DUAL-FUNCTION LASEMD: NOT JUST A PRETTY FACE

Lutronic's Lasemd, used in conjunction with the Multi-Nanosome Granulated (MNG) technology, post-care masks, and take-home cosmeceuticals, is a novel 21st Century approach to gentle skin care for both patient and clinician

LUTRONIC HAS RECENTLY launched their innovative LASEMD (Laser Assisted Single Effective Molecule Delivery) system based on a fractional thulium laser delivering a wavelength of 1927 nm. The system offers dual functions: a Cosmeceutical Delivery System (CDS) to effectively deliver the active molecules of the specialty formulations through the epidermis and into the dermis, and an effective skin rejuvenation system for wrinkle reduction, skin tone improvement and the lightening of mild dyschromia, on and off the face.

Skin barrier function: friend and foe

The skin, comprising the dermis covered by the epidermis, is the largest living organ in the human body. It helps to maintain the homeostasis and hydration of the tissues under it, and at the same time protects them from exogenous insults through the skin barrier function, in which the epidermis plays the major role. In its protective role, however, the epidermis acts as a two-edged sword. While harmful substances find it difficult to penetrate the barrier, so do beneficial substances: this presents a major problem for cosmeceutical manufacturers, because only a small fraction of topically-applied active ingredients can penetrate through the epidermis, in particular the tough, waterproof outer layer, the stratum corneum, and into the dermis wherein lie the target cells and structures, to rejuvenate tired and photoaged skin.

Solution: selectively breaking the barrier with fractional 1927 nm

The left-hand panel in *Figure 1* shows the layers of the skin, comprising the epidermis and part of the upper dermis. The keratinous stratum corneum (horny layer) can be seen lying above the stratum granulosum (granular layer) and the stratum spinosum (prickle cell layer), with these sitting on the stratum basale (basal layer) at the dermoepidermal junction. The tightly-knit keratin flakes of the horny layer are glued together with a mixture of sebum and other secretions, and the daughter keratinocytes in the prickle cell layer have tight cell-cell adhesions, thus presenting two contiguous barriers to any substance trying to reach the dermis.

1927 nm in the near infrared from the thulium laser has a higher affinity for water than the 1064 nm of the Nd:YAG, but not as high as the 2970 nm beam of the Er:YAG. Controlled penetration into the skin can therefore be achieved, based on the selective water absorption achieved by 1927 nm. The prickle cell and basal layers of the epidermis thus present a good target for the Lasemd beam, whereas the horny layer, having little water content, does not. Fractionating the Lasemd beam into 100 µm microbeams means that discrete nonablative microchannels are created through the epidermis and into the superficial papillary dermis, as illustrated in *Figure 1*, right-hand panel.

The permeability of the horny layer is changed although its lattice matrix remains intact, and denaturation of the prickle cell layer destroys the tight cell-cell adhesion, altering permeability. A vacuole is seen where separation has occurred at the dermoepidermal junction. This forms a reservoir wherein active ingredients, applied topically to the skin following lasing, work down through the denatured stratum spinosum and accumulate, allowing the molecules in the cosmeceutical to penetrate into the dermis through the mild coagulation in the superficial layer of the papillary dermal tissues.

The combination of the microsized channels and minimal damage to the stratum corneum and stratum spinosum means that the microdamage to the treated area is virtually invisible to the naked eye, and is followed by microcrust formation and swift

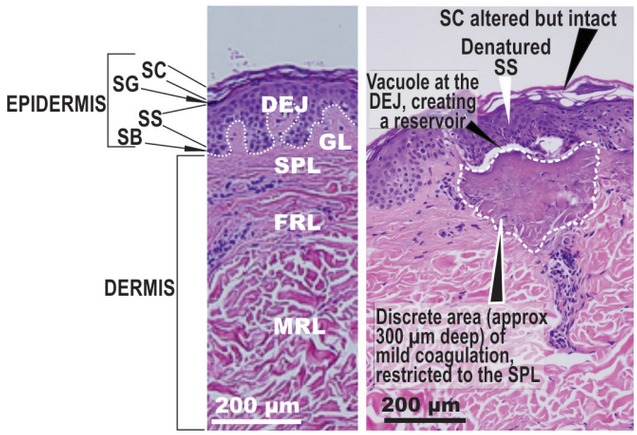

Figure 1 (Left): Structure of skin showing layers. (Right) Lasemd impact on skin in Advance Mode.
Microdamage is surrounded by normal undamaged tissue. (H&E, human skin, original magnification x200)
SC, stratum corneum; SG, stratum granulosum; SS, stratum spinosum; SB, stratum basale; DEJ, Dermoepidermal junction (dotted line); GL Grenz layer of SPL, superficial papillary layer. FPL, fine reticular layer; MRL, mid reticular layer

regeneration of all epidermal layers with no downtime. In addition, anesthesia is not usually required.

