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The clinical treatment effect of androgenetic alopecia with YuFa and YuFa combined with 1550nm non-ablative fractional Laser

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[ABSTRACT] Objective To observe the clinical treatment effect of androgenetic alopecia with YuFa and YuFa combined with 1550nm non-ablative fractional Laser. **Methods:** each AGA patient received 10 treatments at 2-week interval on the split of hair loss scalp including the fronto vertical and parietal regions. After laser treatment immediately, each patient was applied topical YuFa on the whole alopecic area including laser treatment area and instructed to apply twice a day. Hair detector equipment was used to detect hair density and hair diameter pre and post treatment. **Result:** two kinds of treatment therapy increased hair density significantly. ($P < 0.01$). **Conclusions:** It has certain curative effect to treat androgenetic alopecia with YuFa and YuFa combined with 1550nm non-ablative fractional Laser.

[KEY WORDS] androgenetic alopecia; YuFa; 1550nm non-ablative erbium glass fractional Laser. DOI:10.19593/j.issn.2095-0721.2018.03.010

The amount of hair is very important to human appearance. Alopecia caused by various reasons, such as Androgenetic Alopecia (AGA), alopecia areata and cicatricial alopecia, not only affects the appearance, but also negatively affects the psychology of patients, which seriously affects the quality of life of patients [1]. According to the investigation of androgenetic alopecia in 3519 males and 3537 females in Shanghai, the prevalence of androgenetic alopecia in males is 19.9%, and that in females is 3.1% [2].

With the development of economy and the continuous improvement of people's living standards, the expectation of treating androgenetic alopecia is getting higher and higher. Although many studies have shown

that androgen level in circulating blood, 5 α -reductase and local androgen receptor are closely related to the occurrence of androgenetic alopecia, its pathogenesis is still unclear, and the treatment methods for these targets cannot solve all the problems of androgenetic alopecia [3]. Therefore, in order to find a more effective treatment, laser and light, such as low-energy laser treatment, 308nm excimer laser, and PUVA, have been applied to treat alopecia and have been reported to achieve certain curative effects [4]. In recent years, higher energy lasers have been tried to treat alopecia.

Light can be used to treat alopecia. Kwang Ho Yoo et al [5] reported that a patient with alopecia areata with a 2-year history of multiple skin lesions was treated with dot matrix laser. The patient had been treated with topical 5% minoxidil tincture, hormone and intradermal hormone blocking, but his condition was not improved. However, after

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laser treatment for one month, his hair began to regrow, and 30% to 40% of his scalp grew terminal hair after three months, and all his hair grew after six months, and no side effects were found during the treatment. WON-SERK Kim et al [6] conducted C3H/HeN animal experiment with erbium-glass lattice laser at 1550nm and treated 20 male alopecia patients, and also confirmed that lattice laser can promote hair growth, although clinical trials showed that alopecia recurred one month after treatment. Therefore, we assume that the combination of laser and topical hair growth fluid may have better curative effect on alopecia and observe its clinical curative effect.

1 Materials and Methods

1.1 Object of Study

29 patients with AGA of different severity were from the first hospital of China medical university from January 2014 to March 2014. One AGA patient stopped treatment for personal reasons, and the other 28 patients received the whole treatment process. All AGA patients were male, aged 22-59 years, with an average age of (36.9±8.8). The hair loss was classified by BASP method. (table 1A). Before treatment, all patients signed written informed consent. Patients suffering from systemic diseases in the last 6 months, or taking any drugs that affect the hair cycle orally in the last 3 months, or having undergone hair transplantation were excluded.

1.2 Method and Equipment

Using 1550nm non-ablative erbium glass laser (GSD Company, Shenzhen, China) and topical hair growth fluid (gift from Guangzhou Baosijie Cosmetics Company, Guangzhou, China), the hair loss area of each AGA patient was randomly divided into two sides. If the hair loss on both sides was uneven, the severe side was given 1550nm non-ablative erbium glass laser and topical hair treatment, and the

other side was given simple hair treatment. Each patient received 10 laser treatments. The interval was 2 weeks, and the external drug was used once every morning and evening, and was continuously applied until the end of laser treatment. Each patient received 10 laser treatments.

