Correspondence

Treatment of alopecia areata with fractional photothermolysis laser

Dear sir,

Many studies have documented an abnormal cell-mediated immune reaction in alopecia areata (AA). The key histopathologic feature of AA is a lymphocytic infiltrate around the lower hair follicle, which may appear in a characteristic “swarm of bees” pattern. The affected hair follicles terminate their anagen phase prematurely and regress via the induction of massive apoptosis of the lower portion of the follicle (the catagen phase), which results in a resting hair follicle (the telogen phase). The hair follicles may then re-enter the anagen phase, but in the presence of a lymphocytic infiltrate, the anagen is terminated prematurely, which results in miniaturized hair follicles. AA represents a disorder of hair follicle cycling in a dual sense: it almost exclusively attacks anagen hair follicles and then greatly disturbs hair follicle cycling by “catapulting” anagen follicles into the catagen phase.

The treatment of AA depends on the severity and extent of the disease. The medications include a topical irritant, and in mild cases, topical and intrallesional steroids. More aggressive therapy is used for severe cases, however, such as systemic corticosteroids, immunosuppressive drugs, and immune modulators. These treatments frequently show side effects and a relatively high relapse rate. Recently, laser treatment of different wavelengths has been used to manage this problem.

Fractional photothermolysis is a recently introduced laser technique. It produces a unique thermal damage pattern called “microthermal treatment zones (MTZ)” and characteristically spares the tissue surrounding each MTZ. It keeps the stratum corneum intact and gives “fractional” microscopic thermal columns to the dermis, then creates a healing process that includes inflammatory cells, such as lymphocytes.

A 35-year-old male presented to our hospital with a 2-year history of multiple large lesions of alopecia areata on the frontal region of the scalp (Fig. 1a). He was treated with several methods, such as topical 5% monoxidil, topical steroid, and intralesional corticoid injections, for 2 years but did not experience hair regrowth. After obtaining written informed consent, we treated him with fractional laser therapy (Mosaic™ Lutronic, Inc., Gyeonggi, Korea) weekly for 24 weeks. A pulse energy of 10–15 mJ, and a density of 300 MTZ/cm²/pass were used, and two passes per session were performed. The treatment was well tolerated with no reported side effects. Hair growth was already observed after 1 month. After 3 months, lesions were covered with 30 to 40% of mostly pigmented terminal hair. After 6 months of fractional laser therapy, there was complete regrowth in the all lesions (Fig. 1b). No relapse was observed during the follow-up period of 6 months. For this reason, patients were satisfied with the treatment outcome.

The mechanism of the fractional laser in inducing hair regrowth in AA lesions is thought to be the induction of T-cell apoptosis and enhancement of hair growth. Numerous reports are supporting the hypothesis that laser, such as 308 nm excimer laser, diode laser might induce
hair growth due to their ability to induce T-cell apoptosis or decrease inflammation.

Another possible mechanism is a decrease in perifollicular lymphocytic infiltration through “scattering of perifollicular lymphocytes”. The fractional laser therapy makes microscopic thermal columns in the dermis, and then creates a healing process that includes lymphocyte infiltrations. These phenomena may scatter perifollicular lymphocyte infiltration, which is a characteristic histologic feature of AA, around the column lesions. Therefore, fractional laser therapy may halt disease progression by arresting the hair follicles in the telogen stage of the hair cycle and increasing the anagen stage.

Furthermore, minor trauma and wound healing itself can drive hair growth. After wounding, in a mouse model, hair follicles form de novo neogenesis in skin. And this de novo hair follicle neogenesis is originated from nonhair-follicle stem cells. Therefore, fractional laser can also induce minor trauma and wound healing process which might facilitate hair growth.

Even though there is no optimal therapeutic parameter yet for the fractional laser for AA, the authors treated with laser therapy until 24 weeks. These protocols may affect the overall outcome for success, because persistent response was observed after 6 months in many previous reports which were treated by other laser modalities to AA.

Until now, we have no idea which cytokines are key inducers of these interesting phenomena. We hope this puzzle will be solved in the near future by physicians and scientists who major in hair biology.

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This Research was supported by the Chung-Ang University Research Grants in 2009.

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