Dual function Lasemd: CDS and skin rejuvenation, on and off the face

This sub-ablative approach not only allows access to the dermis for topically applied active molecules, but also minimizes post-procedural inflammation and edema, limiting downtime and formation of post-inflammatory hyperpigmentation (PIH), especially in the darker Asian skin types III and greater. This situation is ideal for transepidermal delivery of active cosmeceutical agents, but the mild coagulation in the upper dermis also kickstarts the wound healing process to give neocollagenesis followed by remodelling and rejuvenation of the upper layer of the dermis. This includes the important Grenz layer coursing under, and attached to, the dermoepidermal junction via the basement membrane. The rejuvenated Grenz layer ensures that youthful changes in dermal architecture are transmitted also to the epidermis, and the minimal fractional damage to the stratum corneum and stratum spinosum ensure swift reepithelization.

The denatured areas are surrounded by areas of normal tissues, which assist with the reconditioning of the epidermis and result in luminous, bright-looking skin. Furthermore, because penetration is limited to the epidermis and very superficial dermis, epidermal dyschromia also present an excellent indication for Lasemd in addition to skin rejuvenation, and tissue targets are not limited to the face. The décolleté and backs of the hands are also ideal targets for this dual-purpose system.

Lasemd: station and ampoules create a winning combination

The stylish design of the Lasemd station (*Figure 2*) with its futuristic shape and LED-driven GUI, and an ergonomically designed handpiece make it easily fit into any clinic. The thulium laser energy is delivered to the tissue via a flexible optical fiber and the fractional handpiece. The fractional handpiece delivers microbeams to the tissue, sparing areas of tissue around and between the microbeams. This helps prevent excess thermal build up through heat stacking.

There are two modes for beam delivery: static and dynamic. In static mode the handpiece is moved across the tissue in a stamping motion, whereas in dynamic mode the handpiece is kept in constant motion across the target tissue. Microbeams are precisely laid down in dynamic mode through the unique magnetic roller in the handpiece. The advanced magnetic rolling precisely tracks the delivery of the microbeams to ensure the correct microbeam density regardless of the speed at which the handpiece is moved.

The CDS function of Lasemd is designed to deliver efficiently and directly only the pure formulated effective ingredients into the dermis that can help skin rejuvenate itself through natural healing and regeneration processes. Lutronic has developed and compounded a selection of ampoules for CDS use. Each ampoule, aimed at a specific aspect of skin care, contains sterile nanosized particles encapsulated for liposomal delivery with multi-nanosome granulated (MNG) technology, and optimally formulated for post-laser application due to their sterile formulation, minimal ingredients and prolonged epidermal retention. The ingredients in the ampoules are activated just before application by thorough mixing in the built-in Lasemd incubation port while the clinician is lasing the target tissue, and then applied to the treated area. The specially formulated post-treatment masks and take-home cosmeceuticals required during the 2 weeks after treatment will significantly enhance the overall patient experience. The total treatment time is less than 30 min, and 5 CDS sessions are recommended with 2 weeks between sessions with the Lasemd in the Easy mode.

Figure 2 Lasemd station, ergonomic handpiece and ampoules

For skin rejuvenation, both on and off the face, the Lasemd is applied with multiple passes in Advance mode over 3 sessions, 4 weeks apart. The ability to increase the intrabeam energy in Advance mode allows physicians to utilize Lasemd to create superficial dermal damage similar to the residual thermal damage of the CO_2 laser but without any tissue ablation, thereby minimizing side-effects and downtime, and accelerating tissue regeneration. Moreover, the 300 µm depth of damage (illustrated in the right-hand panel of Figure 1 above) can satisfy the large number of patients whose primary goal is the lightening of dyschromia. This substantial skin rejuvenation effect is what gives Lasemd its true dual function, in addition to its role as a gentle CDS. Lasemd combined with the purely formulated cosmeceuticals provide physicians and patients a wonderful way to rejuvenate and lighten the skin, and maintain a healthy smooth completion.

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