

## Effects of scalp treatment using combinational massage technique on human physiology

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### Abstract

The purposes of this study are to measure physiological reactions of human body according to the scalp treatment, a popularized service in beauty care industry and propose efficient ways of scalp treatment. To meet the goals, total 30 applicants without any medical history(5 males and 5 females in 20's, 30's and 40's respectively) were informed on the purpose of experiment hereof and were investigated and received a 30-minute scalp treatment, which combines standardized scalp treatment massage technique proposed by KAT and ITF with another massage technique operated in the beauty salon run by the author of this paper. 5ml of blood samples were taken from each subject before and after the scalp treatment respectively and the blood sample was divided into 3 different tubes for analysis: 1) 2 ml for blood cell analysis, 2) 2ml for enzyme activity measurement, 3) 1ml for hormone level reading. In order to determine effects of scalp treatment on ALP, GOT, GPT,  $\gamma$ -GTP, WBC, RBC, Hb, Hct, Platelet, MCV, MCH and MCHC, all collected data were used for measuring respective levels of these blood substances by means of enzyme reaction measurement, enzyme activity measurement and automated hematology analyzer. Then, all measured data were analyzed through paired t-test using SPSS WIN 11.5.

As a result, the scalp treatment is associated with improving hepatic function, facilitating blood circulation and helping blood coagulation and hemostasis in a effective way. Therefore, it would be necessary to conduct further studies on this subject related to anemia in the future.

**Key Words** : scalp treatment, enzyme activity, blood cell analysis, blood circulation

### I . Introduction

For traditional society, home was basic and primary environment for economic and social activities. But our contemporary social paradigm requires wider behavioral coverage of economic

and social activities. Thus, we have to make many efforts to adapt ourselves to this changing paradigm, and these efforts usually involve lots of stress. The stress is a physiological phenomenon induced in keeping one's mind on something. According to WHO it also refers to

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the invisible reactions of each organ in human body to bear the burden. The origin of stress comes possibly from the evolution of reflex behaviors that would help mankind to survive in primitive African savanna in the prehistoric era.<sup>1)</sup>

Our stress has considerable effects on our human body in terms of our daily life. To measure the effects, there have been many studies as well as social, psychological and medical findings.<sup>2)</sup> This stress is associated with adolescent physical dysfunction and alexithymia<sup>3)</sup>, and also has significant effects on the inherent works of beauty artists.<sup>4)</sup> Stress occurs in every field we face on daily basis, and the change of our dietary life to adapt ourselves to environmental variations is associated with hypertension<sup>5)</sup>, smoking<sup>6)</sup> and body fat distribution.<sup>7)</sup> Moreover, the stress is a proven and crucial etiologic cause of alopecia.<sup>8)</sup> Indeed, alopecia cases suffer from significant occupational stress<sup>9)</sup>, and this stress usually induces alopecia areata<sup>10)</sup> and aggravates skin disorders<sup>11)</sup> such as alopecia areata and psoriasis. Moreover, it is found that the stress is associated with increased mast cell degranulation and vascular permeability, resulting in the formation of phlogocyte infiltrate around hair follicle.<sup>12)</sup>

Another study reports that mental stress is a major cause of alopecia Myung. Woo. Kim<sup>13)</sup>, Jee. Suk. Lee<sup>14)</sup>, Jin. Hee. Yoon<sup>15)</sup>, et al, and every kind of alopecia is attributed primarily to acquired factors<sup>16)</sup> like stress and insufficient sleep, rather than native factors like heredity and sebum hyper-secretion.