Because the parameters of laser treatment of alopecia have not been established before, we choose the following parameters according to the pain of patients and the color change of scalp after operation: 1550nm non-peeling lattice erbium glass laser: 10-20mJ pulse energy, 300 /cm² density, static mode; After laser treatment, the scalp turns red, and the pain caused by laser treatment can be tolerated, so it is not necessary to use narcotic drugs for external use. For AGA patients, in order to detect the hair density, we symmetrically shaved off a large area of hair with about one dollar coin in the alopecia area.

1.3 Efficacy Evaluation

Before and after treatment, high-resolution digital cameras (Nikon, Tokyo, Japan) and hair detector systems (CBS-1717, Taiwan Province, China) were used to evaluate the hair density and hair thickness of AGA patients before and after treatment. During the evaluation, a large area of hair with about one dollar coin was shaved symmetrically in the alopecia area of the patient, and the hair was positioned with a tape measure, which was measured three times before the treatment and half a month after the final treatment, and the average value was taken. Evaluation of treatment effectiveness includes objective evaluation by doctors and subjective satisfaction evaluation by patients. Satisfaction evaluation includes obvious improvement, moderate improvement, slight improvement, no change and aggravation of illness. Telephone follow-up (3m-fu) was conducted 3 months after 10 treatments to understand the hair growth of patients after

stopping treatment. The evaluation of adverse reactions is based on inquiring patients' complaints and observing skin reactions, including erythema, edema, dandruff, dryness, itching and broken hair.

1.4 Statistical Analysis

Statistical software SPSS17.0 was used for statistics. Paired t test was used to compare the

density difference between the two treatments before and after treatment, Wilcoxon rank sum test was used to compare the density difference between the two treatments, rank sum test was used to compare the density difference between the two treatments, and Mann-Whitney test was used to test the thickness difference. $P < 0.05$.

Table 1 Basic characteristics of 29 AGA patients

| Hair loss classification | Number of cases | Average age (years) | Course of disease (years) | Have a family history | The treatment methods that have been accepted |
|--------------------------|-----------------|---------------------|---------------------------|-----------------------|---|
| M0F2 | 7 | 29±4.7 | 7.6±3.6 | 1 | Minoxidil tincture |
| M0F3 | 10 | 41±8 | 9.1±6.1 | 2 | Untreated |
| M0V2 | 1 | 46 | 4 | 0 | Untreated |
| M2 | 3 | 24±1.7 | 2.7±2.1 | 1 | Minoxidil tincture, oral finasteride |
| M3 | 1 | 25 | 5 | 0 | Oral Chinese medicine |
| M3F2 | 1 | 27 | 15 | 1 | Untreated |
| C2F3 | 1 | 45 | 12 | 0 | Untreated |
| C3V3 | 2 | 41±11 | 5 | 2 | Untreated |
| C3F2 | 1 | 37 | 6 | 1 | Untreated |
| U2 | 2 | 45±1 | 12.5±10.6 | 1 | Untreated |

2 Results

All 28 patients with AGA received the whole treatment process and received telephone follow-up for 3 months. Before the initial treatment, the average hair density was $(68.79 \pm 17.33)/\text{cm}^2$ and the average hair thickness was (55 ± 13) μm . After 5 months of laser combined with topical treatment, the average hair density increased significantly to $(99.27 \pm 16.58)/\text{cm}^2$, but the hair thickness did not improve significantly (56 ± 14) μm , see table 2 and figure 1a. The average hair density increased from $(76.61 \pm 14.15)/\text{cm}^2$ to $(89.76 \pm 15.79)/\text{cm}^2$, while the hair thickness had no significant change (56 ± 16) μm , see Table 3 and Figure 1b. There are also statistical differences between the two treatment groups ($P < 0.01$), as shown in Table 4.

