DOI Number: 10.37506/v20/i1/2020/mlu/194573

A Study on the Effect of Eclipta Prostrata Extract and MTS on the Improvement of Scalp Health and Prevention of Hair Loss for Workers in Their 20s and 30s

Chang-Seok Lee[1], Joo-A Kang[2], Gyeong-yeon Kim[3], Gyu-Ri Kim[4]

[1]Professor, Dept. Department of Beauty and Cosmetic Science, Eulji University, Seongnam 13135, Korea, [2]Professor, Dept. Department of K-Beauty Industry Fusion, Konkuk University Continuing Education Center, Seoul 05029, Korea, [3]Professor, Department of Biological Engineering, Konkuk University, Seoul 05029, Korea, [4]Professor, Dept. Department of Beauty and Cosmetic Science, Eulji University Seongnam 13135, Korea

Abstract

Background/Objectives: External and mental stress from hair loss degrades the quality of life and affects the interpersonal relationship and daily social life of individuals. Lately, due to an increase in hair loss population, various chemically synthesized products for hair loss prevention or treatment have been commercialized in the market. However, these products have well-known adverse effects. In order to prevent such adverse effects, this study aimed to develop a natural substance and utilize a tool that aids its transdermal delivery. This study intended to elucidate the scalp health and hair loss prevention effects of Eclipta prostrata and microneedle therapy system (MTS) use on the scalp of office workers in their 20s and 30s who have suffered from hair loss, in addition, to present a potential product for improving scalp conditions and preventing hair loss.

Method/Statistical Analysis: In order to identify the effects of the MTS and the Eclipta prostrata extract on improvement of scalp condition and prevention of hair loss, this study conducted scalp treatments on 24 office workers in their 20s and 30s who have suffered from hair loss by dividing them into three groups: MTS group, Eclipta prostrata group, and MTS-Eclipta prostrata group. The scalp treatment was performed for 10 weeks with one 30-min turn per week, resulting in 10 turns in total. The same home care products including shampoo and conditioner were distributed to all participants for use during the entire period of experiment. Hair density, hair thickness, effect on scalp improvement, and hairline distance were measured using a scalp diagnostic device (Kong Scope, Korea) and a measuring tape before, 5 weeks after, and 10 weeks after the experiment. Participants were then surveyed for satisfaction level after the experiment.

Findings: In the results, all three groups showed increase in hair density and thickness and a decrease in frontal hairline distance at both hairlines, 10 weeks after the experiment. Only the MTS-Eclipta prostrata group showed a statistically significant increase in hair density from 18 ea at 0 week to 19.43 at 10 weeks, hair line thickness, and frontal hairline distance changes. The Eclipta prostrata group also showed a significant increase in hair thickness. Furthermore, majority of the participants showed clean scalps with new hair growths 10 weeks after the experiment.

Improvements/Applications: It was revealed that co-treatment with MTS and Eclipta prostrata extracthad more effect on hair density, hair thickness and hairline distance change. Furthermore, the satisfaction survey

Corresponding Author:
Gyu-Ri Kim
Professor, Dept. Department of Beauty and Cosmetic Science, Eulji University Seongnam 13135, Korea
e-mail: whiteapple80@hanmail.net

result after the experiment showed a positive response for hair richness and reduction in itching and sebum amount, thereby building self-confidence. Accordingly, it was proved that the use of MTS and the Eclipta prostrata extract is effective in scalp health and hair loss improvement.

Keywords: *Eclipta prostrata extract, MTS (Microneedle Therapy System), Hair care, Hair loss, Scalp health.*

Introduction

The external and mental stress from hair loss negatively affect the quality of life, interpersonal relationship, and daily social life of individuals. An increase in the number of hair loss population leads to an increase in the population that have suffered from hair loss-related symptoms as well. Therefore, creating demands for hair and scalp health products and treatments such as hair transplantation.

For accurate investigation of hair loss population, the data of number of patients who had been hospitalized or had been outpatients due to hair loss from 2013 to 2017 were acquired from the Healthcare Bigdata Open System[1] provided by the Health Insurance Review & Assessment Service (HIRA).