Therefore, it can be assumed that alopecia is much influenced by stress and stress control means a possible reference measure to prevent potential alopecia. The first step toward prevention of alopecia starts from having healthy scalp and controlling stress.<sup>17)</sup> As a part of

various cosmetic operations for clean and healthy scalp skin, the scalp treatment refers to caring for and controlling scalp problems by means of non-medical appliances, which encompass shampoo, scalp cleansing and hair tonic treatment.<sup>18)</sup> It aims to induce organic activation by cleansing scalp and applying artificial stimulations on scalp. By means of continuous and rhythmical repetitive motions relaxing daily stress of clients, scalp treatment can help relax muscular stress and eliminate residual substances, oxides, and dirt under the activation of physiological functions following the discharge of waste from scalp. Therefore, scalp cleansing and massage could ultimately contribute to the maintenance of scalp health condition. Since causes of unclean scalp environment affect alopecia directly and indirectly<sup>19)</sup>, scalp massage using extraction of various essential oils has been recently highlighted and widely used as a means of effective care. This massage has excellent antibiotic effects upon microbes residing in scalp and has also additional expected effects such as mollification and elimination of keratin layer, and reduced stress.<sup>20)</sup>

Since this study intends to measure human physiological reactions to scalp treatment, a popularized service in beauty care industry, and propose efficient ways of scalp treatment, the blood samples were taken from subjects before scalp treatment for the analysis.

Thus, this study is to measure human physiologic reactions before and after scalp treatment. First, blood samples were taken before skin treatment, and they were taken again 2 hours after skin treatment so as to determine possible physiological variations of human body. Ultimately, the purpose of this study is to facilitate activation of skin treatment on the

basis of reactions found in human body, and also extend and reproduce the applications of skin treatment in beauty care industry.

## II. Methods and Analysis

### 1. Subjects

In this study, applicants without any medical history were selected and asked to join an experiment during the last week of October. 30 subjects in total (5 males and 5 females in 20's, 30's and 40's respectively) were informed on the purpose of this experiment and all subjects signed the experiment consent form.

The general characteristics of subjects selected in this experiment are illustrated as listed on <Table 1>

The subjects were consist of 15 males and 15 females. And their age distribution comprised 20~29(10 persons), 30~39(10 persons) and 40~49(10 persons).

### 2. Data Analysis

#### 1) scalp treatment massage

In order to measure short-term effects of scalp treatment, the subjects were asked to join a 30-minute scalp treatment that combines standardized scalp treatment massage technique

(proposed by KAT and ITF with another massage technique commonly operated in the beauty salon run by the author of this paper. Basically, massage treatment should be performed by one technical staff or others alone because of individual differences. But in order to avoid excessive workload of firsthand treatment for 30 subjects, only trained staffs working for same beauty salon – who completed certain trichology (re)orientation course–were allowed to perform scalp treatment. Trichologist refers to a professional who masters know-how on hair and scalp treatment based on trichology, and also specializes in helping people to keep hair and scalp health or improve them. <sup>21)</sup>

#### 2) Blood sampling and data analysis

##### (1) Blood sampling

The subjects were composed of males and females in their 20's, 30's and 40's. And sex ratio was limited to 10 persons(5 males and 5 females) in each age group. They were informed on the purpose of experiment and were asked to consent to join experiment. Then, their blood samples were taken as much as 5 ml respectively before and after scalp treatment, and were subdivided into 3 different tubes (2 ml for blood cell analysis, 2 ml for enzyme activity measurement and 1 ml for hormone level reading) for analysis. Blood samples were taken again 2 hours after scalp treatment.

<Table 1> General characteristics of subjects

Classification		Frequency(No. of persons)	Percentage(%)
	Male	15	50.0
	Female	15	50.0
Age	20 ~ 29	10	33.3
	30 ~ 39	10	33.3
	40 ~ 49	10	33.3
Total		30	100.0

ALP (Alkaline phosphatase) was measured in accordance with enzyme reaction measurement (SSCC Recommendation) using Wako ALP (SSCC; made by Choongwae Pharma Corp.) as reagent and Hitachi 7600-110/ 7170 as test instrument.

