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| RESEARCH ARTICLE

Efficacy of Low Level Laser Therapy Combined with Scalp Microneedling using Clobetasol Propionate 0,05% Solution for the Management of Androgenetic Alopecia

Mungky Sukarnadi[1] ✉ and Syarief Hidayat[2]
[12]Lettice Dermatology, Tanjungpinang, Riau Islands, Indonesia
Corresponding Author: Mungky Sukarnadi, **E-mail**: smungky@yahoo.com

| ABSTRACT
Androgenetic alopecia (AGA) is the most common, affecting over half of men and women. Low-level laser therapy (LLLT) has been claimed as a safe devise-based modality for stimulating hair growth in men and women in AGA. LLLT promote hair growth. Although the mechanism is still unclear, it is postulated that this action is due to mitosis acceleration and may be due to the activation of follicular keratinocytes and stem cells. Microneedling is also known as collagen induction therapy. It has been proposed that the trauma generated by needle penetration in the skin induces dermis regeneration. This research aims to assess the effectiveness of LLLT combined with scalp microneedling in the management of AGA. Three adult patients with AGA were subjected to scalp microneedling using clobetasol propionate 0,05% solution plus LLLT for 25 minutes. The treatment was performed at monthly intervals**.** Results have shown statistically significant improvement after treatment for three months. Low-level laser therapy combined with scalp microneedling could be a safe and good modality for managing AGA as determined by the clinical.

| KEYWORDS

Alopecia Androgenetic, Low Level Laser Therapy, Scalp Microneedling, Clobetasol Propionate

| ARTICLE INFORMATION

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1. Introduction

Androgenetic alopecia (AGA) is a widespread dermatological disorder in which hair of the scalp is gradually converted from terminal to vellus in a reproducible pattern affecting both sexes. This pathophysiology is known as miniaturization. Pattern hair loss, also known as androgenetic alopecia or male pattern hair loss (MPHL) in males and female pattern hair loss (FPHL) in females, is the most common alopecia. [Galadari, 2020; Goren, 2018; Yi, 2020] Androgenetic alopecia is characterized by a progressive decline in hair fibre production by scalp hair follicles and their subsequent miniaturization. MPHL/AGA is due to a combination of genetic predisposition and the effect of androgens. Established medical management for pattern hair loss consists of 5α-reductase inhibitors (finasteride and dutasteride) and topical minoxidil, which require frequent and indefinite use and have limited effectiveness. [Galadari, 2020; Goren, 2018; Yi, 2020]

Due to the need for more successful therapies, LLLT and scalp micronedling have emerged as novel therapies for treating pattern hair loss. LLLT has biostimulatory effects on tissues and is presumed to prolong anagen (growth phase), stimulate anagen reentry from telogen (resting phase), and inhibit early transition to catagen (regression phase). [Galadari, 2020; Goren, 2018; Yi, 2020]. Scalp microneedling may be considered a minimally invasive dermatological technique during which fine needles are rolled over the skin to puncture the corneum stratum. This therapy results in collagen formation, neo-vascularization and growth factors manufacturing of treated areas. Microneedling creates small holes within the skin and multiple micro-channels, increasing transdermal penetration of medication. [Fertig, 2018; Stoll, 2015]

2. Material and Methods

Patient characteristics are reported in Table 1.

Table 1. Characteristics Patient

Patients	Gender	Ludwig degree	Hamilton-Norwood degree	Targeted area	Age
1	Male	III	-	Frontal, Vertex	41
2	Female	-	III Vertex	Parietal, Vertex	53
3	Female	-	III Vertex	Parietal, Vertex	47

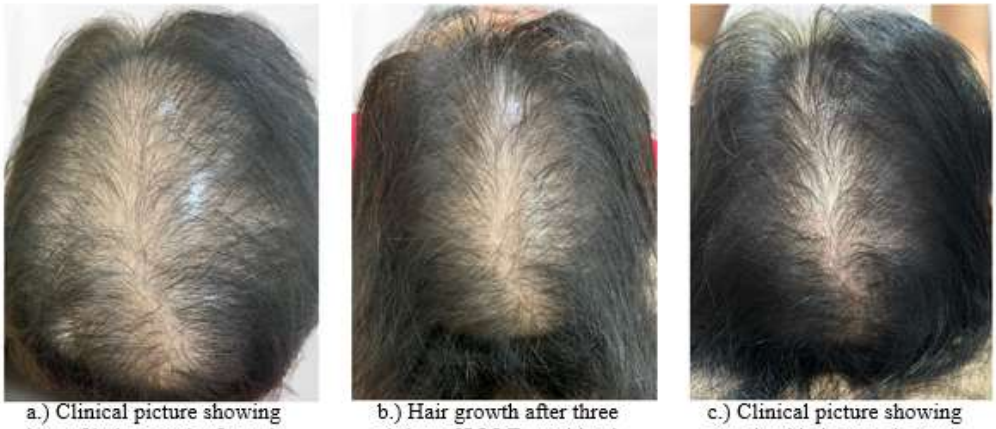
Three adult patients with AGA were subjected to scalp microneedling using clobetasol propionate 0,05% solution plus LLLT for 25 minutes. Thyroid and autoimmune disease, anemia and vitamin B deficiency were excluded.

