic method is different from drug therapy, and it is therefore unlikely that drug-resistant viruses will emerge. In addition, the treatment device can be used jointly by multiple patients and furthermore can be used semipermanently. As shown by the results of this study, a combination of HAART with electron-reducing treatment markedly suppresses the virus, obviously improves the count of CD4-positive T-lymphocytes, and increases body weight. In the future, the use of electron-reducing treatment is likely to delay the start time of treatment with anti-HIV drugs or reduce the drug dosage required. Therefore, the treatment can be considered to be very beneficial in terms of coping with various problems associated with the long-term administration of drugs. The treatment period in the study was only 12 weeks, but better effects of electron-reducing treatment can be expected with extended treatment. For this reason, some of the subjects from whom consent could be obtained have been continuing electron-reducing treatment.

[Acknowledgments]

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