The measurements of GOT (Glutamate Oxaloacetate Transaminase) and AST (Aspartate Aminotransferase) were conducted according to enzyme activity measurement using DAIICHI Pureauto S AST (reference reagent under the JSCC Recommendation, made by Choongwae Pharma Corp.) as a reagent and Hitachi 7600-110/7170 as test instrument.

The measurement of GPT(Glutamate Pyruvate Transaminase) and ALT (Alanine Aminotransferase) was conducted according to enzyme activity measurement using DAIICHI Pureauto S ALT (reference reagent under the JSCC Recommendation, made by Choongwae Pharma Corp.) as a reagent and Hitachi 7600-110/7170 as test instrument.

The measurement of  $\gamma$ -GTP(gamma glutamyl-transferase) was conducted according to enzyme activity measurement by means of DAIICHI Pureauto S GGT(reference reagent under the IFCC Recommendation, made by Choongwae Pharma Corp.) as reagent and Hitachi 7600-110/ 7170 as test instrument.

The measurement of WBC(white blood cell), RBC(red blood cell), Hb (hemoglobin), HCT (Hematocrit), platelet, MCV(mean corpuscular volume), MCH(mean corpuscular hemoglobin) and MCHC(mean corpuscular hemoglobin concentration)

was conducted using automated hematology analyzer(Sysmex XE-2100D, Japan) and several reagents such as Cellpack (EPK), Cellsheath (ESE), Stomatolyser-4DS(FFS), Stomatolyser-NR (SNR),Stomatolyser-4DL(FFD), Stomatolyser-FB (FBA), Stomatolyser-IM (SIM), Sulfolyser(SLS), Retserch(II-RED) and Cellclean(Sysmex, Japan).

(2) Statistical data analysis

All collected data herein were analyzed using SPSS WIN 11.5. As a part of analytic technique, paired t-test was conducted to determine possible effects of scalp treatment on the level of ALP, GOT, GPT,  $\gamma$ -GTP, WBC, RBC, Hb, Hct, platelet, MCV, MCH and MCHC in the blood samples taken from subjects.

### III. Results and Implications

#### 1. Possible Effects of scalp treatment on ALP, GOT, GPT and $\gamma$ -GTP

1) ALP

The results of pre-and post-care reaction tests to determine effects of scalp treatment on ALP can be illustrated as shown in <Table 2> below.

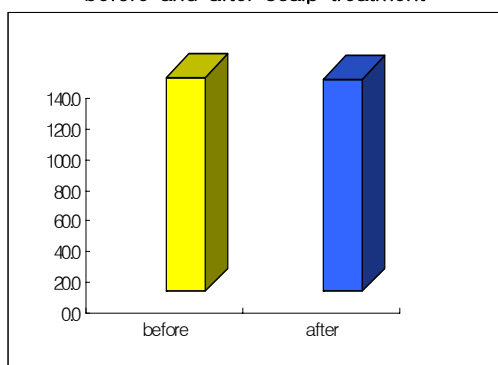
It is found that mean ALP level reached 139.60 before scalp treatment and 138.13 after scalp treatment, which means that ALP level decreased a little after scalp treatment, but there was no significant difference on statistical level. Decreasing ALP level is an index for the diagnosis of

<Table 2> Variations of ALP before and after scalp treatment

구 분	before		after		after-before		t	p
	M	SD	M	SD	M	SD		
ALP	139.60	36.68	138.13	37.01	-1.47	4.51	-1.78	0.085

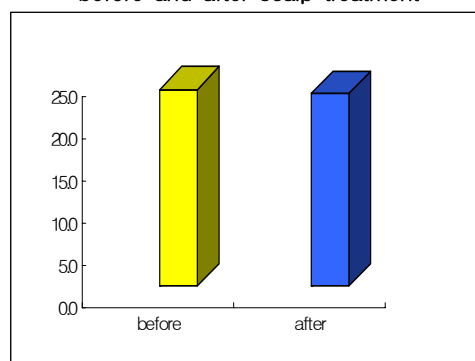
innutrition, hypothyroidism, pernicious anemia and congenital ALP reduction. Here, it is found that scalp treatment doesn't have so much influence on ALP.