The scalp was surgically cleansed with normal saline. A microneedling of 1.5 mm sized needles was gently rolled over the affected areas of the scalp in longitudinal, vertical, and diagonal directions until mild erythema was noted; this was considered as the end point of the procedure. All patients were treated with microneedling using clobetasol propionate 0,05% solution and at the same time was applied to the corresponding scalp area for penetration and massaged with fingers to promote drug absorption combined with sessions of LLLT for 25 minutes. Each procedure lasted for about 40-45 minutes. LLLT combined with scalp microneedling was performed at monthly intervals. The patient was prescribed minoxidil 2%; apply 1 milliliter (mL) to the scalp two times a day.

All patients were evaluated upon their initial visit, at 3 and 6 months from starting the treatment. Efficacy was evaluated using photography.

3. Results

The efficacy was measured by hair regrowth using photography assessment in Figure 1-4. All patients reported a subjective increase in the thickness of thin hair after a month of initiation of the microneedling procedure. After 3 months, new hairs were noticed on the scalp surface and by the end of 6 months, significant scalp coverage was noted.



a.) Clinical picture showing loss of hair over the frontal scalp

b.) Hair growth after three sitting of LLLT combined scalp microneedling scalp

c.) Clinical picture showing sustained hair growth at follow up after 6 months

Figure 1. Patient 1

a.) Clinical photography at baseline

b.) 3 months after treatment

c.) 6 month after treatment

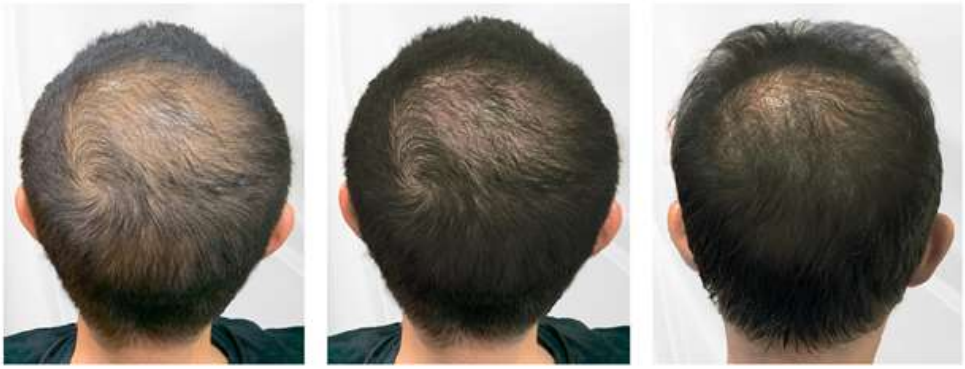
Figure 2. Patient 2

a.) Clinical photography at baseline

b.) 3 months after treatment

c.) 6 month after treatment

Figure 3. Patient 2



a.) Clinical photography at baseline

b.) 3 months after treatment

c.) 6 month after treatment

Figure 4. Patient 3

4. Discussion

Pattern hair loss, also known as androgenetic alopecia, or male pattern hair loss in males and female pattern hair loss in females, is the most common alopecia.[Adil, 2017] Prevalence increases with age, and a study found that 57% of women and 73.5% of men over the age of 80 suffered from pattern hair loss [Gan, 2005] Because hair is an important aspect of human appearance, which is commonly used for identification and is one factor of physical appeal, hair loss can lead to diminished quality of life and flawed social worth. [Wells, 1995]. In this case, one female patient and 2 male patients above 40 were the subjects. The hair condition of female patients was loss of hair over the frontal scalp. Both male patients' hair condition of losing hair at baseline.

Androgenetic alopecia is progressive, so therapy aims to improve the clinical presentation and prevent disease progression. This can be achieved if the therapy is carried out early in AGA. Therapeutic modalities choice for AGA is an antiandrogen, androgen-independent, and coadjuvant therapy. Finasteride 1 mg and minoxidil 2–5 % solution are the only US FDA-approved treatment options for AGA. [Blume, 2019].