Interestingly, different types of AGA have different effects on the same treatment. No matter what kind of treatment method, it has a significant effect on F-type and U-type alopecia classified by BASP (Figure 2,

Figure 3), but it has little effect on M-type and C-type alopecia. (Figure 4) According to the objective evaluation of photos, 22 cases (78.6%) of 28 patients were effective. 8 cases (28.6%) showed significant improvement, 10 cases (35.7%) showed moderate improvement and 4 cases (14.3%) showed slight improvement. However, 6 cases (21.4%) showed no improvement. Self-evaluation of patients showed that 22 patients (78.6%) consciously improved to varying degrees, while 6 patients (21.4%) showed no improvement but no aggravation. There were no obvious side effects, such as erosion, edema, Dandruff, dry or broken hair and so on, except erythema immediately after laser operation. After 3 months' telephone follow-up, 2 patients with M2 and M3 decided to undergo hair transplantation because they were not improved. Other patients hoped to continue our treatment plan.

Table 2 Evaluation of hair detector after laser-assisted external treatment

| | Hair density (/cm ²) | Hair thickness (um) |
|---|----------------------------------|---------------------|
| Before treatment | 68.79±17.33 | 55±13 |
| After laser-assisted combined treatment with external drugs | 99.27±16.58 | 56±14 |
| <i>P</i> | <i>P</i> < 0.01 | <i>P</i> > 0.05 |

Table 3 Evaluation of hair detector after treatment with simple external medicine

| | Hair density (/cm ²) | Hair thickness (um) |
|--|----------------------------------|---------------------|
| Before treatment | 76.61±14.15 | 56±10 |
| After treatment with external medicine alone | 89.76±15.79 | 56±16 |
| <i>P</i> | <i>P</i> < 0.01 | <i>P</i> > 0.05 |

3 Discussion

Ito and his colleagues [7] reported in Nature for the first time in 2007 that after full-thickness skin injury in mice (C57BL/6J mice, 1cm² full-thickness skin was excised), complete regenerated hair follicles appeared during the repair of the injury.

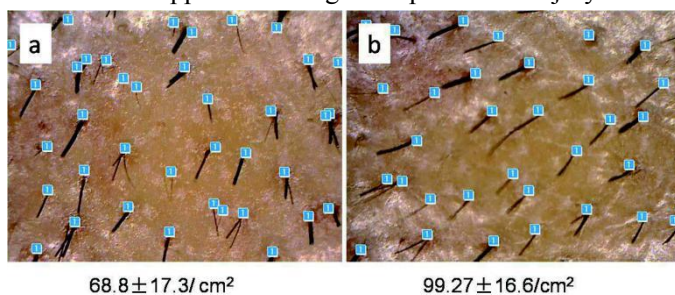


Fig. 1A, Changes of average hair density before and after laser-assisted external treatment

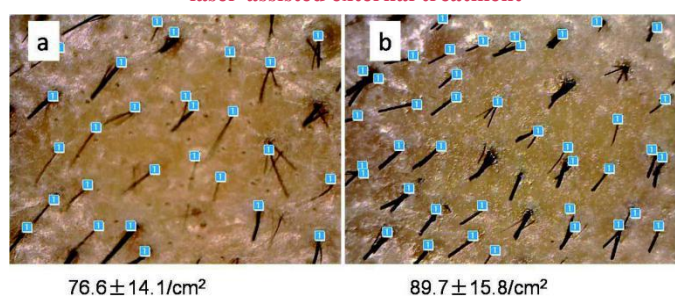


Fig. 1B, changes of average hair density before and after treatment with external medicine alone

Table 4 Comparison of hair density and thickness changes between two treatments

| | Hair density (/cm ²) | Hair thickness (um) |
|---|----------------------------------|---------------------|
| Laser-assisted combined treatment with external drugs | 30.48±12.79 | 1±8 |
| After treatment with external medicine alone, | 13.15±10.14 | 0.1±14.9 |
| <i>P</i> | <i>P</i> < 0.01 | <i>P</i> > 0.05 |