<Figure 2> Variations of ALP before and after scalp treatment



was not any significant difference on statistical level. Increasing GOT level is an index for the diagnosis of fatty liver and liver cancer. Here, it is found that scalp treatment doesn't have so much influence on GOT.

<Figure 3> Variations of GOT before and after scalp treatment



## 2) GOT

The results of pre- and post-care reaction test to determine possible effects of scalp treatment on GOT can be illustrated as shown in <Table 3>.

It is found that mean GOT level reached 23.30 before scalp treatment and 22.83 after scalp treatment, which means that GOT level decreased a little after scalp treatment, but there

## 3) GPT

The results of pre- and post-care reaction test to determine possible effects of scalp treatment on GPT can be illustrated as shown in <Table 4>.

It is found that mean GPT level reached 22.33 before scalp treatment and 21.83 after scalp treatment, which means that GPT level decreased

<Table 3> Variations of GOT before and after scalp treatment

구분	before		after		after-before		t	p
	M	SD	M	SD	M	SD		
GOT	23.30	7.50	22.83	7.22	-0.47	1.87	-1.37	0.182

<Table 4> Variations of GPT before and after scalp treatment

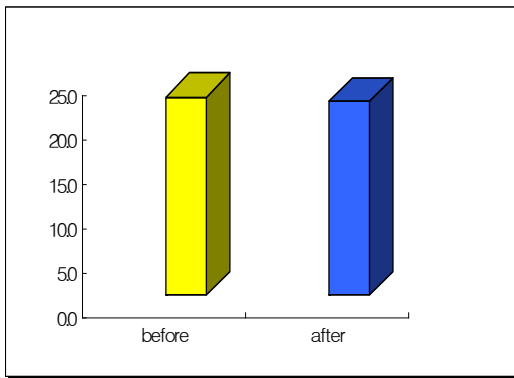
구분	before		after		after-before		t	p
	M	SD	M	SD	M	SD		
GPT	22.33	14.83	21.83	14.74	-0.50	0.82	-3.34**	0.002

\*\* p<.01

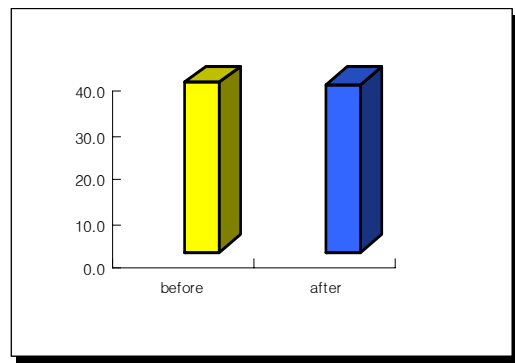
after scalp treatment, and there were significant differences on statistical level ( $t = -3.34, p < .01$ ). Typically, GPT responds sensitively to hepatic cell injury, and increasing GPT level is an index used to diagnose fatty liver, liver cirrhosis and liver cancer. Particularly, GPT level tends to increase when our body feels tired. In view of the positive effects of scalp treatment on decreasing GPT level, it is found that scalp treatment is effective in improving hepatic functions, which shows that it is also effective in recovery from physical fatigue.

treatment, which means that  $\gamma$ -GTP level decreased a little after scalp treatment, but there was not any significant difference on statistical level. Based on the finding that  $\gamma$ -GTP level increases due to fatty liver, chronic active hepatitis and alcoholic hepatitis, it is found that scalp treatment doesn't have so much influence on  $\gamma$ -GTP. The analysis on possible effects of foot reflex massage on  $\gamma$ -GTP also came to a finding about significant effects<sup>22)</sup>, but it is found that scalp treatment doesn't have so much influence on  $\gamma$ -GTP.