According to HIRA, the number of hair loss patients treated in 2013 was 205,659. Also, there was a slight decrease in number from 208,688 in 2014 to 208,534 in 2015 and a significant increase from 212,916 in 2016 to 215,025 in 2017[1].

Recently, there have been several studies and clinical trials that evaluate the efficacy of natural extracts on hair growth, for instance,cultured wild ginseng roots which was proven to facilitate hair loss prevention, hair growth, dandruff control, and have antibacterial properties[2].

MTS is a device that can approximately create 200,000 micro-holes with its 192 microneedles to facilitate effective transdermal transport of compounds and induce collagen synthesis[3]. According to a study, use of MTS on human dermis showed improvement in pores, pigment reduction, hair density, and hair thickness. Moreover, the use of traditional medicinal herb extracts, green tea, biota seed and MTS resulted in increased hair density[4].

Eclipta prostrata L. refers to an annual or biennial plant that belongs to the Asteraceae family and typically grows in moist areas and in central or southern regions of Korea.A damage to its stem causes a leak of Chineseink-like black liquid which can be used to dye beard or hair black and to grow hair, a method used by the ancients asstated in Uibangyuchwi, the biggest oriental medicine encyclopedia. Ithas various names such as Yejangcho, Mukallyeon, Mukttucho, Mukcho, Mugyeoncho, Hallyeonpul, and Haryeoncho. In Sinsuboncho, it is named as Eopungjang and in Dogyengboncho as Hallyeonja, which is its generic name. Inoriental medicine, Eclipta prostrata is characterized to have a spicy and salty taste and a warm property[5, 6]. The entire body of Eclipta prostrata plant contains active ingredients such as saponin, nicotine, tannin, vitamin A, ecliptine, and thiophene compounds while its leaves containwedelolactone and desmethylwedelolactone-7-glucoside[7]. Of these, nicotine and wedelolactone have been known to cause the dark coloringof the liquid.

One study stated that Eclipta prostrata can be used for management of inflammation[8]. Recently,both desmethyl-wedelolactone and wedelolactone were isolated from the leaf extract[9] and 2-[butadiin-(1,3)-yl]-5-[buten-(3)-in-(1)-yl]-thiophen, a thiophene derivative, was separated from the entire body of the Eclipta prostrata plant[10]. Other studies have reported on the biological activities of the compounds found in Eclipta prostrata such as their effects on liver function in hepatic carbon tetrachloride poisoning [11], as well as mechanism of their hypoglycemic effect [12, 13], anticancer effect [14], hair growth effect in albino rats [15], healing effects of ethanol extracts[16], and immune-boosting effects[17, 18].

The traditional oriental medicine literature show that Eclipta prostrata can change gray hairs to black, can provide anti-aging function[19], and can be used for prevention and treatment of inflammatory diseases[20,21]. This study aims to elucidate the effects of Eclipta prostrata and MTS on scalp and hair loss in normal office workers in their 20s and 30s who have suffered from hair loss, in addition, to present a potential product for improving scalp conditions and preventing hair loss.

Method

1. **Study Subjects:** The participants of this study were 24 normal office workers in their 20s and 30s from K call center in Yun deung po-gu, Seoul. Their patterns of hair loss, types of scalp, and general characteristics were examined.
2. **Study Materials:** Carefully screened Eclipta prostrata was cleanly washed and dried, then matured with ultrasound waves within the solvent (1,3- Butylene Glycol 30% and Glycerin 5%) for 96 hours at 60°C. Afterwards, filtration was performed for extraction. The extraction ratio of Eclipta prostrata was 1:15~20, containing 5~6% of the original juice from Eclipta prostrata.

Table 1. Ingredient analysis

Compounding Ingredient	Weight (%)
Purified Water	62
Butylene Glycol	30
Glycerin	5
Eclipta Prostrata Extract	3
Total	100

3. Study Procedure

The comparison of variables of before and after the care such as hair density, hair thickness, effect on scalp improvement, and frontal hairline distance change,of male and female adult office workers in their 20s and 30s who have suffered from scalp troubles and hair loss is shown in Figure 2.

