

Physician Editorial on Low Level Light Therapy

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Fighting Hair Loss

Low-light level lasers, in combination with traditional therapy, are a powerful adjunct in the battle against hair loss.

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A new era of nonsurgical hair restoration technology is here for men with hair loss.

We all know that hair loss can be emotionally devastating for women; hair has long been a symbol of feminine beauty and sensuality. But hair loss in men is no less devastating. Men report reduced self-esteem, difficulty dating and trouble securing a new job. A balding hairline makes a man look and feel older than he is.

Many men with hair loss have dreamed of the "magic bullet," the special vitamin or treatment that will reverse hair loss. Surgical hair treatments, such as hair transplantation, scalp reduction, flaps and tissue expansion, are available. So is medication, such as Minoxidil and Propecia. However, most treatments have been disappointing, usually saving the hair that's already there, but doing little to grow back the hair that's already lost.

For obvious reasons, most men are skeptical of treatments that promise to reverse hair loss. But a new era of hair restoration technology, using "cold" laser hair therapy (LHT), offers hope for those who don't have advanced hair loss. LHT alone and in combination with topical *and/or* oral medications has produced excellent results for men and women.

Also known as "cold" lasers, LHT uses therapeutic soft low-light level lasers (LLLL) that were developed in Europe for healing wounds, treating hair loss and other diseases of the scalp.

The laser uses a pure visible red light at 633 nm, the optimum wavelength and frequency to stimulate a dramatic increase in micro-circulation of blood supply in the scalp. This increases cellular metabolism and promotes the repair of damaged cells and weakened hair follicles, leading to the cessation of hair loss and the stimulation of hair re-growth.

The exact mechanism of action for visible red LHT at the cellular and sub-cellular level is not clear. However, current evidence suggests the effects are based on enhanced cell proliferation. Specific biological effects can be seen by irradiating a cell.¹ In particular, 633 nm light directly affects the physical state of pore molecules.

The physical state of a cell is affected by changing the permeability to calcium ions. An abrupt and transient increase in calcium ion concentrations act as intracellular messengers. This photochemical change affects the mitochondria, and, in turn, messenger RNA synthesis, which ultimately leads to the observed enhancement of cell proliferation.

Karu¹ demonstrated that radiation produces specific biological effects in tissue, while Trelles et al.^{2,3} Muxeneder and Mester et al.⁵ demonstrated the effects of LLLL in multiple trials, including vertebral pain management, the treatment of headaches and local immune responses. Subsequently, LLLL was successfully applied to wound healing. Researchers observed that LLLL stimulated rapid healing in a safe and effective manner. Thus, many irradiated septic wounds would heal.

This same principle is now applied in LHT. The device repairs damaged blood vessels in the scalp by promoting neovascularization, thereby providing hair follicles with the circulation they require.

The LHT program uses a laser device with multiple lasers on a rotating head. The rotating head is housed in a moveable hood that is positioned directly above the patient's head. The patient is seated while the hood is lowered onto the head, approximately 2 cm from the scalp. The close proximity of the laser to the patient's scalp allows for maximum irradiation and minimal dispersion of the laser light energy. Each patient receives 20 minutes of treatment three times a week for six to 12 months. The FDA has certified the laser as a class 1 cosmetic

device.

Patient selection is based on an initial medical evaluation to rule out other causes of hair loss. Then we take a series of close-up photographs of the head, followed by a series of 1 cm video microscopic images of the frontal, vertex and temporal hairlines. These pictures are used for before-and-after comparisons when the patient is followed up at three-month intervals.

LHT is extremely safe. An LLLL device doesn't emit ablative energy. Hence, there is no risk of injuring the patient's epidermis or dermis. The laser energy does, however, stimulate blood flow, and patients may complain of a transient headache after the first few treatments.

With three 20-minute treatments per week, patients have a nonsurgical, no-risk and safe method for regaining "hair. LHT is commonly combined with traditional medical treatments for even greater effectiveness. Most patients receive six to 12 months of treatments followed by weekly or monthly maintenance treatments. The cost of treatment varies from \$3,000 to \$5,000 per year, plus the cost of medications.

LHT is effective in treating androgenetic alopecia and telogen effluvium. Based on the experience in my practice, 80 percent of patients with androgenetic alopecia report increased hair density after the first three to six months of treatment. Nearly all of my patients with telogen effluvium report complete cessation of shedding. The hair growth continues while patients complete the full one year of LHT and will taper after 12 months. Most patients will require monthly follow-up treatments to maintain their results. All patients who take oral or topical medications are encouraged to continue on those as well.

Origins of Hair Loss

Hair loss is a multifactorial problem affected by genetics, hormones and environmental issues, as well as diet and daily activity. Many people believe that hair loss is passed down to men through their mother's side or to women from their father's side.

In 1916, a female physician named Dorothy Osborne started the myth that the baldness gene behaves in an autosomal dominant manner in men and an autosomal recessive manner in women.⁵ However, we now understand that hair loss is a complex trait, and a contribution exists from both parents. Having said this, we also know that the majority of male pattern baldness is androgen related.⁷ The extent of expression of testosterone, dihydrotestosterone (DHT) and DHT receptors is hereditary in men and women. One third of the sex hormonebinding globulin changes of age depend on genetic factors, as does the variability in testosterone concentrations.