<Figure 4> Variations of GPT before and after scalp treatment



<Figure 5> Variations of  $\gamma$ -GTP before and after scalp treatment



4)  $\gamma$ -GTP

The results of pre- and post-care reaction test to determine possible effects of scalp treatment on  $\gamma$ -GTP can be illustrated as shown in <Table 5>.

It is found that mean  $\gamma$ -GTP level reached 38.10 before scalp treatment and 37.70 after scalp

2. Possible Effects of scalp treatment on WBC, RBC, Hb, Hct, Platelet, MCV, MCH and MCHC

1) WBC

The results of pre- and post-care reaction test to determine possible effects of scalp treatment on WBC can be illustrated as shown in <Table 6>.

<Table 5> Variations of  $\gamma$ -GTP before and after scalp treatment

구	단위	before		after		after-before		t	p
		M	SD	M	SD	M	SD		
$\gamma$ -GTP		38.10	43.87	37.70	43.50	-0.40	1.40	-1.56	0.130

<Table 6> Variations of WBC before and after scalp treatment

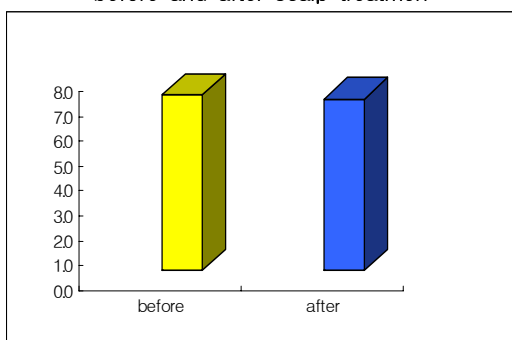
구분	항목	before		after		after-before		t	p
		M	SD	M	SD	M	SD		
	WBC	7.04	1.58	6.87	1.59	-0.17	0.67	-1.36	0.184

<Table 7> Variations of RBC before and after scalp treatment

구분	항목	before		after		after-before		t	p
		M	SD	M	SD	M	SD		
	RBC	4.63	0.53	4.60	0.53	-0.03	0.08	-2.38*	0.024

\* p<.05

<Figure 6> Variations of WBC before and after scalp treatment



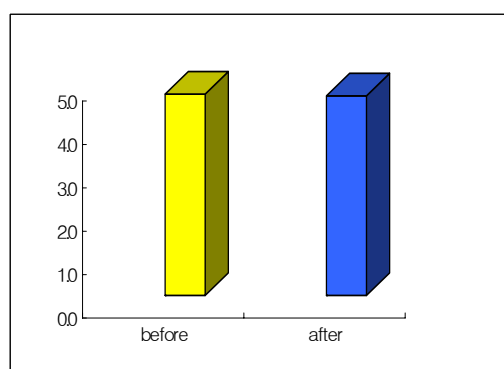
It is found that mean WBC level reached 7.04 before scalp treatment and 6.87 after scalp treatment, which means that WBC level decreased a little after scalp treatment, but there was not any significant difference on statistical level. In addition to body temperature measurement, WBC is one of most elementary data. WBC produces leukotaxin and helps leukocyte to pass through capillary membrane for the benefit of phagocytosis. It increases with bacterial infection and inflammatory reaction, while decreasing with virus infection and aplastic anemia. But it is found that scalp treatment does not have so much influence on WBC.

## 2) RBC

The results of pre-and post-care reaction test

to determine possible effects of scalp treatment on RBC can be illustrated as shown in <Table 7>.