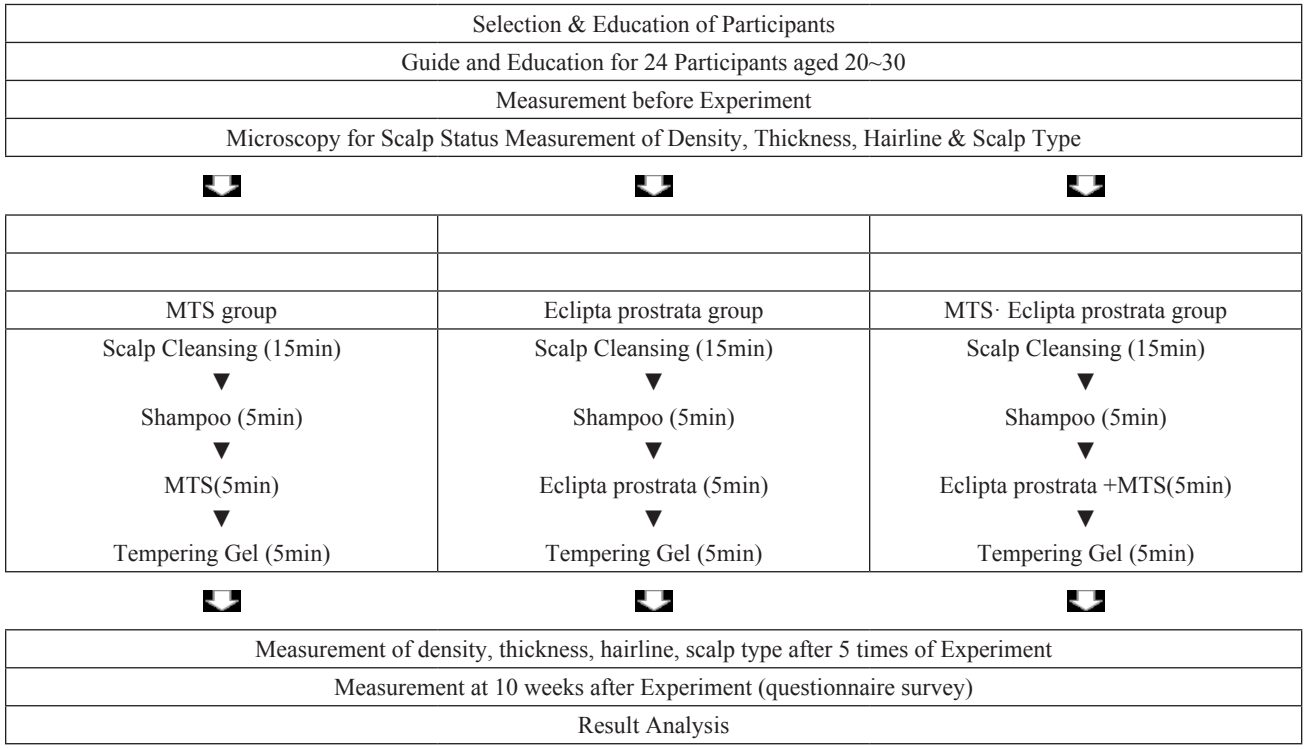


Figure 2. Whole Experiment Flow Diagram

4. **Analysis Methodology:** The acquired results were statistically processed using SAS (Statistical Analysis System version 9.1.3) and Statistics Program R (version 2.13.0).

Result

1. **General Characteristics of Participants:** The general characteristics, hair loss patterns, scalp types, time of initial hair loss, and stress of participants were examined. The average age of the 22 to 30-year-old participants was 28. In terms of hair loss, no family history accounted for 45.8%, 33.3% from father's side and 20.8% from mother's side. Furthermore, normal stress accounted for 66.7% and scalp type fell into two, oily or dry, both 33.3%.