Diets low in proteins and vitamins also will lead to unwanted hair loss. Essential vitamins for good follicular health include thiamin (B1), riboflavin (B2), niacin (B3), biotin and zinc. Additional supplements include boron, methylsulfonylmethane (sulfur), L-cysteine, L-methionine and lutein. A healthy active lifestyle that includes a balanced diet with nutritional and mineral supplements for hair health will maintain strong hair follicles, leading to thick hair shafts.

Male pattern baldness, also referred to as androgenetic alopecia, is prevalent in Americans, affecting 30 million men starting as early as their teens and all the way into adulthood.⁸ Patients typically present with a focal distribution of hair loss in various stages well documented by the Hamilton-Norwood classification. This is a clinical grading scale for staging male androgenetic alopecia and describes the progression of male pattern baldness in a range from stages I to VIII. A gradual onset of hair loss occurs bi-temporally from the frontal areas, with progression to a wider area of thinning hair that may or may not have bare patches. Men will experience minimal shedding, and pulling on hair will not yield a lot of hair.

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More than 20 million women suffer from androgenetic alopecia as well. Female patients present with similar complaints of hair loss as their male counterparts. But female hair loss is further complicated by telogen effluvium, a more generalized distribution of hair loss more commonly seen in women than men. This condition is characterized by thinning hair, without bare patches, and prominent shedding and frequent telogen hairs when brushing or pulling on the hair.

In both sexes, the hair loss pattern described by androgenetic alopecia or telogen effluvium is primarily associated with genetic and hormonal factors. Multiallelic genetic factors exist from either parent that predetermine a person's sensitivity to androgens. The hormonal factors affect androgen receptors, thereby reducing normal blood supply to hair follicles. Over time, this leads to atrophy of the miniaturized hair follicles and thinning hair. This process continues unchecked until the hair follicles have completely atrophied.

We can achieve complete reversal of follicular atrophy and hair loss when treatment is initiated within two years of its onset. Unfortunately, many patients wait 10 or more years after hair loss before pursuing any treatment. Most forms of hair loss that are diagnosed and treated at an early age respond to treatment. However, most treatments started late in the progression of hair loss are less effective and will only reduce or stop the progression.

Medications to Treat Hair Loss

Along with LHT, androgenetic alopecia has three commonly accepted forms of treatment: Minoxidil, anti-androgen therapy and hair transplantation.

Minoxidil is FDA-approved and available for men and women as first-line therapy for androgenetic alopecia and telogen effluvium. It's available over-the-counter in 2 percent to 5 percent concentrations or up to 10 percent solutions by prescription. In use for 18 years, it shows minimal to moderate hair regrowth potential. The benefits of minoxidil will be lost, however, within six months if patients stop using it. Side effects may include itching, headaches, dizzy spells and possible heartbeat irregularities; most will resolve with regular use.

Anti-androgen therapy in the form of Propecia (finasteride) is available for men. Finasteride inhibits the 5-alpha reductase enzyme that transforms testosterone into the dihydro-testosterone (DHT) that's primarily responsible for androgenetic alopecia. Blocking the action of DHT seems to stimulate minimal to moderate hair regrowth. Side effects may include impotence, loss of libido and reduced sperm count. Patients who cannot tolerate side effects are instructed to stop using the medication.

Small-scale, variably controlled studies on young men with mild to moderate male pattern hair loss suggest that combination therapy with minoxidil and finasteride may be more effective than monotherapy.⁹

For patients with advanced hair loss or complete baldness who do not respond to medical treatment, surgery is the most substantial permanent solution. In fact, surgical hair restoration is the only permanent solution to baldness. The process involves a series of grafting treatments that extract plugs of hair or individual hair follicles from the back of the head, where hair grows densely, and implanting them in the balding areas. Most patients require two to three treatment sessions. The cost varies based on the surgeon's expertise and whether he extracts/implants plugs or individual follicles. The latter is more time-consuming and, therefore, more expensive.

If your patients haven't tried a medical treatment, or don't have advanced hair loss, then consider starting traditional medical treatments in combination with LHT.

At my offices in New York and Los Angeles, patients receive LHT in combination with topical and/or oral medications when indicated. Patients typically enroll in a 12-month program that includes before and after pictures, a microscopic scalp evaluation, a general medical evaluation and the required course of treatment with LHT.

Most male patients with advanced androgenetic alopecia and female patients with androgenetic alopecia or telogen effluvium will receive a variety of topical medications. We encourage male patients with fewer than 10 years' history of androgenetic alopecia to start finasteride to ensure the best chance of hair regrowth.

The treatment options are many and each can be customized. Fortunately, people no longer need to endure hair loss. The most important consideration for complete hair restoration is to start treatment at an early age and to save hair while patients have it.

With LHT, we have the enhanced benefits of low-light level lasers that stimulate biophysical repair and neovascularization. This is a remarkable adjunct to the combination of other therapies we now have. It warrants further consideration and integration into practices serious about treating hair loss.

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