<Figure 7> Variations of RBC before and after scalp treatment



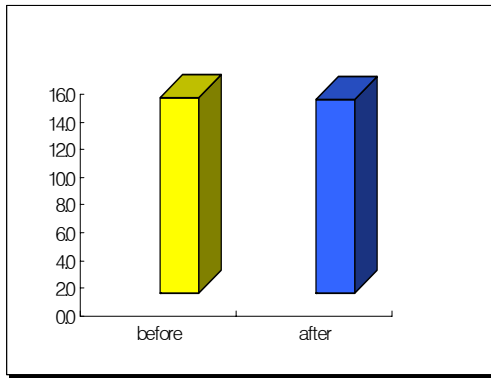
It is found that mean RBC level reached 4.63 before scalp treatment and 4.60 after scalp treatment, which means that RBC level decreased a little after scalp treatment, but there were significant differences on statistical level ( $t=-2.38, p<.05$ ). Decreasing RBC level leads to lower capacity to transport  $O_2$  followed by oxygen deficit, resulting in anemia. On the contrary, increasing RBC level leads to hemoconcentration followed by more inactivated blood circulation. Based on positive effects of scalp treatment on decreasing RBC level, it is

found that the scalp treatment is not advisable for clients suffering from anemia, hematocrasia and hemorrhage.

### 3) Hemoglobin(Hb)

The results of pre-and post-care reaction test to determine possible effects of scalp treatment on Hemoglobin(Hb) can be illustrated as shown in <Table 8>.

<Figure 8>Variations of Hemoglobin(Hb) before and after scalp treatment



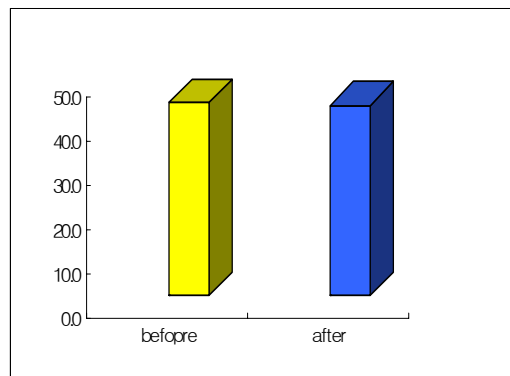
It is found that mean Hb level reached 14.05 before scalp treatment and 13.96 after scalp treatment, which means that Hb level decreased

a little after scalp treatment, but there was no significant difference on statistical level( $t=-2.38$ ,  $p<.05$ ). Hemoglobin plays a crucial role in carrying  $O_2$  into various tissue cells and absorbing waste product and  $CO_2$ . Here, it is found that scalp treatment doesn't have so much influence on the variation of Hb.

### 4) Hematocrit(Hct)

The results of pre-and post-care reaction test to determine possible effects of scalp treatment on Hematocrit(Hct) can be illustrated as shown in <Table 9>.

<Figure 9> Variations of Hematocrit(Hct) before and after scalp treatment



<Table 8> Variations of Hemoglobin(Hb) before and after scalp treatment

구	단위	before		after		after-before		t	p
		M	SD	M	SD	M	SD		
Hemoglobin(Hb)		14.05	1.95	13.96	1.96	-0.09	0.25	-1.88	0.071

<Table 9> Variations of Hematocrit(Hct) before and after scalp treatment

구	단위	before		after		after-before		t	p
		M	SD	M	SD	M	SD		
Hematocrit(Hct)		43.61	4.70	43.05	4.85	-0.56	0.93	-3.31**	0.002

\*\*  $p<.01$



It is found that mean Hct level reached 43.61 before scalp treatment and 43.05 after scalp treatment, which means that Hct level decreased after scalp treatment, and there were significant differences on statistical level ( $t=-3.31$ ,  $p<.01$ ). Hematocrit refers to the ratio of red blood cell in blood, which carries  $O_2$  in blood. Increasing Hct level causes vomiting, diarrhea and congenital heart disease, while decreasing Hct level causes anemia and iron deficiency anemia(IDA) but results in higher blood flow rate.

Based on positive effects of scalp treatment on decreasing Hct level, it is found that any anemia case should avoid scalp treatment, but scalp treatment is effective in facilitating blood circulation.