2. **Hair Density Change before and after Experiment for each Group:** The measurements revealed non-significant increased tendency in hair density in both the MTS and the Eclipta prostrata groups while the MTS-Eclipta prostrata group exhibited a statistically significant difference with 18.00 ea at week 0 to 19.43 at 10 weeks after the experiment as shown in table 2.

Table 2. Hair Density Change before and after Experiment for each Group (Unit : ea/#)

Group	0 Week	5 Week	10Week	χ^2	Probabilit[b] (*p* value)
	M±SD				
MTS	19.23±3.34	19.32±3.27	19.98±3.37	1.237	0.0643
EPE	17.40±2.69	17.63±2.81	18.13±2.78	1.344	0.0703
MTS+EPE	18.00±2.92	18.63±2.95	19.43±3.08	15.073	0.0015**

** $P < 0.01$, # Unit Area 0.38cm×0.28cm

3. **Hair Thickness Change before and after Experiment for each Group:** The comparison of hair thickness at week 0 and at week 10 revealed an increase in all three groups. A statistically significant difference was observed in the Eclipta prostrata and the MTS-Eclipta prostrata groups as shown in Table 3.

Table 3. Hair Thickness Change before and after Experiment for each Group (Unit : mm)

Group	0 week	5 week	10 week	χ^2	Probability[b] (*p* value)
	M±SD				
MTS G	0.0382±0.0065	0.0381±0.0059	0.0410±0.0062	1.258	0.0664
EPE G	0.0378±0.0081	0.0381±0.0084	0.0411±0.0078	11,563	0.0204
MTS+EPE	0.0374±0.0071	0.0382±0.0073	0.0409±0.0065	12.453	0.0153*

*$P < 0.05$

4. **Frontal Hairline Distance Change:** The results of frontal hairline distance, measured to a terminal hair, revealed a decreased tendency at 10 weeks after the experiment in all three groups. Only the MTS-Eclipta prostrata group was statistically significant.

Table 4. Frontal Hairline Change before and after Experiment for each Group (Unit : cm)

Group	0 week	5 week	10 week	χ^2	Probabilit[b] (*p* value)
	M±SD				
MTS	13.19±1.63	12.52±1.54	0.67±0.09	0.42	0.1929
EPE	13.28±1.26	12.55±1.28	0.73±0.19	0.554	0.1465
MTS+EPE	13.33±1.51	12.45±1.51	0.88±0.23	13.572	0.0065**

** $P < .01$

5. **Scalp Improvement:** The scalp status of most participants showed blurry and generally reddened scalps with excessive sebum and dead skin cell-clogged holes, predominantly thin and weak hairs and empty follicles. Ten weeks post-treatment revealed a nearly normal scalp appearance of pellucid and clean scalp with decreased amount of excreted sebum, clean holes, and new hair growth as shown in Figure 3.

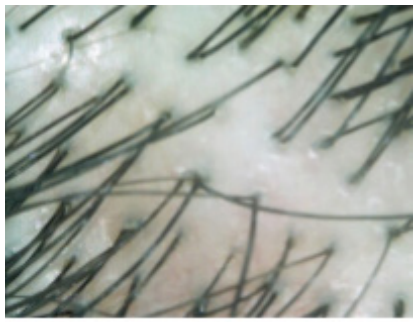
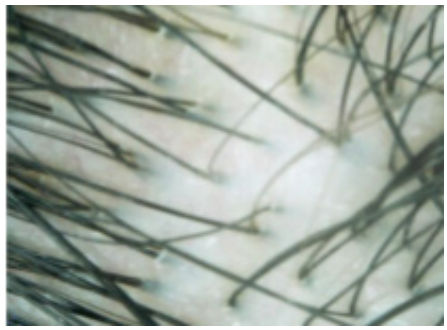
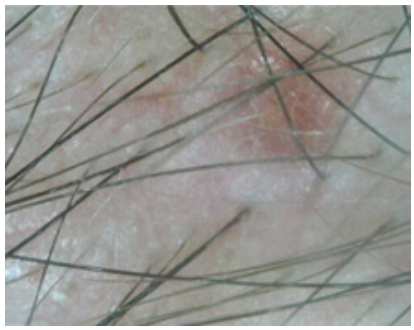
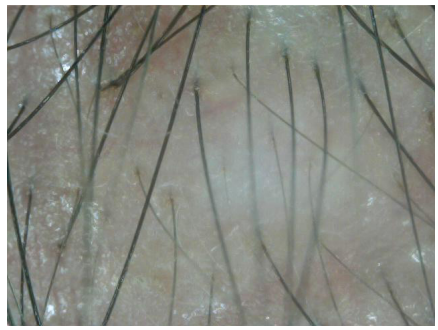
	Before	After
A		
B		
C		
D		