A variety of laser and light sources have been promoted for the treatment of hair loss. The mechanism of action has yet to be discovered. It has been hypothesized that light may activate dormant hair follicles, increase blood flow, and upregulate the production of growth factors and adenosine triphosphate that stimulate anagen hair. Low-level light therapy is a fairly new technique for treating AGA with different devices, such as a comb, hood, and helmet. [Kelly, 2016]

Low-intensity light is called low-level laser therapy, which stimulates tissue cellular activity. It is associated with various wavelengths, from red to infrared laser light, that promote tissue repair and regeneration. The overall effect of LLLT on the body is called photobiomodulation. The "optical window" for biological tissue is approximately 650–1200 nm. The tissue penetration is maximum at these wavelengths, and thus, red or near-infrared light (600–950 nm) is utilized in LLLT. LLLT has been reported to stimulate hair growth in men and women in androgenetic alopecia and was approved by the US FDA in 2007. It is assumed to stimulate anagen phase re-entry in telogen hair follicles, prolong the anagen phase's duration, and increase proliferation rates in active anagen hair follicles. In addition, it also helps to promote reparative regeneration, which occurs during wound healing, and physiological regeneration, which occurs during the hair cycle, which relies heavily on cell proliferation. These laser actions may normalize the physiological regeneration of scalp hair follicles affected in various hair loss disorders such as male and female AGA, alopecia areata, and chemotherapy-induced hair loss. [Avci, 2013; Suchonwanit, 2018; Ash, 2015; Darwin; 2018]

A systematic review of ten trials demonstrated significant improvement of the androgenic alopecia compared to baseline or controls when treated with LLLT. This review suggests using LLLT independently or as an adjuvant of minoxidil or finasteride [Darwin, 2018]. Another systematic review concludes that LLLT is a promising noninvasive treatment for AGA. [16] In this case, we used LLLT after scalp microneedling for 25 minutes.

Microneedling therapy is becoming popular in the management of acne scars and also for facial rejuvenation. Recently, it has been shown to stimulate hair growth. The proposed mechanism of action is the stimulation of dermal papillae and stem cells. Microneedling also increases the blood supply to the hair follicles. It has also been hypothesized that the microinjury produced by microneedling helps recruit growth factors and induce hair growth. [Kelly, 2016].

Scalp microneedling was first reported in 2012. Two studies have shown increased gene expression related to hair after microneedling in mice. Possible mechanisms are (a) the release of platelet-derived growth factor (PDGF) through platelet activation and the mechanism of wound regeneration; (b) activation of follicle stem cells during wound healing; and (c) gene overexpression associated with hair growth such as VEGF, b-catenin, Wnt3a, and Wnt10b. [Kelly, 2016]. A study by Dhurat and Mathapati on microneedling shows beneficial effects on promoting new hair regrowth, even in patients who responded poorly to conventional therapy. [Dhurat, 2015].

Microneedling has been successfully paired with other hair growth-promoting therapies, such as minoxidil, platelet-rich plasma, and topical steroids, and has been shown to stimulate hair follicle growth. It is thought that microneedling facilitates penetration of such first-line medications, and this is one mechanism by which it promotes hair growth. [Fertig, 2018].

Meanwhile, the microchannels formed by microneedling can improve the bioavailability of drugs. Currently, microneedling successfully promotes hair growth with other growth-promoting agents such as minoxidil, platelet plasma and topical corticosteroids. [Fertig, 2018].

Combining microneedling with clobetasol propionate solution 0,05% application facilitates absorption of the drug with its known immunomodulatory effects. Another advantage of the combination of microneedling with clobetasol propionate solution 0,05% could be the collagen induction by microneedling. Corticosteroids reduce inflammation around the hair follicle and allow it to

return to the normal growth cycle. Clobetasol propionate cream was more efficacious than hydrocortisone cream, and betamethasone valerate was more effective as foam than lotion. The action of corticosteroids in AGA suppresses the T-cell-mediated immune response against hair follicles. [Lenane, 2014]. In this study, all patients were treated with scalp microneedling of 1.5 mm sized needles using clobetasol propionate 0,05% solution. At the same time, it was applied to the corresponding scalp area for penetration and massaged with fingers to promote drug absorption.

Our cases showed a great increase in hair growth without any complications associated with the LLLT combining scalp microneedling procedure. As can be seen from the photos, the results were satisfactory.

5. Conclusion

The pathogenesis of androgenetic alopecia is multifactorial and is still not clear. The efficacy of conventional therapies concerning new hair growth could be better. The present case series showed effective and promising results using combinations of LLLT and scalp microneedling using clobetasol propionate 0,05% solution. No side effects have been reported in the cases, and LLLT combined scalp microneedling is safe. However, the total number and frequency of sessions and long-term sustainability of response of LLLT combined with scalp micro needling need to be evaluated within a larger population.

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