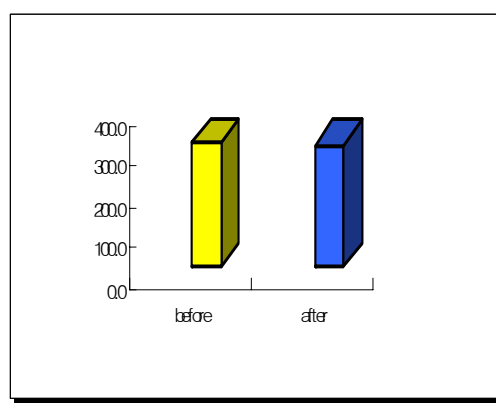
#### 5) Platelet

The results of pre-and post-care reaction test to determine possible effects of scalp treatment on platelet can be illustrated as shown in <Table 10>.

It is found that mean platelet level reached 303.73 before scalp treatment and 299.37 after scalp treatment, which means that platelet level decreased after scalp treatment, and there were

significant differences on statistical level ( $t=-2.12$ ,  $p<.05$ ). Based on platelet level associated with blood coagulation and hemostasis, it is found that scalp treatment is effective in both blood coagulation and hemostasis.

<Figure 10> Variations of Platelet before and after scalp treatment



#### 6) MCV

The results of pre- and post-care reaction test to determine possible effects of scalp treatment on MCV can be illustrated as shown in <Table 11>.

<Table 10> Variations of Platelet before and after scalp treatment

구분	before		after		after-before		t	p
	M	SD	M	SD	M	SD		
Platelet	303.73	62.88	299.37	59.59	-4.37	11.30	-2.12*	0.043

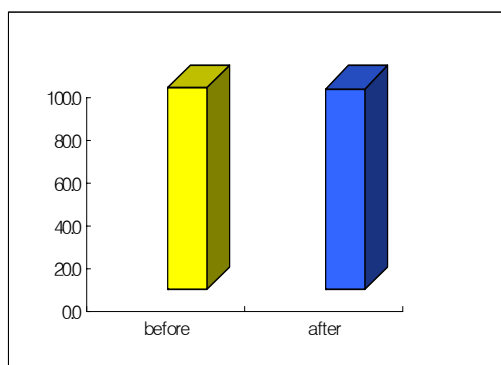
\* $p<.05$

<Table 11> Variations of MCV before and after scalp treatment

구분	before		after		after-before		t	p
	M	SD	M	SD	M	SD		
MCV	94.40	6.09	93.88	6.21	-0.52	0.84	-3.39**	0.002

\*\*  $p<.01$

**<Figure 11> Variations of MCV before and after scalp treatment**



It is found that mean MCV level reached 94.40 before scalp treatment and 93.88 after scalp treatment, which means that MCV level decreased after scalp treatment, and there were significant differences on statistical level( $t=-3.39$ ,  $p<.01$ ). Based on decreasing MCV level in association with iron deficiency anemia(IDA) and chronic anemia, it is found that any client with anemia or related symptoms must avoid scalp treatment.

7) MCH

The results of pre- and post-care reaction test to determine possible effects of scalp treatment on MCH can be illustrated as shown in <Table 12>.

It is found that mean MCH level reached 30.34

**<Table 12> Variations of MCH before and after scalp treatment**

구	단위	before		after		after-before		t	p
		M	SD	M	SD	M	SD		
MCH		30.34	2.58	30.38	2.55	0.03	0.28	0.66	0.5

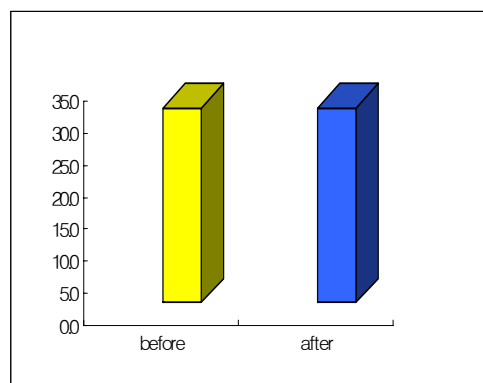
**<Table 13> Variations of MCHC before and after scalp treatment**