Figure 3. Scalp Status Change in MTS group before and after the Care

Discussion

This study was conducted by dividing the participants into a control group, which used a scalp improvement agent with the natural extracts and an experimental group, which added scalp scrubs. People with long-standing hair loss treatment failure had benefited from improvement thus, the Eclipta prostrata was observed to have positive effects on the hairs and on the problematic scalps. The study demonstrated a notable effect on hair loss treatment in the control group which used scalp improvement agent with natural Eclipta prostrata extract and a significant improvement in hair growth and thickness in the experimental group that used scalp improvement agent, natural Eclipta prostrata extract, and

MTS. Furthermore, aside from improved problematic scalp, the latter had better improvement in the number and thickness of hairs compared to the control group that only used MTS.

Based on these results, it is deemed that the compounds of the Eclipta prostrata extract, such as saponin, tannin, amara, ecliptine (Eclipta prostrata with small leaves), vitamin A-like substances, and wedelolactone and demethylwedelolactone-7-glucosid that are compounds of nicotine and coumarin, have brought in antioxidative and antibacterial effects to human body, thereby improving blood circulation and preventing hair loss and dandruff formation. The study elucidated the effects of Eclipta prostrata and MTS only in participants who are office workers aged 20-30 years old, therefore, further studies by age groups and by scalp types are necessary.

Conclusion

This study compared the variables,which include hair density, hair thickness, scalp improvement effect and the frontal hairline distance change, of before and after the care in the male and female office workers in their 20s and 30s who have suffered from scalp troubles and hair loss. The results are as follows.Firstly, hair density of all three groups increased at 10 weeks after the experiment. Secondly, in terms of hair thickness, all three groups exhibited an increased tendency whencomparing Week 0 and Week 10. Also,the Eclipta prostrata group showed a statistically significant difference. Thirdly, regarding frontal forehead hairline distance, the measurement results of the distance to a terminal hair revealed that a decreased tendency was observed at both hairlines at 10 weeks after the experiment in all three groups. The MTS-Eclipta prostrata groups had statistically significant difference in all variables. Lastly, most of the pre-treatment scalp status of the participants were overall red and blurry, had holes clogged with excessive sebum and dead skin cells,with predominantly thin and weak hairs, and had some empty follicles. Ten weeks later, however, it was observed that the status of most of the scalpswere pellucid and clean, close to normal scalp appearance, and with presence of new hair growths, decreased amount of secreted sebum, and clean hole surroundings.

In summary, when co-treated with MTS and Eclipta prostratafor scalp care, a positive effect was observed in terms of hair density, hair thickness, and frontal hairline distance compared to those of MTS or Eclipta prostratause alone, moreover, participants from all three groups showed satisfaction after scalp care.