Fig. 2, AGA, M0F2 type, right laser plus external drug treatment, left only external drug treatment

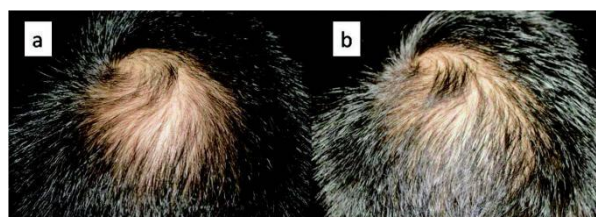


Fig. 3, AGA, C2V2, laser plus external medication

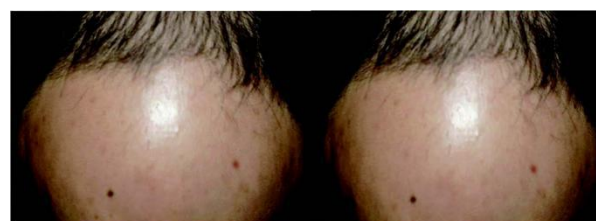


Fig. 5, AGA, C3 type, laser plus drug therapy

Therefore, it can be concluded that the process of wound repair can induce the skin to enter a state similar to "embryolization" and restore the potential of multi-directional differentiation, which may provide a new direction for hair loss treatment. However, this kind of massive wound will inevitably lead to scar formation in human body, so it is very important to choose the wound which can promote hair growth and has little side effect. G.-Y. Lee et al [8] used 1550nm non-exfoliating erbium glass laser to treat female androgenetic alopecia. The results showed that this laser can induce hair growth, detect the changes of hair density and thickness, and obtain a significant increase, which is similar to our experimental results, especially the hair follicle density increased significantly. Dot-matrix laser can generate micro-beams arranged in an array to act on the skin, forming a plurality of microscopothermal zones (MTZs). MTZs has a straight diameter of 50-150μm and a depth of 400-1000μm, including completely peeled

skin tissue in the center and a circle of thermal coagulation zone around it. MTZs induces a more "sufficient" wound repair response to the surrounding normal skin to promote skin regeneration. Prignano F et al [9] treated 18 Caucasian patients with lattice laser and detected the levels of EGF, bFGF, PDGF, TGF- β , VEGF and other cytokines. It was found that the expression of these cytokines began to increase immediately after operation and remained high until 30 days after operation. Many studies show that the activation of hair follicle stem cells must involve a variety of cytokines and growth factor signaling pathways in order to promote hair regeneration [10].

Therefore, it is speculated that the wound repair induced by dot-matrix laser may interact with cytokines secreted by various inflammatory cells and activate various signal pathways, thus promoting the proliferation and differentiation of hair follicle stem cells. As for the specific mechanism, further research is needed. Our experiment not only uses laser to treat alopecia, but also uses topical hair tonic, so the clinical effect is relatively better. This is not only related to the fact that dot matrix laser destroys the normal barrier function of skin and promotes the absorption of external drugs, but also closely related to the promotion of hair by domain hair tonic. Yufa Shengfa Liquid uses natural plant extracts such as Polygonum multiflorum, Ginseng, Gynostemma pentaphyllum, Angelica sinensis and Swertia japonica as main raw materials to treat various types of alopecia. It mainly expands blood vessels, increases local microcirculation, improves scalp microenvironment [11, 12], enhances Shh and β -catenin protein expression, promotes hair follicle transition from resting stage to growth stage, prolongs hair follicle growth stage, promotes melanin synthesis of hair follicle [13, 14], reduces apoptosis of hair follicle cells, and promotes differentiation and proliferation of hair papilla cells and provides nutritional support for

hair follicle growth by activating ERK and AKT signal pathway in hair papilla [15-17]. Therefore, the treatment of various alopecia by laser combined with Yufa Shengfa Liquid is worthy of further study and clinical application.

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