구	단위	before		after		after-before		t	p
		M	SD	M	SD	M	SD		
MCHC		32.11	1.29	32.34	1.31	0.23	0.41	3.03**	0.005

\*\*  $p<.01$

before scalp treatment and 30.38 after scalp treatment, which means that MCH level increased a little after scalp treatment, but there was not any significant differences on statistical level. Based on decreasing MCH level as a function of anemia due to retardation of hemoglobin synthesis as well as increasing MCH level as a function of hyperlipidemia and leukocytosis, it is found that scalp treatment doesn't have so much influence on the variation of MCH level.

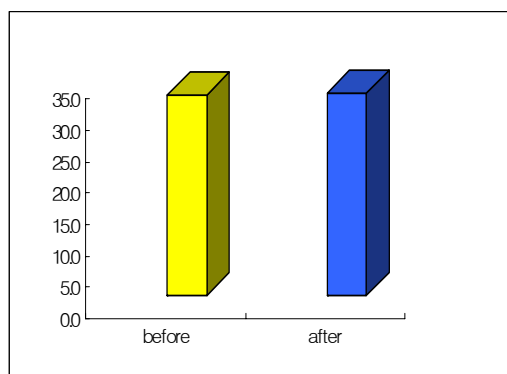
**<Figure 12> Variations of MCH before and after scalp treatment**



8) MCHC

The results of pre-and post-care reaction test to determine possible effects of scalp treatment on MCHC can be illustrated as shown in<Table 13>

<Figure 13> Variations of MCHC before and after scalp treatment



It is found that mean MCHC level reached 32.11 before scalp treatment and 32.34 after scalp treatment, which means that the MCHC level increased after scalp treatment, and there were significant differences on statistical level ( $t=3.03$ ,  $p<.01$ ). Based on increasing MCHC level as a function of hereditary spherocytosis, homozygous sickle cell anemia and hemoglobin dysfunction as well as decreasing MCHC level as a function of severe anemia, it is found that any client suffering from anemia or related symptoms should avoid scalp treatment.

#### IV. Conclusions

Scalp treatment was conducted by means of various massage techniques such as India's Ayurveda Champi head massage (invented ca. 4,000 years ago) and other different and further techniques to avoid scalp alopecia (around AD 700). This study sought to measure variations in the level of ALP, GOT, GPT,  $\gamma$ -GTP, WBC, RBC, Hb, Hct, Platelet, MCV, MCH and MCHC after this scalp treatment. As a result, this study could come to the following conclusions:

It was found that scalp treatment doesn't have

so much influence on the level of ALP, GOT and  $\gamma$ -GTP, but has significant effects on GPT( $t=-3.34$ ,  $p<.01$ ), while it doesn't have so much influence on WBC, Hb and MCH, but has significant effects on RBC( $t=-2.38$ ,  $p<.05$ ). Moreover, it is found that scalp treatment has significant effects on the level of hematocrit (Hct)( $t=-3.31$ ,  $p<.01$ ), platelet( $t=-2.12$ ,  $p<.05$ ), MCV( $t=-3.39$ ,  $p<.01$ ) and MCHC( $t=3.03$ ,  $p<.01$ ).

Based on these data, it can be concluded that scalp treatment is effectively associated with improving hepatic functions, facilitating blood circulation and helping blood coagulation and hemostasis in favor of better recovery from physical fatigue, but it will be necessary for further studies to focus on anemia or equivalent cases in association with scalp treatment.

This study refers to measurement on short-term effects of scalp treatment, so it will be necessary for follow-up studies to try a repetitive measurements on effectiveness of scalp treatment in human physiology.

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Received February 15, 2008

Revised (April 3, 2008 April 30, 2008)

Accepted May 6, 2008