Based on the findings of this study, Eclipta prostrata is expected to play the role of a safe anti-hair loss agent and scalp condition enhancer, and is thought to have a high potential as a cosmetic with an anti-hair loss function.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

References

1. Healthcare BigData Open System.The annual status of the number of people with hair loss. Available from: http://www.opendata.hira.or.kr. (2017).
2. G. S. An and G. S. An. Experimental Study on the Prevention of Hair Loss and Hair Growth by Herb Extracts Containing Wild Ginseng Cultured Root, Korean Society of Human Beauty and Art. 4(10), 221-226, (2009).
3. J. H. Kim. Improvement of the clinical experiment which uses the Micro-needle and Galvanic Current Machine of skin condition. Sookmyung Women's University.(2008).
4. N. R. Kang, H. J. Yoon and W. S. Ko, Effects of Microneedle Therapy System(MTS) and Hwangryeonhaedoktang Pharmacopuncture Solution on Hair Growth in an Alopecia Model of C57BL/6N Mouse. J Korean Med Ophthalmol Otolaryngol Dermatol. 29(1):47-6, (2016).
5. S. N. Park, S. L. Lee, B. L. Song, Antioxidant, Antiaging and Antimicrobial Effects of Ethanolic Extract and Ethyl Acetate Fraction from Eclipta prostrata. J. Soc. Cosmet. Scientists Korea, pp.349-362, (2018)
6. Korea Institute of Oriental Medicine. Clean up basic drugs used: Report on the characteristics and differentiation necessary for the standardization of herbal medicines. Korea Medical Research Institute, Seoul, pp 601-609, (1998)
7. B. J. Jeng and M.K. Shin. Dohae Hyangje Dictionary.Seoul: Yeonglimsa. 1043-4, (2003).
8. H. C. Jo. Anti-inflammatory effects of the water extract of Ecliptae Herba. Master's Thesis, Graduate School of Daegu Haany University.(2010).

9. Zhu YP. Chinese Maetria, harwood academic publishers, The Netherlands, 646, 1998.
10. Bohlmann F, Zdero C. Uber die Inhaltsstoffe aus Eclipta erectra L. chem ber. 103: pp834-841, (1970).
11. Srivastava R, Kulshreshtha KK. Bioactive polysaccharides from plants, phytochemistry. 28 : 2877~2902, (1986).
12. S. Dixit and M. Achar, Study of Bhringaraja (Eclipta alba) therapy in jaundice in children, J. Sci. Res. Plant Med., 2(4), 96 (1981).
13. H. Wagner, B. Geyer, Y. Kiso, H. Hikino, and G. S. Rao, Coumestans as the main active principles of the liver drugs Eclipta alba and Wedelia calendulacea1, Planta Medica, 52(5), 370 (1986).
14. Y. D. Jung, H. Lee. Y.k. Lim. Immunity of Hannyeoncho Herbal Acupuncture on Foot Gene and anticancer activity. Korean Acupuncture Journals. 20 (3): 141-53, (2003).
15. R. K. Roy, M. Thakur, and V. K. Dixit, Hair growth promoting activity of Eclipta alba in male albino rats, Arch. Dermatol. Res., 300(7), 357 (2008).
16. S. Sharma and M. S. Sikawar, Wound healing activity of ethanolic extract of leaves of Eclipta alba, Pharmacogn. Mag., 4(13), 108 (2008).
17. Lee YS, Kim HS, Kim SK, Kim SD.IL-6 mRNA Expression in Mouse Peritoneal Macrophages and NIH3T3 Fibroblasts in Response to Candida albicans. J Microbiol Biotechnol. 2000; 10: 8-15, (2000)
18. Higuchi M, Higashi N, Taki H,Osawa T. Cytolytic mechanism of activated macrophages. Tumor necrosis factor and L-arginine-dependent mechanism acts as synergistically as themajor cytolytic mechanism of activated macrophages. J Immunol. 144:1425-31, (1990).
19. K. H. Bae, Korean medicinal plant. Kyohak. Seoul, pp 502, (2000).
20. V. G. Khanna and K. Kannabiran, Antimicrobial activity of saponin fractions of the leaves of Gymnema sylvestre and Eclipta prostrata, World J. Microbiol. Biotechnol., 24(11), 2737 (2008).
21. D. I. Kim, S. H. Lee, J. H. Choi, H. S. Lillehoj, M. H. Yu, and G. S. Lee, The butanol fraction of Eclipta prostrata (Linn) effectively reduces serum lipid levels and improves antioxidant activities in CD rats, Nutr. Res., 28(8), 550 (2008)